KPRG

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

# CCR COMPLIANCE
# PRELIMINARY CLOSURE ALTERNATIVES ANALYSIS REPORT
# WILL COUNTY STATION PONDS 1N, 1S, 2S, AND 3S

**Midwest Generation, LLC**
**Will County Generating Station**
**529 E. Romeo Road**
**Romeoville, Illinois 60446**

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# 1.0 INTRODUCTION

Midwest Generation, LLC (Midwest Generation) currently operates the coal-fired steam electric generating station, referred to as Will County Station, located in Romeoville, Illinois ("site" or "generating station"). As part of the coal-fired operations and managing the coal combustion residuals (CCR), the station operates two active surface impoundments (Pond 2S and Pond 3S) and previously operated two now inactive surface impoundments (Pond 1N and Pond 1S). Pond 2S and Pond 3S are used as settling ponds to remove CCR from the stations process water that is sluiced into each pond. Pond 3S was taken out of service as of April 11, 2021 and Pond 2S was taken out of service as of June 1, 2022. Ponds 1N and 1S were taken out of service in 2010 with the CCR remaining in place. In 2013, the water in Ponds 1N and 1S was drained, and both ponds were reconfigured so that they could not accumulate liquids. Figure 1 shows the existing site conditions including the locations of the ponds.

As of the date of this report, Midwest Generation has ceased operating the Will County Generating Station and, therefore, has ceased operating Pond 2S. With the ceased operation of Pond 2S, all four ponds at the site are now inactive and will be closed. In accordance with 35 Illinois Administrative Code Part 845.710(b), a Facility (Owner/Operator) is required to initiate and complete a Closure Alternatives Analysis (CAA) prior to selecting a final closure method. This CAA evaluates the closure options for all four ponds.

This Closure Alternatives Analysis is structured to provide the following information:

- The proposed closure alternatives that will be analyzed,
- An analysis of the closure alternatives that meets the requirements set forth in Section 845.710(b)(1) through 845.710(b)(4),
- The results of groundwater contaminant modeling including how the modeled closure alternative will comply with the applicable groundwater protection standards, and
- A description of the fate and transport of contaminants associated with each closure alternative over time, including seasonal variations.

This document presents the results of the closure alternatives analysis for Ponds 1N, 1S, 2S, and 3S that was completed in accordance with 845.710.

## 2.0 PHYSICAL SITE CONDITIONS

Ponds 1N, 1S, 2S, and 3S are located adjacent to each other on the southwest portion of the station property. The physical properties of the foundation materials in which Ponds 1N, 1S, 2S, and 3S were constructed consist of a fill layer with underlying sandy and gravelly units and some clay. KPRG performed a site investigation in 2005 that consisted of performing soil borings adjacent to the four existing CCR surface impoundments. The borings performed around the ponds show that the site stratigraphy consists of a 1.5-foot to 2.5-foot thick fill layer at the site surface. This surface layer is underlain by a 1-foot thick layer of sand and silt with some gravel, which is underlain by 5 feet of lean clay. The surface layer is underlain by a 3-foot thick layer of sand and gravel with clay and this layer is then underlain by 5 feet of silty clay. Bedrock was generally encountered at approximately 10 feet below ground surface (bgs).

The silty clay is underlain by Silurian Dolomite with an average Rock Quality Designation (RQD) of 94.84%. The RQD from the samples collected with the closest proximity to Ponds 1N, 1S, 2S and 3S is 99.45%. The closest proximity samples are approximately 13 to 15 miles from Pond 2S and Pond 3S. These RQDs were obtained from a study performed by the Illinois Geological Survey in 1991 titled, "Geotechnical Properties of Selected Pleistocene, Silurian, and Ordovician Deposits of Northeastern Illinois". An RQD greater than 75% is considered good and an RQD greater than 90% is considered excellent. The RQD is a measure that determines the rock quality, which is used as part of the early site evaluation process when determining locations for engineered structures such as power facilities, underground tunnels, and dams. During the early site evaluation process, the RQD is used to determine any potential problems of bearing capacity, settlement, or sliding. The higher the RQD percentage, the more competent the rock and its ability to support structures, resist settlement and prevent sliding.

Based on construction documents available from Harza dated 1979, dikes existed in the area prior to construction of the ponds. During construction, these dikes were raised and widened with compacted fill material. The fill material was placed at the desired height and width and compacted to the extent to prevent erosion. As part of placing the fill material, any unsuitable material identified within the existing foundations was specified to be removed based on the construction drawings.

The interior slopes were originally lined with fill material and shot rock, which is similar to rip rap, and the pond base was originally lined with three layers consisting of a 12-inch Poz-O-Pac layer, a 12-inch fill layer, and another 12-inch Poz-O-Pac layer on top of the fill layer. The interior slopes and base were then covered with a bituminous curing coat. In 2013, Pond 2S's original upper Poz-O-Pac layer and fill material in the pond base were removed and replaced with a 60-mil HDPE geomembrane liner on the base and interior slopes for Pond 2S. The lower layer of Poz-O-Pac remained. Pond 2S also has a concrete geocell on the sides of the basin. In 2009, Pond 3S's original upper Poz-O-Pac layer and fill material in the pond base were removed and replaced with a 60-mil HDPE geomembrane liner on the base and interior slopes for Pond 3S. The lower layer of Poz-O-Pac remained. A warning layer was constructed in both Ponds 2S and 3S on top of the HDPE geomembrane liner that consisted of 12 inches of sand-sized material overtopped with 6 inches of crushed stone like material. The interior slopes of Ponds 1N and 1S were originally lined with fill material and shot rock, which is similar to rip rap, and the pond base was originally lined with three layers consisting of a 12-inch Poz-O-Pac layer, a 12-inch fill layer, and another 12-inch Poz-O-Pac layer on top of the fill layer. The interior slopes and base were then covered with a bituminous curing coat.

The side slopes were designed with 3H:1V (horizontal:vertical) interior slopes, with 3H:1V exterior slopes when the outer embankment is the interior slope of the adjacent pond. The exterior embankment of the south slope of Pond 2S was designed with a 2H:1V slope, the exterior embankment of the west slope of Pond 2S and Pond 3S is approximately 3H:1V. The north embankment of Pond 2S does not have an exterior slope because the crest of the embankment is at the same elevation as the ground level going north. The exterior embankment of the north slope of Pond 1N was designed with an approximate 2H:1V slope, the exterior embankment of the west slope of Pond 1N and Pond 1S is approximately 3H:1V. The north embankment of Pond 1S does not have an exterior slope because the crest of the embankment is at the same elevation as the ground level going north.

## 2.1 Summary of Geology and Hydrogeology

### *2.1.1 Geology*

The physiography of Will County is made up of ground moraines, end moraines, outwash plains, stream terraces, flood plains and bogs. It is in the Till Plaines and Great Lakes Sections of the Central Lowland Province. Near surface soils in the vicinity of the subject impoundment are predominately Romeo Silt Loam and Joliet Silt Loam, both with areas that are frequently flooded. These soils are poorly drained. Organic content ranges from 3 to 5 percent and have a low to negligible accelerated erosion rate, a low to high corrosivity rate and a pH range from slightly acidic to slightly basic (6.1 to 8.4). Surface runoff class is low (Soil Survey of Will County Illinois). Based on the Surficial Geology Map of Romeo Quadrangle (Caron, 2017) the surficial deposits in the vicinity of the subject surface impoundments are identified as disturbed ground, which is generally described as diamicton, sand, gravel, silt and peat as much as 40 feet thick. This disturbed ground is generally interpreted as disturbed land, which includes former gravel pits and major areas of construction.

The general stratigraphy in the area consists of post-glacial alluvium underlain by unconsolidated glacial deposits, which overlay Silurian dolomite. The Silurian dolomite is underlain by the Maquoketa Group, which includes the Scales Shale, which is considered a regional aquitard separating the overlying Silurian dolomite from the deeper Cambro-Ordovician sandstone and limestone aquifers. To evaluate local stratigraphy, water well logs and engineering test boring logs were obtained for water wells and engineering test borings in the vicinity of the Will County Generation Station. The depths of these wells and borings range from 50 feet to 300 feet. The fifteen (15) monitoring wells that were installed in the vicinity of the subject surface impoundments, MW-1 through MW-15, are shown on Figure 1. Based on an evaluation of the monitoring well boring logs, the following general site-specific stratigraphy is defined:

- Fill (approx. 5’ to 10’ thick) – Consisting of a thin layer of sand and gravel roadway followed by brown and black silty clay and silty sand mixed with gravel and crushed dolomite. The fill may include coal, black cinders and slag.

- Silty Sand, Silt and Clay (approx. 1' – 16' thick) – Consisting of gravelly tan to brown silty sand fining downward to gray/greenish mottled silty clays and clay.

- Bedrock – Dolomite bedrock. Top of weathered bedrock is generally encountered between 9 feet and greater than 20 feet below ground surface with depth increasing towards the southwest. It is noted that at monitoring well location MW-12, top of bedrock was not encountered at the terminus of the boring at 20 feet below ground surface.

The Silurian dolomite is divided into four units identified as a weathered bedrock rind, Joliet Formation dolomite, Kankakee Formation dolomite and the Elwood/Wilhelmi dolomite. Beneath the Silurian dolomite is the Ordovician age Maquoketa Group consisting of the Brainard Shale, Fort Atkinson dolomite and the Scales Shale. The Brainard Shale unit is not necessarily regionally continuous; therefore, it may or may not be present beneath the subject site. The Scales Shale unit, however, is extensive and is a recognized regional aquitard, which hydraulically isolates the deeper bedrock aquifers from the shallower Silurian dolomite. Based on the available information, the dolomite bedrock thickness to the top of the Scales Shale beneath the Will County site is approximately 55 feet.

Regional and local studies and investigations document fractures in the Silurian dolomite describing a primary joint set that is vertical and oriented about N52ºE and N40ºW. The N40ºW joints are described as "more distinct". Natural spacing between the joint sets ranges from three (3) to more than 10 feet, and joint apertures are described as less than 1/16$^{th}$ -inch. Bedding plane fractures are also described. Descriptions from various bedrock quarry walls show significant clay infilling of the vertical joints and bedding plane fractures. Evidence of water movement through fractures is interpreted from iron staining and mineralization (primarily calcite, with some pyrite and marcasite).

Silurian dolomite is a calcium-magnesium carbonate rock that includes horizons of cherty (silica) nodules and is documented both regionally and locally to include mineralization along fractures and within vugs. The mineralization includes, but is not limited to calcite (calcium carbonate) and various sulfide minerals such as pyrite, marcasite, etc. As such, the presence of these minerals and associated weathering products can also be expected within the overlying unconsolidated materials.

There are no underground mines beneath the subject CCR surface impoundments.

### *2.1.2 Hydrogeology*

Based on information from the Soil Survey of Will County, the average annual precipitation is approximately 37 inches with about 63% of that total falling between April and October of any given year. The average seasonal snowfall is approximately just over 10 inches.

The nearest surface water bodies are the Des Plaines River and the Chicago Ship and Sanitary Canal (CSSC) respectively located to the west and east of the subject CCR units. There are no drinking water intakes within the segment of river adjacent to the subject site and for that matter on any portion of the Des Plaines River downstream of the site (Meet Your Water – An Introduction to Understanding Drinking Water in Northeastern Illinois, Metropolitan Planning Council, 2017).

Groundwater beneath the subject units occurs under water table conditions. Saturated conditions are generally encountered between eight (8) and 12 feet bgs, depending on the well location, within the lower portion of the above defined silty sand/silt/clay unit and/or bedrock. A review of the hydrograph shows some slight temporal fluctuations with the highest water levels tending to be in the May timeframe and the lowest water levels generally occurring August through October timeframe.

Groundwater flow maps for the four quarters from 3rd quarter 2020 through the 2nd quarter 2021 were provided as part of the initial operating permit applications submitted for Ponds 1N, 1S, 2S, and 3S. The maps include groundwater elevation data from all 15 wells surrounding the surface impoundments. These maps show that groundwater flow is in a westerly direction and this is consistent with historical flow data for the site. The horizontal hydraulic gradient is fairly shallow and ranges from 0.0025 ft/ft to 0.0053 ft/ft. Additional groundwater data is provided in the initial operating permit applications for Ponds 1N, 1S, 2S, and 3S.

Hydraulic conductivity values were initially estimated for monitoring wells MW-1, MW-4, MW-6, MW-7, and MW-9, screened in the carbonate unit, from slug tests completed by Patrick Engineering in 2010. The geometric mean of the data for these wells was approximately 30 feet per day (ft/d; $3.47 \times 10^{-4}$ ft/sec) for each well, as calculated by Patrick Engineering Hydrogeologic Assessment Report – Will County Station, February 2011. The slug test data were reviewed as part of the modeling study being completed for the Construction Permit application and the data were reanalyzed using corrected input values for the well casing and borehole dimensions, effective porosity of the sand filter pack material and minor line fitting refinement. The revised geometric mean of the test data for these wells decreased to approximately 20 ft/d ($2.31 \times 10^{-4}$ ft/sec) for each well. The estimated effective porosity of the aquifer materials (0.2) was obtained from literature (Applied Hydrogeology, Fetter, 1980).

At this time, based on the geology discussion in Section 2.1.1 and the site-specific hydrogeology discussions above, the groundwater beneath the CCR surface impoundment is considered as Class I Potable Resource Groundwater in accordance with Section 620.210. However, a Groundwater Management Zone (GMZ) in accordance with Section 620.250 and an Environmental Land Use Control (ELUC) were established where the CCR surface impoundments are located as part of a Compliance Commitment Agreement (CCA) between Midwest Generation and Illinois EPA. The ELUC states that the groundwater shall not be used as potable water.

A survey of all potable water sources within a 2,500 feet radius of the Will County Generating Station was completed by Natural Resources Technology (NRT) in 2009. The following databases and sources of information were utilized in order to determine community water source and water well locations and construction near the ash pond wastewater treatment systems:

- Illinois State Geological Survey (ISGS) -Water Well Database Query;
- Illinois State Water Survey (ISWS) Private Well Database and water well construction report request; and
- Illinois Division of Public Water Supply web-based Geographic System (GIS) files.

As part of the operating permit application preparation, KPRG evaluated the NRT information and reviewed the new Illinois State Geological Survey database and interactive map references as "ILWATER". There are no potable use water wells downgradient of Pond 1N, Pond 1S, Pond 2S and Pond 3S. There are three existing water wells on the Will County Station property owned by Midwest Generation. These are identified as well numbers 01276, 00253 and 01275. The locations of these wells have been corrected relative to their locations plotted on the ILWATER map. All three wells are greater than 1,500 feet deep. Well 01276 on the north end of the property is no longer in use (retired). Two additional wells located on the property shown as numbers 40018 and 40017 have no backup records (i.e., no installation date information and no depth/log information). Discussions with plant personnel indicate no presence or knowledge of these two additional wells beyond the three known wells (wells 01276, 00253, 01275) suggesting these may be spurious data inputs. The well located on the northeast side of the property (number 40016) within the coal storage pile area is registered to Chicks Romeo Tavern and is actually located approximately 1 mile to the west of the Will County Station along Romeo Road (715 W. Romeo Rd.). There are two wells owned by Isle Ala Cache Park/Museum to the northwest, on the other side of the Des Plaines River, which is a regional hydrogeologic boundary. The well noted to the south (number 41780) is associated with the cement operation to the south.

A search of the Illinois Department of Natural Resources dedicated nature preserve database (https://www2.illinois.gov/dnr/INPC/Pages/NaturePreserveDirectory.aspx) was performed to determine whether there may be a nearby-dedicated nature preserve. The Romeoville Prairie Nature Preserve is located west of the Des Plaines River and north of Romeo Road, approximately one-quarter mile northwest of the subject impoundments. It is noted that the Des Plaines River is a hydrogeologic barrier and the noted nature preserve is on the other side of the river and upstream relative to surface water flow of the river.

Based on the geology of the site presented above and the above hydrogeology discussions, the primary contaminant migration pathway for a potential release from the subject CCR surface impoundments would be downward migration to groundwater. Due to its proximity to the Des Plaines River, which is the adjacent hydrogeologic flow boundary, minimal to no downward vertical flow mixing is anticipated. There are no other utility or man-made preferential pathway corridors that would act to potentially intercept the flow to move any contamination in a direction other than to the west. There are no potable water wells downgradient of the subject CCR surface impoundments screened within the aquifer of concern. Also, as previously discussed, there are no potable surface water intakes on the Des Plaines River either along or downstream of the subject site.

There is quarterly groundwater quality data associated with Pond 1N, Pond 1S, Pond 2S, and Pond 3S dating back to December 2010. However, the parameter list established in 2010 was slightly different from that specified in Section 845.600 and included analysis of dissolved inorganic parameters rather than total inorganic parameters.

Pond 2S and Pond 3S were identified as being subject to the new federal requirements under Federal Register, Environmental Protection Agency, 40 CFR Parts 257.94, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule dated April 17, 2015 (Federal CCR Rule). As required under the Federal CCR Rule, eight rounds of background sampling were completed for the monitoring wells within the monitoring network for the subject CCR surface impoundments (MW-5, MW-6 and MW-9 through MW-12). This included the full list of Appendix III (detection monitoring) and IV (assessment monitoring) parameters. Subsequently, quarterly groundwater monitoring for the first two years, followed by semi-annual groundwater monitoring, of these wells was continued for only Appendix III detection monitoring parameters since there were no detections of Appendix III parameters above the established statistical background for those wells and/or an Alternate Source Demonstration (ASD) was completed indicating a source of impacts other than the subject surface impoundments. Since the effective date of the State CCR Rule, quarterly groundwater monitoring for the full list of parameters specified in 845.600, which includes all parameters in the Federal CCR Rule Appendix III/IV, has continued. This data is available in the stations Initial Operating Permit application. In addition, it is noted that Illinois EPA added turbidity measurements to the list with a required eight rounds of background of that parameter for each well in the monitoring network for the subject CCR surface impoundments.

Because Pond 1N and Pond 1S did not accumulate liquids, they were not identified as being subject to the federal requirements under Federal Register, Environmental Protection Agency, 40 CFR Parts 257.94, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule dated April 17, 2015 (Federal CCR Rule). Therefore, the required eight rounds of background sampling for monitoring wells associated with these two ponds (wells MW-1 through MW-4, MW-7, MW-8 and MW-13 through MW-15) were completed between April 2021 and December 2021 with the enactment of the State CCR Rule. There is additional background sampling data starting in 2015 for monitoring well MW-9 since this well is also part of the Ponds 2S/3S monitoring system, which were included in the Federal CCR Rule program. As required under the State CCR Rule, all samples collected were analyzed for the full list of parameters specified in 845.600(a)(1) plus calcium and turbidity. The available CCR monitoring data through 2021 is available in the station’s Initial Operating Permit application.

## 3.0 IDENTIFICATION OF CLOSURE ALTERNATIVES

The Will County Generating Station has ceased operations and Ponds 1N, 1S, 2S, and 3S are now considered inactive CCR surface impoundments and subject to the State CCR Rule 35 Ill. Adm. Code Part 845. The ponds will be closed as part of decommissioning the generating station. Closure of the ponds must be completed either by leaving the CCR in place and installing a final cover system or through removal of the CCR and decontamination of the CCR surface impoundment, as described in Sections 845.720 through 845.760. Prior to selecting a closure method, a closure alternatives analysis must be completed in accordance with the requirements of 845.710.

The closure alternatives evaluated in accordance with Sections 845.710(b) through 845.710(d) are as follows:

- Closure Alternative 1: Complete removal of CCR including alternative modes of transporting the CCR in accordance with Sections 845.710(c) and 845.740.
- Closure Alternative 2: Leave the CCR in place in each pond and install a final cover system.
- Closure Alternative 3: Leave the CCR in place and perform in-situ soil stabilization.
- Closure Alternative 4: Consolidate the CCR and install a final cover system.

A brief description of each closure alternative is presented below.

### 3.1 Closure Alternative 1: Complete Closure by Removal

The ponds were used to temporarily contain CCR removed from the boilers and dewater the CCR before it is hauled offsite for permanent disposal. Typically, one pond was used at a time until it reached its storage capacity, then a different pond would be used. Ponds 1N and 1S were used to manage CCR when the station operated Generating Units 1 and 2. Ponds 2S and 3S were used to manage CCR for the most recently operated Generating Units 3 and 4. Generating Units 1 and 2 were retired and Ponds 1N and 1S were retired in 2010. Ponds 2S and 3S were used to manage CCR for Generating Units 3 and 4. Pond 3S ceased receiving CCR as of April 11, 2021 and Pond 2S ceased receiving CCR as of June 1, 2022.

The extent of the CCR in all four ponds was determined using a topographical survey from 2022, the original design drawings, and the as-built drawings for the Ponds 2S and 3S liner replacement. The CCR in Pond 1N ranges from the ground surface (590 ft amsl to 591 ft amsl) to 7.5-8.5 feet below ground surface (bgs) (582.5 ft amsl). The CCR in Pond 1S ranges from the ground surface (590 ft amsl to 591 ft amsl) to 7.5-8.5 feet bgs (582.5 ft amsl). The CCR in Pond 2S ranges from the ground surface (590 ft amsl to 591 ft amsl) to 7-8 feet bgs (583 ft amsl). The CCR in Pond 3S ranges from the ground surface (590 ft amsl to 591 ft amsl) to 7.7-8.7 feet bgs (582.3 ft amsl).

As stated in 845.740(a), closure by removal consists of removing all CCR and decontaminating all areas affected by releases of CCR from the CCR surface impoundment. CCR removal and decontamination of the CCR surface impoundment are complete when all CCR and CCR residues, containment system components such as the impoundment liner and contaminated subsoils, and CCR impoundment structures and ancillary equipment have been removed. To execute closure by removal of Pond 1N, 1S, 2S, and 3S, the following activities would occur:

- Dewater any standing water in Ponds 2S and 3S, which should be only stormwater at this point. Pond 1N and 1S do not contain standing water;
- Install erosion control measures, prior to earthwork;
- Excavate and stage CCR to allow for additional dewatering, as necessary;
- Load the CCR into haul trucks and transport for off-site disposal;
- Remove geomembrane liner and demolish concrete outlet structures.

The estimated quantity of CCR material that would require excavation from Pond 1N is 28,700 CY; Pond 1S is 30,300 CY; Pond 2S is 32,000 CY; and Pond 3S is 32,600 CY, which totals 123,600 CY. The volumes are based on the bank/in-place CCR quantity based upon the existing site elevations, the estimated depth of the CCR material based on the December 2022 topographic survey and the original design drawings of the ponds. The estimated quantities include the total quantity of the original Poz-O-Pac liners that remain in all four ponds. The estimated quantity for Pond 1S includes the north portion of the embankment that separates Ponds 1S and 2S. The estimated CCR quantity for Ponds 2S and 3S includes the total quantity of the warning layer because it is anticipated that IEPA will require the warning layer be included as CCR material, the south portion of the embankment that separates Pond 1S and 2S, and the embankment that separates Ponds 2S and 3S. If any portion of the warning layer is not considered as CCR material, then it will be used as part of the base material installed to assist with stormwater drainage from the excavated ponds. The extent of the removal areas and post-excavation contours are shown on Figure 2. As the bank/in-place material is removed, it may be stockpiled and staged as necessary to allow for any additional dewatering from the CCR prior to it being loaded and transported offsite. As the CCR is excavated, it is expected to swell by approximately 30%, which creates a handling and transportation volume for Pond 1N of 37,310 CY; Pond 1S - 39,390 CY; Pond 2S - 41,600 CY; and Pond 3S - 42,380 CY.

Ponds 1N and 1S have the original Poz-O-Pac liner system and Pond 2S and 3S have a 40-mil geomembrane liner on top of part of the original Poz-O-Pac liner system. Ponds 1N and 1S were closed in 2010 after Generating Units 1 and 2 were shutdown. Ponds 2S and 3S were relined in 2013/2014 as part of a Compliance Commitment Agreement between Midwest Generation and the Illinois Environmental Protection Agency. The relining consisted of removing part of the original Poz-O-Pac liner system to achieve a desired elevation, then installing the 40-mil geomembrane liner over top of the remaining Poz-O-Pac. On top of the above liners for each pond are eighteen inches of a warning system consisting of 12 inches of a cushion layer directly on the liner followed by 6 inches of warning layer. The cushion layer and warning layer are anticipated to consist of a sand/small aggregate type of materials.

Some or all of the liner system from each pond will be removed after the CCR material in accordance with 845.740(a). The Poz-O-Pac liner system in Ponds 1N and 1S will be evaluated for potential CCR contamination after the CCR material has been removed from each pond. If it appears the Poz-O-Pac liner surface has been contaminated by CCR material, it will be removed until the liner system no longer visually appears to contain CCR contamination. The removed Poz-O-Pac components will be hauled to the same landfill as the CCR material for disposal. The geomembrane liner in Ponds 2S and 3S will be removed and hauled to the same landfill as the CCR material for disposal. The remaining Poz-O-Pac liner below the geomembrane liner will be visually evaluated for the presence of CCR material, and if observed, the Poz-O-Pac liner would be removed and hauled offsite for landfill disposal.

As part of this scenario, dewatering will be necessary to remove water that may have accumulated in Ponds 2S and 3S to begin CCR removal. As needed, dewatering will occur if precipitation accumulates during the removal of the CCR material. The dewatered water would be pumped into the outlet structure for the respective pond where it would discharge through the existing drainage and NPDES system. Dewatering is not required for Ponds 1N and 1S prior to CCR removal because precipitation drains into the existing outlet structures. As CCR material is removed from Ponds 1N and 1S, accumulated precipitation may occur and would require dewatering. Detailed cost estimates in accordance with Section 845.710(d)(1) are provided in Table 4. The cost for closure by removal uses Laraway Recycling and Disposal Facility as the disposal facility; however, no discussions for disposal at this facility have occurred at this time.

Fill material is necessary to be placed in the bottom of the removal excavation after the removal activities have occurred. This fill material is necessary to create a sloped bottom so stormwater will drain from the bottom of this excavation into the existing process water drainage and recirculation system. Approximately 40,000 CY of fill material is necessary to achieve the necessary slopes to ensure drainage will occur.

As part of closure by removal as required by 845.740(b), groundwater monitoring must continue for three (3) years or for three years after groundwater monitoring does not show an exceedance of the groundwater protection standard established under 845.600, whichever is longer. A discussion of this closure alternative option relative to established evaluation criteria is provided in Section 4.0.

### *3.1.1 Availability of Nearby Landfill Space*

As stated above, closure by removal and disposal at an existing off-site landfill will require dewatering, excavation, loading, transportation, and disposal of an estimated combined 161,000 CY of CCR from Pond 1N (37,310 CY), Pond 1S (39,390 CY), Pond 2S (41,600 CY), and Pond 3S (42,380 CY). There are four (4) landfills in the northeast region of Illinois and they are all within 75 miles of the Will County station, 1) Laraway Recycling and Disposal Facility, 2) Prairie View Recycling and Disposal Facility, 3) Countryside Landfill, Inc., and 4) Zion Landfill.

Laraway Recycling and Disposal Facility (Laraway RDF) is approximately 16 miles from the station and the closest of the three identified landfills. Prairie View Recycling and Disposal Facility (Prairie View RDF) is approximately 36 miles and the second closest landfill, Countryside

Landfill, Inc. is approximately 56 miles from the station, and Zion Landfill is approximately 75 miles from the station. In regards to the closure by removal scenario and off-site disposal of CCR, the available landfill capacity based on IEPA's 2021 Landfill Capacity Report at each facility is as follows:

- Laraway Recycling and Disposal Facility – 5,405,667 CY with 4 years of life expectancy based on the current disposal rate.

- Prairie View Recycling and Disposal Facility – 13,167,434 CY with 16 years of life expectancy based on the current disposal rate.

- Countryside Landfill, Inc. – 1,516,739 CY with 4 years of life expectancy based on the current disposal rate.

- Zion Landfill – 4,573,014 CY with 7 years of life expectancy based on the current disposal rate.

Waste Management operates Laraway RDF, which accepts municipal waste, clean/contaminated soils, construction & demolition debris, and other wastes. This landfill does not accept hazardous waste. As noted above the amount of material that would require disposal is 161,000 CY and the capacity of the landfill is approximately 5.4 million CY, which is enough capacity to contain the amount of CCR requiring disposal. Access to this landfill would require truck traffic on county/state highways and local township roads. Laraway RDF has only five years of lifetime capacity remaining and limited ability to accept new waste because of existing contractual obligations. KPRG reached out to the landfill to request their potential acceptance of the CCR material. At this time, a response has not been received.

