REMEDY SELECTION REPORT

COAL ASH PONDS
ELMER SMITH STATION
DAVIESS COUNTY
OWENSBORO, KENTUCKY

Prepared For:
OWENSBORO MUNICIPAL UTILITIES
OWENSBORO, KENTUCKY

Prepared By:
CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
PITTSBURGH, PENNSYLVANIA

CEC Project No. 164-014.0021

October 27, 2021

Civil & Environmental Consultants, Inc.

Pittsburgh | 333 Baldwin Road | Pittsburgh, PA 15205 | p: 412-429-2324 f: 412-429-2114 | www.cecinc.com

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1.0 INTRODUCTION

The United States Environmental Protection Agency (U.S. EPA) issued 40 Code of Federal Regulations (CFR) §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 this Remedy Selection Report for the Coal Ash Ponds (aka the Site) at the Elmer Smith Station (ESS) pursuant to the CCR Rule, specifically 40 CFR §257.97, because constituents of concern (COCs) were quantified in groundwater at concentrations exceeding the Groundwater Protection Standards (GWPS) developed for the Site.

It is intended that this document be placed in the facility's operating record as required by 40 CFR §257.105(h)(12), submitted to the appropriate State regulatory agency in accordance with 40 CFR §257.106(h)(9) and posted on the publicly-accessible website as required by 40 CFR §257.107(h)(9).

2.0 SITE OVERVIEW

2.1 BACKGROUND

The Ash Pond area associated with the Site is less than 10 acres in size and consists 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 Pollution 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, 19621, 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 pursuant to 40 CFR §257.91, as documented in the GMS Certification Report dated October 17, 2017, and Amended GMS Certification Reports dated March 2019 and August 2021. Prior to the installation of the GMS, groundwater monitoring had not been conducted at the Site. Subsequently, CEC performed groundwater sampling consistent with requirements of the Detection Monitoring Program of the CCR Rule. Statistically significant increases (SSIs) of Appendix III parameters relative to baseline concentrations at designated background wells were identified in the groundwater samples collected from the downgradient GMS wells triggering a transition from the Detection Monitoring

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

Program to the Assessment Monitoring Program in April 2018. Two COCs (molybdenum and selenium) have been quantified at statistically significant levels (SSLs) during the Assessment Monitoring Program in downgradient GMS wells. Molybdenum has been quantified at SSLs in GMS wells MW-5 and MW-6 since April 2018, prompting an Assessment of Corrective Measures (ACM), which was detailed in the ACM report dated May 29, 2019. Selenium was quantified at a SSL in GMS well MW-6 in December 2020 and confirmed during a resampling event in February 2021.

Preparations for the public meeting to discuss the results of the ACM were underway in early 2020. However, OMU was unable to hold a public meeting due to mass gathering restrictions imposed by the Commonwealth of Kentucky due to the Covid-19 pandemic. OMU has been evaluating costs associated with the Corrective Measures Options (CMOs) provided in the ACM in the interim, as well as the risks and benefits of each source control option since issuance of the ACM. OMU has also prepared semi-annual reports documenting the progress in selecting and designing the remedy, pursuant to 40 CFR §257.97. Copies of these reports are available on the publicly-accessible website.

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 about 26 to 43 feet bgs, varying in thickness from approximately 1 foot to over 16 feet, with increasing thickness towards the south/southeast. The clay layer is underlain by saturated, coarse-grained deposits that comprise the uppermost aquifer at the Site. A geologic cross-section is provided as Figure 3. Aquifer saturated thickness in the vicinity of the Site ranges from

approximately 60 to 100 feet[2]. Based on the elevation of the groundwater table and the bottom elevation of the Ash Ponds, groundwater is not in direct communication with the Ash Ponds. Boring logs for the Site are provided in the GMS Certification Report (amended August 2021).

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 2020 sampling events ranged from 60.50 feet below top of casing (BTOC) at MW-7 to 38.06 feet BTOC at MW-1. Static groundwater elevations on-site during 2020 ranged from 358.27 feet above mean sea level (AMSL) at MW-8 to 367.07 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 4a, 4b, and 4c.

Groundwater elevation measurements obtained during the May 13, 2020 groundwater monitoring event indicated that the groundwater flow direction was to the southeast (Figure 4a) 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 and as such, the 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 (Figure 4b) 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 appears to be consistent with

[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.

prior findings, the flow direction is not and is interpreted to be a result of OMU terminating the operation of the production wells in the vicinity of the Ash Ponds in October 2020 and activating a well field about 1 mile to the southwest and downstream of ESS to generate groundwater for treatment and distribution to its drinking water customers. Groundwater flow patterns are interpreted to currently be in a state of flux as they transition from the pumping-induced state created by the operation of the production wells proximate to ESS to a state that is consistent with present-day conditions, which includes a combination of influence from the new production wells pumping to the southwest and the groundwater-surface water interactions of the adjacent Ohio River.

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].

[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

The GMS consists of nine monitoring wells. While initially used for both groundwater elevation and quality monitoring, monitoring wells 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. Monitoring well MW-9 was added in 2021 in response to the shifting groundwater flow direction and selenium SSL in MW-6 that was identified in December 2020 and serves to monitor both groundwater elevation and groundwater quality downgradient from the Ash Ponds. Refer to the GMS Certification Reports for lithologic descriptions and well construction diagrams.

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). Therefore, 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 former operation of the nearby production wells at that time. MW-7 was selected as a secondary location to represent background conditions based on its hydraulic position and distance from the Ash Ponds.

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 to the southeast from 2016 through mid-2020, 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 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).

The recent detection of selenium at a SSL in MW-6 and, more notably, the changes in groundwater flow direction, necessitated a reconfiguration of the GMS network by OMU to re-evaluate the relationship of existing wells relative to the CCR unit. Based upon current and expected future groundwater flow direction, MW-8 will be utilized as a background monitoring well along with existing background monitoring well MW-7. MW-2 will transition to become a downgradient GMS well along with MW-1, which will have groundwater quality monitoring activities reinstated. An additional GMS well (MW-9) was installed in June 2021 to the west and downgradient of the Ash Ponds and subsequently developed and sampled in conjunction with the 2021 first semi-annual Assessment Monitoring sampling event to evaluate groundwater quality due to the detection of selenium at a SSL in MW-6, and the changes in the groundwater flow direction. Laboratory results and results of the statistical evaluation for this sampling event will be included in the 2021 Annual Groundwater Monitoring and Corrective Action Report.

OMU plans to continue to monitor the groundwater elevations over the next year and will evaluate re-classification of the GMS wells (i.e., upgradient versus downgradient) and/or the need for additional GMS wells as part of the 2021 Annual Groundwater Monitoring and Corrective Action Report. OMU will revise their statistical evaluation plan to reflect the changes to the GMS wells' upgradient and downgradient designations. A summary of the GMS wells is provided in the table below.

CCR RULE GROUNDWATER MONITORING SYSTEM

Location	Relative Location	Well Diameter (in.)	Total Depth (ft.-bgs)	Screen Length (ft.)
MW 1	Downgradient	4	57	10
MW-2	Downgradient	4	57	10
MW-3	Upgradient	4	57	10
MW-4	Upgradient	4	59	10
MW-5	Downgradient	4	59	10
MW-6	Downgradient	4	59	10
MW-7	Background	4	72	10
MW-8	Background	4	63	15
MW-9	Downgradient	4	52	10

4.0 GROUNDWATER CONTAMINANT DISTRIBUTION

As noted in Section 2.1, the Site transitioned from Detection Monitoring to Assessment Monitoring in 2018, based upon detection of several Appendix III COCs (boron, calcium, sulfate, and total dissolved solids) at concentrations representing a SSI over background levels. Statistical analysis of the analytical results from the Assessment Monitoring sampling events conducted in 2018 quantified the presence of molybdenum at a SSL in downgradient monitoring wells MW-5 and MW-6. Subsequently, selenium concentrations were observed to increase in MW-6 and resulted in a SSL during the December 2020 groundwater sampling event. Molybdenum and selenium had not been identified in upgradient and/or background monitoring wells previously (with the exception of selenium in MW-2, see below for additional details), and the likelihood of potential sources of this constituent between the Ash Ponds and these downgradient monitoring wells was interpreted to be very low; therefore, the source of the impact is assumed to be the Ash Ponds. Therefore, two additional monitoring wells were installed, developed and sampled to delineate the extent of the plume. MW-8 was installed to the south of MW-5 and MW-6 during a time period when groundwater flow direction was to the south/southeast, and MW-9 was installed after groundwater flow direction shifted to the southwest with the idling of the nearby municipal production wells.