Waste Management operates Prairie View, which accepts municipal solid waste, contaminated soil, construction & demolition debris, and other wastes from sixteen (16) counties around the area. This landfill does not accept hazardous waste. As noted above, the amount of material that would require disposal is 161,000 CY and the capacity of the landfill is approximately 13.1 million CY, which is enough capacity to contain the amount of CCR requiring disposal. Prairie View has contractual obligations with existing entities and has limited ability to take on new sources of waste. KPRG reached out to the landfill to request their potential acceptance of the CCR material. At this time, a response has not been received.

Waste Management operates Countryside Landfill, Inc., which accepts municipal waste, clean/contaminated soils, construction & demolition debris, and other wastes. This landfill does not accept hazardous waste. As noted above the amount of material that would require disposal is 161,000 CY and the capacity of the landfill is approximately 1.5 million CY, which is enough to contain the amount of CCR requiring disposal. This landfills five-year average disposal volume is 371,346 CY and the disposal quantity is 161,000 CY, which is over forty percent of the yearly volume. In addition, this landfill is 56 miles from the Will County station, which creates a long turn-around time for each truck and decreases the loads per day that can be disposed of along with the increased emissions from so many miles being driven. Therefore, this landfill is not a practical option for disposal of CCR from the ponds.

GFL Environmental, Inc. operates Zion Landfill, which accepts municipal waste, contaminated soils, and special waste. This landfill does not accept hazardous waste. As noted above the amount of material that would require disposal is 161,000 CY and the capacity of the landfill is approximately 4.5 million CY, which is enough to contain the amount of CCR requiring disposal. Access to this landfill would require truck traffic on county/state highways and local township roads. In addition, this landfill is 56 miles from the Will County station, which creates a long turn-around time for each truck and decreases the loads per day that can be disposed of along with the increased emissions from so many miles being driven. Because of the distance this landfill is from the station, it is not a practical option for disposal of CCR from the ponds.

It should be noted that adverse reactions could occur between CCR and municipal solid waste causing elevated temperatures. Elevated temperatures may cause compliance issues for the landfill such as odors, air emissions, changes in leachate quality and adverse settlement. It is because of these concerns that landfills may place limits on how much CCR they accept or may not accept any CCR at all.

#### *3.1.2 Modes of Transport*

As required by 845.710(c)(1), this closure by removal analysis includes evaluating whether the CCR can be transported from the site for disposal by rail, barge, low-polluting trucks, or some combination of these transportation modes. These are discussed below.

##### *3.1.2.1 Rail Transport*

The site currently has railroad access that runs adjacent to Ponds 1N, 1S, 2S and 3S that was used to deliver coal to the station. The site coal delivery system is located near the northeast corner of Pond 1N, which unloaded the coal from the rail cars, and the coal was then transported to the coal yard, located in the northeast corner of the property, using a conveyor system. The coal delivery system was only designed to unload coal from the rail cars and store on site, but not designed to load the rail cars. The existing rail car coal unloading system is contained indoors within a building. In order to load rail cars, a new permanent system would have to be designed and constructed or existing commercially available equipment would need to be evaluated to determine if a temporary loading system could be erected. In the event a temporary loading system could be erected, the closest landfill to the site is Laraway RDF and its location was evaluated in relation to the railroad system and the Will County station. The location of the railroad that travels from the vicinity of the Will County station does not go directly to Laraway RDF, but the rail system travels from the Will County station to Midwest Generation’s Joliet #9 generating station, which has a system that unloads rail cars. Theoretically, this system could be used to unload the CCR, which could be loaded into trucks and hauled to Laraway RDF, which is approximately 5 miles from the Joliet #9 station. In 2016, the Joliet #9 station was converted from coal to natural gas. Since the station ceased coal-handling operations, the rail car unloading system has been completely decommissioned and is no longer operational. A substantial amount of work would be necessary to make this system operational, which includes the following:

- Reconstructing the power system. The system that powered the unloading equipment was disconnected at the power source from the electrical utility company so the entire infrastructure would need to be installed that provided power from the utility’s electrical grid to the unloading system controls. This would also include reinstalling the appropriate transformers.

- Replacing all the systems conveyor belts, which are at least 150 feet in length.
- Renting or purchasing new handling equipment to move the material after it has been unloaded.
- Completing an engineering review to determine the systems' structural viability and making any necessary structural repairs.
- Re-hiring or hiring new personnel to operate this system because the previous personnel have now left Midwest Generation since the station has ceased coal-handling operations.

Executing the above listed tasks is estimated to cost in excess of $500,000 in addition to the costs associated with constructing a temporary rail car loading system at the Will County station, removing the CCR from the ponds, and loading the CCR onto trucks that will haul it to the landfill. The railroad in the area of Laraway RDF travels adjacent to the Des Plaines River and not near the landfill. There are railroad spurs off of the main line that enter into the Union Pacific railyard along with the Zenith-Energy Joliet Terminal, which are capable of unloading railcars but not the type of railcar that would be used to haul the CCR material. It is also unlikely these companies would accommodate the unloading of CCR railcars without additional expense to modify their onsite equipment. The railroad does travel within 2 miles of Prairie View RDF, but a specific unloading station would need to be constructed along with purchasing property for this. From this point, the CCR would still need to be loaded onto dump trucks and driven to the landfill. The issue of needing an unloading location also exists for Countryside Landfill and Zion Landfill, which are located approximately 1 mile and 3 miles from a railroad line, respectively. The expense associated with this is not justifiable based on a CCR quantity of only 161,000 CY and the fact this would be a one-time event. Transporting the CCR by rail is not a viable option because of the logistics necessary to use the rail system to load, unload, and transport the CCR.

#### *3.1.2.2 <u>Barge Transport</u>*

The Will County station is sandwiched between the Des Plaines River and the Chicago Sanitary and Ship Canal (CSSC). The east side of the station is designed to allow a barge to dock and unload coal. A conveyor system is present along the east side to unload coal from a barge and place it in the coal yard. It may be possible to use this existing system to load CCR onto a barge for transport. Laraway RDF and Prairie View RDF are the only landfills that are located near any major river that would be able to accommodate barge traffic. Laraway RDF is near the Des Plaines River, which is less than one-half mile away. Prairie View RDF is near the Kankakee River, which is approximately 3-4 miles away, but no obvious barge port is present. A barge terminal and conveyor system is located at the Port of Will County Barge Terminal, which is owned by CenterPoint Properties. The terminal consists of a barge terminal and conveyor system for the movement and storage of materials. This terminal is approximately two miles from Laraway RDF and approximately 16 miles from Prairie View RDF. The Port of Joliet is located approximately five miles from Laraway RDF and 15-16 miles from Prairie View RDF, which could be an alternative barge terminal. Neither river enters the landfills; therefore, the CCR material would still need to be off loaded from the barge and loaded onto a truck for final disposal in the landfill. If the existing barge terminals can be used to unload CCR material, agreements would be needed between the barge terminal operators and Midwest Generation, along with payment for using the facilities. If the existing barge terminals cannot be used, then unloading facilities would need to be constructed at the end of the barge trip. Not only will this require time for permitting, but also access agreements would be needed with landowners that may be unwilling to agree. If an agreement can be arranged to use the existing barge terminals to unload CCR material, then transpiration via barge may be a viable option. If the existing barge terminals cannot be used, then transporting the CCR via barge is not a viable transportation option.

#### *3.1.2.3 New On-Site Landfill*

As required by 845.710(c)(2), this closure by removal analysis includes identifying whether an on-site landfill is present on the property or if an on-site landfill could be constructed. The Will County station property does not have an existing onsite landfill, but the existing site has the land available to construct a new on-site landfill. Based on the quantity of 161,000 CY an area up to approximately 540,000 square feet (12.4 acres) would be required to construct a new on-site landfill. Because of the site elevations (590-592 ft amsl), the anticipated groundwater elevation (578-582 ft amsl) in the coal pile area, and the five-feet separation requirement, the landfill would need to be constructed from the ground surface up. The base of the landfill would be from the site elevation of 590-592 ft amsl and the embankments would extend up to a crest elevation of 602 ft amsl based on a surface area of 540,000 square feet. The berms must be constructed as a perimeter to contain the CCR. If the landfill embankments were taller, then the footprint of the landfill would diminish.

The 12.4 acres is only the space required for CCR storage, additional land would be needed for property line setbacks, the leachate collection equipment, access roads, groundwater monitoring network, and other necessary equipment. Because of the groundwater elevation, any landfill would be constructed at ground elevation, which means any portion of the landfill, would extend above ground at least 10 feet and up to 15 feet to allow for the necessary space for the CCR and the final cover construction. The only areas at the Will County station where a landfill could be constructed are the former coal pile area or the green space to the southeast. The former coal pile area (northeast area) is not acceptable for a landfill because two of the stations water supply wells are located nearby. The green space area to the southeast of the ponds would have enough space if the tanks and silos in the southeast corner of the site were demolished. This would add to the cost of constructing the landfill along with obtaining additional demolition permits.

Constructing an onsite landfill would require obtaining the necessary permits and conducting the siting process. The siting process requires local approval and a public meeting. This process can take many years (estimated at 3-5 years) based on permitting requirements, any zoning changes, design requirements, and obtaining the necessary local approvals. The presence of an onsite landfill may make the property less desirable for resale and the City of Romeoville may not allow the construction of a landfill because it does not agree with their land use plan. The cover that would be placed over the CCR in a new landfill is the same cover that would be placed over the CCR closed in place in the ponds. In addition, Ponds 1N and 1S have the existing Poz-O-Pac liner that assists in preventing precipitation from passing through the pond into the subsurface. The liners in Pond 2S and 3S were replaced in 2013/2014 with a 60-mil HDPE geomembrane, which has a permeability of no greater than $10^{-9}$ cm/s.

It is unlikely the current Will County Station property is adequate to construct a new on-site landfill; adjacent parcels that could potentially be purchased were also evaluated. The land west of the station is the Des Plaines River, the land to the east is the CSSC, the land beyond the CSSC is in a floodplain, and the properties to the north and south are developed and in a floodplain. The adjacent properties are not viable options for a new landfill. If a nearby property could be located, it is unlikely it is a viable option to construct a landfill. First, the sale of the property is not certain. Second, the construction of a new landfill includes the sitting process, which requires local approval and local approval is not guaranteed. In addition, the smaller quantity of material that requires disposal and the fact it is a one-time disposal event, does not justify the time and expense of sitting and constructing a new landfill.

### 3.2 Closure Alternative 2: Closure in Place with a Final Cover System

The closure in place with a final cover system (FCS) alternative would consist of leaving the CCR in place in Ponds 1N, 1S, 2S, and 3S, placing additional fill material (as needed), and covering with a final cover system in accordance with 845.750. The final cover system would consist of a geomembrane low permeability layer, which is topped with an alternative final protective layer that provides equivalent performance to a soil final protective layer. The FCS would be sloped to allow for precipitation to runoff and drain into each ponds existing discharge structure, which enters the water recirculation system. The water is discharged to the CSSC through the permitted outfall in compliance with the existing NPDES permit.

The FCS product that would be used is the proprietary ClosureTurf cover system created by Watershed Geo. The ClosureTurf FCS consists of a geomembrane low permeability layer that also incorporates a drainage layer. The final protective layer is replaced with engineered synthetic turf that is infilled with sand/small aggregate to provide ballast to the synthetic turf. The infiltration layer will be a 60-mil HDPE geomembrane with a hydraulic conductivity that is no greater than $1x10^{-7}$ cm/sec. The engineered synthetic turf is comprised of polyethylene fibers that are tufted through a double layer of woven geotextiles that are highly UV and heat resistant. The engineered synthetic turf is then infilled with small aggregate that is approximately 1/8 inch to 1/4 inch diameter in size. The small aggregate is brushed into the synthetic turf to ensure that it settles to the bottom of the turf, which provides ballast and prevents the turf's movement during wind events.

Pond 1N has a crest embankment elevation that ranges between 590 and 591 ft amsl, a bottom elevation of approximately 582.5 ft amsl, and the discharge structure has a weir elevation of approximately 589 ft amsl. Pond 1N has an outer concrete wall that is part of the discharge structure, which has an average elevation of 593.4 ft amsl. The majority of the CCR in Pond 1N has an approximate elevation of 588-589 ft amsl with the east edge of the CCR at an elevation of 590 ft amsl. The southwest corner of Pond 1N has CCR elevation that range from 588 ft amsl to 583 ft amsl to allow for any precipitation that flows towards this corner to drain out of the pond into the existing drainage structure. The existing CCR material will be graded to slope towards the existing drainage structure to allow drainage to prevent the accumulation of precipitation. It may be necessary to add addition fill material to achieve the desired grade elevations. Approximately 100 CY of existing CCR will be graded and 4,910 CY of fill material is required. The ClosureTurf FCS would then be placed on top of the sloped surface with the geomembrane being attached to the discharge structure, the synthetic turf placed on top of the geomembrane, and the turf infilled with sand/small aggregate. The surface of the final protective layer will be sloped towards the Pond 1N discharge structure to allow for drainage.

Pond 1S has a crest embankment elevation that ranges between 590 and 591 ft amsl, a bottom elevation of approximately 582.5 ft amsl and the discharge structure has a weir elevation of approximately 589 ft amsl. Pond 1S has an outer concrete wall that is part of the discharge structure which has an average elevation of 593.4 ft amsl and a concrete wall on the east side that is part of an influent channel that has an average approximate elevation of 591.46 ft amsl. The majority of the CCR in Pond 1S has an approximate elevation of 587-590 ft amsl with the southeast edge of the CCR at an elevation of 591 ft amsl. The northwest corner of Pond 1S has CCR elevations that range from 587 ft amsl to 583.5 ft amsl to allow for any precipitation that flows towards this corner to drain out of the pond into the existing drainage structure. The existing CCR material will be graded to slope towards the existing drainage structure to allow drainage to prevent the accumulation of precipitation. It may be necessary to add addition fill material to achieve the desired grade elevations. Approximately 50 CY of existing CCR will be graded and 3,910 CY of fill material is required. The ClosureTurf FCS would then be placed on top of the sloped surface with the geomembrane being attached to the discharge structure, the synthetic turf placed on top of the geomembrane, and the turf infilled with sand/small aggregate. The surface of the final protective layer will be sloped towards the Pond 1S discharge structure to allow for drainage.

Pond 2S has a crest embankment elevation that ranges between 590 and 591 ft amsl, a bottom elevation of approximately 583 ft amsl and the discharge structure has a weir elevation of approximately 589 ft amsl. Pond 2S has an outer concrete wall that is part of the discharge structure, which has an elevation between 593.4 ft amsl and 593.5 ft amsl. Any CCR in Pond 2S is below the water level in the pond, which is between elevations 588-589 ft amsl and could not be observed or surveyed. Pond 2S will be dewatered to expose the existing CCR to execute the closure in place. The existing CCR material will be graded to slope towards the existing drainage structure to allow drainage to prevent the accumulation of precipitation. It may be necessary to add addition fill material to achieve the desired grade elevations. Approximately 40 CY of existing CCR will be graded and 6,700 CY of fill material is required. The ClosureTurf FCS would then be placed on top of the sloped surface with the geomembrane being attached to the discharge structure, the synthetic turf placed on top of the geomembrane, and the turf infilled with sand/small aggregate. The surface of the final protective layer will be sloped towards the Pond 2S discharge structure to allow for drainage.

Pond 3S has a crest embankment elevation that ranges between 590 and 592 ft amsl, a bottom elevation of approximately 582.3 ft amsl and the discharge structure has a weir elevation of approximately 589 ft amsl. Pond 3S has an outer concrete wall that is part of the discharge structure, which has an average elevation of 593.48 ft amsl. The majority of the CCR in Pond 3S is present along the perimeter of the pond and has an approximate elevation of 588-590 ft amsl with the CCR in the center of the pond being lower with an elevation of 588 ft amsl to less than 584 ft amsl. Water is present in the center of Pond 3S. The existing CCR material will be graded to slope towards the existing drainage structure to allow drainage to prevent the accumulation of precipitation. It may be necessary to add addition fill material to achieve the desired grade elevations. Approximately 230 CY of existing CCR will be graded and 8,300 CY of fill material is required. The ClosureTurf FCS would then be placed on top of the sloped surface with the geomembrane being attached to the discharge structure, the synthetic turf placed on top of the geomembrane, and the turf infilled with sand/small aggregate. The surface of the final protective layer will be sloped towards the Pond 3S discharge structure to allow for drainage.

The soils used in the FCS will consist of clean material sourced from as close to Pond 1N, 1S, 2S, and 3S as possible. It may be necessary to use multiple soil sources. A discussion of this closure alternative option relative to established evaluation criteria is provided in Section 4.0.

### 3.3 Closure Alternative 3: Closure in Place with Soil Stabilization

The in-situ solidification/stabilization (ISS) treatment would occur for the CCR in all four ponds. The ISS treatment would be completed over an approximate combined area of 287,700 square feet, which consists of Ponds 1S, 2S, and 3S and includes the berms separating these ponds. The ISS would be performed for Pond 1N separately and would be completed over an approximate 88,400 square feet area. This alternative would include the ISS of approximately 84,000 CY of CCR in Ponds 1N, 1S, 2S, and 3S. The ISS would be applied by soil mixing from the top of the CCR to the bottom-most extent of the CCR in the ponds. The ISS treatment range in Ponds 1N, 1S, 2S, and 3S extends from elevation 590-591 ft amsl to elevation 580.5 ft amsl, which consists of a treatment thickness range of 9.5-10.5 feet. The upper one foot of the Poz-O-Pac liner system would be removed in Ponds 1N and Ponds 1S to the fill layer so it can be included in the ISS treatment. This would occur by stockpiling the CCR material within the extent of the pond, removing the Poz-O-Pac and then placing CCR material where the Poz-O-Pac was removed. The geomembrane liners in Ponds 2S and 3S would need to be removed prior to the ISS treatment. This would consist of stockpiling some of the CCR material within the pond extent, removing the geomembrane liner and then placing the stockpiled CCR where the geomembrane was removed. For purposes of this closure alternatives analysis, it is assumed the ISS will be implemented through bucket mixing due to the shallow treatment thickness range.

ISS treatment consists of adding reagents to physically bind/solidify and/or chemically react/stabilize the CCR, resulting in a solidified or stabilized mass with reduced constituent mobility and leachability. The ISS will isolate the CCR from human contact and from groundwater by encapsulating in a low permeability monolith. Active reagents used in ISS can include pozzolanic compounds such as cement or blast furnace slag to produce a solidified material, reducing contact with groundwater and surface water. Other additives such as bentonite may be included to help lower permeability as needed. The reagents and additives are typically mixed with water to create a flowable and pumpable slurry that is then mixed with the CCR. The effectiveness and reagent mix for solidification/stabilization would need to be evaluated in a treatability study. Samples would be collected from the CCR in the ponds and bench top testing would be performed to determine the proper mix design. It may be necessary to use multiple mix designs to treat the ISS based on site factors.

Performing ISS will result in expansion of the treated CCR. This expansion is typically 10% to 25% of the original treatment volume. Depending on the soil type, the expansion can range from 10% for sandy materials to 25% or more for clayey materials. One such application of ISS to treat sandy silty fill material resulted in ISS swell of up to 40%. Testing during the ISS treatability study and the ISS pilot test will provide an estimate of the ISS swell expected from the CCR. For this closure alternative analysis, the swell volume estimate will be 30% to present a conservative estimate of the cost and volume of ISS. Any generated ISS swell would be used to achieve a slope of the ISS surface to prevent accumulation of precipitation and ponding.

The completed ISS treatment area would be covered with an FCS. The extent of the treatment area requiring additional clean soil is 376,100 square feet and approximately 37,000 CY of excess ISS will be regraded to achieve the necessary grades to prevent ponding water. The FCS would be sloped to allow water to drain towards the perimeter of the ISS treatment area and the ponds existing discharge structures. Conceptually, the cover installation would consist of direct placement of clean fill on the treated ISS area, and then covered with the FCS. The clean fill will be approximately one foot thick, as necessary. The clean fill including the FCS will be graded to ensure positive drainage and minimize ponding and for the purposes of this report, it is assumed the FCS will be ClosureTurf. Material used for the clean fill will consist of material imported from non-contaminated sites and/or sources. It is assumed 10% more material will be required to allow for compaction of the fill to achieve the one-foot thickness. Stockpiles of on-site materials may be used in the FCS cover.

### 3.4 Closure Alternative 4: Closure in Place by Consolidation with Final Cover System

The closure in place by consolidation with a final cover system (FCS) alternative would consist of leaving the CCR in place in Ponds 1N and 1S, placing the CCR material from Ponds 2S and 3S into Ponds 1N and 1S, and covering that material with a final cover system in accordance with 845.750. The final cover system would consist of a geomembrane low permeability layer, which is topped with an alternative final protective layer that provides equivalent performance to a soil final protective layer. The FCS would be sloped to allow for precipitation to runoff and drain into the existing Pond 1N and 1S discharge structures. The water from the Pond 1N and 1S discharge structures is discharged to the CSSC through the permitted outfall in compliance with the existing NPDES permit.

The FCS product that would be used is the proprietary ClosureTurf cover system created by Watershed Geo. The ClosureTurf FCS consists of a geomembrane low permeability layer that also incorporates a drainage layer. The final protective layer is replaced with engineered synthetic turf that is infilled with sand/small aggregate to provide ballast to the synthetic turf. The infiltration layer will be a 60-mil HDPE geomembrane with a hydraulic conductivity that is no greater than $1x10^{-7}$ cm/sec. The engineered synthetic turf is comprised of polyethylene fibers that are tufted through a double layer of woven geotextiles that are highly UV and heat resistant. The engineered synthetic turf is then infilled with small aggregate that is approximately 1/8 inch to 1/4 inch diameter in size. The small aggregate is brushed into the synthetic turf to ensure that it settles to the bottom of the turf, which provides ballast and prevents the turf's movement during wind events.

Pond 1N has a crest embankment elevation that ranges between 590 and 591 ft amsl, a bottom elevation of approximately 582.5 ft amsl, and the discharge structure has a weir elevation of approximately 589 ft amsl. Pond 1N has an outer concrete wall that is part of the discharge structure, which has an average elevation of 593.4 ft amsl. The majority of the CCR in Pond 1N has an approximate elevation of 588-589 ft amsl with the east edge of the CCR at an elevation of

590 ft amsl. The southwest corner of Pond 1N has CCR elevation that range from 588 ft amsl to 583 ft amsl to allow for any precipitation that flows towards this corner to drain out of the pond into the existing drainage structure. The existing CCR material from Pond 2S and Pond 3S will be added to Pond 1N and graded to slope towards the existing drainage structure to allow drainage to prevent the accumulation of precipitation. It may be necessary to add additional fill material to achieve the desired grade elevations. Up to 32,000 CY of existing Pond 2S and Pond 3S CCR will be consolidated in Pond 1N. The ClosureTurf FCS would then be placed on top of the sloped surface with the geomembrane being attached to the discharge structure, the synthetic turf placed on top of the geomembrane, and the turf infilled with sand/small aggregate. The surface of the final protective layer will be sloped towards the Pond 1N discharge structure to allow for drainage.

Pond 1S has a crest embankment elevation that ranges between 590 and 591 ft amsl, a bottom elevation of approximately 582.5 ft amsl and the discharge structure has a weir elevation of approximately 589 ft amsl. Pond 1S has an outer concrete wall that is part of the discharge structure which has an average elevation of 593.4 ft amsl and a concrete wall on the east side that is part of an influent channel that has an average approximate elevation of 591.46 ft amsl. The majority of the CCR in Pond 1S has an approximate elevation of 587-590 ft amsl with the southeast edge of the CCR at an elevation of 591 ft amsl. The northwest corner of Pond 1S has CCR elevations that range from 587 ft amsl to 583.5 ft amsl to allow for any precipitation that flows towards this corner to drain out of the pond into the existing drainage structure. The existing CCR material from Pond 2S and 3S that cannot be placed in Pond 1N will be added to Pond 1S and graded to slope towards the existing drainage structure to allow drainage to prevent the accumulation of precipitation. It may be necessary to add addition fill material to achieve the desired grade elevations. Up to 32,600 CY of existing Pond 2S and Pond 3S CCR will be consolidated in Pond 1S. The ClosureTurf FCS would then be placed on top of the sloped surface with the geomembrane being attached to the discharge structure, the synthetic turf placed on top of the geomembrane, and the turf infilled with sand/small aggregate. The surface of the final protective layer will be sloped towards the Pond 1S discharge structure to allow for drainage.

The soils used in the FCS will consist of clean material sourced from as close to Pond 1N and 1S as possible. It may be necessary to use multiple soil sources. A discussion of this closure alternative option relative to established evaluation criteria is provided in Section 4.0.

## 4.0 CLOSURE ALTERNATIVES EVALUATION CRITERIA

The closure alternatives were evaluated based on requirements under State CCR Rule Part 845.710(b)(1) through 845.710(b)(4). The evaluation criteria consisted of the following:

- Long- and short-term effectiveness and protectiveness, including reliability;
- Effectiveness of controlling future releases;
- Ease or difficulty of Implementation; and
- The degree to which concerns of the community residents are addressed.

Each closure alternative was evaluated using the above criteria and that evaluation is provided in Table 3. The following highlights are provided from that evaluation. Groundwater modeling was performed in accordance with 845.710(d)(2) and 845.710(d)(3) to assist in evaluating the long- and short-term effectiveness of each closure alternative. A discussion of the groundwater modeling and the results are presented in Section 5.

*Alternative Closure Scenario 1: Closure by Removal*

- Removing the CCR from Pond 1N, 1S, 2S, and 3S would require excavating and hauling 161,000 CY, which would take over 200 days to execute based on 50 truckloads per day and 15 cubic yards per truck (750 CY/day).

- Removing the CCR would remove any remaining amounts of the CCR mass. Groundwater modeling has shown that theoretical impacts to groundwater are reduced by about 80% within 50 years and removing the mass would remove the potential for future contamination.

- Additionally, the truck traffic removing the CCR will negatively affect the neighboring properties, including air quality and noise pollution, since the entrance and egress for the trucking would be directly via E. Romeo Road and E. Material Service Road.

- This option will require at least 3 years of post-closure monitoring.

*Alternative Closure Scenario 2: Closure in Place with a Final Cover System*

- ClosureTurf has successfully been used around the country to close CCR surface impoundments and landfills.

- The ClosureTurf final cover will require approximately 25,410 CY of clean fill material and more overall truck traffic to and from the site because the ponds have to be filled to achieve the necessary grades and elevations. It will require approximately 35 days to deliver clean fill to the site based on 50 truckloads per day and 15 CY per truck.

- The ClosureTurf and soil infill will cover the CCR, prevent infiltration into the CCR, and prevent any human or animal contact.

- The ClosureTurf option will require 30 years of post-closure monitoring.

- Minimizing infiltration through the existing CCR will prevent future groundwater impacts. Any elevated constituents that have been detected in the groundwater will disperse through the existing groundwater and concentrations will decrease in time.

*Alternative Closure Scenario 3: Closure in place with In-Situ Solidification/Stabilization*

- ISS is expected to contain and stabilize the CCR and is anticipated to be an adequate and reliable means of reducing the leaching potential of the CCR if it is exposed to groundwater and precipitation.

- Placement and maintenance of the FCS would provide adequate and reliable means of controlling exposures to stabilized CCR.

- ISS and installation of the FCS would result in impacts to the community relative to truck traffic and noise during the construction. However, as materials requiring offsite disposal are minimized, this disturbance would be less than closure by removal.

- Approximately 84,000 in-place CY of CCR, warning layer, and Poz-O-Pac would be treated with ISS.

- The leaching potential of CCR would be irreversibly reduced through ISS. The mobility of CCR into surface water or via flooding (i.e., associated with erosion) would be further reduced by installation of the FCS.

*Alternative Closure Scenario 4: Consolidation with Closure in Place*

- ClosureTurf has successfully been used around the country to close CCR surface impoundments and landfills.

- The ClosureTurf final cover will require moving approximately 32,000 CY from Pond 2S and 32,600 CY from Pond 3S and placing in Ponds 1N and 1S. The proposed method for moving the material is mechanical excavation and hauling.

- In addition, only 140 CY of clean fill material would be needed to achieve the necessary grades and elevations. It will require approximately 52 days to consolidate CCR in Ponds 1N and 1S based on 50 truckloads per day and 15 CY per truck.

- The ClosureTurf and soil infill will cover the CCR, prevent infiltration into the CCR, and prevent any human or animal contact.

- The ClosureTurf option will require 30 years of post-closure monitoring.

- Removing the CCR from Ponds 2S and 3S, consolidating in Ponds 1N and 1S, and closing in place will minimize future groundwater impacts. Groundwater modeling has shown that existing groundwater impacts will reduce in time with removal and consolidation. Groundwater impacts will reduce approximately 70% over 25 years.

## 5.0 GROUNDWATER MODELING

This section discusses the results of the groundwater modeling and a description of the fate and transport of each closure alternative over time in accordance with 845.710(d)(2) and 845.710(d)(3). As discussed in the Illinois CCR Compliance Ash Ponds 1 North and 1 South Annual Groundwater Monitoring and Corrective Action Report, and in the Illinois CCR Compliance Ash Ponds 2 South and 3 South Annual Groundwater Monitoring and Corrective Action Report, both dated January 30, 2023, arsenic, calcium, chloride, molybdenum, and sulfate were detected at concentrations above proposed Groundwater Protection Standards during the 4$^{th}$ quarter 2022 sampling in downgradient monitoring wells. These parameters were the focus of predictive modeling comparisons for the various alternatives discussed in the previous sections. It is noted that boron was also added to the above list of parameters to be evaluated since it is a main indicator of potential CCR impacts.

The groundwater flow modeling that was conducted is based on a hypothetical distribution of dissolved contaminants beneath the four ponds, assuming a source at the ponds, to evaluate the potential closure alternatives. To conduct the support modeling a hypothetical unit source with a concentration of “1” was established beneath the ponds and projected forward in time with advection and dispersion to establish an equilibrated distribution of contaminants in groundwater if the ponds were the source. The equilibrated distribution (base case) of the mass was then used as the initial concentrations in the groundwater for model runs to simulate the closure alternatives to evaluate corresponding improvement in groundwater quality from the base case scenario.

The four proposed closure alternatives discussed above were modeled and the results are presented as follows. The figures referenced in this section are from the Will County Groundwater Modeling Report completed in support of CCR regulatory compliance and are located in Attachment 1.

### 5.1 Closure Alternative 1

This alternative simulated the removal of the CCR from all four ponds. From the initial equilibrated model run (see Figure 16 in Attachment 1), the source was removed from all four ponds and the change in concentrations was modeled over 5-years, 25-years, 50-years, and 100-years; these model runs are shown on Figures 17 and 18 located in Attachment 1. In general, this closure alternative results in the dissolved contaminants being reduced over time in the subsurface beneath the four ponds. Figure 17 shows the relative concentrations downgradient of the ponds are reduced to less than approximately 0.7 within 5 years and reduced to 0.2 or less within 25 years beneath and downgradient from the ponds. Figure 18 shows relative concentrations at 50 years with further reduction occurring beneath and downgradient of the ponds with relative concentrations less than 0.2. By 100 years, the dissolved contaminants are effectively removed from groundwater beneath and downgradient of the ponds, as shown on Figure 18.

5.2 Closure Alternative 2

This alternative simulated the closure-in-place of all four ponds using an FCS. From the initial equilibrated model run (see Figure 16 in Attachment 1), the hypothetical dissolved contaminants remained in the groundwater beneath the ponds and infiltration was simulated at a reduced rate of $1x10^{-15}$ meters per second (m/s), which represents the engineered FCS placed over the four ponds. The change in concentrations was modeled over 5-years, 25-years, 50-years, and 100-years and these model runs are shown on Figures 19 and 20 located in Attachment 1. As shown on Figure 19, within 5 years relative concentrations in the groundwater are reduced to less than 0.7 downgradient of Pond 1N and less than 0.9 downgradient of Pond 1S. Figure 19 also shows relative concentrations have decreased by a change of about 10 percent to less than 0.4 downgradient of Ponds 2S and 3S. Within 25 years relative concentrations have reduced below 0.3 downgradient of Ponds 1N, 2S, and 3S, and below relative concentrations of approximately 0.8 downgradient of Pond 1S as shown on Figure 19. Figure 20 shows relative concentrations are mostly stable after 25 years with little change at years 50 and 100 with relative concentrations mostly at 0.4 or less downgradient of the ponds.

5.3 Closure Alternative 3

This alternative simulated the ISS treatment of the CCR in the ponds along with the placement of an FCS. As in Closure Alternative 2, the hypothetical dissolved contaminants remained in the groundwater beneath the ponds and infiltration was simulated at a reduced rate of $1x10^{-13}$ centimeters per second (cm/s), which represents the engineered FCS placed over the four ponds. The reduced permeability caused by the ISS treatment was simulated with a horizontal flow barrier around the ISS treatment area with a permeability of $1x10^{-7}$ cm/s. Figure 22 shows that by 5 years, relative concentrations have decreased downgradient of Ponds 1N and 1S to less than approximately 0.6, to less than approximately 0.8 downgradient of Pond 2S, and to less than approximately 0.4 downgradient of Pond 3S. By 25 years, the dissolved mass is mostly confined to the pond footprints, where the source is encapsulated by the ISS treatment. Relative concentrations less than approximately 0.1 to 0.2 remain downgradient of Ponds 1N and 3S as shown on Figure 22. There is little change to the downgradient dissolved mass by 50 years, and by 100 years, the dissolved mass is effectively removed from the groundwater downgradient of the Ponds as shown on Figure 23.

5.4 Closure Alternative 4

This alternative simulated the removal of CCR from Ponds 2S and 3S, which is then placed into Ponds 1N and 1S followed by closure-in-place of the CCR in Ponds 1N and 1S using an FCS. In this alternative, the dissolved contaminants were removed from beneath Ponds 2S and 3S with infiltration remaining at natural conditions. The dissolved contaminants remained beneath Ponds 1N and 1S with infiltration simulated at a reduced rate of 1x10-13 centimeters per second (cm/s), which represents the engineered FCS placed over Ponds 1N and 1S. Figure 24 shows relative concentrations have decreased below 0.3 downgradient of Pond 1N and 1S and relative concentrations are below 0.1 in the groundwater downgradient of Ponds 2S and 3S. By 50 years, the dissolved contaminants are effectively removed from the groundwater downgradient of Ponds

2S and 3S as shown on Figure 25. Relative concentrations in shallow groundwater downgradient of Ponds 1N and 1S have mostly stabilized by 50 years to less than 0.3 and have not reduced further within 100 years as Figure 25 indicates.

### 5.5 Relation to Constituent Concentrations

The following section is from the Will County Groundwater Modeling Report created by BAS Groundwater Consulting, Inc. This section discusses how the above performed groundwater modeling and the effectiveness of each closure alternative was applied to specific constituents detected in downgradient monitoring wells. The figures referenced in this section are located in Attachment 1. The effective reductions in the theoretical mass concentrations discussed in Sections 5.1 through 5.4 for the four closure alternatives were related to the concentrations of several CCR constituents being monitored in groundwater that were detected at concentrations above their proposed Groundwater Protection Standards (GWPSs) during the 4th quarter 2022 groundwater monitoring event. Specifically, these were arsenic, boron, calcium, chloride, molybdenum, and sulfate. The concentrations of these constituents from the 4th quarter 2022 monitoring in downgradient monitoring wells were used as the starting concentrations for this evaluation. The percent decrease in the surrogate concentrations were calculated from the starting concentrations through the 100-year simulation for each closure alternative, at nine, downgradient CCR monitoring well locations MW-07 through MW-15.

The relative reduction of the surrogate concentration over time can be related to the dissolved mass of any constituent by applying the percent decrease of the surrogate concentration to an initial concentration of a specific constituent of concern. As noted above, an initial concentration was assigned at each of these nine monitoring well locations for specific constituents of concern based on the 4th quarter 2022 sampling event. The calculated percent decrease in the surrogate concentration over the 100-year model simulations was applied to the assigned initial concentration in each monitoring well. For example, the initial concentration (4th quarter 2022 sampling data) for arsenic in monitoring well MW-07 is 0.0032 milligrams per liter (mg/L). The initial, relative surrogate concentration in monitoring well MW-07 is 0.75 (relative to the source concentration of “1”). The decrease in the surrogate concentration throughout the 100-year closure scenario was calculated as a percentage of the initial, relative concentration in this monitoring well, and the percentage decrease was applied to the initial concentration of 0.0032 mg/L to yield a curve of decreasing arsenic concentrations for the model scenario. The resulting concentrations for each constituent of concern in each monitoring well was compared to the proposed Section 845.600(a) GWPSs for each constituent. The GWPSs are presented as dashed lines on each monitoring well’s decay curve graph for each modeled alternative.

The decay curves for arsenic concentrations are shown on Figures 27, 28, and 29 for monitoring wells downgradient of Ash Ponds 1N, 1S, 2S, and 3S, respectively for Closure Alternatives 1 through 4. The current concentrations of arsenic are below the proposed GWPSs for Ash Ponds 1N, 1S, 2S, and 3S in all downgradient monitoring wells except MW-10 and MW-11. Therefore, all of the arsenic decay curves start below the dashed line representing the arsenic proposed GWPSs on Figures 27 through 29, except in monitoring wells MW-10 and MW-11. Arsenic concentrations decrease over time in all four modeled alternatives, including in monitoring wells

MW-10 and MW-11 (Figure 29). Arsenic concentrations decrease below the proposed GWPS in monitoring wells MW-10 and MW-11 in all closure alternatives within approximately 4 to 15 years.

The decay curves for boron concentrations are shown on Figures 30, 31, and 32 for monitoring wells downgradient of Ash Ponds 1N, 1S, 2S, and 3S, respectively for Closure Alternatives 1 through 4. The current concentrations of boron are below the proposed GWPSs for Ash Ponds 1N, 1S, 2S, and 3S in all downgradient monitoring wells therefore, all of the boron decay curves start below the dashed line representing the boron GWPSs on Figures 30 through 32. Boron concentrations decrease over time in all four modeled alternatives.

The decay curves for calcium concentrations are shown on Figures 33, 34, and 35 for monitoring wells downgradient of Ash Ponds 1N, 1S, 2S, and 3S, respectively for Closure Alternatives 1 through 4. The current concentrations of calcium are below the GWPSs for Ash Ponds 1N, 1S, 2S, and 3S in all downgradient monitoring wells except MW-15, therefore, all of the calcium decay curves start below the dashed line representing the calcium GWPSs on Figures 33 through 35 except for monitoring well MW-15. Calcium concentrations decrease over time in all four modeled alternatives at all well locations. At well MW-15, the calcium concentration is reduced to below the proposed GWPS of 109.5 mg/L in all four scenarios within approximately 2 to 5 years (Figure 33).

The decay curves for chloride concentrations are shown on Figures 36, 37, and 38 for monitoring wells downgradient of Ash Ponds 1N, 1S, 2S, and 3S, respectively for Closure Alternatives 1 through 4. The current concentrations of chloride are below the proposed GWPSs for Ash Ponds 1N, 1S, 2S, and 3S in all downgradient monitoring wells except MW-09 in which the chloride concentration is equal to the proposed GWPS of 200 mg/L. Therefore, all of the chloride decay curves start below the dashed line representing the chloride GWPSs on Figures 36 through 38 except for monitoring well MW-09. Chloride concentrations decrease over time in all four modeled alternatives. Chloride concentrations decrease below the proposed GWPS of 200 mg/L in monitoring well MW-09 in all closure alternatives within approximately 1 to 1.5 years (Figure 37).

The decay curves for molybdenum concentrations are shown on Figures 39, 40, and 41 for monitoring wells downgradient of Ash Ponds 1N, 1S, 2S, and 3S, respectively for Closure Alternatives 1 through 4. The current concentrations of molybdenum are below the proposed GWPSs for Ash Ponds 1N, 1S, 2S, and 3S in all downgradient monitoring wells except MW-08 in which the molybdenum concentration is slightly higher (0.11 mg/L) than the proposed GWPS of 0.1 mg/L. Therefore, all of the molybdenum decay curves start below the dashed line representing the molybdenum GWPSs on Figures 39 through 41 except for monitoring well MW-08. Molybdenum concentrations decrease over time in all four modeled alternatives. Molybdenum concentrations decrease below the proposed GWPS of 0.1 mg/L in monitoring well MW-08 in all closure alternatives within approximately 2 to 5 years (Figure 40).

The decay curves for sulfate concentrations are shown on Figures 42, 43, and 44 for monitoring wells downgradient of Ash Ponds 1N, 1S, 2S, and 3S, respectively for Closure Alternatives 1 through 4. The current concentrations of sulfate are below the GWPSs for Ash Ponds 1N, 1S, 2S, and 3S in all downgradient monitoring wells except MW-14 in which the sulfate concentration is higher (570 mg/L) than the proposed GWPS of 547.6 mg/L. Therefore, all of the sulfate decay curves start below the dashed line representing the sulfate GWPSs on Figures 42 through 44 except for monitoring well MW-14. Sulfate concentrations decrease over time in all four modeled alternatives. Sulfate concentrations decrease below the proposed GWPS of 547.6 mg/L in monitoring well MW-14 similarly in all closure alternatives within approximately 1.5 years (Figure 42).

## 6.0 SUMMARY

Four closure scenarios were evaluated as part of the closure alternatives analysis for closure of Ponds 1N, 1S, 2S, and 3S in accordance with 845.710(b). The four options evaluated are as follows:

1) Closure by removal;
2) Closure in place in Ponds 1N, 1S, 2S, and 3S with an FCS;
3) Closure in place with in-situ solidification/stabilization in both north and south portions with a soil cover; and
4) Closure in place by consolidating CCR from Ponds 2S and 3S in Ponds 1N and 1S with an FCS.

The options were evaluated based on effectiveness/protectiveness, ease of implementation, and addressing the concerns of the community residents.

Closure by removal would require the excavation, transportation, and disposal of 161,000 CY of CCR, warning layer material, and existing Poz-O-Pac liner and take approximately 210 days to complete. The CCR removed is assumed to be disposed of at Laraway RDF for the purposes of evaluating this alternative. If this alternative were to move forward, discussions with the landfill would have to occur prior to selecting this alternative. The area of the removed CCR would be partially re-filled with clean material and graded to prevent accumulation of standing water and facilitate drainage towards the existing ponds' discharge structure. Once the closure by removal is complete, groundwater monitoring in accordance 845.600 would occur for three (3) years.

The closure in place in all four ponds scenario requires filling the ponds to achieve the proper grades and constructing the FCS on this fill material. This scenario would require all four ponds to be filled with approximately 25,410 CY of additional material in order to bring the grade up to the proper elevations to allow precipitation to gravity flow off the FCS. The ClosureTurf FCS system would then be placed on top of the fill material in the ponds. Each ponds' FCS is sloped to drain towards the existing discharge structures in each pond. From the ponds, the water is recycled through the recirculation system and ultimately discharged through the station's NPDES permitted outfall. This option would take approximately 4 months to complete and groundwater monitoring in accordance with 845.600 would occur for thirty years.

The in-situ solidification/stabilization (ISS) treatment of the CCR in the ponds would be completed over an approximate 287,700 square feet area. This alternative would include the ISS of approximately 124,000 CY of CCR in the ponds. The ISS would be applied by soil mixing from the top of the CCR to the bottom most extent of the CCR. The completed ISS treatment area would be covered with a ClosureTurf FCS. It is anticipated that the swell material generated during treatment would be used to obtain the necessary grades to prevent ponding water. The ISS swell material would be sloped to allow water to drain towards the west perimeter of the ISS treatment area and the existing ponds' discharge structures. If the swell material quantity is inadequate, then clean soil will supplement as necessary to achieve the desired grades and slopes.

The closure in place by consolidation with an FCS alternative would consist of leaving the CCR in place in Ponds 1N and 1S, placing the CCR material from Ponds 2S and 3S into Ponds 1N and 1S, and covering that material with a final cover system in accordance with 845.750. The FCS would be sloped to allow for precipitation to runoff and drain into the existing Pond 1N and 1S discharge structures. The water from the Pond 1N and 1S discharge structures is discharged to the CSSC through the permitted outfall in compliance with the existing NPDES permit. The existing CCR material, warning layer, and Poz-O-Pac liner from Ponds 2S and 3S will be added to Ponds 1N and 1S and graded to slope towards the existing drainage structure to allow drainage to prevent the accumulation of precipitation. It may be necessary to add addition fill material to achieve the desired grade elevations. Up to 64,600 CY of material from Ponds 2S and 3S will be consolidated between Ponds 1N and 1S. The ClosureTurf FCS would then be placed on top of the sloped surface with the geomembrane being attached to the discharge structure, the synthetic turf placed on top of the geomembrane, and the turf infilled with sand/small aggregate. The surface of the final protective layer will be sloped towards the Ponds 1N and 1S discharge structure to allow for drainage. The soils used in the FCS will consist of clean material sourced from as close to Pond 1N and 1S as possible. It may be necessary to use multiple soil sources.

Groundwater modeling has shown that all four (4) closure alternatives reduce concentrations of groundwater constituents to levels below the proposed groundwater protection standards in the downgradient monitoring wells.

## 7.0 PROFESSIONAL ENGINEER'S CERTIFICATION

This closure alternatives analysis has been prepared in accordance with 35 Ill. Adm. Code 845.710.

Joshua D. Davenport, P.E.
Illinois Professional Engineer

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STATE OF ILLINOIS

# TABLES

**Table 1 - Closure Alternatives Evaluation**

| 35 Ill. Adm. Code Part 845.710(b)(1) through 845.710(b)(4) Requirements | | Closure Alternatives | | | |
|---|---|---|---|---|---|
| | | Closure by Removal | Closure-in-Place with a Final Cover System | Closure-in-Place with Insitu Stabilization/Solidification | Consolidation & Closure-in-Place with a Final Cover System |
| 845.710(b)(1)(A) | Magnitude of existing risk reduction | The excavation and removal of the CCR from the four ponds would remove a potential source. This will prevent any precipitation from contacting existing CCR and the potential from passing through the unsaturated CCR into the groundwater. The excavation and removal of CCR also eliminates human/animal exposure to any CCR. The groundwater modeling has shown that by removing the CCR source material, a reduction of about 80% would occur in groundwater concentrations after 50 years. | Closing the CCR ponds in place with the ClosureTurf final cover system will prevent infiltration through the CCR material. The final cover system also eliminates human/animal exposure to any CCR, in addition to removing the hazard of an open pond. The final cover system would be constructed by grading the existing CCR in each pond, filling each pond with clean material and covering with a geomembrane infiltration layer that has a permeability of $1 \times 10^{-13}$ cm/s, which is covered with a synthetic turf/small aggregate infill erosion layer. This type of cover system has been used throughout the country since 2009 to effectively close CCR surface impoundments. The groundwater modeling has shown that a reduction of 20%-70% of groundwater concentrations would occur after 25 years with the groundwater concentrations reaching steady state conditions at this time with no further increases in groundwater concentrations. | Closing the CCR in place with treating the CCR with in-situ solidification/stabilization will prevent infiltration through the CCR material that may be present. The soil cover also eliminates human/animal exposure to any CCR, in addition to removing the hazard of an open area. The ISS would be conducted by mixing the CCR with reagents (cement, bentonite) using either an excavator bucket or a large diameter auger, followed up by covering with ClosureTurf. The ISS would have a permeability of less than $1 \times 10^{-7}$ cm/s. This type of technology has been used throughout the country since the 1960's to effectively treat impacted soil throughout the country. The groundwater modeling has shown that a reduction of approximately 80% of groundwater concentrations would occur after 25 years and the groundwater concentrations would reach a steady state condition after 25 years. | Closing the CCR in place with the ClosureTurf final cover system will prevent infiltration through the CCR material that may be present. The final cover system also eliminates human/animal exposure to any CCR. The final cover system would be constructed by consolidating the CCR from Ponds 2S and 3S into Ponds 1N and 1S and covering with a geomembrane infiltration layer that has a permeability of $1 \times 10^{-13}$ cm/s, which is covered with a synthetic turf/sand infill erosion layer. This type of cover system has been used throughout the country since 2009 to effectively close CCR surface impoundments. The groundwater modeling has shown that a reduction of 70% of groundwater concentrations would occur after 25 years and the groundwater concentrations would reach a steady state condition after 25 years with no further increases in groundwater concentrations. |
| 845.710(b)(1)(B) | Likelihood of future CCR releases | Since the CCR would be removed, the likelihood of a future CCR release is eliminated. Groundwater monitoring would continue after the removal occurs to identify if concentrations are present above the GWPSs. | Covering the CCR would prevent the future release of CCR because it would not be exposed to surface water runoff and the potential for erosion. Releases of CCR to the Des Plaines River have not been identified. The material brought on-site would be evaluated to determine that it will not cause a future release. | Solidifiying and covering the CCR would prevent the future release of CCR because it would not be exposed to surface water runoff, infiltration, and the potential for erosion. Releases of CCR to the Des Plaines River has not been identified. The material brought on-site would be evaluated to determine that it will not cause a future release. | Covering the CCR would prevent the future release of CCR because it would not be exposed to surface water runoff and the potential for erosion. Releases of CCR to the Des Plaines River has not been identified. The material brought on-site would be evaluated to determine that it will not cause a future release. |
| 845.710(b)(1)(C) | Long-term management required | Long-term management of the ponds would be very minimal because the CCR would be removed. Therefore, there is no potential for future releases and no inspections required. Groundwater monitoring is required in accordance with 845.740(b) and 845.600. Groundwater monitoring is required for at least 3 years. | Post-closure activities will be required in accordance with 845.780 which includes regular inspections of the ClosureTurf FCS and groundwater monitoring. The post-closure care period is at least 30 years. | Post-closure activities will be required in accordance with 845.780 which includes regular inspections of the ClosureTurf and groundwater monitoring. The post-closure care period is at least 30 years. | Post-closure activities will be required in accordance with 845.780 which includes regular inspections of the ClosureTurf FCS and groundwater monitoring. The post-closure care period is at least 30 years. |
| 845.710(b)(1)(D) | Short-term risks to the community during closure activities | The short-term risk to the community is very minimal to non-existent. The only potential risk would be from an increase in truck traffic hauling the CCR for offsite disposal and truck traffic returning to the site because each truck will make multiple trips per day for disposal. Over 10,700 truck loads is required to haul the CCR off-site for disposal. This has the potential to cause 0.133 traffic accident injuries and 0.006 traffic accident fatalities based on a 20-mile round trip for each truckload. 10,700 truckloads has the potential to produce 43 lbs of particulate matter emissions. | The short-tem risk to the community is minimal and would come from the increased truck traffic bringing the fill material and ClosureTurf FCS supplies to the site. Filling the ponds to the required elevations would require approximately 23,500 CY of additional clean material from off-site and approximately 1,600 trucks to transport this material. The ClosureTurf materials would require approximately 57 truckloads. This has the potential to cause 0.0250 traffic accident injuries and 0.0012 traffic accident fatalities based on a 20-mile round trip for each truckload. The total number of truckloads has the potential to produce approximately 8 lbs of particulate matter emissions. | The short-tem risk to the community is minimal and would come from the increased truck traffic bringing the ClosureTurf FCS supplies to the site. Bringing the ClosureTurf FCS materials would require approximately 61 truckloads. This has the potential to cause 0.0167 traffic accident injuries and 0.0008 traffic accident fatalities. The total number of truckloads has the potential to produce approximately 5 lbs of particulate matter emissions. | The short-tem risk to the community is minimal and would come from the increased truck traffic bringing the ClosureTurf FCS supplies to the site. Consolidating CCR from Ponds 2S and 3S would require moving approximately 64,600 CY of CCR material and approximately 4,300 truckloads to transport this material, but this material is transported onsite and would not encounter offsite traffic. The ClosureTurf supplies transportation has the potential to cause 0.0016 traffic accident injuries and 0.0001 traffic accident fatalities based on tranport from South Carolina to Romeoville for the supplies. The total number of truckloads has the potential to produce approximately 0.5 lbs of particulate matter emissions. |
| 845.710(b)(1)(E) | Time to complete closure, post-closure or 845.740(b) groundwater monitoring | Excavation and disposal of the ponds' 161,000 CY of CCR is estimated to take over 210 days, based on disposing of 50 trucks/day of CCR. Post-closure activities are not required when closure by removal is performed, but groundwater monitoring must be conducted for at least 3 years after closure activities. | The total anticipated time to complete closure construction is 4 months and post closure activities will take 30 years, which includes groundwater monitoring. | The total anticipated time to complete closure construction is up to 9 months and post-closure activities will take 30 years, which includes groundwater monitoring. | The total anticipated time to complete closure construction is 4 months and post-closure activities will take 30 years, which includes groundwater monitoring. |
| 845.710(b)(1)(F) | Potential threat to human health and environment | The potential threat to human health and the environment is minimal to non-existent because the CCR source material has been removed. Groundwater monitoring has shown that impacts to groundwater are not present. | The potential threat to human health and the environment is minimal to non-existent because the CCR has been covered and no exposure routes are available. Infiltration through the existing CCR has been almost eliminated because of the FCS. Drinking water sources are not located in the area. | The potential threat to human health and the environment is minimal to non-existent because the CCR has been solidified and covered and no exposure routes are available. Infiltration through the existing CCR has been almost eliminated because of the FCS. Drinking water sources are not located in the area. | The potential threat to human health and the environment is minimal to non-existent because the CCR in Ponds 2S and 3S have been removed and consolidated with the CCR in Ponds 1N and 1S, which is then covered and no exposure routes are available. Infiltration through the remaining CCR has been almost eliminated because of the FCS. Drinking water sources are not located in the area. |