Analytical data received for MW-8 did not identify the presence of molybdenum or other COCs at concentrations exceeding their respective GWPS. MW-9 was installed, developed, and sampled in conjunction with the first semi-annual Assessment Monitoring event for 2021, the results of which are still pending. Groundwater analytical data are summarized in Table 2.

Molybdenum has been quantified during each of the groundwater sampling events conducted since June 2017 (Baseline, Detection Monitoring, and Assessment Monitoring) in monitoring wells MW-5 and MW-6. Concentrations at SSLs above the GWPS level of 0.10 milligrams per Liter (mg/L) have been detected during Assessment Monitoring events. Concentrations of molybdenum in MW-5 have ranged from 0.34 mg/L to 0.85 mg/L, and concentrations in MW-6 have ranged from 1.7 mg/L to 2.1 mg/L. The average concentrations are approximately 3.5 times higher in MW-6 (1.88 mg/L) than in MW-5 (0.52 mg/L). Concentrations of molybdenum have fluctuated over this time span after an initial peak and then subsequent decrease commencing in 2017, but appear to

exhibit a downward trend. A plot of the molybdenum concentrations in these two monitoring wells versus time is provided as Figure 5.

Molybdenum has been quantified in upgradient/background monitoring well MW-2 since November 2019 at relatively low concentrations ranging from 0.0077 mg/L to 0.011 mg/L. Molybdenum has also been quantified in downgradient monitoring well MW-4. CEC notes that molybdenum may have been present at low concentrations prior to November 2019 in groundwater at these locations, but laboratory reporting limits, which have since been reduced with the use of an alternate approved analytical method (EPA Method 6020), may have obscured low level concentrations previously. With no detections of molybdenum in GMS well MW-8, which was installed as a downgradient GMS well as part of the release characterization efforts, the molybdenum plume appeared to be limited to the area of MW-5 and MW-6, possibly extending some distance to the southeast due to the historic influence of the multiple nearby water production wells located at the Site. However, the idling of these production wells in favor of the new well field to the southwest of the Site has caused a shift in the groundwater flow direction, as noted in Section 2.2.1, and it is uncertain if the plume morphology has transitioned in conjunction with this change. Pending results from newly-installed groundwater monitoring well MW-9 will further delineate these molybdenum impacts.

Also as noted in Section 2.1, selenium was quantified at a SSL in MW-6 during the second Semi-Annual Assessment Monitoring sampling event performed in December 2020. While selenium has previously been detected in MW-6 at concentrations ranging from 0.035 mg/L to 0.047 mg/L, and in MW-5 at concentrations ranging from 0.019 mg/L to 0.031 mg/L, the December 2020 event marked the first instance where the concentration exceeded the GWPS (0.050 mg/L). Selenium was not detected at MW-2 prior to the May 2019 sampling event. CEC notes that selenium subsequently was detected at concentrations exceeding the GWPS in the groundwater samples collected from MW-2 in both November 2019 (0.017 mg/L) and December 2020 (0.057 mg/L), and that the December 2020 concentration was observed after the groundwater flow direction had shifted. Concentrations of selenium have fluctuated over this time span but appear to exhibit an upward trend. A plot of the selenium concentrations in MW-6 versus time is provided as Figure 6.

CEC also notes that the selenium concentration detected in the groundwater sample collected from MW-2 in December 2020 (0.057 mg/L) exceeded the GWPS. However, the GWPS will be re-evaluated with the reconfiguration of the GMS network to evaluate whether this is a SSL and the appropriate notifications and reporting amendments will be made.

5.0 ASSESSMENT OF CORRECTIVE MEASURES

CEC prepared the ACM report for the Site (May 2019) pursuant to 40 CFR §257.96, a copy of which is available on the publicly-accessible website. The following is a summary of the findings from the ACM. As required by the CCR Rule, numerous potential corrective measures for the Ash Ponds were evaluated and were screened based on several factors including the following specific elements defined in 40 CFR §257.96(c)(1):

- Performance,
- Reliability,
- Ease of implementation,
- Potential safety impacts,
- Cross-media impacts, and,
- Exposure control to residual contamination.

The corrective measures objectives are based on the current and anticipated future land and groundwater use and were developed using information gathered from subsurface explorations and groundwater monitoring as well as applicable promulgated regulations and relevant guidance and ultimately form the basis for the selected corrective measure.

Findings from the groundwater monitoring performed at the Site indicate that two constituents (molybdenum and selenium) have been quantified at SSLs in excess of their respective GWPS of 0.1 mg/L and 0.05 mg/L. The GWPS for molybdenum is the health-based level adopted by the U.S. EPA for constituents without a maximum contaminant level (MCL), and the GWPS for selenium is the MCL. In order to comply with the CCR Rule, the following corrective measures objectives were identified:

1. Reduce leaching of CCR 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,
2. Monitor performance of the selected corrective measure through continued sampling of the GMS wells to demonstrate compliance with the GWPS.

These corrective measures objectives were used in the evaluation of the screening of the remedial options, which are listed below.

CORRECTIVE MEASURE OPTIONS
1. Monitored Natural Attenuation
2. Waste Excavation and Disposal
3. In-Situ Remediation
4. Capping
5. Pump and Treat
6. Cut-off Wall

An option was dismissed if it did not satisfy any corrective measures objectives, it was considered to have excessive risk or be ineffective with regards to the COCs, or it was not considered feasible given Site constraints. An option was retained if it could be used, whether solely or in conjunction with one of the other options listed, to meet the corrective measures objectives. A description of each corrective measure considered for the Site and the evaluation for each screening criteria was provided in the ACM report. CMOs 1, 2, and 5 were retained as feasible options for further consideration in implementing at the Site.

A public meeting was held at ESS on July 26, 2021, during which the CMOs were presented, and the public was invited to comment. No comments or questions were received in response to the meeting.

6.0 REMEDY SELECTION

Per CFR §257.97(b)(1) through (5), this section describes how the remedy that was selected to address groundwater impacts meets the requirements listed below and specifies a schedule for implementing the corrective actions:

1. Is protective of human health and the environment;
2. Attains the GWPS as specified pursuant to §257.97(h);
3. Controls the source(s) of release so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in Appendix IV to this part into the environment;
4. Removes from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems; and,
5. Complies with standards for management of wastes as specified in §257.98(d).

After considering the retained options, excavation and transportation of the CCR off-site for disposal or beneficial re-use (Option 2) was selected as the remedy for the Site. The "clean closure" excavation option provides for 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. OMU outlined the preliminary approach for implementing this remedy in the Initial and Post Closure Plan for the facility, dated October 17, 2016 (revised October 19, 2017). Monitored natural attenuation will also be performed to monitor the performance of the excavation remedy, while the pump and treat option will be retained in the event that the excavation does not improve the groundwater conditions.

Prior to initiating CCR removal activities in each of the Ash Ponds, the contributing sources of water will be diverted to start the free water removal process. Water will be removed via gravity flow and pumps when needed and discharged through the existing NPDES outfall.

The facility will continue to maintain the GMS and conduct groundwater monitoring in accordance with 40 CFR §257.90 through 257.98.

6.1 PROTECTION OF HUMAN HEALTH & ENVIRONMENT

The current land use of the Site is considered to be industrial, and land use in the future is anticipated to continue in that capacity. Neither workers nor visitors to the ESS facility are exposed to impacted groundwater, because access to the monitoring wells is protected by a locked steel cover. Additionally, access to the Site is controlled by perimeter fencing, locking gates, and entrances staffed with security personnel. Potential receptors that could be exposed to impacted groundwater are limited to consultants that handle groundwater monitoring duties. Personnel engaged in these activities are well-trained in sampling techniques, personal protective equipment, and incident response so as to minimize the potential for unsafe exposure. Further, there are no known sensitive ecosystems present at or adjacent to the Site.

As previously mentioned, OMU has historically extracted groundwater from a network of production wells proximate to the Site for the purpose of municipal supply. However, groundwater production from these wells proximate to the Site ceased in October 2020, and production transitioned to a well network about 1 mile to the southwest and downstream of ESS. The former production wells proximate to the Site are screened from approximately 80 to 130 feet bgs in a deeper horizon within the aquifer than the GMS wells, which are screened from approximately 45 to 70 feet bgs. Groundwater extracted by the idled production wells, if re-activated, would be subject to pre-treatment and quality assurance/quality control practices that are in place prior to distribution. The groundwater ingestion pathway appears to be incomplete as groundwater at the Site is no longer extracted for potable purposes and a review of the water well records maintained on the Kentucky Groundwater Data Repository did not indicate the presence of potable water wells in the vicinity of the Site. Additionally, groundwater impacts do not appear to extend off-Site.

While some short-term exposures to airborne/fugitive dust may be possible during implementation of the selected remedy, the long-term benefits are protective of human health and the environment as the goal is to remove as much, if not all, of the CCR as practical and thereby eliminating potential exposure routes and pathways for receptors. OMU plans to follow the facility's dust and erosion control protocols during excavation of the Ash Ponds to reduce runoff, fugitive emissions, direct-contact, and inhalation by construction and excavation workers. In implementing the remedy, OMU

will comply with local, state, and federal erosion and sediment control requirements and waste management regulations.

6.2 ATTAINMENT OF GWPS

While some residual impacts to groundwater quality should be anticipated in the near-term after the CCR removal efforts, source removal is ultimately anticipated to greatly reduce or eliminate future leaching of COCs to groundwater, which will in turn improve compliance with the GWPS. Additionally, the high conductivity and transmissivity of the aquifer will have beneficial effects such as dispersion of the residual dissolved-phase impacts.

Following implementation of remedial activities, a corrective action groundwater monitoring program will be established in accordance with 40 CFR §257.98(a)(1). The effectiveness of the corrective action will be evaluated by comparing groundwater monitoring results to the GWPS. CEC prepared a statistical analysis plan for the Site dated October 17, 2017, in accordance with the CCR Rule and U.S. EPA's *Statistical Analysis of Groundwater Monitoring Data at Resource Conservation and Recovery Act (RCRA) Facilities, Unified Guidance* (2009). The plan incorporates a selection process regarding the appropriate statistical analysis of groundwater data collected in compliance with the CCR Rule. Additionally, the plan describes the statistical procedures to be used to establish background conditions and implement corrective action monitoring.

Based on the statistical plan, a remedy will be considered to have successfully decreased concentrations to levels less than the GWPS when average concentrations of monitoring well-constituent pairs where a SSL has previously been identified are less than the GWPS (i.e., when the lower confidence limit [LCL] of the mean is less than the GWPS). Further, a remedy is considered complete when confidence intervals constructed for Appendix IV constituents for monitoring wells identified with SSLs have not exceeded the GWPS for 3 consecutive years [40 CFR §257.98(c)(2)]. The statistical analysis plan includes a detailed path for calculating the upper confidence limit (UCL) for the monitoring well-constituent pairs based on the nature of the data (i.e. seasonality, distribution of data, significant non-detects, etc.).

If a corrective action monitoring program is in place, it must meet the requirements of an assessment monitoring program per 40 CFR §257.98(a)(1)(i).

6.3 SOURCE CONTROL AND REMOVAL OF CONTAMINATED MATERIAL

While excavation of the CCR will not effectively remove the dissolved-phase contaminants that have already been released to groundwater from the Ash Ponds, it will remove the contaminant source mass, which will in turn reduce the potential for future releases to the subsurface.

6.4 REMOVAL OF RELEASED MATERIAL

Under 40 CFR 257.97(b)(4), the selected remedy must remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible. Analytical data obtained to date indicate that dissolved-phase impacts to groundwater appear to be limited to the vicinity of the Ash Ponds and have not migrated beyond the Site boundary. It is anticipated that after source removal, groundwater concentrations of molybdenum and selenium in affected monitoring wells will decrease to levels less than the GWPS. Absent contaminant source leaching, groundwater will be recharged through natural infiltration and potentially via the Ohio River depending on the groundwater flow direction. The natural recharge will result in the reduction of concentrations in groundwater through advection and dispersion of the existing plume. Given the relatively low concentrations and the high hydraulic conductivity of the aquifer, this natural process is considered a feasible mechanism to address dissolved-phase impacts, and active removal is not warranted. Groundwater at the Site will continue to be monitored to assess the post-closure groundwater concentrations.

6.5 WASTE MANAGEMENT

Current waste management practices associated with the Ash Ponds at ESS include the transport of CCR off-site for beneficial re-use in compliance with the provisions of RCRA, 40 CFR §257.98(d), as well as other local, state, and federal regulations. Considering the facility hauls CCR from the Ash Ponds for off-Site disposal and/or beneficial re-use as part of ongoing operations and maintenance activities, implementation of the clean closure remedy should be streamlined. CCR

that is excavated from the Ash Ponds will continue to be handled in accordance with local, state, and federal applicable regulatory requirements.

6.6 SCHEDULE

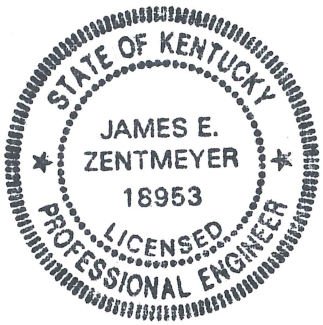
With both of the power-generating units now idled and discharges to the Ash Ponds limited to stormwater runoff, it is anticipated that the clean closure remedy can be implemented in the fourth quarter of 2021. A project schedule for the implementation of the selected remedy has been developed based on considerations outlined in 40 CFR §257.97(d) and has been added to the CCR Rule timeline for the ESS facility and is included as Table 3.

7.0 REMEDY SELECTION CERTIFICATION

CCR Impoundment Information
Name: Elmer Smith Station Ash Ponds
Operator: Owensboro Municipal Utilities
Address: 4301 E 4th Street Owensboro, Kentucky 42303

I, James E. Zentmeyer, being a registered Professional Engineer in the Commonwealth of Kentucky hereby certify to the best of my knowledge, information, and belief that the remedy selected to address releases of constituents of concern associated with CCR from the Ash Ponds located at Elmer Smith Station in Owensboro, Kentucky, as documented herein, meets the requirements set forth in the CCR Rule (40 CFR §257.97).

Print Name: James E. Zentmeyer
Company: Civil & Environmental Consultants, Inc.



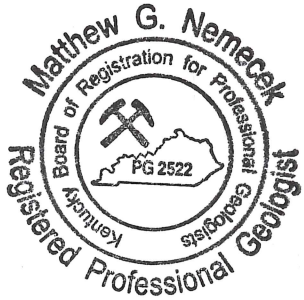
Signature: James E Zentmeyer

Date: Oct. 27, 2021

License Number: 18953
My license renewal date is June 30, 2022

I, Matthew G. Nemecek, being a registered Professional Geologist in the Commonwealth of Kentucky hereby certify to the best of my knowledge, information, and belief that the remedy selected to address releases of constituents of concern associated with CCR from the Ash Ponds located at Elmer Smith Station in Owensboro, Kentucky, as documented herein, meets the requirements set forth in the CCR Rule (40 CFR §257.97).