**Table 1 - Closure Alternatives Evaluation**

| 35 Ill. Adm. Code Part 845.710(b)(1) through 845.710(b)(4) Requirements | | Closure Alternatives | | | |
|---|---|---|---|---|---|
| | | **Closure by Removal** | **Closure-in-Place with a Final Cover System** | **Closure-in-Place with Insitu Stabilization/Solidification** | **Consolidation & Closure-in-Place with a Final Cover System** |
| 845.710(b)(1)(G) | Long-term reliability of engineering/institutional controls | Having removed all the CCR is the most reliable alternative because the potential for any source material to remain is non-existent. | Geomembrane final cover systems and specifically ClosureTurf have been used throughout the country to effectively prevent CCR and other solid wastes from impacting human health and the environment. | The ISS treatment creates a solidified/stabilized monolith of CCR with cement and sometimes bentonite to improve impermeability. The typical lifespan of concrete is greater than 30 years up to 100 years and the neutral pH of the groundwater will not degrade the monolith, extending its lifespan. | Geomembrane final cover systems and specifically ClosureTurf have been used throughout the country to effectively prevent CCR and other solid wastes from impacting human health and the environment. |
| 845.710(b)(1)(H) | Potential for future corrective action | Because the CCR is being removed, the need for future corrective actions is not present. | Groundwater modeling has shown that the concentrations will decrease with the closure alternative, so the potential for future correction is minimal. | Groundwater modeling has shown that the concentrations will decrease by approximately 80% after 25 years with this closure alternative, so the potential for future correction is minimal. | Groundwater modeling has shown that the concentrations will decrease with the closure alternative by approximately 70% after 25 years with this closure alternative, so the potential for future correction is minimal. |
| 845.710(b)(2)(A) | The extent containment reduces further releases | The CCR has been removed from the ponds and the potential for further releases is non-existent. | The CCR would remain within the confinements of the ponds and below the FCS. Previous groundwater monitoring has shown that a release of CCR has not occurred. The geomembrane used in the FCS prevent the infiltration of water thereby preventing any further release. | The CCR would remain within the confinements of the ponds and solidified using cement. The permeability would be less than $1x10^{-7}$ cm/s, preventing groundwater and precipitation from traveling through the CCR thereby preventing any further release. Previous groundwater monitoring has shown that a release of CCR has not occurred. The soil cover minimizes the direct contact to the solidified CCR. | The CCR would remain within the confinements of Ponds 1N and 1S below the FCS. Previous groundwater monitoring has shown that a release of CCR has not occurred. The geomembrane used in the FCS prevent the infiltration of water thereby preventing any further release. |
| 845.710(b)(2)(B) | Extent of the use of treatment technologies | Treatment will not be occurring as part of this closure alternative. The only technology used is the construction equipment to execute the removal. | Treatment will not be occurring as part of this closure alternative. ClosureTurf technology will be used to create the FCS. ClosureTurf consists of a geomembrane liner with synthetic turf and sand/small aggregate on top of the geomembrane. ClosureTurf has been successfully used at other CCR surface impoundments and landfills as cover systems. | ISS is the treatment technology that will be used as part of this scenario. No other technologies will be used. The completed ISS monolth will be covered with a soil cover that is then seeded. | Treatment will not be occurring as part of this closure alternative. ClosureTurf technology will be used to create the FCS. ClosureTurf consists of a geomembrane liner with synthetic turf and sand/small aggregate on top of the geomembrane. ClosureTurf has been successfully used at other CCR surface impoundments and landfills as cover systems. |
| 845.710(b)(3)(A) | Degree of difficulty associated with constructing technology | Removing and disposing of the CCR is not diffult work and many contractors are able to perform this type of work. Finding a disposal location would be the most difficult because existing facilities may not accept the CCR and the permitting and constructing of a new landfill is difficult due to potential environmental and local resistance and availability of materials. | Filling, grading, and compacting in the ponds is not difficult. This is a process that has been occurring for many years and several construction companies in the area are capable of performing this work. The installation of the ClosureTurf system is not difficult, but the provider of ClosureTurf requires a certified company perform the work. This limits the availability of installation contractors because the certified list of contractors is a limited number. ClosureTurf has been successfully installed in over 17 states throughout the country beginning in 2009. These states include New York, California, Minnesota, and Massachusetts. | ISS has been effectively used since the 1960's. The companies that routinely perform ISS treatment do not have difficulties with implementing this scenario. | Excavating, grading, and compacting CCR from Ponds 2S and 3S into Ponds 1N and 1S is not difficult. This type of work has routinely been performed throughout the country. This is a process that has been occurring for many years and several construction companies in the area are capable of performing this work. The installation of the ClosureTurf system is not difficult, but the provider of ClosureTurf requires a certified company perform the work. This limits the availability of installation contractors because the certified list of contractors is a limited number. ClosureTurf has been successfully installed in over 17 states throughout the country beginning in 2009. These states include New York, California, Minnesota, and Massachusetts. |
| 845.710(b)(3)(B) | Expected operational reliability of the technologies | This closure alternative does not require the operation of any technologies. The construction equipment that would be used to excavate and haul the CCR are expected to operate without interruption. | ClosureTurf has operated reliably at the other installations around the country. ClosureTurf experienced a hurricane in South Carolina that produced a 26-inch rainfall, which did not damage the ClosureTurf and so minimally displaced the sand infill that no maintenance was required. | ISS has been effectively used to treatment soil impacts and CCR. QA/QC efforts as part of the treatment is constantly performed and has shown that permeabilites are routinely less than $1x10^{-7}$ cm/s. Unconfined compressive strength of the soil is typically greater than 50 psi. | ClosureTurf has operated reliably at the other installations around the country. ClosureTurf experienced a hurricane in South Carolina that produced a 26-inch rainfall, which did not damage the ClosureTurf and so minimally displaced the sand infill that no maintenance was required. |
| 845.710(b)(3)(C) | Need to coordinate with and obtain necessary approvals and permits from other agencies | This closure alternative would require approval from the Illinois EPA. | This closure alternative would require approval from the Illinois EPA. | This closure alternative would require approval from the Illinois EPA. | This closure alternative would require approval from the Illinois EPA. |
| 845.710(b)(3)(D) | Availability of necessary equipment and specialists | Equipment and personnel are easily available to excavate the CCR. Locating a disposal location is the most difficult part of this alternative. | This closure alternative would require a contractor that is approved by Watershed Geo to install ClosureTurf. Several contractors throughout the country have been certified to install ClosureTurf. The availability of a certified ClosureTurf installer is less than an earthwork contractor, but it should not be a concern. | This closure alternative would require a contractor that is capable of performing in-situ solidification/stabilization. Several contractors throughout the country are able to perform this work. The availability of an ISS contractor is less than an earthwork contractor, but it should not be a concern. | This closure alternative would require a contractor that is capable of performing hydraulic dredging and a contractror approved by Watershed Geo to install ClosureTurf. Several contractors throughout the country have been certified to install ClosureTurf. The availability of a hydraulic dredging contractor and certified ClosureTurf installer is less than an earthwork contractor, but it should not be a concern. |

**Table 1 - Closure Alternatives Evaluation**

| 35 Ill. Adm. Code Part 845.710(b)(1) through 845.710(b)(4) Requirements | | Closure Alternatives | | | |
|---|---|---|---|---|---|
| | | Closure by Removal | Closure-in-Place with a Final Cover System | Closure-in-Place with Insitu Stabilization/Solidification | Consolidation & Closure-in-Place with a Final Cover System |
| 845.710(b)(3)(E) | Available capacity and location of needed treatment, storage, and disposal services | The available capacity of disposal for 161,000 CY is expected to be difficult to obtain. The location for any disposal is unknown and would require contacting proper disposal facilities in the area to inquire about space availability. Based on the 2021 Landfill Capacity Report, Laraway RDF has capacity in excess of 5 million CY, but at this time it is unkown the existing contracted air space. Disposal facilities are reluctant to accept CCR because of concerns with interactions between CCR and existing waste. | This closure alternative does not require treatment, storage, or disposal services. Any storage of materials would occur at the station | This alternative does not require any disposal or storage services. Any storage of materials would occur at the station. This alternative uses the ISS treatment technology performed by specialized contractors trained in this type of work. These contractors are specialized, however, there availability is not detrimental to the completion of this alternative. | This closure alternative does not require treatment, storage, or disposal services. Any storage of materials would occur at the station |
| 845.710(b)(4) | Degree to which community concerns are addressed | All the potential closure alternatives address the community concerns. The community is concerned about the potential for future groundwater contamination which is addressed by the closure alternatives. The CCR is removed from its existing location and contact with future precipitation is removed. | All the potential closure alternatives address the community concerns. The community is concerned about the potential for future groundwater contamination which is addressed by the closure alternatives. The installation of an FCS would prevent the infiltration of precipitation which would minimize contamination of groundwater from the remaining CCR. | All the potential closure alternatives address the community concerns. The community is concerned about the potential for future groundwater contamination which is addressed by the closure alternatives. The stabilization/solidification would prevent the infiltration of precipitation which would minimize contamination of groundwater from the remaining CCR. | All the potential closure alternatives address the community concerns. The community is concerned about the potential for future groundwater contamination which is addressed by the closure alternatives. The consolidation of CCR and installation of an FCS would prevent the infiltration of precipitation which would minimize contamination of groundwater from the remaining CCR. |
| 845.710(d)(4) | Assessment of Impacts to Waters in the State | This closure alternative does not impact the Des Plaines River or the Chicago Sanitary and Ship Canal. The groundwater modeling performed in support of this analysis has shown that any theoretical impacts to the river are reduced to less than 80% of the original concentration after 50 years. By 100 years, the dissolved mass is effectively removed from shallow groundwater. | This closure alternative does not impact the Des Plaines River or the Chicago Sanitary and Ship Canal. The groundwater modeling performed in support of this analysis has shown that any theoretical impacts to the river are reduced to less than 80% of the original concentration after 50 years. By 100 years, the dissolved mass is effectively removed from shallow groundwater. | This closure alternative does not impact the Des Plaines River or the Chicago Sanitary and Ship Canal. Groundwater modeling perofrmed in support of this analysis has shown that any theoretical impacts to the river are reduced to about 80% of the original concentration after 25 years. | This closure alternative does not impact the Des Plaines River or the Chicago Sanitary and Ship Canal. Groundwater modeling performed in support of this analysis has shown that any theoretical impacts to the river are reduced by about 70% of the original concentration after 25 years. |

**Table 2: Closure Alternatives Analysis Cost Estimates Comparison**

**Scenario 1: Closure Costs for Closure By Removal & Disposal at Landfill**

| Construction Activity | Cost |
|---|---|
| Mobilization/Demobilization | $60,000 |
| Site Preparation | $21,534 |
| Dewatering | $9,666 |
| Pond 1N, 1S, 2S, 3S Excavation | $5,574,498 |
| Bottom Fill | $1,281,652 |
| Indian Creek Landfill RDF Disposal | $11,838,517 |
| **Construction Subtotal** | $18,785,866 |
| Construction Management (4.5%) | $845,364 |
| Engineering & Design (10%) | $694,735 |
| Owner Construction Supervision (4.5%) | $845,364 |
| 30% Contingency | $5,635,760 |
| **CLOSURE TOTAL** | $26,807,089 |

**Scenario 2: Closure Costs for Closure in Place with a Final Cover System**

| Construction Activity | Cost |
|---|---|
| Mobilization/Demobilization | $60,000 |
| Site Preparation | $17,015 |
| Dewatering | $9,666 |
| Ponds 1N, 1S, 2S, 3S Site Grading | $840,474 |
| ClosureTurf Cover System | $1,184,682 |
| **Construction Subtotal** | $2,111,837 |
| Construction Management (4.5%) | $95,033 |
| Engineering & Design (10%) | $92,716 |
| Owner Construction Supervision (4.5%) | $41,722 |
| 30% Contingency | $633,551 |
| **CLOSURE TOTAL** | $2,974,859 |

**Scenario 3: In-Situ Stabilzation with Final Cover System**

| Construction Activity | Cost |
|---|---|
| Mobilization/Demobilization | $60,000 |
| Site Preparation | $21,534 |
| Dewatering | $9,666 |
| Geomembrane Removal | $430,812 |
| Ponds 1N, 1S, 2S, and 3S ISS | $7,412,422 |
| ClosureTurf Cover System | $1,077,521 |
| **Construction Subtotal** | $9,011,955 |
| Construction Management (4.5%) | $405,538 |
| Engineering & Design (10%) | $793,443 |
| Owner Construction Supervision (4.5%) | $405,538 |
| 30% Contingency | $2,703,587 |
| **CLOSURE TOTAL** | $13,320,061 |

**Scenario 4: Closure Costs for Closure in Place with Consolidation & Final Cover System**

| Construction Activity | Cost |
|---|---|
| Mobilization/Demobilization & Site Preparation | $60,000 |
| Site Preparation & Dewatering | $31,200 |
| Pond 2S, 3S Excavation | $1,204,273 |
| Discharge & Inlet Structures Demolition | $101,692 |
| Bottom Fill | $616,992 |
| ClosureTurf Cover System | $567,524 |
| **Construction Subtotal** | $2,581,681 |
| Construction Management (4.5%) | $116,176 |
| Engineering & Design (10%) | $201,416 |
| Owner Construction Supervision (4.5%) | $116,176 |
| 30% Contingency | $774,504 |
| **CLOSURE TOTAL** | $3,789,953 |

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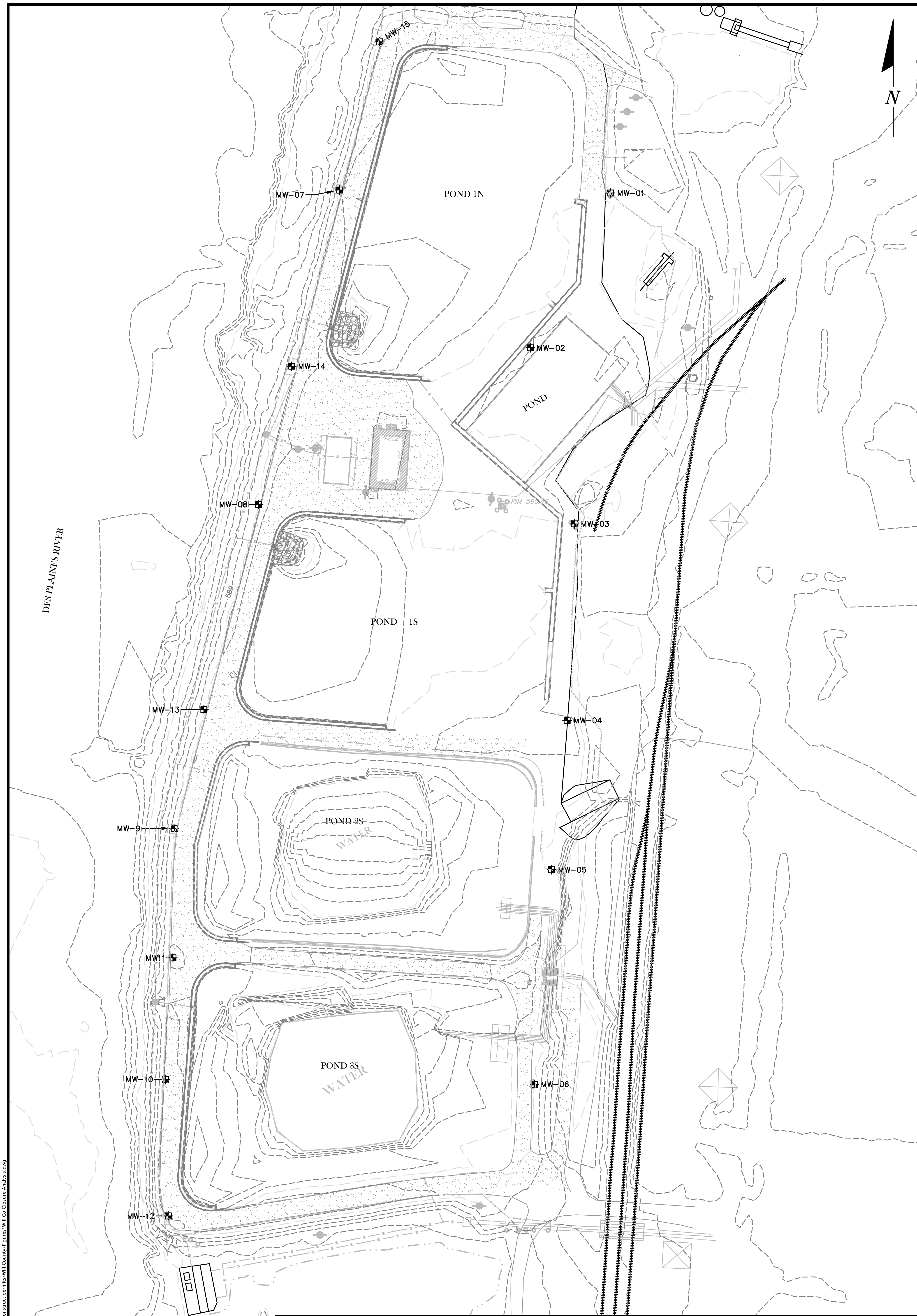
# FIGURES




ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG

KPRG and Associates, inc.

14665 West Lisbon Road, Suite 1A Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478

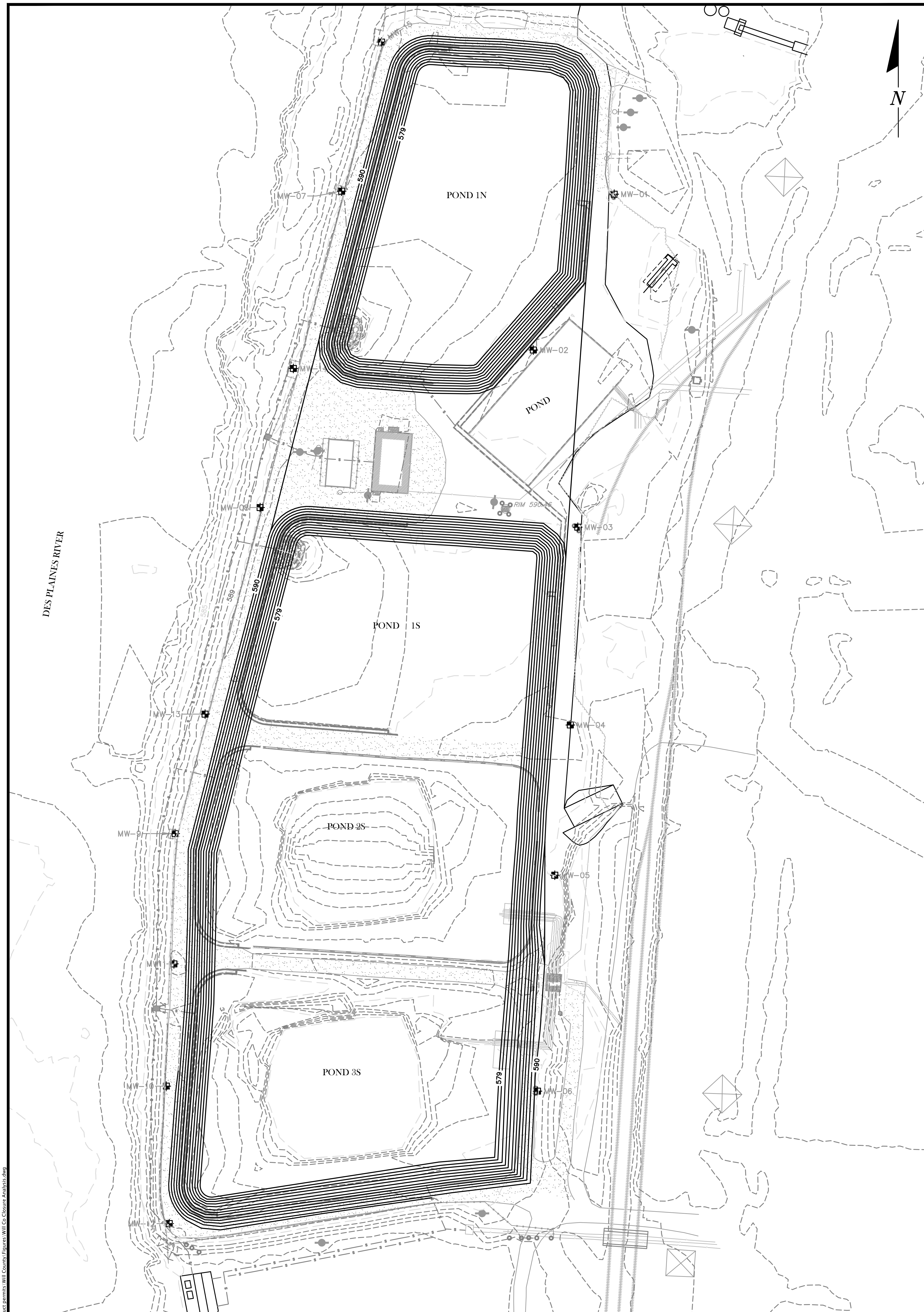
414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

EXISTING SITE CONDITIONS

WILL COUNTY GENERATING STATION
ROMEOVILLE, ILLINOIS

| | |
|---|---|
| Scale: 1" = 100' | Date: May 1, 2023 |
| KPRG Project No. 19620.3 | FIGURE 1 |

W:\projects\midwest generation\operating & construct permits\Will County\Figures\Will Co Closure Analysis.dwg




LEGEND

590 ——— PROPOSED CONTOURS

585 - - - EXISTING CONTOURS

0 100'

APPROXIMATE SCALE

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG

KPRG and Associates, inc.

14665 West Lisbon Road, Suite 1A Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478

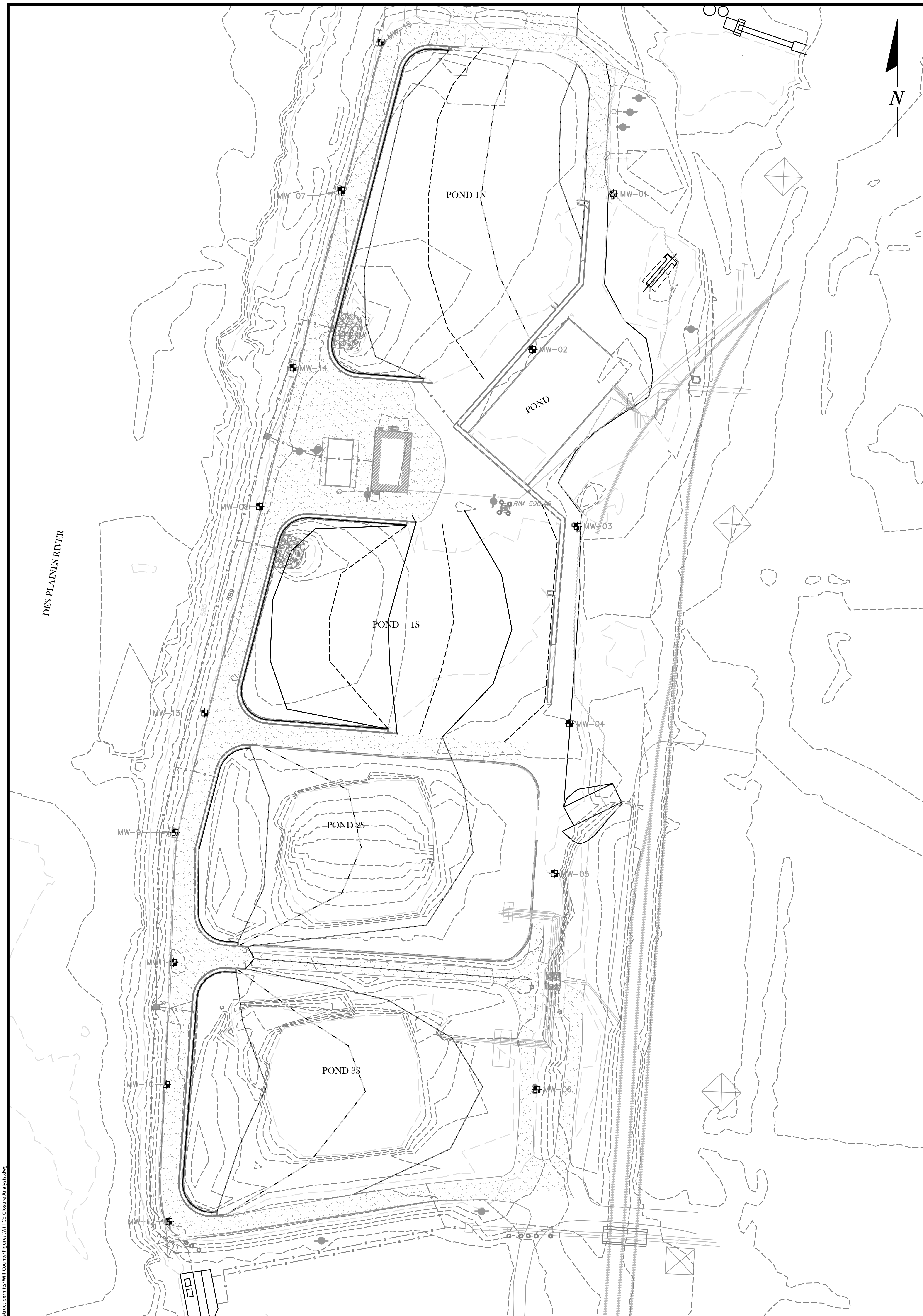
414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

CLOSURE BY REMOVAL ALTERNATIVE

WILL COUNTY GENERATING STATION
ROMEOVILLE, ILLINOIS

| | |
|---|---|
| Scale: 1" = 100' | Date: May 2, 2023 |
| KPRG Project No. 19620.3 | FIGURE 2 |

W:\projects\midwest generation\operating & construct permits\Will County\Figures\Will Co Closure Analysis.dwg




LEGEND

590 ——— PROPOSED CONTOURS

585 – – – EXISTING CONTOURS

0 100'

APPROXIMATE SCALE

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG

KPRG and Associates, inc.

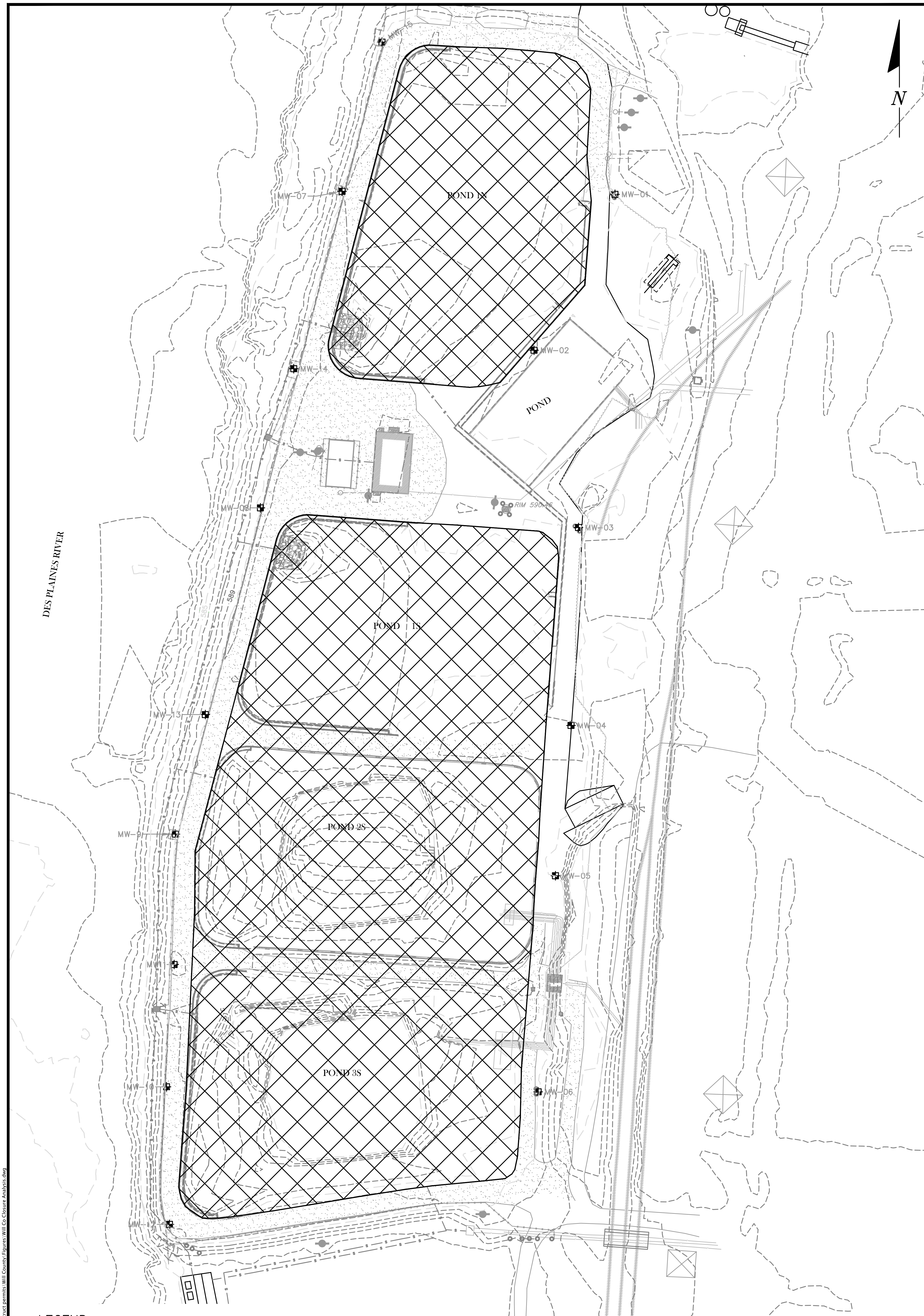
14665 West Lisbon Road, Suite 1A Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478

414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

CLOSURE In PLACE ALTERNATIVE

WILL COUNTY GENERATING STATION
ROMEOVILLE, ILLINOIS

| Scale: 1" = 100' | Date: May 2, 2023 |
|---|---|
| KPRG Project No. 19620.3 | FIGURE 3 |




LEGEND

PROPOSED AREA OF IN-SITU STABILIZATION/SOLIDIFICATION

0 100'
APPROXIMATE SCALE

E N V I R O N M E N T A L C O N S U L T A T I O N & R E M E D I A T I O N

KPRG

KPRG and Associates, inc.