Print Name: Matthew G. Nemecek
Company: Civil & Environmental Consultants, Inc.

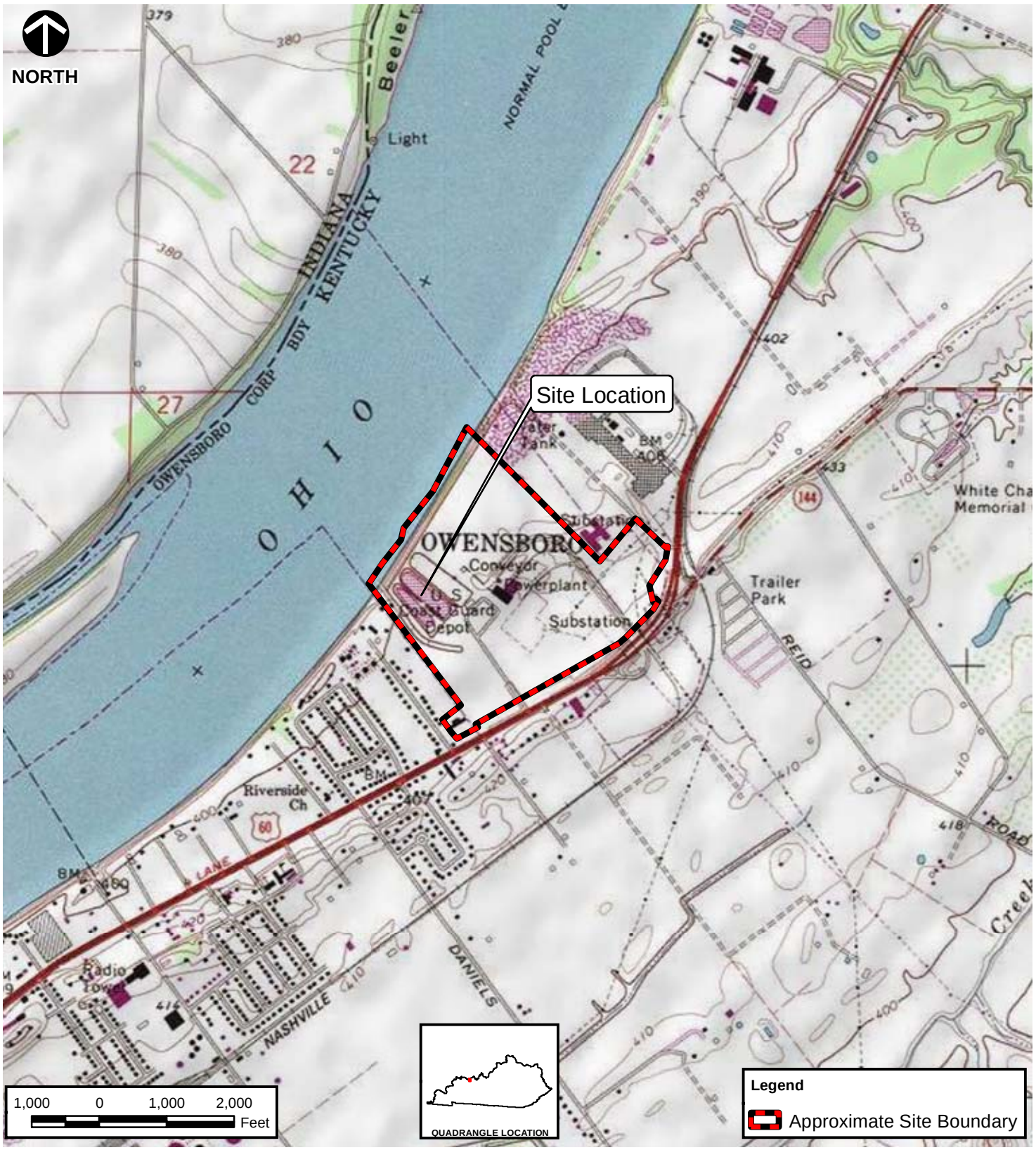


Signature: Matthew Nemecek

Date: October 2021

License Number: KY-2522
My license renewal date is September 30, 2023

FIGURES



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

Civil & Environmental Consultants, Inc.
333 Baldwin Road - Pittsburgh, PA 15205
412-429-2324 - 800-365-2324
www.cecinc.com

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

NORTH

Ohio River

MW-3
MW-2
MW-1
Pond 1
Pond 2
Pond 3
MW-9
MW-4
MW-6
MW-5
MW-7
49
63
48
66
61
65
69
64
68
67
50
MW-8

Ellis Smeathers Road

State Route 2380

Coast Guard Lane

Cooling Water Discharge Canal (channelized)

Cavin Water Treatment Plant

E 4th Street (State Route 144)

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

Legend

- Approximate Site Boundary
- GMS Monitoring Well
- OMU Municipal Production Well (Idle)

PROJECT LOCATION

200 0 200 400 Feet

Civil & Environmental Consultants, Inc.
333 Baldwin Road - Pittsburgh, PA 15205
412-429-2324 - 800-365-2324
www.cecinc.com

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

SITE AND VICINITY AERIAL MAP
WITH GMS WELLS

DRAWN BY:	MGN	CHECKED BY:	MGN	APPROVED BY:	HTW*
DATE:	JUL 27, 2021	SCALE:	1 " = 400 '	PROJECT NO:	164-014

FIGURE NO: **2**

Signature on File *

\\svr-fs-pit\projects\2016\164-014\-GIS\Maps\Task 0021 - Remedy Selection\164014_EN21_S&VAM_FIG2.mxd - 7/27/2021 - 2:50:29 PM (mnemecek)

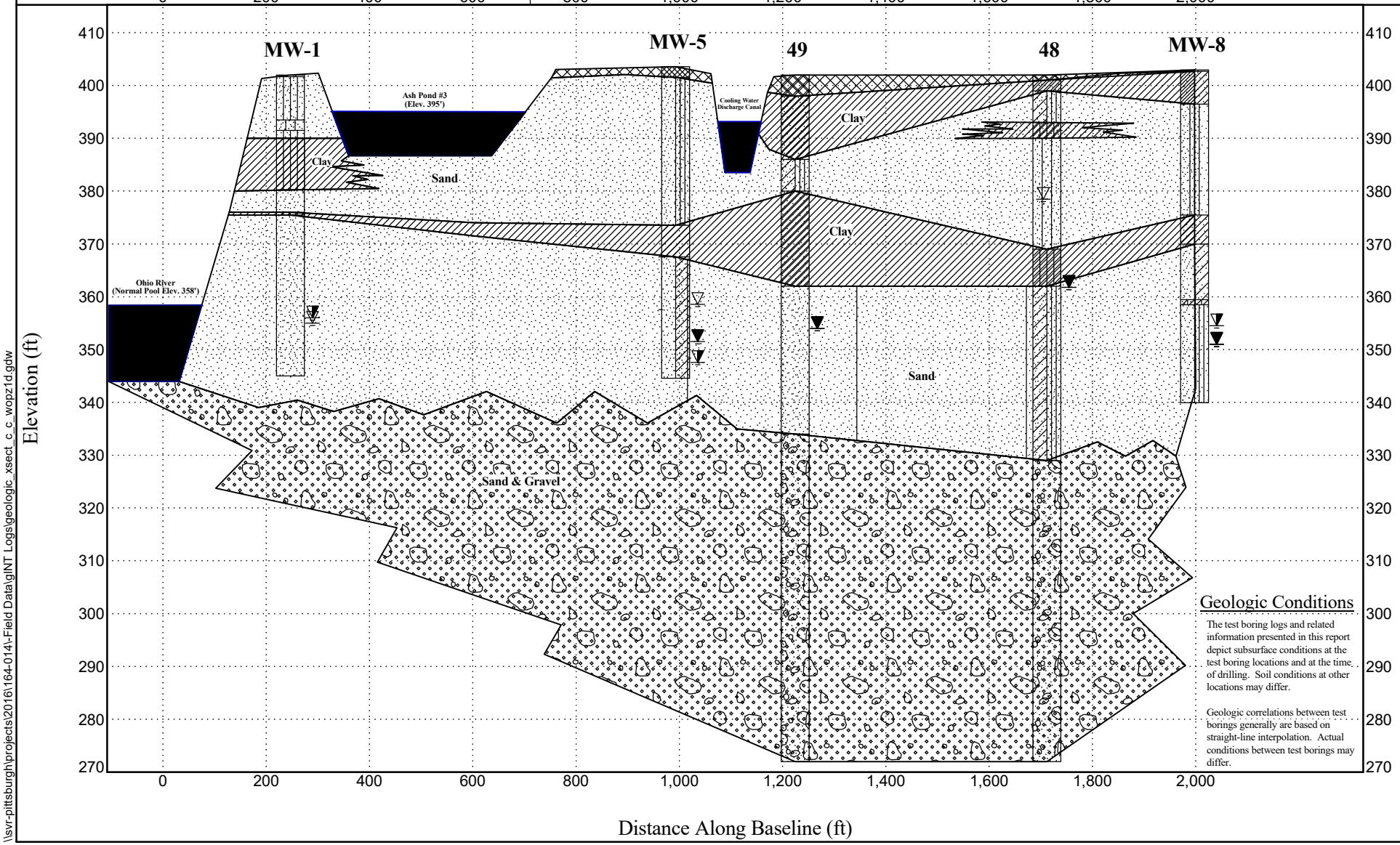
Civil & Environmental Consultants, Inc.
333 Baldwin Road
Pittsburgh, Pennsylvania 15205