14665 West Lisbon Road, Suite 1A Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478

414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

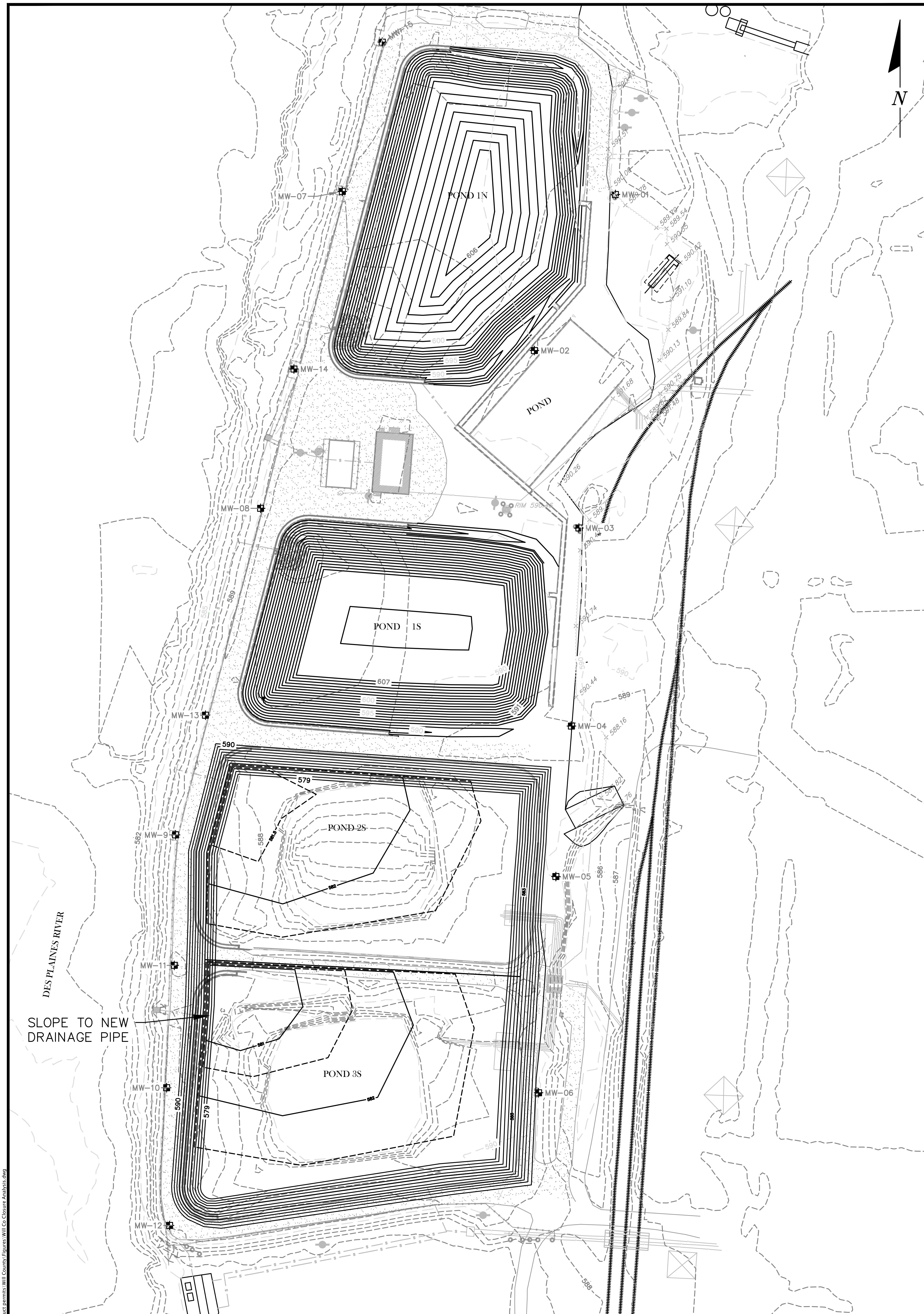
CLOSURE BY IN-SITU STABILIZATION/SOLIDIFICATION ALTERNATIVE

WILL COUNTY GENERATING STATION
ROMEOVILLE, ILLINOIS

Scale: 1" = 100' | Date: May 2, 2023

KPRG Project No. 19620.3 | FIGURE 4

W:\projects\midwest generation\operating & construct permits\Will County\Figures\Will Co Closure Analysis.dwg




LEGEND

590 ——— PROPOSED CONTOURS

585 – – – EXISTING CONTOURS

0 100'

APPROXIMATE SCALE

E N V I R O N M E N T A L C O N S U L T A T I O N & R E M E D I A T I O N

KPRG

KPRG and Associates, inc.

14665 West Lisbon Road, Suite 1A Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478

414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

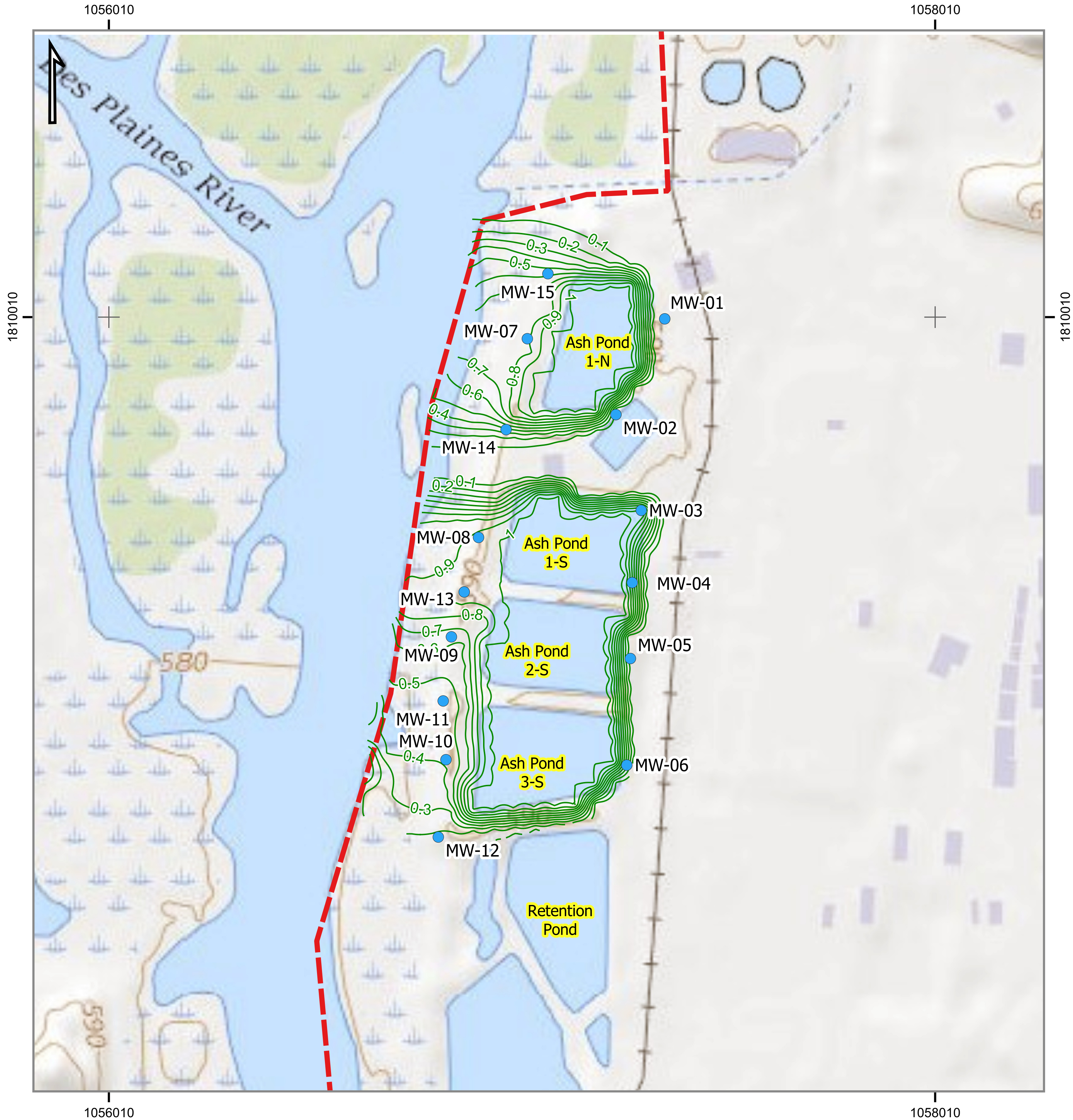
CLOSURE IN PLACE WITH CONSOLIDATION ON POND 1N AND POND 1S

WILL COUNTY GENERATING STATION
ROMEOVILLE, ILLINOIS

| Scale: 1" = 100' | Date: May 2, 2023 |
|---|---|
| KPRG Project No. 19620.3 | FIGURE 5 |

W:\projects\midwest generation\operating & construct permits\Will County\Figures\Will Co Closure Analysis.dwg

# ATTACHMENT 1




LEGEND

- SITE MONITORING WELL
- APPROXIMATE SITE BOUNDARY
- 100-YEAR RELATIVE SURROGATE CONCENTRATIONS

Maximum relative concentrations above competent bedrock

0 200 400 ft

FEET

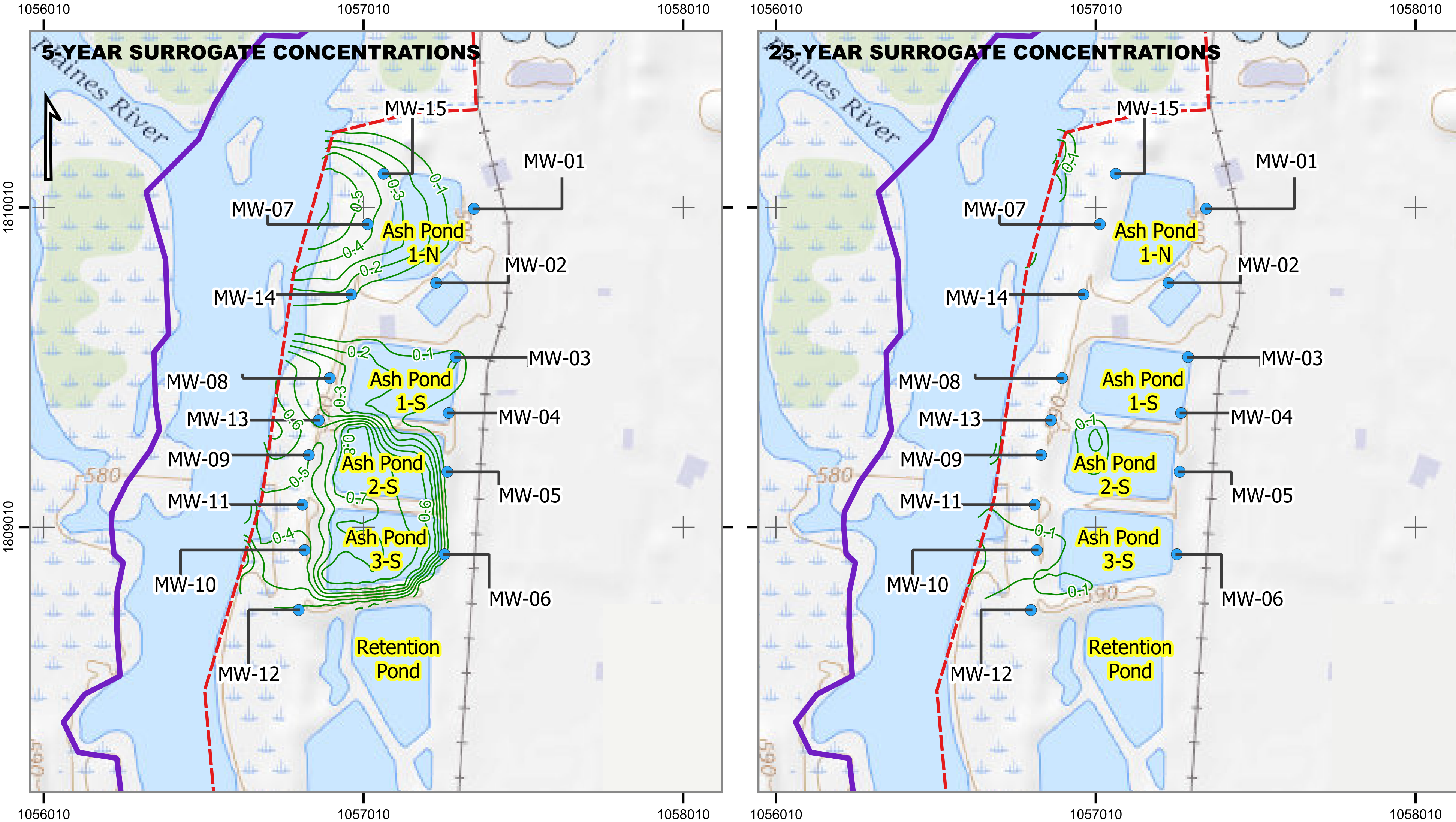
Coordinate System: NAD_1983_StatePlane_Illinois_East_FIPS_1201_Feet
Project File: Figure16_SurrogateSimulations.qgz

BAS GROUNDWATER CONSULTING

KPRG

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **100-YEAR RELATIVE SURROGATE CONCENTRATIONS** |

| | | | |
|---|---|---|---|
| SCALE AT ANSI A | DRAWN | DZF | 04/21/2023 |
| 1:4,000 | CHECKED | BAS | 04/21/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 16 | |




LEGEND

- SITE MONITORING WELL
- MODEL BOUNDARY
- APPROXIMATE SITE BOUNDARY
- RELATIVE SURROGATE CONCENTRATIONS

Maximum relative concentrations above competent bedrock

BAS GROUNDWATER CONSULTING

KPRG

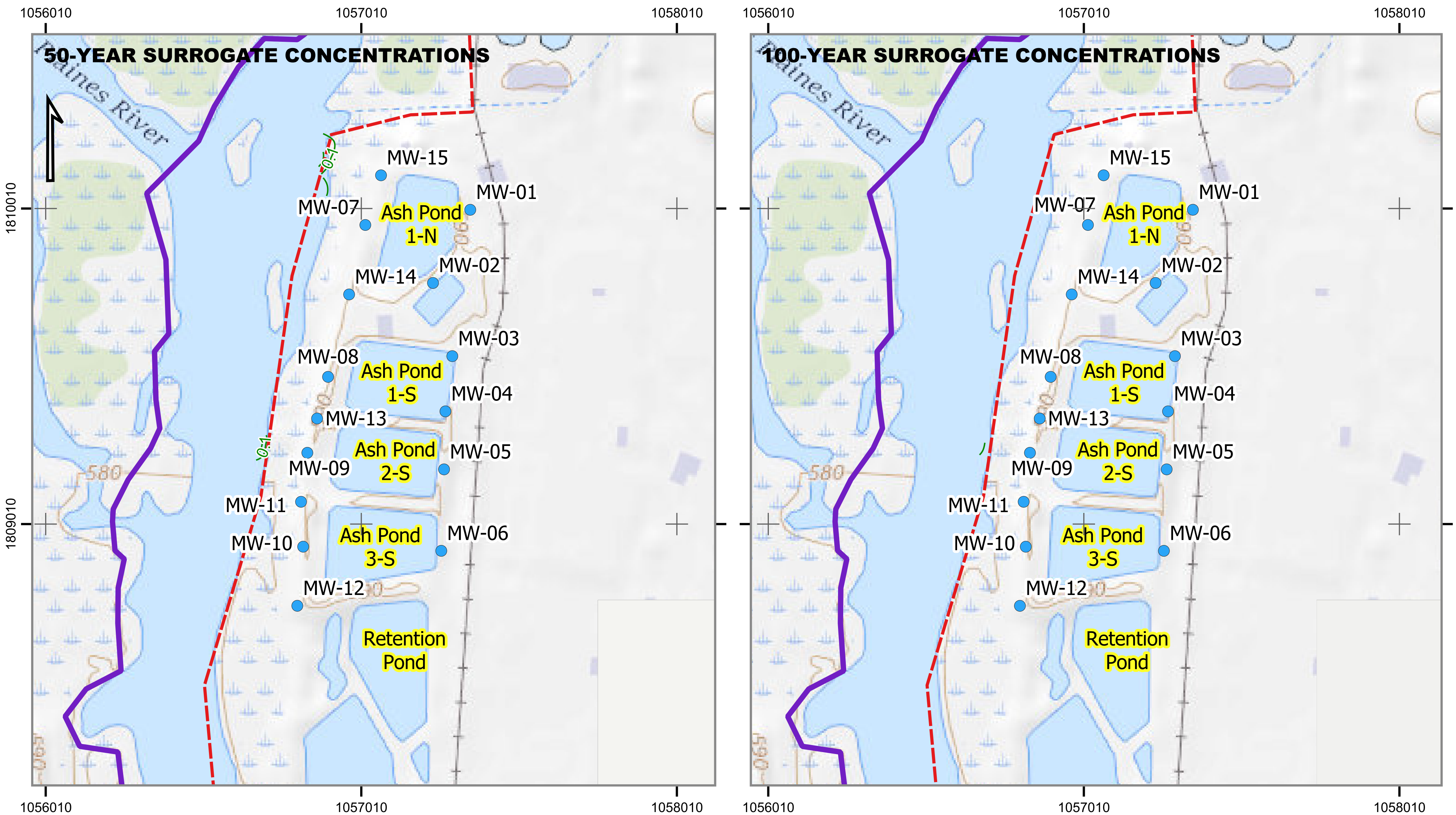
0 200 400 ft

FEET

Coordinate System:
NAD_1983_StatePlane_Illinois_East_FIPS_1201_Feet
Project File:
Figure17_RelativeSurrogateConcentrations_5_25_Years_Scenario1.qgz

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **RELATIVE SURROGATE CONCENTRATIONS AT 5 AND 25 YEARS, SCENARIO 1** |

| SCALE AT ANSI A | DRAWN | DZF | 04/21/2023 |
|---|---|---|---|
| 1:5,400 | CHECKED | BAS | 04/21/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 17 | |




LEGEND

- SITE MONITORING WELL
- MODEL BOUNDARY
- APPROXIMATE SITE BOUNDARY
- RELATIVE SURROGATE CONCENTRATIONS

Maximum relative concentrations above competent bedrock

BAS GROUNDWATER CONSULTING

K P R G

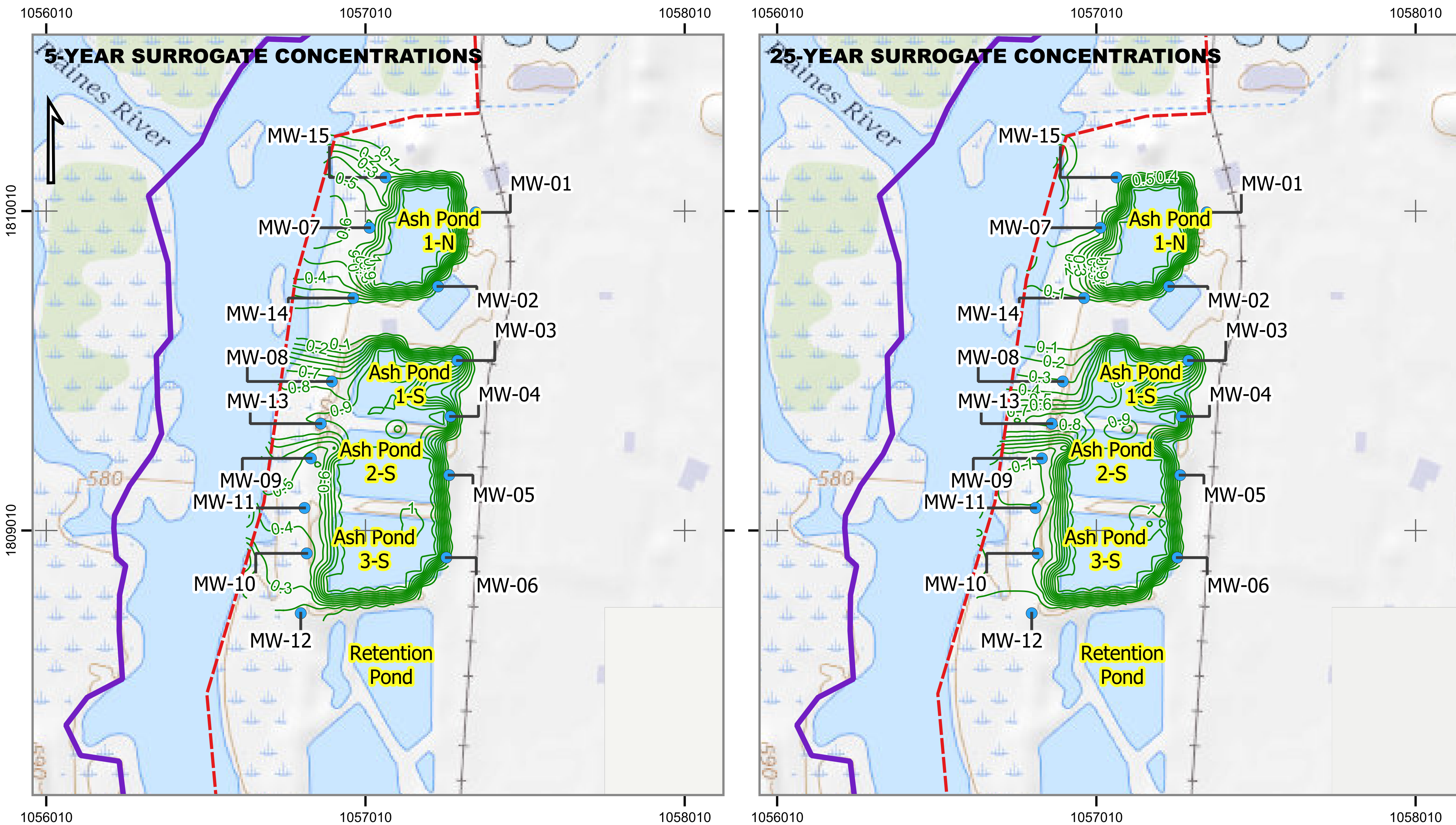
0 200 400 ft

FEET

Coordinate System:
NAD_1983_StatePlane_Illinois_East_FIPS_1201_Feet
Project File:
Figure18_RelativeSurrogateConcentrations_50_100_Years_Scenario1.qgz

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **RELATIVE SURROGATE CONCENTRATIONS AT 50 AND 100 YEARS, SCENARIO 1** |

| SCALE AT ANSI A | DRAWN | DZF | 04/21/2023 |
|---|---|---|---|
| 1:5,400 | CHECKED | BAS | 04/21/2023 |
| BAS PROJECT No. 21141501 | FIGURE: 18 | | |




LEGEND

- SITE MONITORING WELL
- MODEL BOUNDARY
- APPROXIMATE SITE BOUNDARY
- RELATIVE SURROGATE CONCENTRATIONS

Maximum relative concentrations above competent bedrock

BAS GROUNDWATER CONSULTING

KPRG

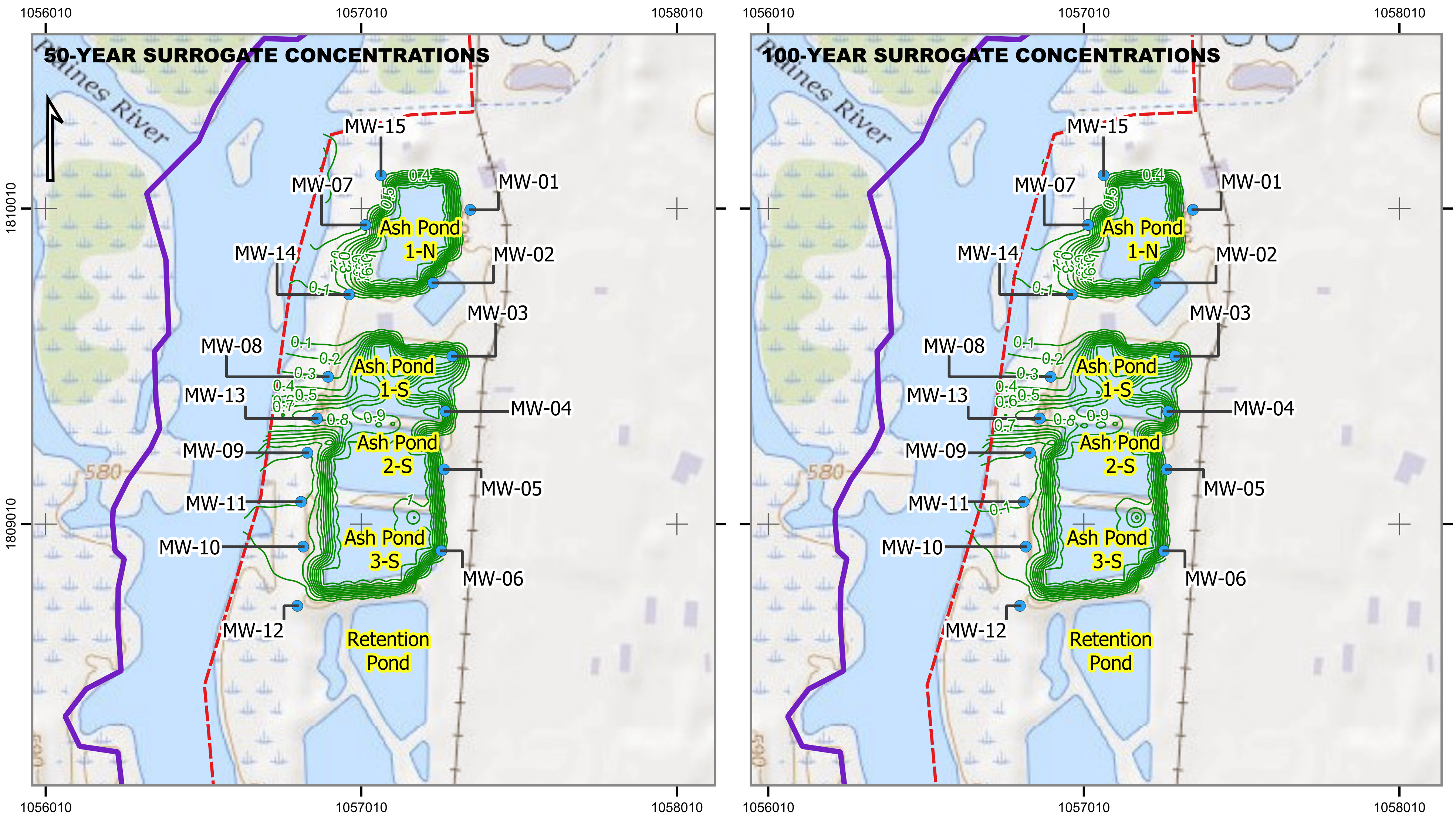
0 200 400 ft

FEET

Coordinate System: NAD_1983_StatePlane_Illinois_East_FIPS_1201_Feet

Project File: Figure19_RelativeSurrogateConcentrations_5_25_Years_Scenario2.qgz

| | | | |
|---|---|---|---|
| CLIENT | MIDWEST GENERATION | | |
| SITE | WILL COUNTY 529 OLD ROMEO RD, ROMEOVILLE, IL | | |
| TITLE | **RELATIVE SURROGATE CONCENTRATIONS AT 5 AND 25 YEARS, SCENARIO 2** | | |
| SCALE AT ANSI A 1:5,400 | DRAWN | DZF | 04/21/2023 |
| | CHECKED | BAS | 04/21/2023 |
| BAS PROJECT No. 21141501 | FIGURE: **19** | | |