CLIENT Owensboro Municipal Utilities
PROJECT NUMBER 164-014
PROJECT NAME Elmer Smith Ash Pond
PROJECT LOCATION Owensboro, Kentucky

GEOLOGIC CROSS-SECTION
Figure 3

LEGEND

- Fill (made ground)
- Clay
- Sandy Silt
- Poorly-graded Sand
- Sand & Gravel
- Water Level At Time of Drilling
- Water Level At End of Drilling
- Water Level After Drilling



Geologic Conditions

The test boring logs and related information presented in this report depict subsurface conditions at the test boring locations and at the time of drilling. Soil conditions at other locations may differ.

Geologic correlations between test borings generally are based on straight-line interpolation. Actual conditions between test borings may differ.

\\svr-pittsburgh\projects\2016\164-014\-Field Data\gINT Logs\geologic_xsect_c_c_wopz1d.gdw

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)

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
MAY 13, 2020

DRAWN BY: MGN	CHECKED BY: MGN	APPROVED BY: HTW*	FIGURE NO:	4a
DATE: AUG 16, 2021	SCALE: 1 " = 400 '	PROJECT NO: 164-014		

Signature on File *

\\svr-fs-pit\projects\2016\164-014\-GIS\Maps\Task 0021 - Remedy Selection\164014_EN21_PSM(05-13-20)_FIG4a.mxd - 8/16/2021 - 3:23:09 PM (mnemecek)

NORTH

Ohio River

MW-3
359.4
MW-2
359.31
MW-1
358.88
MW-9
0
MW-6
359.28
MW-4
359.56
MW-5
358.95
MW-7
360.61
MW-8
358.27

360.5'
360'
359.5'
359'
358.5'

Inferred Groundwater Flow Direction

49
48
50
63
61
66
65
69
64
68
67

Cooling Water Discharge Canal (channelized)

Cavin Water Treatment Plant

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 (Idle)
- Equipotential Line
- MW-1 GMS Monitoring Well
- 579.45 Groundwater Elevation (feet above mean sea level)

PROJECT LOCATION

200 0 200 400 Feet

Civil & Environmental Consultants, Inc.
333 Baldwin Road - Pittsburgh, PA 15205
412-429-2324 - 800-365-2324
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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: 4b
DATE: AUG 16, 2021	SCALE: 1 " = 400 '	PROJECT NO: 164-014	

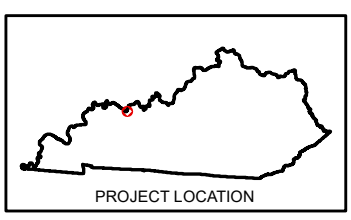
Signature on File *

\\svr-fs-pitt\projects\2016\164-014\-GIS\Maps\Task 0021 - Remedy Selection\164014_EN21_PSM(12-02-20)_FIG4b.mxd - 8/16/2021 - 3:24:22 PM (mnemecek)

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)



200 0 200 400 Feet

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333 Baldwin Road - Pittsburgh, PA 15205
412-429-2324 - 800-365-2324
www.cecinc.com

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: 4c
DATE: AUG 16, 2021	SCALE: 1 " = 400 '	PROJECT NO: 164-014	

Signature on File *

\\svr-fs-pit\projects\2016\164-014\-GIS\Maps\Task 0021 - Remedy Selection\164014_EN21_PSM(06-30-21)_FIG4c.mxd - 8/16/2021 - 3:29:03 PM (mnemecek)

Figure No. 5

Owensboro Municipal Utilities CCR -February 2021 Event

Molybdenum [mg/L]

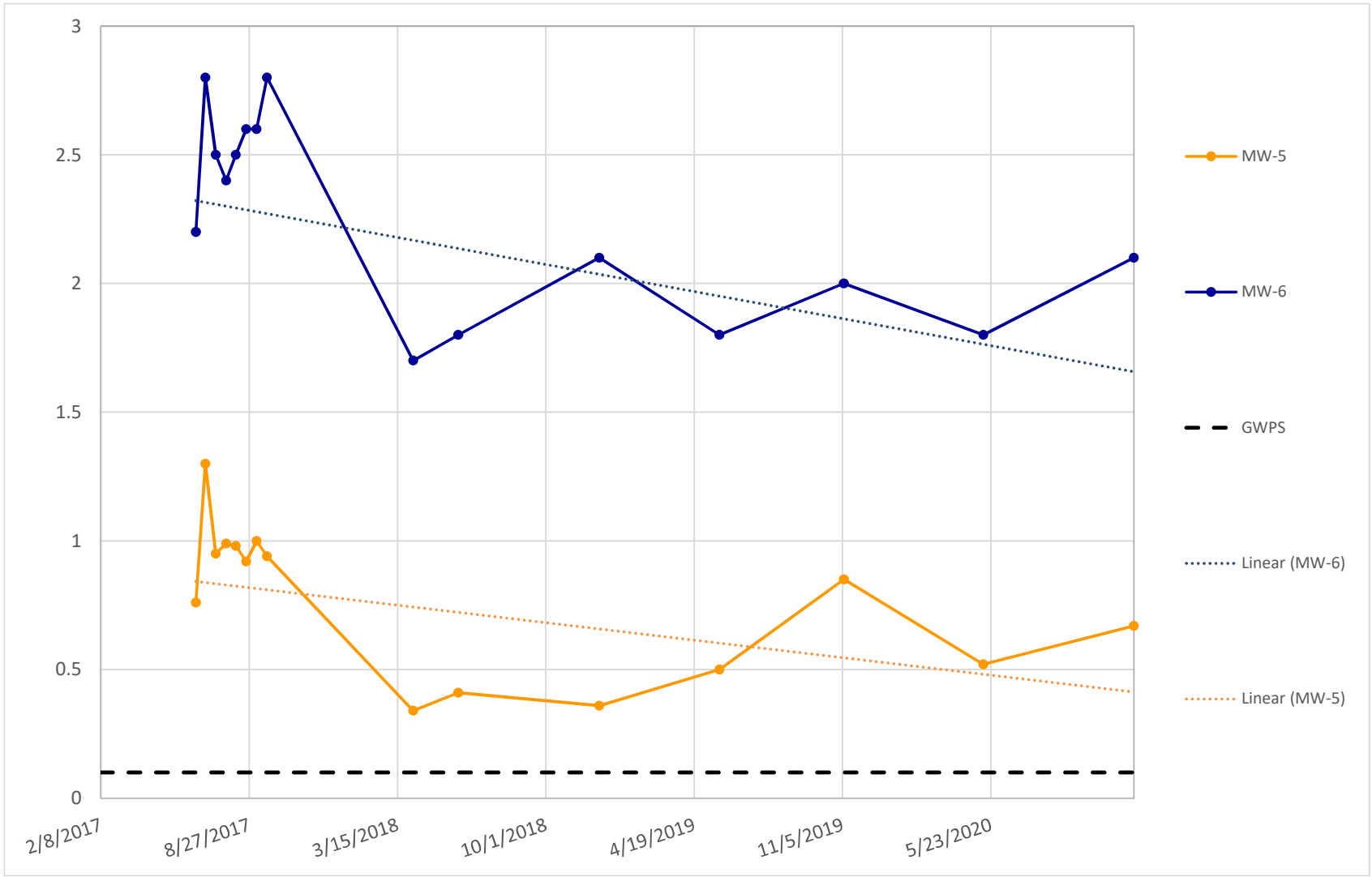
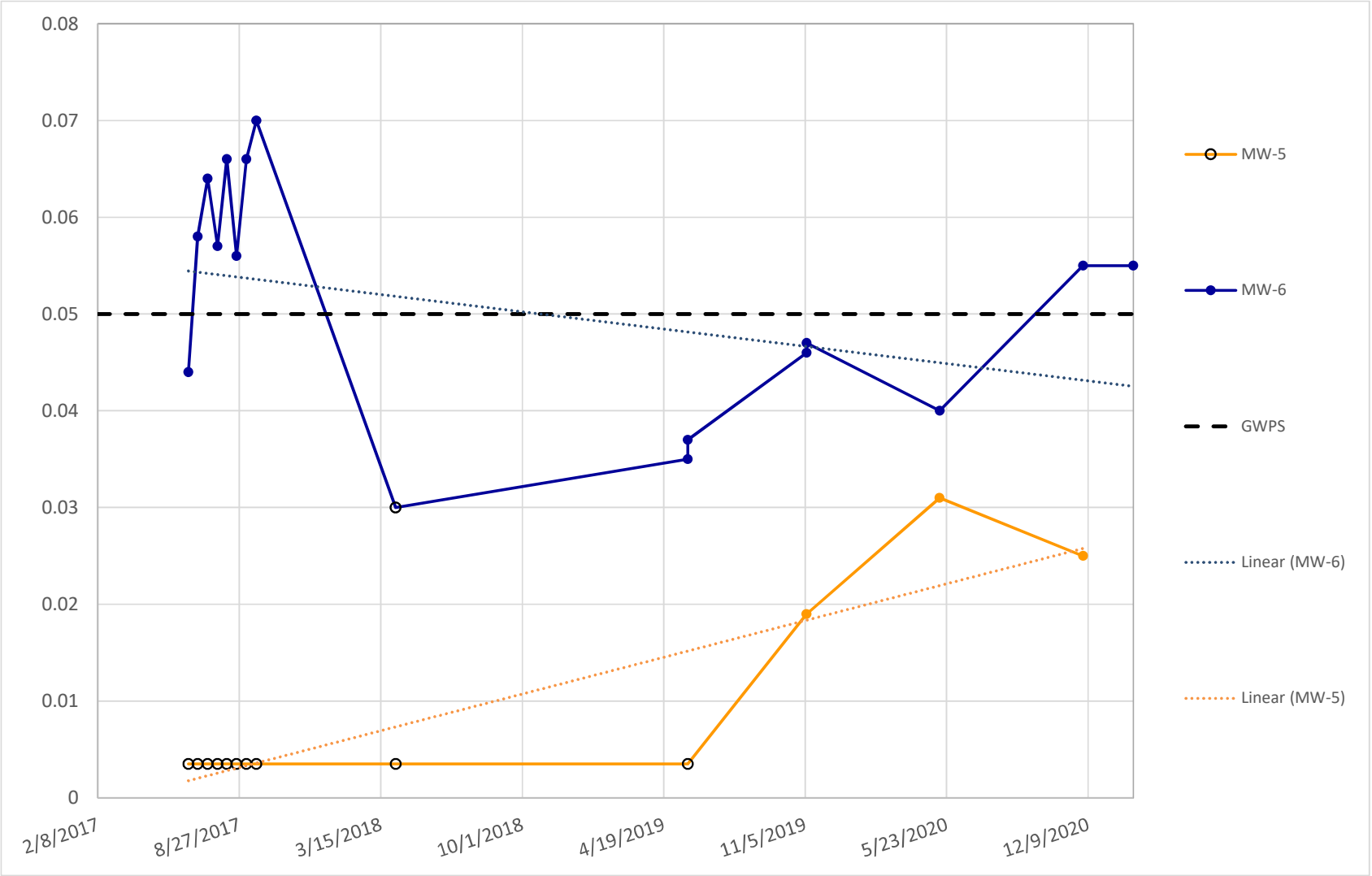


Figure No. 6

Owensboro Municipal Utilities CCR -February 2021 Event

Selenium [mg/L]



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)	Downgradient	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
				6/30/2021	45.16	359.37
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
				6/30/2021	45.85	359.70

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
				6/30/2021	46.68	359.71
MW-4 (8006-9525)	Upgradient	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
				6/30/2021	47.01	361.01

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
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
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
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
MW-9 (8007-1813)	Downgradient	401.78	405.18	6/30/2021	44.88	360.30