LEGEND

- SITE MONITORING WELL
- MODEL BOUNDARY
- APPROXIMATE SITE BOUNDARY
- RELATIVE SURROGATE CONCENTRATIONS

Maximum relative concentrations above competent bedrock

BAS GROUNDWATER CONSULTING

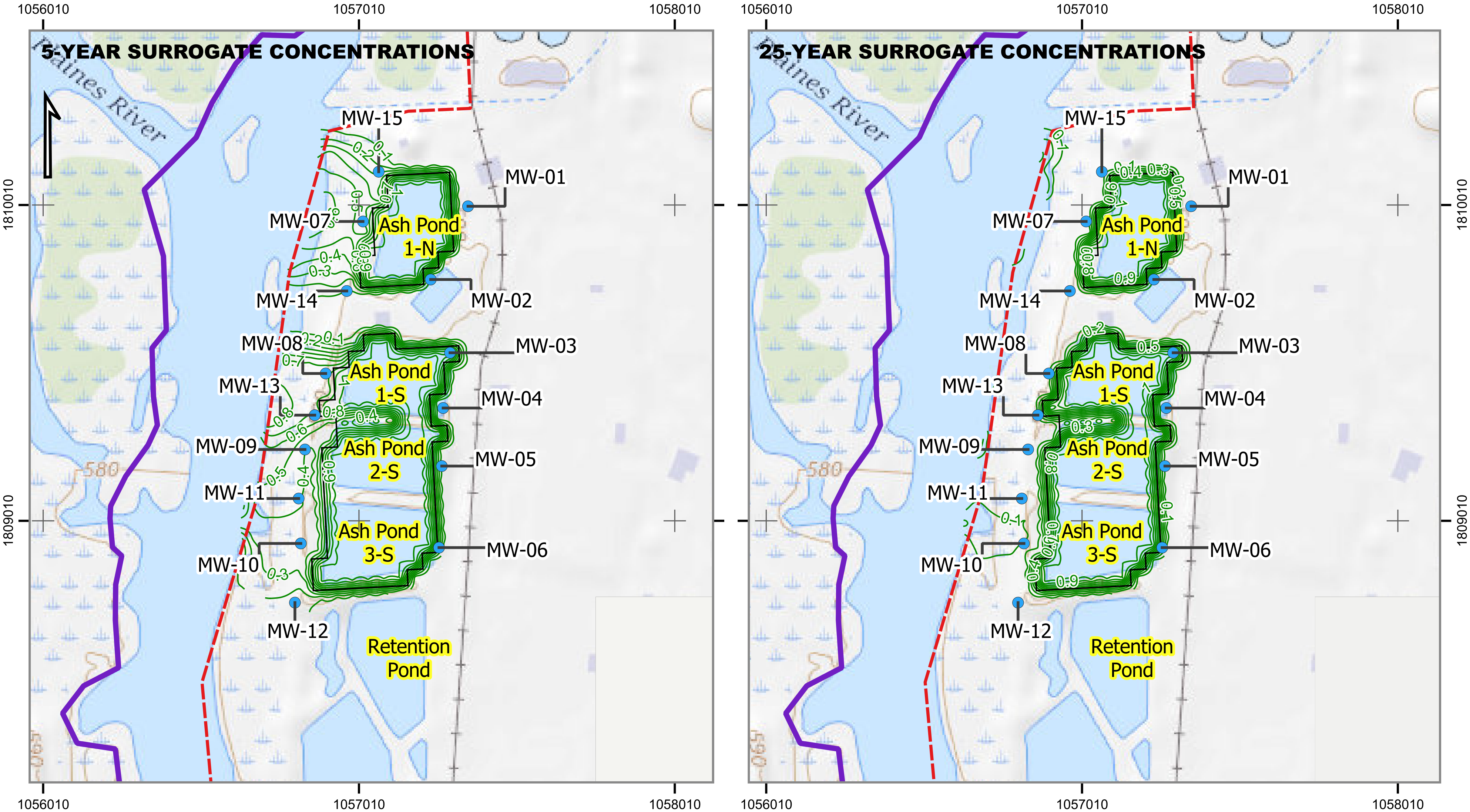
KPRG

0 200 400 ft

FEET

Coordinate System: NAD_1983_StatePlane_Illinois_East_FIPS_1201_Feet
Project File: Figure20_RelativeSurrogateConcentrations_50_100_Years_Scenario2.qgz

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **RELATIVE SURROGATE CONCENTRATIONS AT 50 AND 100 YEARS, SCENARIO 2** |
| SCALE AT ANSI A | 1:5,400 |
| DRAWN | DZF 04/21/2023 |
| CHECKED | BAS 04/21/2023 |
| BAS PROJECT No. | 21141501 |
| FIGURE: | **20** |




LEGEND

- SITE MONITORING WELL
- MODEL BOUNDARY
- APPROXIMATE SITE BOUNDARY
- AREA OF BARRIER WALL
- RELATIVE SURROGATE CONCENTRATIONS

Maximum relative concentrations above competent bedrock

BAS GROUNDWATER CONSULTING

K P R G

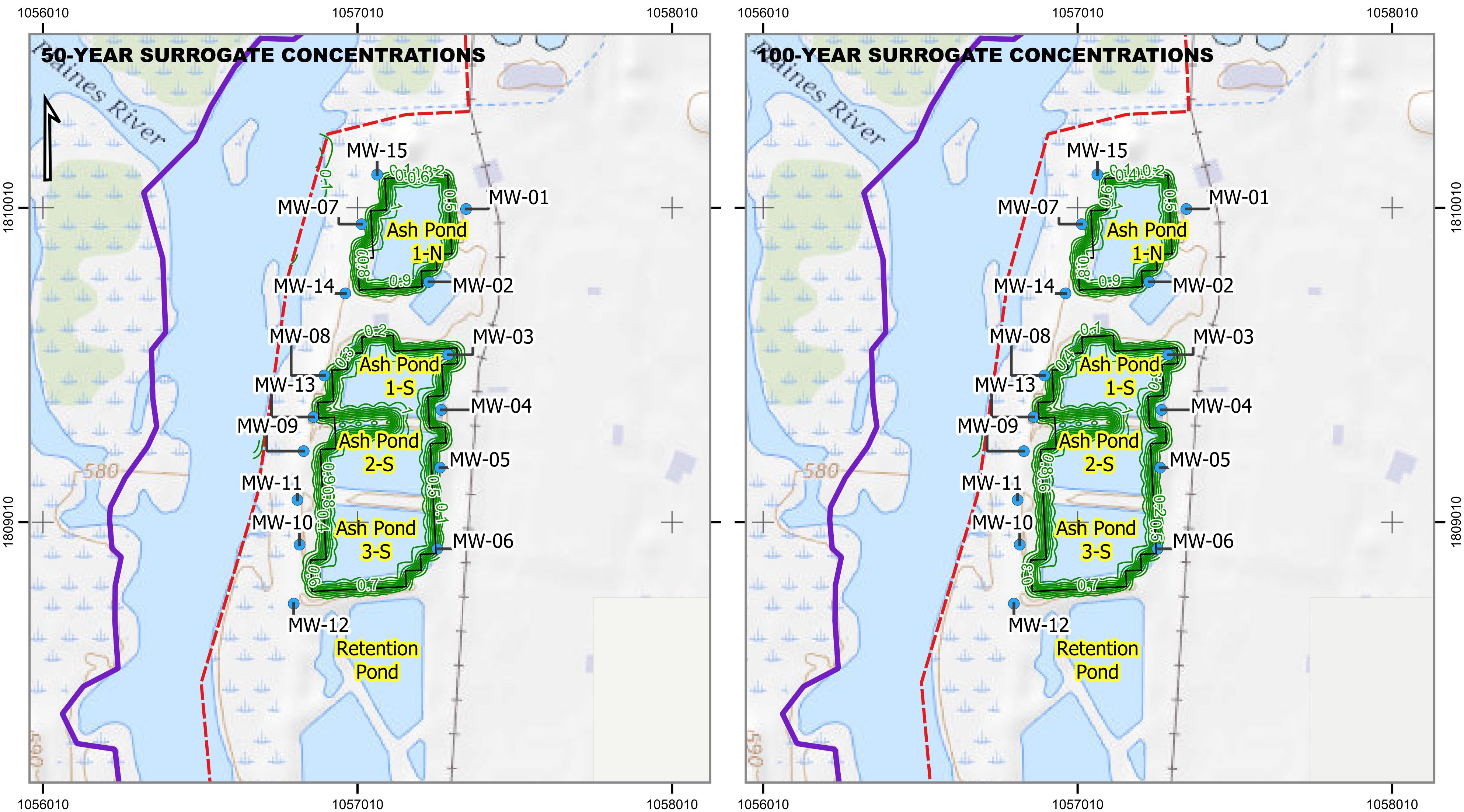
0 200 400 ft

FEET

Coordinate System:
NAD_1983_StatePlane_Illinois_East_FIPS_1201_Feet
Project File:
Figure22_RelativeSurrogateConcentrations_5_25_Years_Scenario3.qgz

| | |
|---|---|
| *CLIENT* | MIDWEST GENERATION |
| *SITE* | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| *TITLE* | **RELATIVE SURROGATE CONCENTRATIONS AT 5 AND 25 YEARS, SCENARIO 3** |

| | | | |
|---|---|---|---|
| *SCALE AT ANSI A*<br>1:5,400 | *DRAWN* | *DZF* | 04/21/2023 |
| | *CHECKED* | *BAS* | 04/21/2023 |
| *BAS PROJECT No.*<br>*21141501* | | *FIGURE:*<br>**22** | |




LEGEND

- SITE MONITORING WELL
- MODEL BOUNDARY
- APPROXIMATE SITE BOUNDARY
- AREA OF BARRIER WALL
- RELATIVE SURROGATE CONCENTRATIONS

Maximum relative concentrations above competent bedrock

BAS GROUNDWATER CONSULTING

KPRG

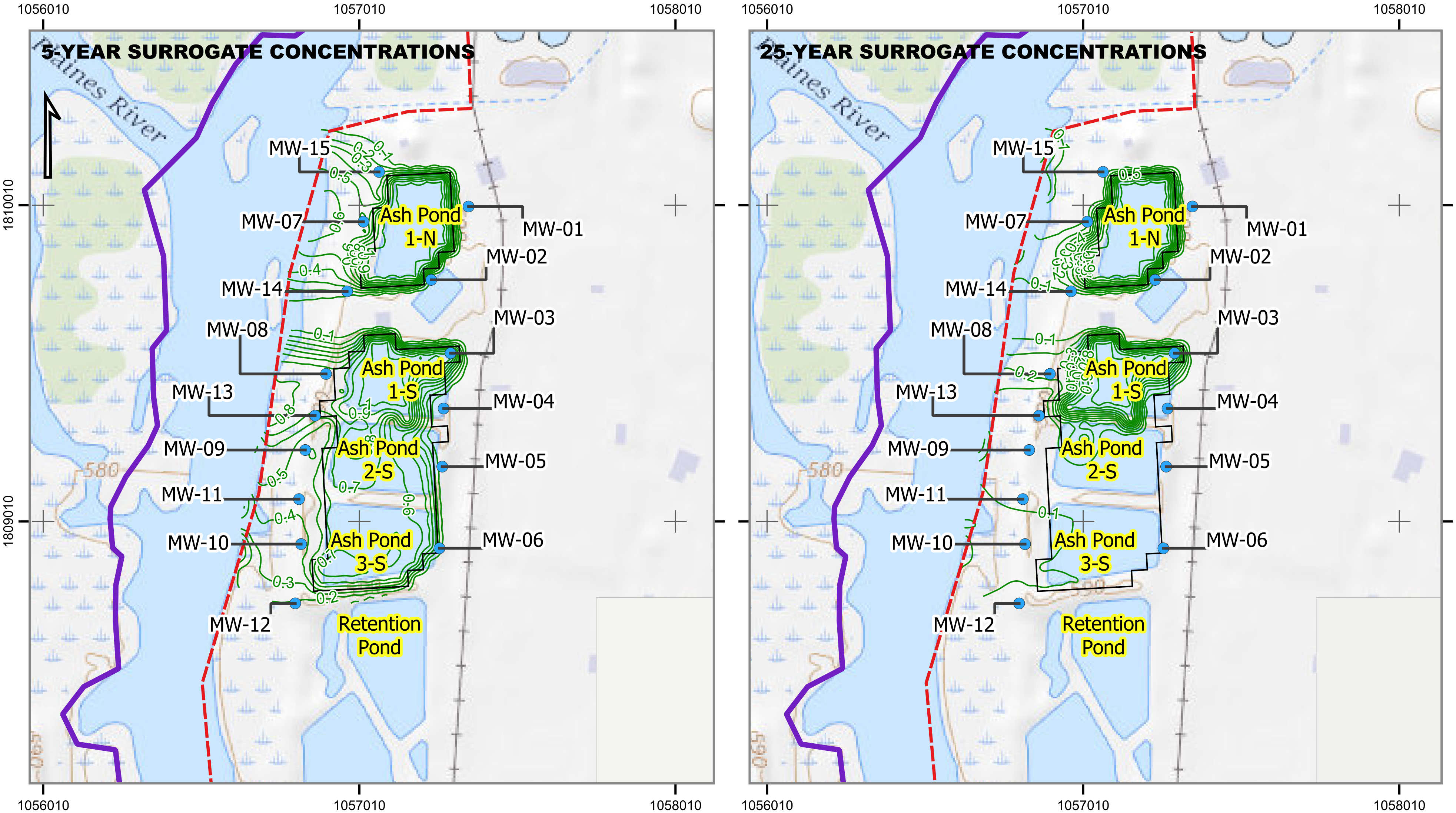
0 200 400 ft

FEET

Coordinate System:
NAD_1983_StatePlane_Illinois_East_FIPS_1201_Feet
Project File:
Figure23_RelativeSurrogateConcentrations_50_100_Years_Scenario3.qgz

| | |
|---|---|
| *CLIENT* | MIDWEST GENERATION |
| *SITE* | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| *TITLE* | **RELATIVE SURROGATE CONCENTRATIONS AT 50 AND 100 YEARS, SCENARIO 3** |

| *SCALE AT ANSI A* | *DRAWN* | *DZF* | 04/21/2023 |
|---|---|---|---|
| 1:5,400 | *CHECKED* | *BAS* | 04/21/2023 |
| *BAS PROJECT No.* 21141501 | *FIGURE:* **23** | | |




LEGEND

- SITE MONITORING WELL
- MODEL BOUNDARY
- APPROXIMATE SITE BOUNDARY
- AREA OF BARRIER WALL
- RELATIVE SURROGATE CONCENTRATIONS

Maximum relative concentrations above competent bedrock

BAS GROUNDWATER CONSULTING

K P R G

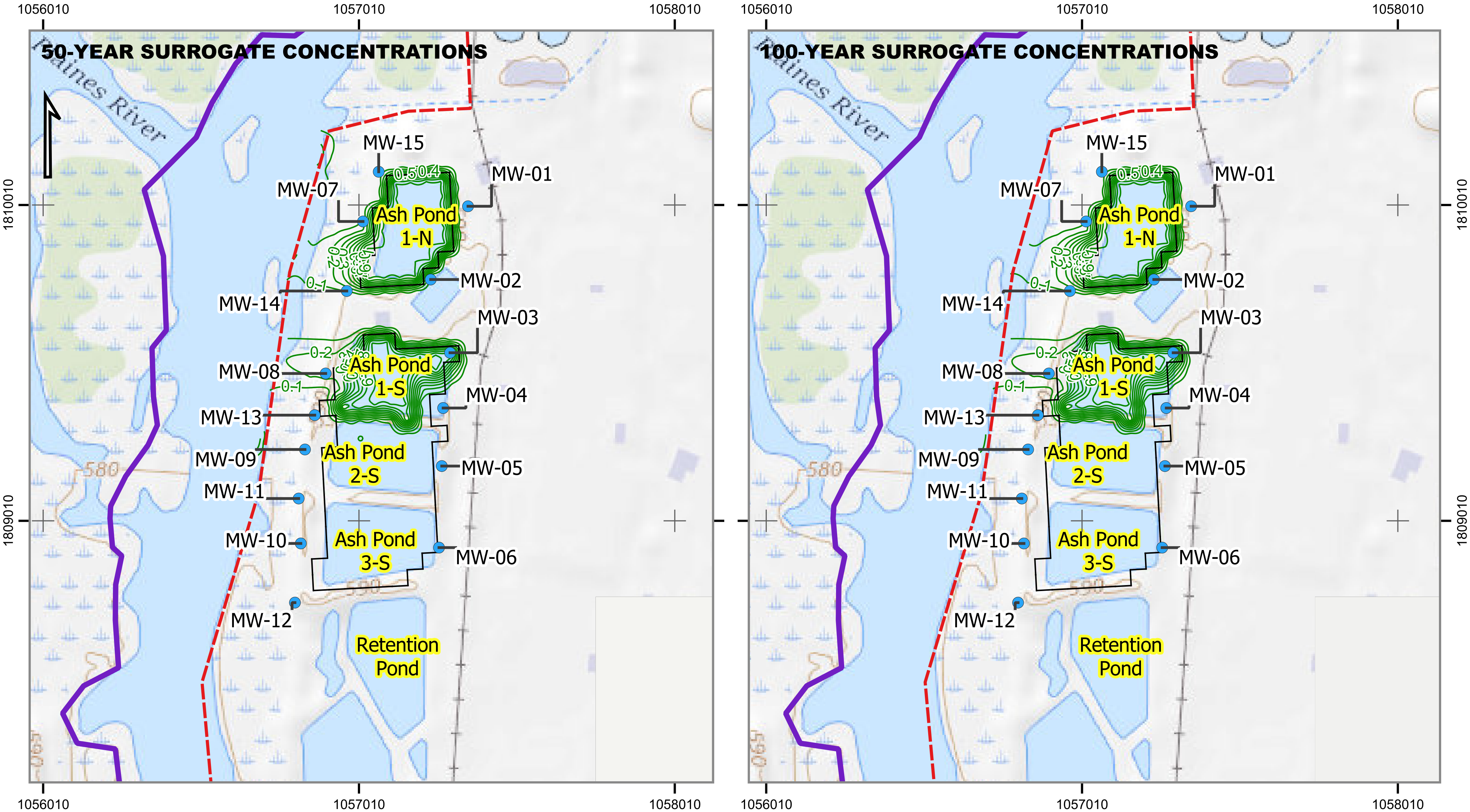
0 200 400 ft

FEET

Coordinate System: NAD_1983_StatePlane_Illinois_East_FIPS_1201_Feet
Project File: Figure24_RelativeSurrogateConcentrations_5_25_Years_Scenario4.qgz

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **RELATIVE SURROGATE CONCENTRATIONS AT 5 AND 25 YEARS, SCENARIO 4** |

| SCALE AT ANSI A | DRAWN | DZF | 05/09/2023 |
|---|---|---|---|
| 1:5,400 | CHECKED | BAS | 05/09/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: **24** | |




LEGEND

- SITE MONITORING WELL
- MODEL BOUNDARY
- APPROXIMATE SITE BOUNDARY
- AREA OF BARRIER WALL
- RELATIVE SURROGATE CONCENTRATIONS

Maximum relative concentrations above competent bedrock

BAS GROUNDWATER CONSULTING    KPRG

0    200    400 ft
FEET

Coordinate System:
NAD_1983_StatePlane_Illinois_East_FIPS_1201_Feet
Project File:
Figure25_RelativeSurrogateConcentrations_50_100_Years_Scenario4.qgz

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **RELATIVE SURROGATE CONCENTRATIONS AT 50 AND 100 YEARS, SCENARIO 4** |

| SCALE AT ANSI A | DRAWN | DZF | 04/21/2023 |
|---|---|---|---|
| 1:5,400 | CHECKED | BAS | 04/21/2023 |
| BAS PROJECT No. 21141501 | FIGURE: **25** | | |

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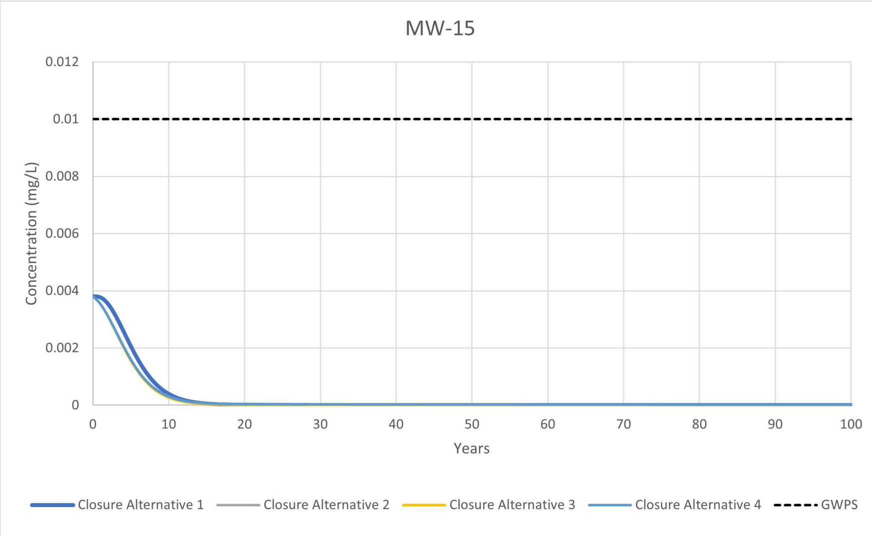
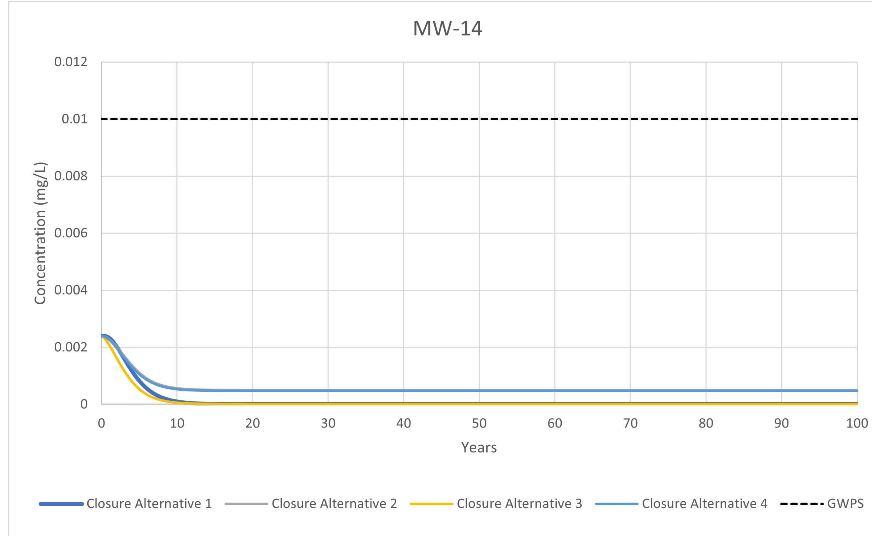
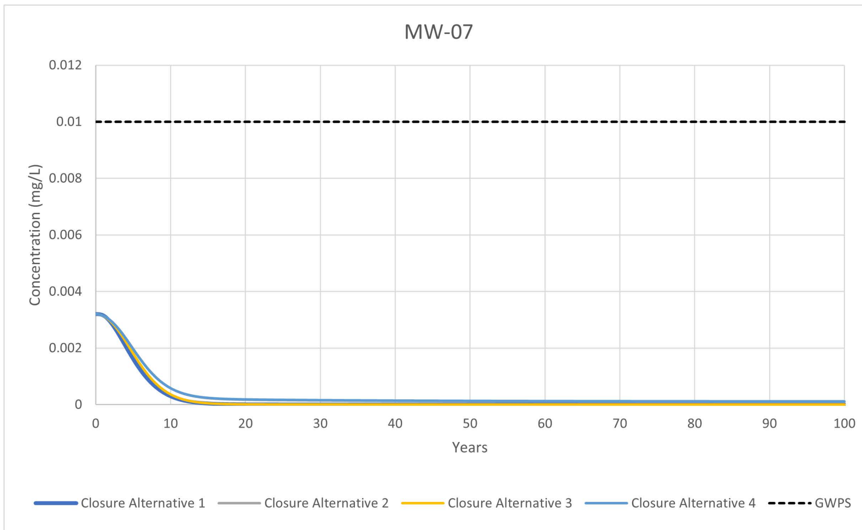
# ATTACHMENT 2




BAS GROUNDWATER CONSULTING

KPRG

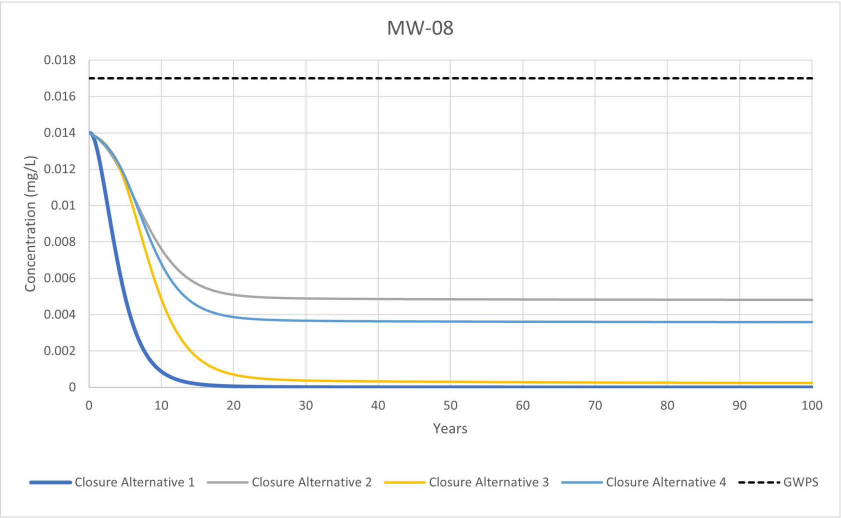
| | | | |
|---|---|---|---|
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 27 | |

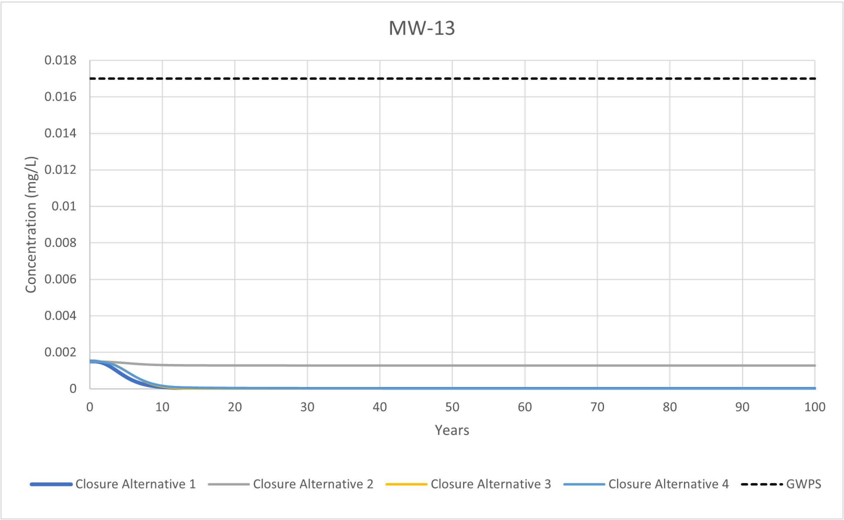
CLIENT
MIDWEST GENERATION

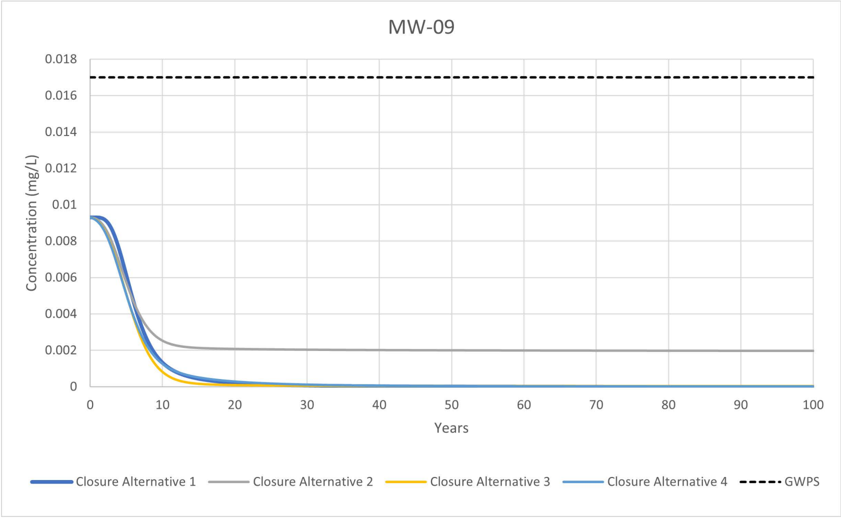
SITE
WILL COUNTY
529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE
**ARSENIC CONCENTRATIONS OVER TIME, POND 1N DOWNGRADIENT WELLS**