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								Upgradient									
Sample ID		MW-2								MW-4									**Groundwater**
Collection Date		4/5/18	6/5/18	12/12/18	12/12/18	5/23/19	11/7/19	5/13/20	12/2/20	4/5/18	6/5/18	6/5/18	12/12/18	5/23/19	11/7/19	5/13/20	5/13/20	12/2/20	**Protection Standard**
Total Metals	**Units**																		
Antimony	mg/L	<0.0060	NA	NA	NA	<0.0060	NA	<0.0050	NA	<0.0060	NA	NA	NA	<0.0060	NA	<0.0050	<0.0050	NA	0.006
Arsenic	mg/L	<0.010	NA	NA	NA	<0.010	NA	<0.0050	NA	<0.010	NA	NA	NA	<0.010	NA	<0.0050	<0.0050	NA	0.010
Barium	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	**0.062**	**0.019**	**0.067**	<0.10	<0.10	<0.10	<0.10	<0.10	**0.045**	**0.024**	**0.024**	**0.020**	2
Beryllium	mg/L	<0.00040	NA	NA	NA	<0.00040	NA	<0.0020	NA	<0.00040	NA	NA	NA	<0.00040	NA	<0.0020	<0.0020	NA	0.004
Boron	mg/L	NA	<0.10	**0.11**	0.14	<0.10	**17**	**0.36**	**17**	NA	**11**	**10**	**5.6**	**9.8**	**13**	**4.6**	**4.6**	**1.5**	0.330
Cadmium	mg/L	<0.0050	NA	NA	NA	<0.0050	NA	<0.0020	NA	<0.0050	NA	NA	NA	<0.0050	NA	<0.0020	<0.0020	NA	0.005
Calcium	mg/L	NA	**53**	**100**	**100**	**70**	**250**	**71**	**210**	NA	**180**	**180**	**100**	**200**	**200**	**110**	**110**	**83**	139.35
Chromium	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.0050	<0.0050	NA	<0.020	<0.020	<0.020	<0.020	<0.020	<0.0050	<0.0050	<0.0050	NA	4.10
Cobalt	mg/L	<0.0040	NA	NA	NA	<0.0040	<0.0050	<0.0050	NA	<0.0040	NA	NA	NA	<0.0040	<0.0050	<0.0050	<0.0050	NA	0.098
Lead	mg/L	<0.015	NA	NA	NA	<0.015	NA	<0.0050	NA	<0.015	NA	NA	NA	<0.015	NA	<0.0050	<0.0050	NA	0.015
Lithium	mg/L	<0.10	NA	NA	NA	<0.010	<0.0050	<0.010	<0.010	<0.10	NA	NA	NA	<0.010	<0.0050	<0.010	<0.010	<0.010	0.040
Mercury	mg/L	<0.00020	NA	NA	NA	<0.00020	NA	<0.00020	NA	<0.00020	NA	NA	NA	<0.00020	NA	<0.00020	<0.00020	NA	0.002
Molybdenum	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	**0.011**	**0.0077**	**0.0078**	<0.10	<0.10	<0.10	<0.10	<0.10	**0.0085**	**0.0093**	**0.0094**	**0.02**	0.10
Selenium	mg/L	<0.030	NA	NA	NA	<0.030	**0.017**	<0.0050	**0.057**	<0.030	NA	NA	NA	<0.030	<0.0050	<0.0050	<0.0050	<0.0050	0.050
Thallium	mg/L	<0.0050	NA	NA	NA	<0.0020	NA	<0.0050	NA	<0.0050	NA	NA	NA	<0.0020	NA	<0.0050	<0.0050	NA	0.002
Anions																			
Chloride	mg/L	NA	**18**	**18**	**18**	**16**	**45**	**15**	**45**	NA	**37**	**37**	**27**	**200**	**44**	**35**	**35**	**19**	50.0
Fluoride	mg/L	<2.0	**0.30**	<2.0	<2.0	<2.0	<0.20	<0.20	<2.0	<2.0	<0.50	<0.50	<2.0	<2.0	<0.20	<0.20	<0.20	<2.0	4
Sulfate	mg/L	NA	**36**	**19**	**19**	**56**	**570**	**43**	**510**	NA	**370**	**370**	**140**	**730**	**500**	**200**	**200**	**72**	154.26
Radium																			
Radium-226	pCi/L	<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)	**0.49 (+/-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)	9.32
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)**	<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)	
pH																			
pH	s.u.	NA	**7.7**	**7.6**	**6.1**	**7.8**	**6.9**	**7.6**	**7.6**	NA	**7.5**	**7.4**	**7.8**	**7.2**	**6.8**	**7.3**	**7.4**	**7.5**	8.01
Total Dissolved Solids																			
Total Dissolved Solids	mg/L	NA	**260**	**420**	**420**	**330**	**1,400**	**300**	**1,500**	NA	**1,100**	**1,100**	**570**	**1,300**	**1,300**	**690**	**680**	**450**	950.8

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

		Downgradient							Downgradient										
Sample ID		MW-5							MW-6										**Groundwater**
Collection Date		4/5/18	6/5/18	12/12/18	5/23/19	11/7/19	5/13/20	12/2/20	4/5/18	4/5/18	6/5/18	12/12/18	5/23/19	5/23/19	11/7/19	11/7/19	5/13/20	12/2/20	**Protection Standard**
Total Metals	**Units**																		
Antimony	mg/L	<0.0060	NA	NA	<0.0060	NA	<0.0050	NA	<0.0060	<0.0060	NA	NA	<0.0060	<0.0060	NA	NA	<0.0050	NA	0.006
Arsenic	mg/L	<0.010	NA	NA	<0.010	NA	<0.0050	NA	<0.010	<0.010	NA	NA	<0.010	<0.010	NA	NA	<0.0050	NA	0.010
Barium	mg/L	**0.11**	**0.12**	<0.10	<0.10	**0.074**	**0.095**	**0.049**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	**0.05**	**0.05**	**0.032**	**0.048**	2
Beryllium	mg/L	<0.00040	NA	NA	<0.00040	NA	<0.0020	NA	<0.00040	<0.00040	NA	NA	<0.00040	<0.00040	NA	NA	<0.0020	NA	0.004
Boron	mg/L	NA	**12**	**10**	**12**	**13**	**11**	**8.2**	NA	NA	**10**	**11**	**9.1**	**9.2**	**13**	**13**	**10**	**10**	0.330
Cadmium	mg/L	<0.0050	NA	NA	<0.0050	NA	<0.0020	NA	<0.0050	<0.0050	NA	NA	<0.0050	<0.0050	NA	NA	<0.0020	NA	0.005
Calcium	mg/L	NA	**150**	**120**	**130**	**130**	**220**	**110**	NA	NA	**180**	**170**	**130**	**130**	**150**	**150**	**110**	**150**	139.35
Chromium	mg/L	<0.020	<0.020	<0.020	<0.020	<0.0050	<0.0050	NA	**0.021**	**0.020**	<0.020	<0.020	<0.020	<0.020	<0.0050	<0.0050	<0.0050	NA	4.10
Cobalt	mg/L	<0.0040	NA	NA	<0.0040	<0.0050	<0.0050	NA	<0.0040	<0.0040	NA	NA	**0.0063**	**0.006**	<0.0050	<0.0050	<0.0050	NA	0.098
Lead	mg/L	<0.015	NA	NA	<0.015	NA	<0.0050	NA	<0.015	<0.015	NA	NA	<0.015	<0.015	NA	NA	<0.0050	NA	0.015
Lithium	mg/L	<0.10	NA	NA	**0.019**	**0.02**	**0.019**	**0.019**	<0.10	<0.10	NA	NA	<0.010	<0.010	<0.0050	<0.0050	<0.010	<0.010	0.040
Mercury	mg/L	<0.00020	NA	NA	<0.00020	NA	<0.00020	NA	<0.00020	<0.00020	NA	NA	<0.00020	<0.00020	NA	NA	<0.00020	NA	0.002
Molybdenum	mg/L	**0.34**	**0.41**	**0.36**	**0.5**	**0.85**	**0.52**	**0.67**	**1.7**	**1.7**	**1.8**	**2.1**	**1.8**	**1.8**	**2**	**2**	**1.8**	**2.1**	0.10
Selenium	mg/L	<0.030	NA	NA	<0.030	**0.019**	**0.031**	**0.025**	<0.030	<0.030	NA	NA	**0.035**	**0.037**	**0.047**	**0.046**	**0.040**	**0.055**	0.050
Thallium	mg/L	<0.0050	NA	NA	<0.0020	NA	<0.0050	NA	<0.0050	<0.0050	NA	NA	<0.0020	<0.0020	NA	NA	<0.0050	NA	0.002
Anions																			
Chloride	mg/L	NA	**62**	**49**	**70**	**38**	**110**	**37**	NA	NA	**37**	**37**	**30**	**29**	**31**	**31**	**25**	**34**	50.0
Fluoride	mg/L	**2.3**	**1.9**	<2.0	**2.2**	**2.2**	**2.2**	**2.1**	<2.0	<2.0	<0.50	<2.0	<2.0	<2.0	**0.93**	**0.91**	**1.1**	<2.0	4
Sulfate	mg/L	NA	**390**	**260**	**330**	**340**	**600**	**260**	NA	NA	**370**	**550**	**450**	**450**	**480**	**460**	**370**	**400**	154.26
Radium																			
Radium-226	pCi/L	<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)	<0.19 (+/-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)	9.32
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)	<0.98 (+/-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)**	
pH																			
pH	s.u.	NA	**7.5**	**8.0**	**7.6**	**7.9**	**7.4**	**7.6**	NA	NA	**7.4**	**7.8**	**7.4**	**7.5**	**7.4**	**7.0**	**7.4**	**7.5**	8.01
Total Dissolved Solids																			
Total Dissolved Solids	mg/L	NA	**1,200**	**840**	**1,100**	**940**	**1,600**	**840**	NA	NA	**1,100**	**1,100**	**870**	**1,000**	**960**	**960**	**750**	**870**	950.8