Project File: Figure27_ArsenicConcentrations.qgz



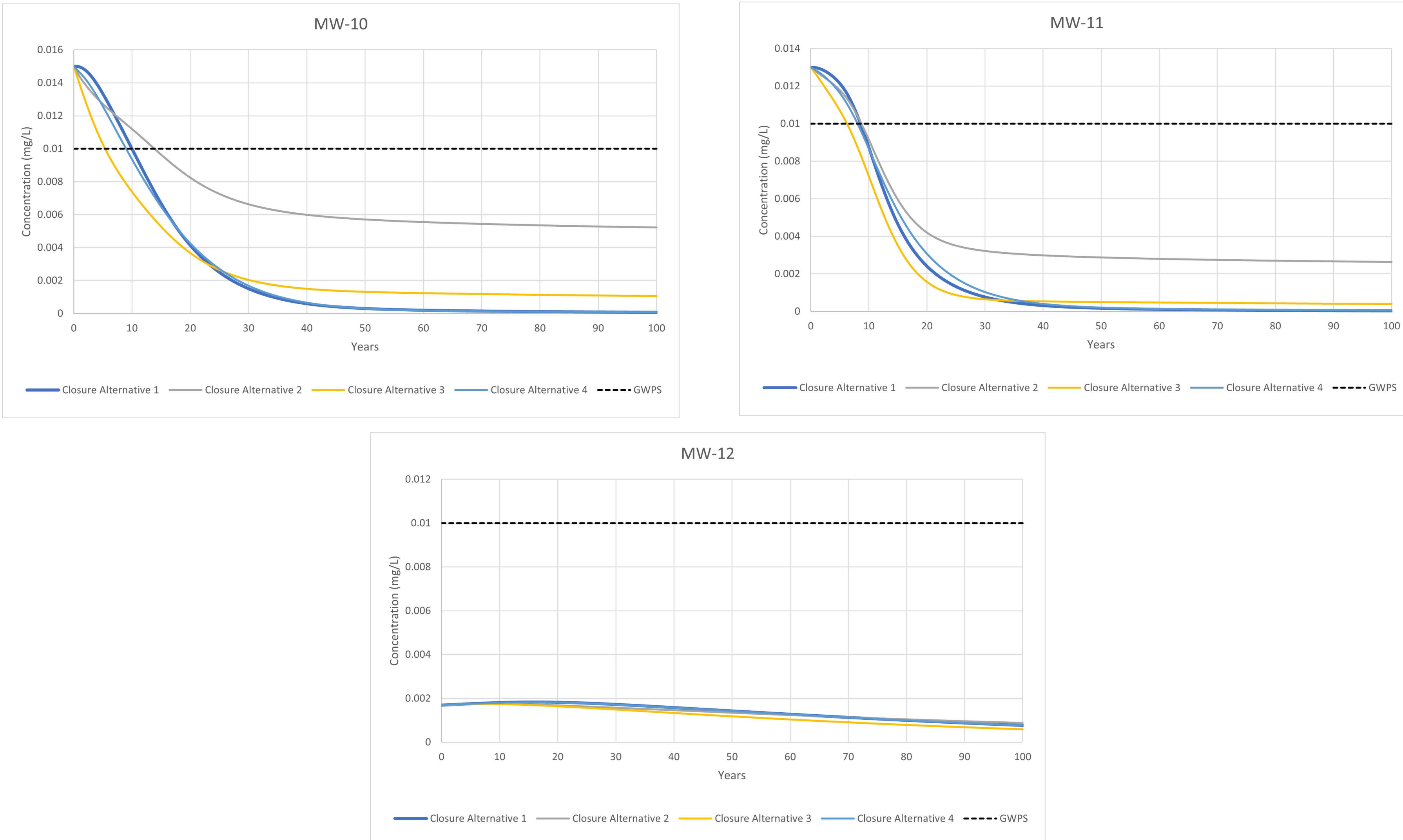

BAS GROUNDWATER CONSULTING

KPRG

| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | FIGURE: 28 | | |

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **ARSENIC CONCENTRATIONS OVER TIME, POND 1S DOWNGRADIENT WELLS** |

Project File: Figure28_ArsenicConcentrations1S.qgz



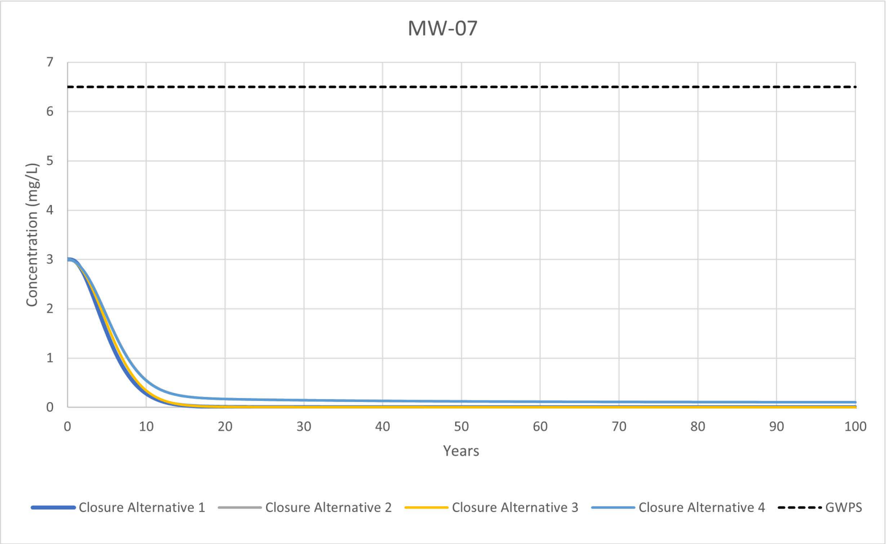

BAS GROUNDWATER CONSULTING

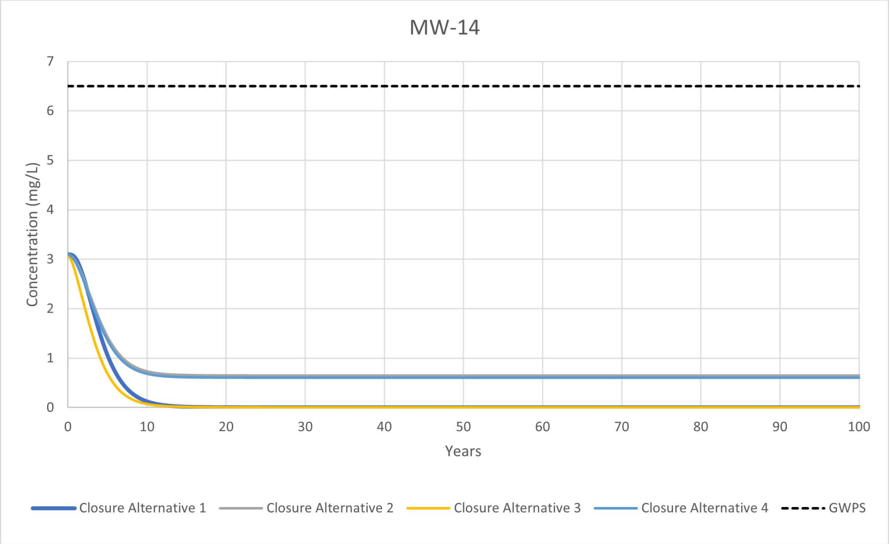
K P R G

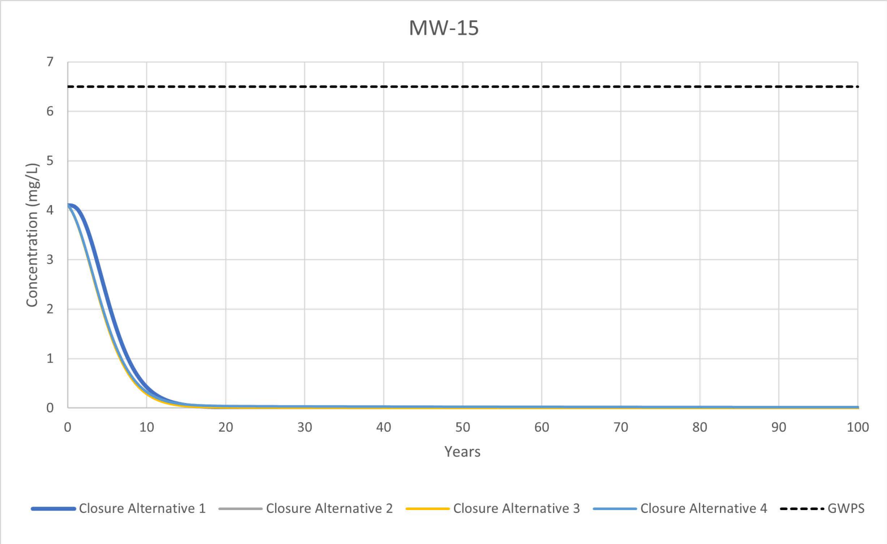
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | FIGURE: **29** | | |

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **ARSENIC CONCENTRATIONS OVER TIME, PONDS 2S/3S DOWNGRADIENT WELLS** |

Project File: Figure29_ArsenicConcentrations2S3S.qgz




BAS GROUNDWATER CONSULTING

KPRG

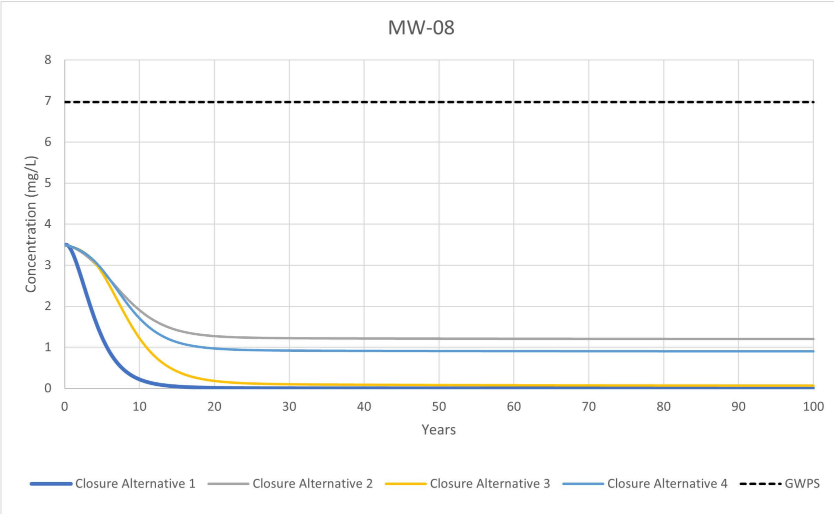
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 30 | |

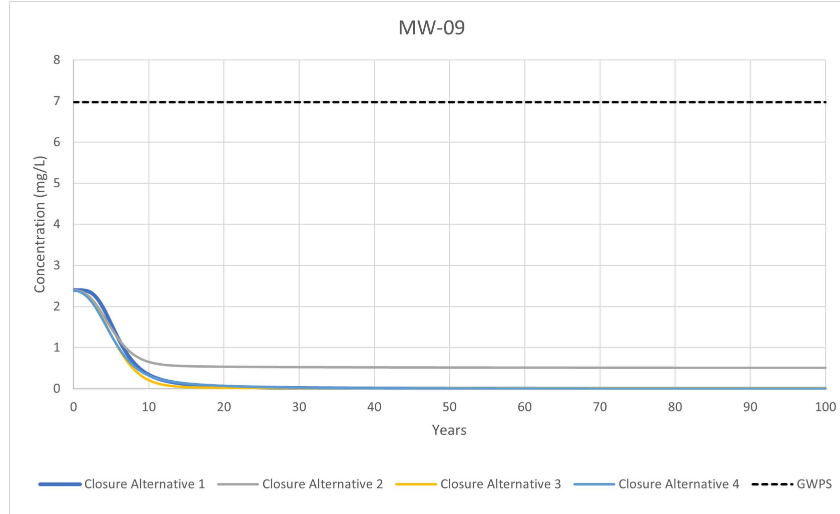
CLIENT
MIDWEST GENERATION

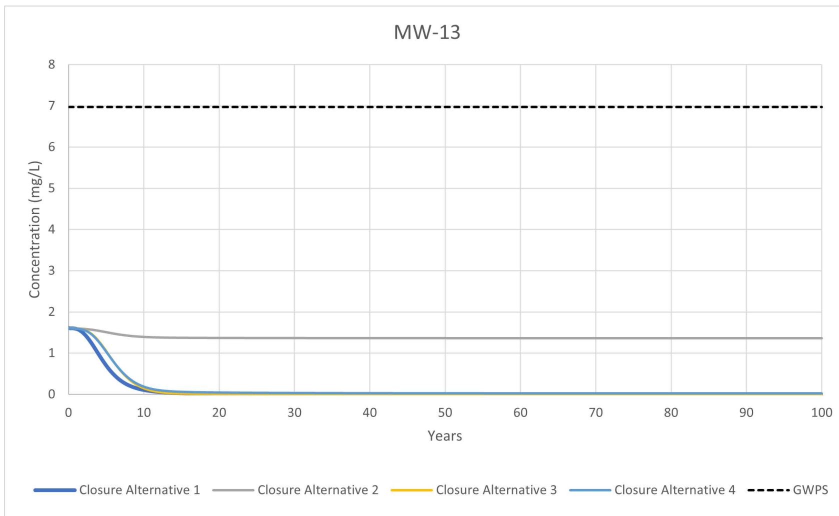
SITE
WILL COUNTY
529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE
**BORON CONCENTRATIONS OVER TIME, POND 1N DOWNGRADIENT WELLS**

Project File: Figure30_BoronConcentrations1N.qgz




BAS GROUNDWATER CONSULTING

KPRG

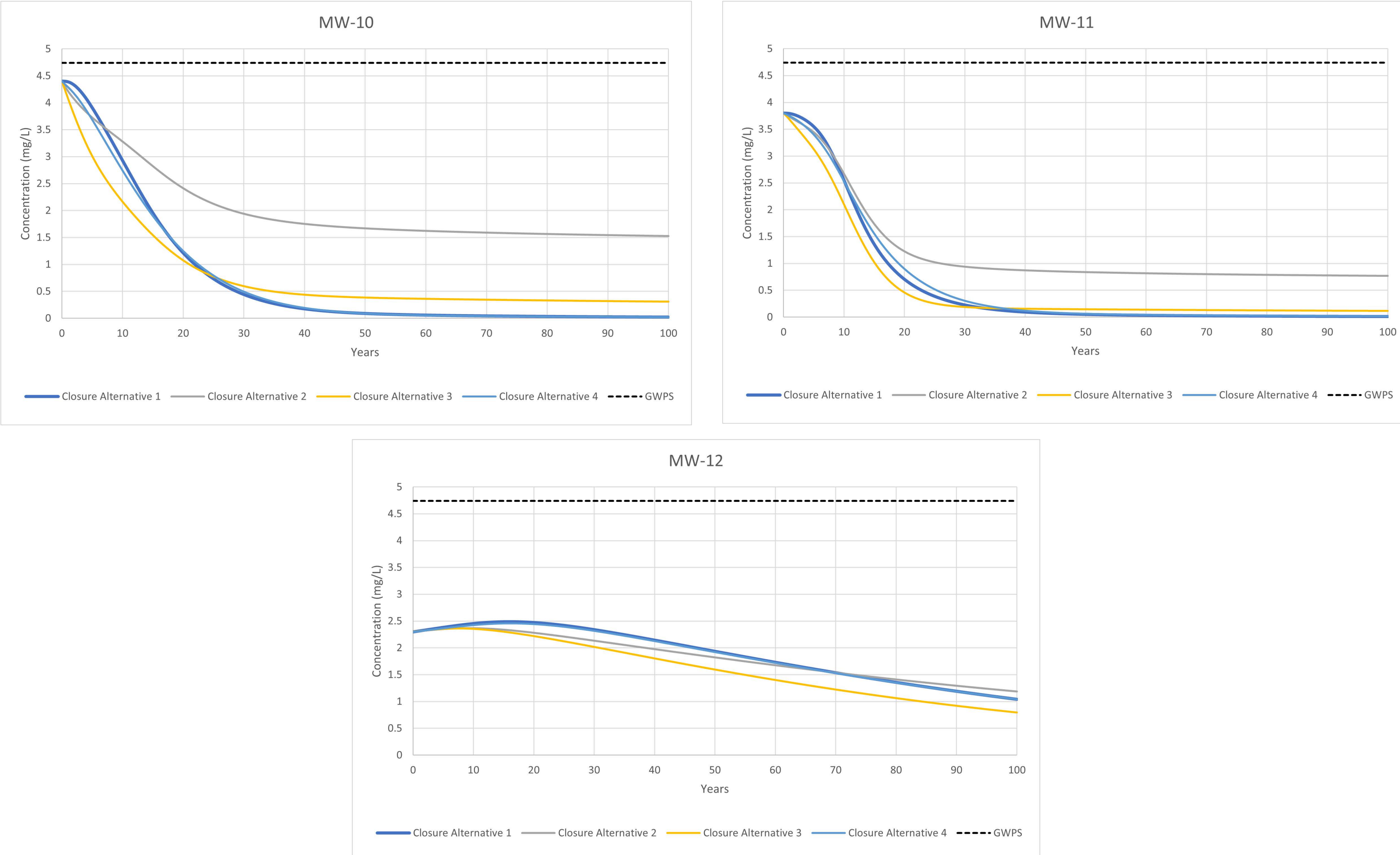
| | | | |
|---|---|---|---|
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 31 | |

CLIENT: MIDWEST GENERATION

SITE: WILL COUNTY, 529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE: **BORON CONCENTRATIONS OVER TIME, POND 1S DOWNGRADIENT WELLS**

Project File: Figure31_BoronConcentrations1S.qgz




BAS GROUNDWATER CONSULTING

KPRG

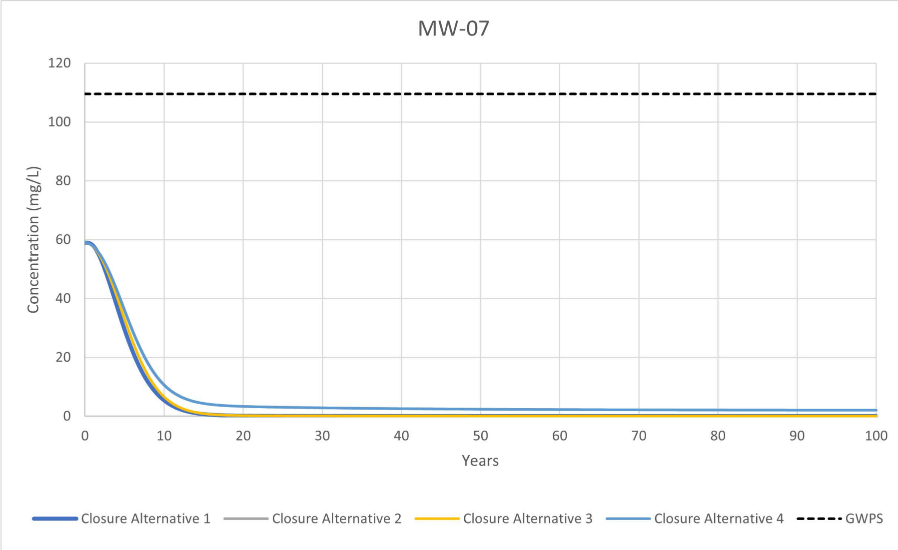
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 32 | |

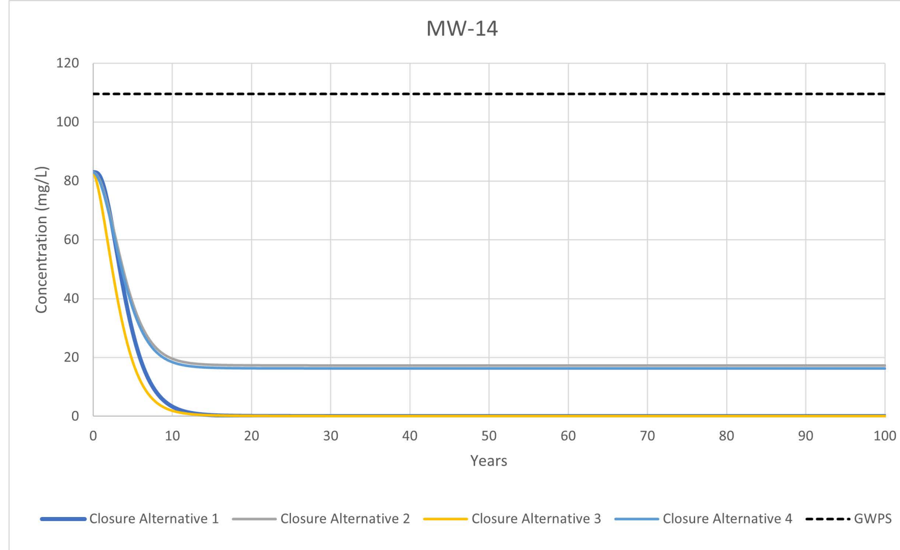
CLIENT: MIDWEST GENERATION

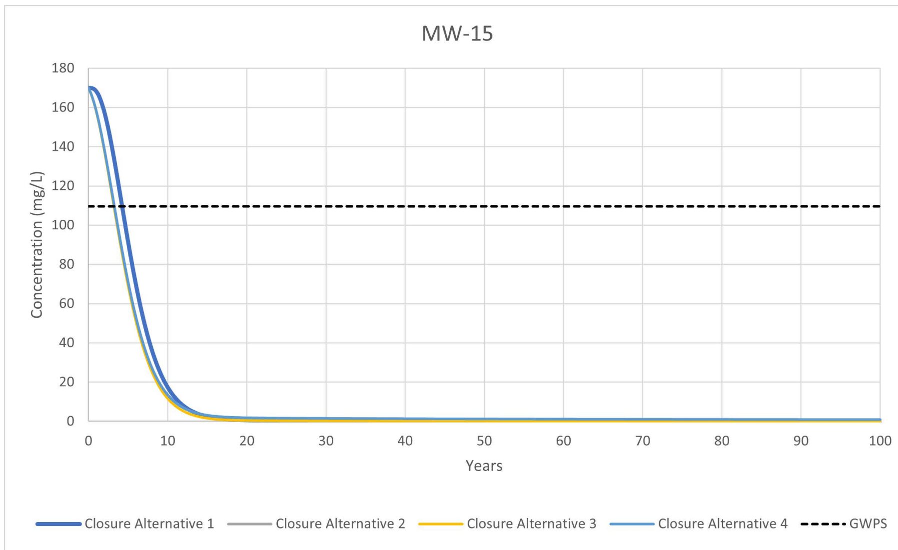
SITE: WILL COUNTY, 529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE: **BORON CONCENTRATIONS OVER TIME, POND 2S/3S DOWNGRADIENT WELLS**

Project File: Figure32_BoronConcentrations2S3S.qgz



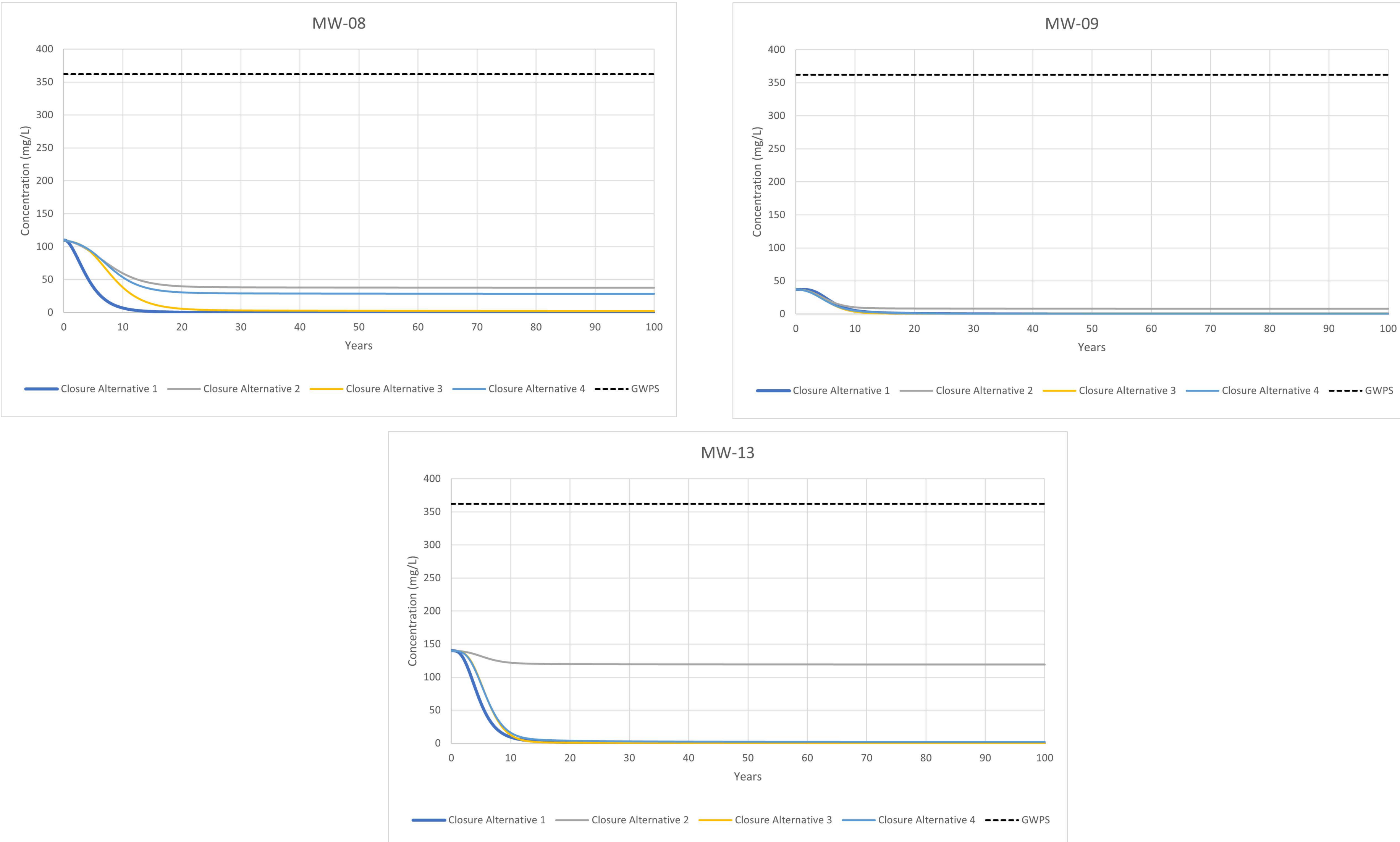

BAS GROUNDWATER CONSULTING

KPRG

| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | FIGURE: 33 | | |

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **CALCIUM CONCENTRATIONS OVER TIME, POND 1N DOWNGRADIENT WELLS** |

Project File: Figure33_CalciumConcentrations1N.qgz




BAS GROUNDWATER CONSULTING

KPRG

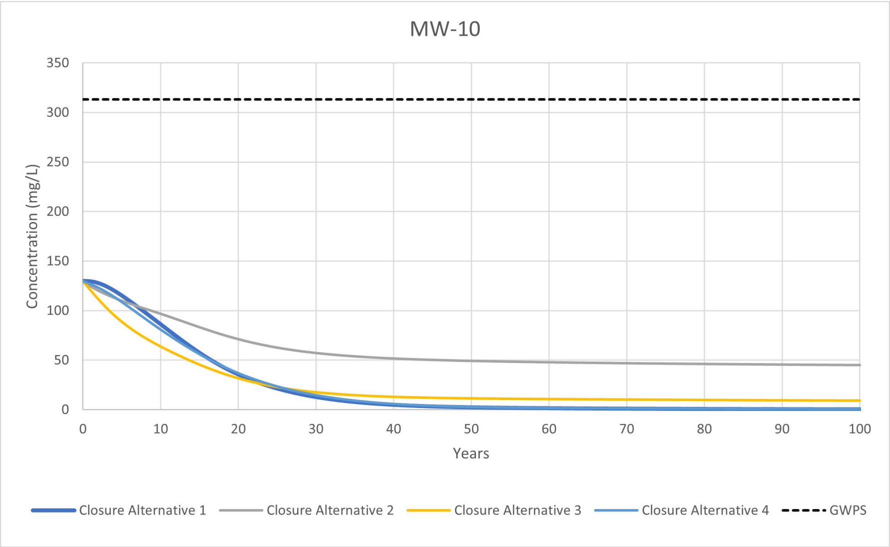
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 34 | |