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

		Background							Background						
Sample ID		MW-7							MW-8						**Groundwater**
Collection Date		4/5/18	6/5/18	12/12/18	5/23/19	11/7/19	5/13/20	12/2/20	12/27/18	5/23/19	11/7/19	5/13/20	12/2/20	12/2/20	**Protection Standard**
Total Metals	**Units**														
Antimony	mg/L	<0.0060	NA	NA	<0.0060	NA	<0.0050	NA	<0.0060	<0.0060	NA	<0.0050	NA	NA	0.006
Arsenic	mg/L	<0.010	NA	NA	<0.010	NA	<0.0050	NA	<0.010	<0.010	NA	<0.0050	NA	NA	0.010
Barium	mg/L	**0.13**	**0.12**	**0.13**	**0.10**	**0.10**	**0.089**	**0.090**	**0.13**	**0.12**	**0.17**	**0.094**	**0.095**	**0.094**	2
Beryllium	mg/L	<0.00040	NA	NA	<0.00040	NA	<0.0020	NA	<0.00040	<0.00040	NA	<0.0020	NA	NA	0.004
Boron	mg/L	NA	<0.10	<0.10	<0.10	**0.11**	**0.15**	**0.067**	<0.10	<0.10	**0.15**	**0.11**	**0.12**	**0.12**	0.330
Cadmium	mg/L	<0.0050	NA	NA	<0.0050	NA	<0.0020	NA	<0.0050	<0.0050	NA	<0.0020	NA	NA	0.005
Calcium	mg/L	NA	**100**	**99**	**100**	**97**	**95**	**99**	**84**	**98**	**100**	**88**	**88**	**88**	139.35
Chromium	mg/L	<0.020	**0.22**	<0.020	**0.02**	**0.02**	<0.0050	NA	<0.020	<0.020	<0.0050	<0.0050	NA	NA	4.10
Cobalt	mg/L	<0.0040	NA	NA	<0.0040	<0.0050	<0.0050	NA	<0.0040	<0.0040	<0.0050	<0.0050	NA	NA	0.098
Lead	mg/L	<0.015	NA	NA	<0.015	NA	<0.0050	NA	<0.015	<0.015	NA	<0.0050	NA	NA	0.015
Lithium	mg/L	<0.10	NA	NA	<0.010	<0.0050	<0.010	<0.010	<0.10	<0.010	<0.0050	<0.010	<0.010	<0.010	0.040
Mercury	mg/L	<0.00020	NA	NA	<0.00020	NA	<0.00020	NA	<0.00020	<0.00020	NA	<0.00020	NA	NA	0.002
Molybdenum	mg/L	<0.10	<0.10	<0.10	<0.10	<0.0050	<0.0050	<0.0050	<0.10	<0.10	<0.0050	<0.0050	<0.0050	<0.0050	0.10
Selenium	mg/L	<0.030	NA	NA	<0.030	<0.0050	<0.0050	<0.0050	<0.030	<0.030	<0.0050	<0.0050	<0.0050	<0.0050	0.050
Thallium	mg/L	<0.0050	NA	NA	<0.0020	NA	<0.0050	NA	<0.0050	<0.0020	NA	<0.0050	NA	NA	0.002
Anions															
Chloride	mg/L	NA	**21**	**19**	**15**	**14**	**16**	**19**	**24**	**31**	**36**	**31**	**31**	**30**	50.0
Fluoride	mg/L	<2.0	**0.22**	<2.0	<2.0	<0.20	<0.20	<2.0	<2.0	<2.0	<0.20	<0.20	<2.0	<2.0	4
Sulfate	mg/L	NA	**84**	**91**	**92**	**62**	**61**	**55**	**59**	**75**	**69**	**45**	**46**	**45**	154.26
Radium															
Radium-226	pCi/L	**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)	<0.28 (+/-0.2)	<0.47 (+/-0.26)	NA	<0.26 (+/-0.16)	<0.25 (+/-0.16)	<0.33 (+/-0.19)	9.32
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)	<0.70 (+/-0.33)	<0.80 (+/-0.36)	NA	<0.78 (+/-0.37)	**0.84 (+/-0.41)**	**1.14 (+/-0.47)**	
pH															
pH	s.u.	NA	**7.0**	**7.6**	**7.2**	**7.5**	**7.4**	**7.1**	**7.0**	**7.2**	**7.6**	**7.1**	**7.3**	**7.5**	8.01
Total Dissolved Solids															
Total Dissolved Solids	mg/L	NA	**570**	**490**	**500**	**500**	**470**	**370**	**420**	**510**	**510**	**420**	**410**	**460**	950.8

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

Sample ID		Equipment Blank							Groundwater
Collection Date		4/5/18	6/5/18	12/12/18	5/23/19	11/7/19	5/13/20	12/2/20	Protection Standard
Total Metals	**Units**								
Antimony	mg/L	<0.0060	NA	NA	<0.0060	NA	<0.0050	NA	0.006
Arsenic	mg/L	<0.010	NA	NA	<0.010	NA	<0.0050	NA	0.010
Barium	mg/L	<0.10	<0.10	<0.10	<0.10	<0.0050	<0.0050	<0.0050	2
Beryllium	mg/L	<0.00040	NA	NA	<0.00040	NA	<0.0020	NA	0.004
Boron	mg/L	NA	<0.10	<0.10	<0.10	**0.1**	<0.020	<0.020	0.330
Cadmium	mg/L	<0.0050	NA	NA	<0.0050	NA	<0.0020	NA	0.005
Calcium	mg/L	NA	<0.20	**0.36**	<0.20	<0.50	<0.50	<0.50	139.35
Chromium	mg/L	<0.020	<0.020	<0.020	<0.020	<0.0050	<0.0050	NA	4.10
Cobalt	mg/L	<0.0040	NA	NA	<0.0040	<0.0050	<0.0050	NA	0.098
Lead	mg/L	<0.015	NA	NA	<0.015	NA	<0.0050	NA	0.015
Lithium	mg/L	<0.10	NA	NA	<0.010	<0.0050	<0.010	<0.010	0.040
Mercury	mg/L	<0.00020	NA	NA	<0.00020	NA	<0.00020	NA	0.002
Molybdenum	mg/L	<0.10	<0.10	<0.10	<0.10	<0.0050	<0.0050	<0.0050	0.10
Selenium	mg/L	<0.030	NA	NA	<0.030	<0.0050	<0.0050	<0.0050	0.050
Thallium	mg/L	<0.0050	NA	NA	<0.0020	NA	<0.0050	NA	0.002
Anions									
Chloride	mg/L	NA	<1.0	<2.0	<2.0	<0.20	**0.81**	<2.0	50.0
Fluoride	mg/L	<2.0	<0.10	<2.0	<2.0	<0.20	<0.20	<2.0	4
Sulfate	mg/L	NA	<1.0	<5.0	<5.0	**0.95**	<0.50	<2.0	154.26
Radium									
Radium-226	pCi/L	<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)	9.32
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)	
pH									
pH	s.u.	NA	**6.6**	**7.4**	**7.0**	**5.5**	**5.6**	**5.8**	8.01
Total Dissolved Solids									
Total Dissolved Solids	mg/L	NA	**44**	**30**	<20	**26**	<20	<10	950.8

= 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 3
CCR Rule Timeline & Remedy Implementation Schedule
Owensboro Municipal Utilities - Elmer Smith Station

Calendar Year	2016				2017				2018				2019				2020				2021												2022				2023	2024	2025	2026
Remedial Activity Description	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1				Q2				Q3				Q4				Q1	Q2	Q3	Q4				
Site Characterization/GMS Installation																																							
Baseline Monitoring																																							
Detection Monitoring																																							
Assessment Monitoring																																							→
Release Characterization																																							
Public Meeting																																							
Remedy Screening																																							
Remedy Selection/Selected																																							
Remedial Implementation																																							