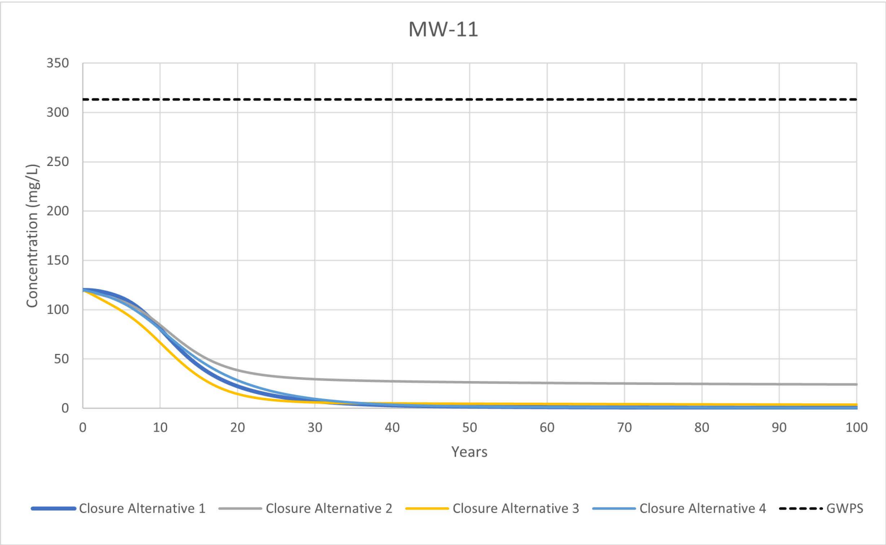
CLIENT
MIDWEST GENERATION

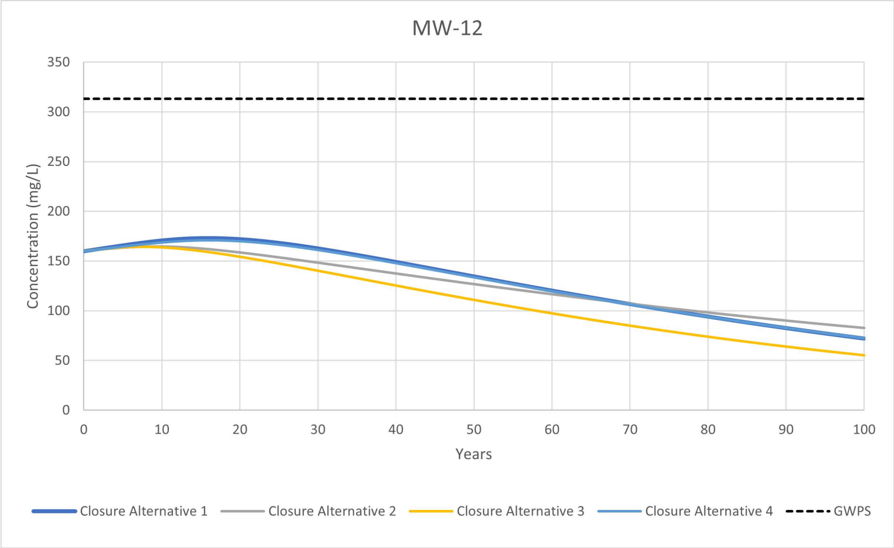
SITE
WILL COUNTY
529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE
**CALCIUM CONCENTRATIONS OVER TIME, POND 1S DOWNGRADIENT WELLS**

Project File: Figure34_CalciumConcentrations1S.qgz




BAS GROUNDWATER CONSULTING

KPRG

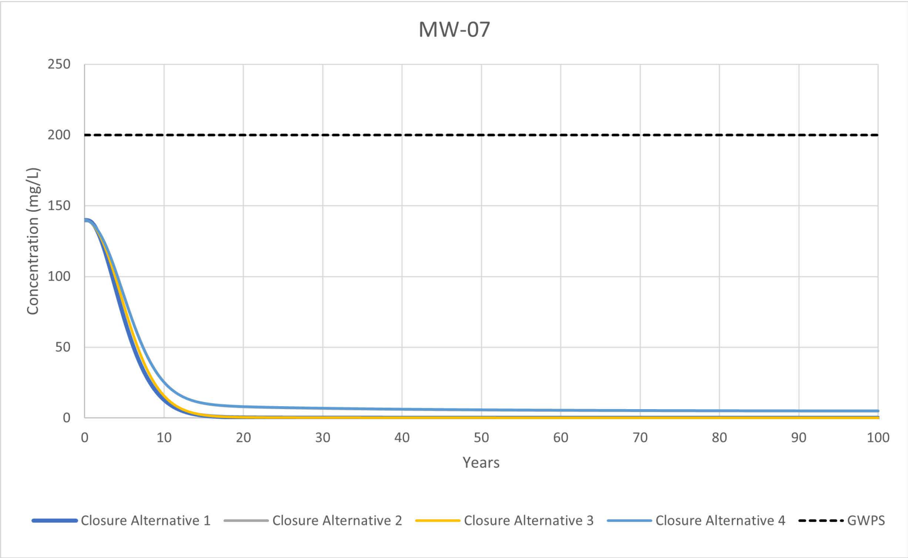
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 35 | |

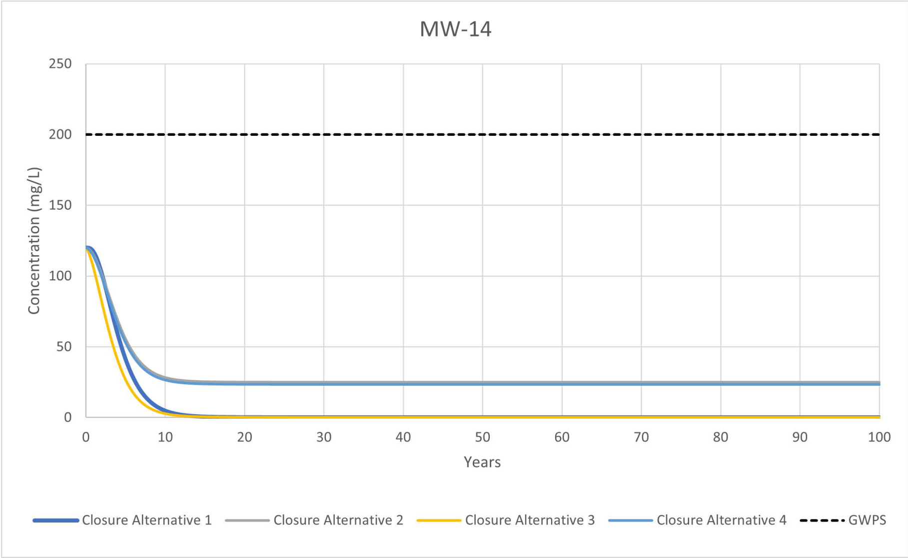
CLIENT
MIDWEST GENERATION

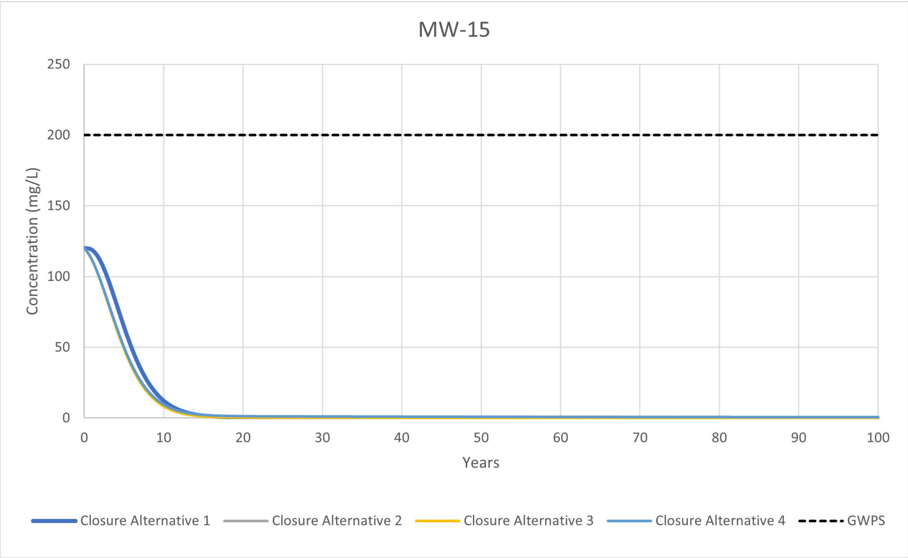
SITE
WILL COUNTY
529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE
**CALCIUM CONCENTRATIONS OVER TIME, PONDS 2S/3S DOWNGRADIENT WELLS**

Project File: Figure35_CalciumConcentrations2S3S.qgz




BAS GROUNDWATER CONSULTING

KPRG

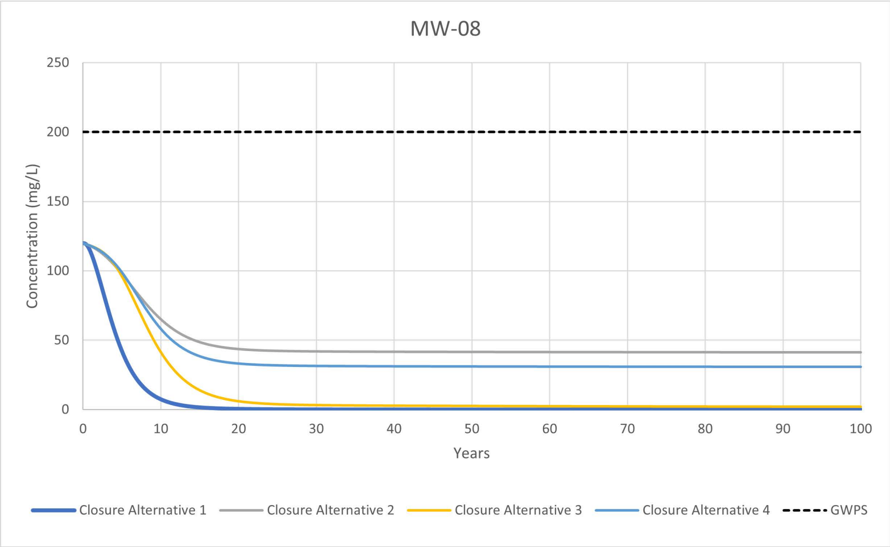
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 36 | |

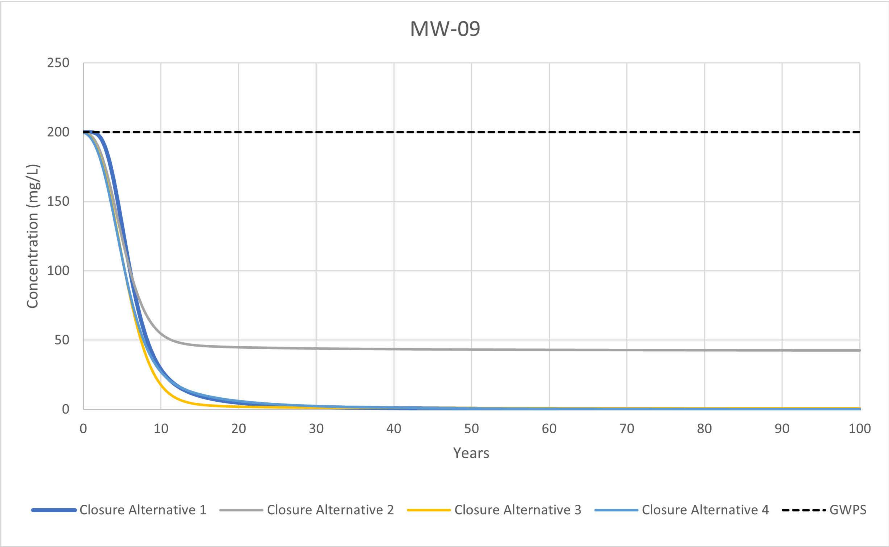
CLIENT
MIDWEST GENERATION

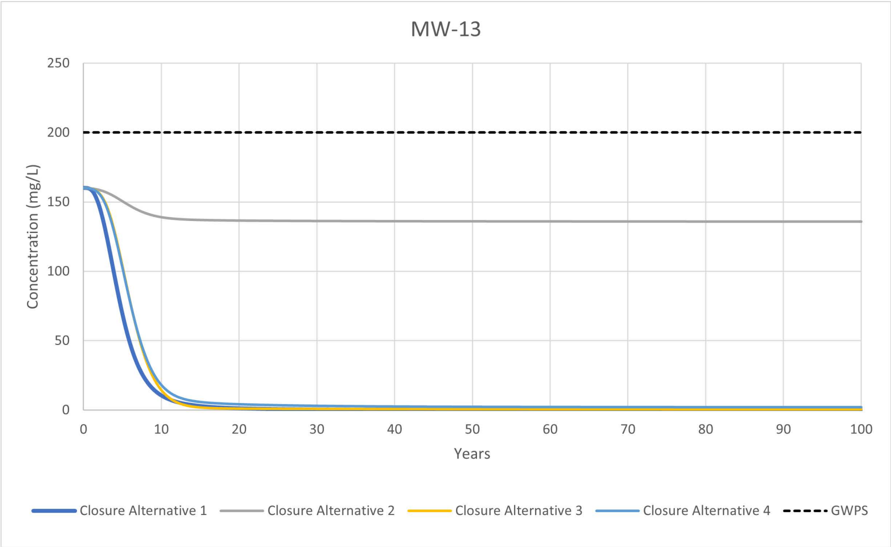
SITE
WILL COUNTY
529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE
**CHLORIDE CONCENTRATIONS OVER TIME, POND 1N DOWNGRADIENT WELLS**

Project File: Figure36_ChlorideConcentrations1N.qgz




BAS GROUNDWATER CONSULTING   KPRG

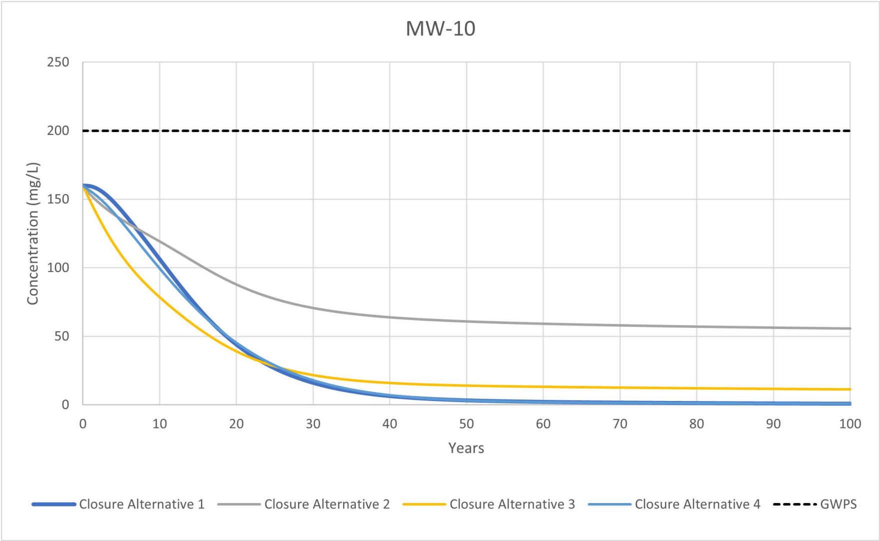
| SCALE AT ANSI A | DRAWN DZF 03/20/2023 |
|---|---|
| | CHECKED BAS 03/20/2023 |
| BAS PROJECT No. 21141501 | FIGURE: **37** |

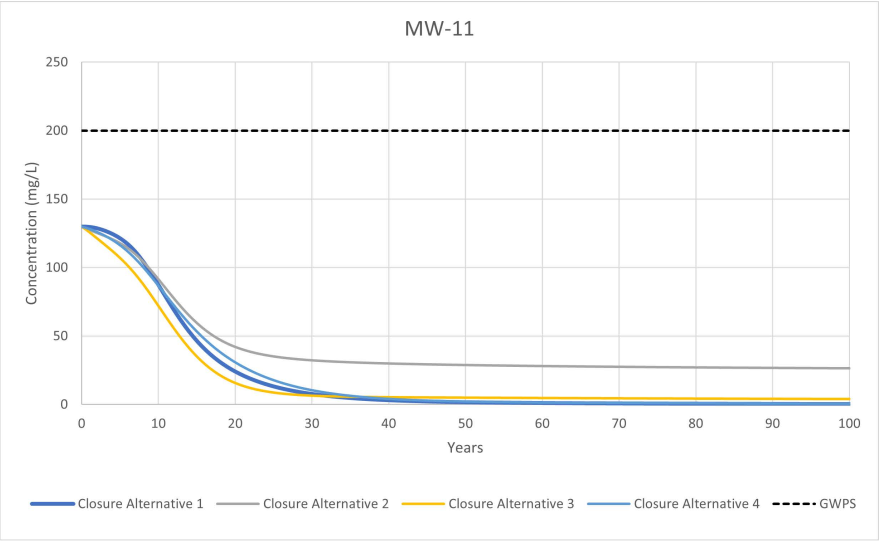
CLIENT: MIDWEST GENERATION

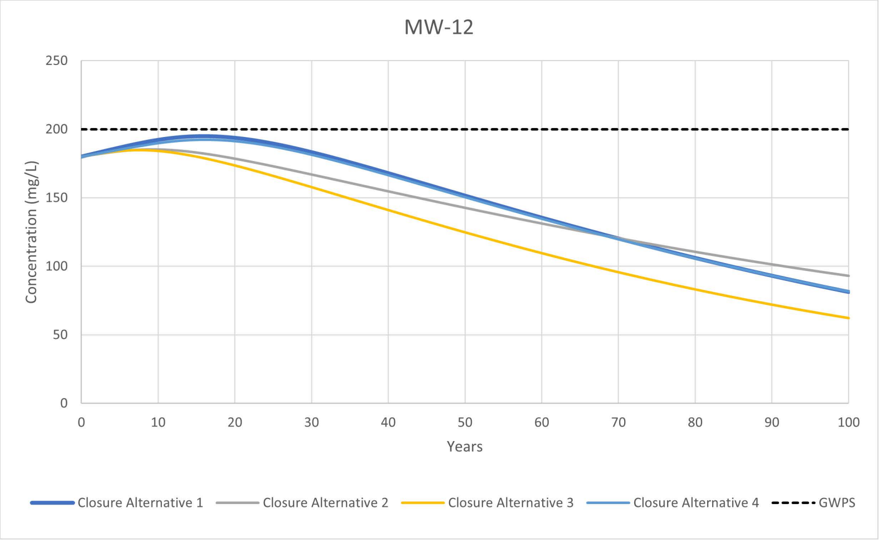
SITE: WILL COUNTY
529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE: **CHLORIDE CONCENTRATIONS OVER TIME, POND 1S DOWNGRADIENT WELLS**

Project File: Figure37_ChlorideConcentrations1S.qgz




BAS GROUNDWATER CONSULTING

KPRG

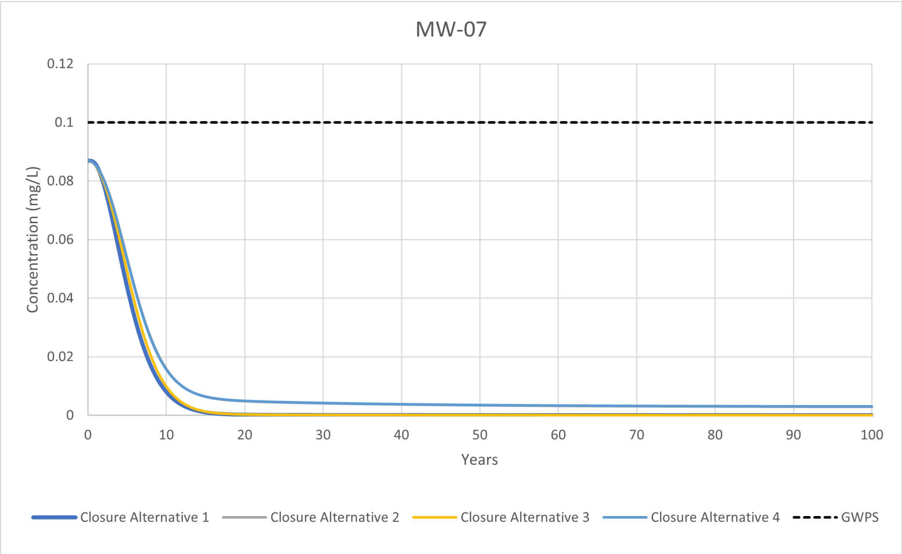
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 38 | |

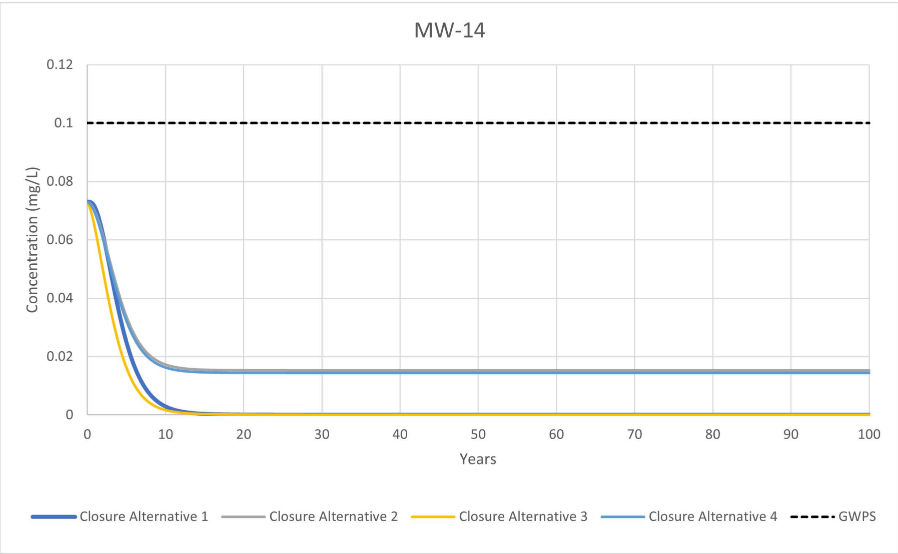
CLIENT
MIDWEST GENERATION

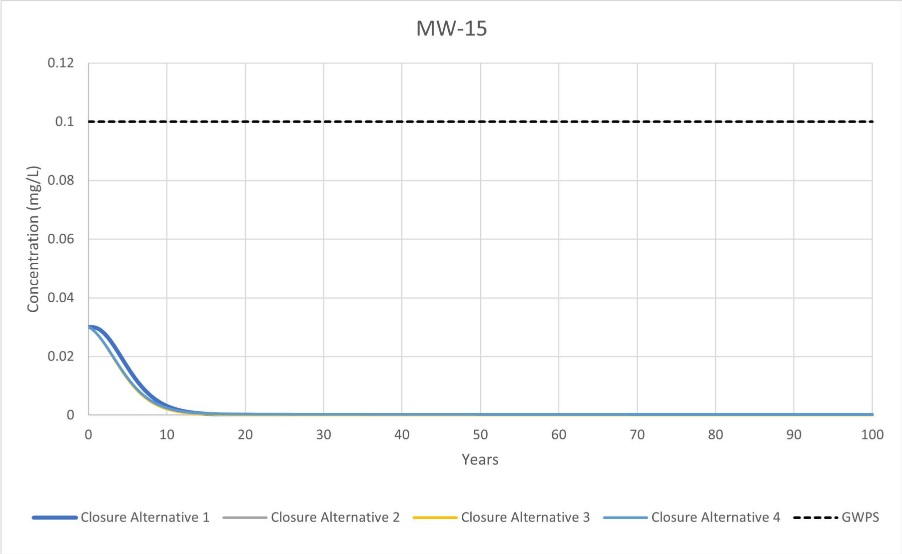
SITE
WILL COUNTY
529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE
**CHLORIDE CONCENTRATIONS OVER TIME, PONDS 2S/3S DOWNGRADIENT WELLS**

Project File: Figure38_ChlorideConcentrations2S3S.qgz




BAS GROUNDWATER CONSULTING

K P R G

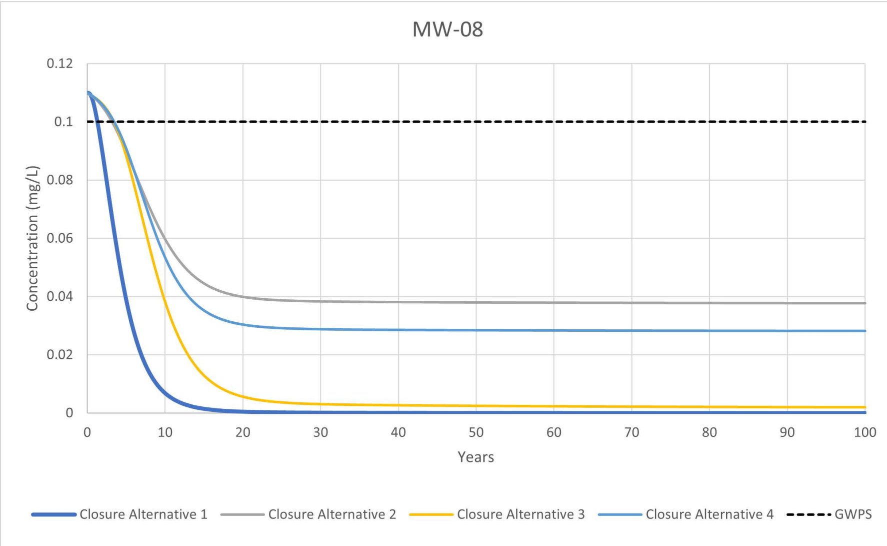
| | | | |
|---|---|---|---|
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 39 | |

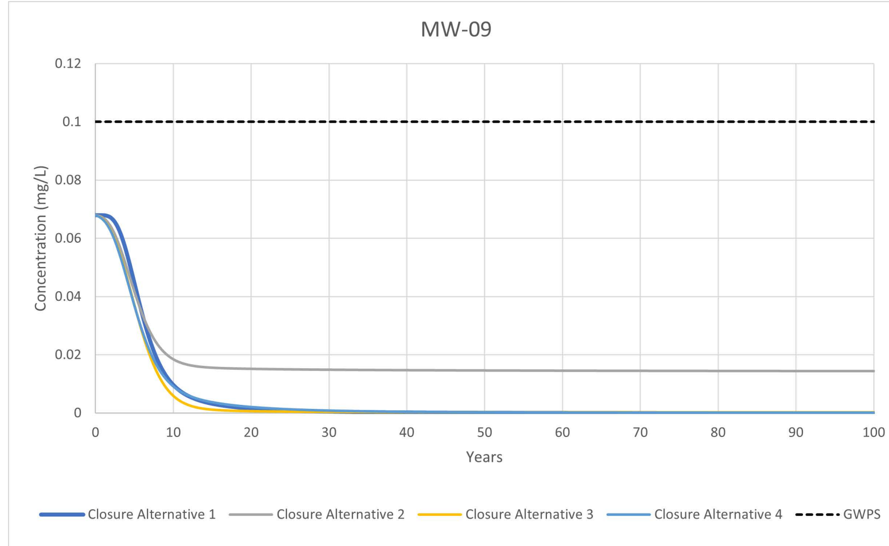
CLIENT
MIDWEST GENERATION

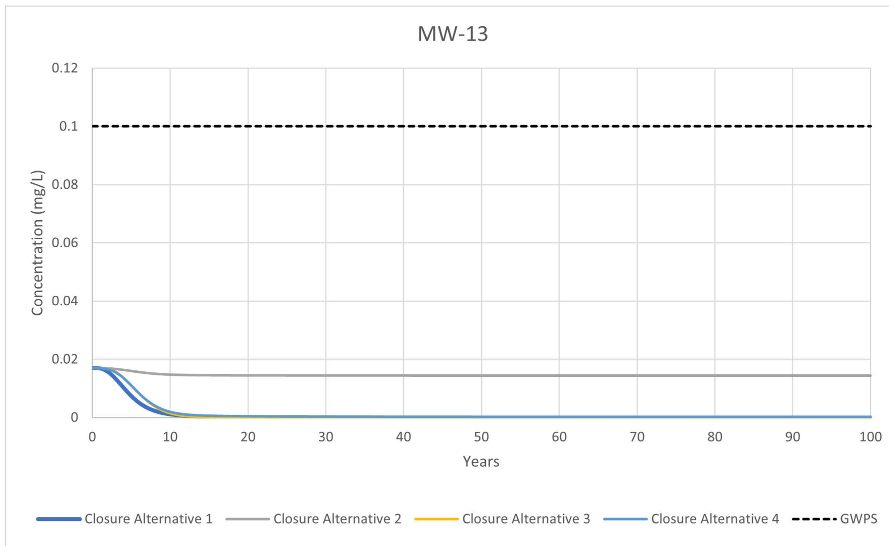
SITE
WILL COUNTY
529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE
**MOLYBDENUM CONCENTRATIONS OVER TIME, POND 1N DOWNGRADIENT WELLS**

Project File: Figure39_MolybdenumConcentrations1N.qgz



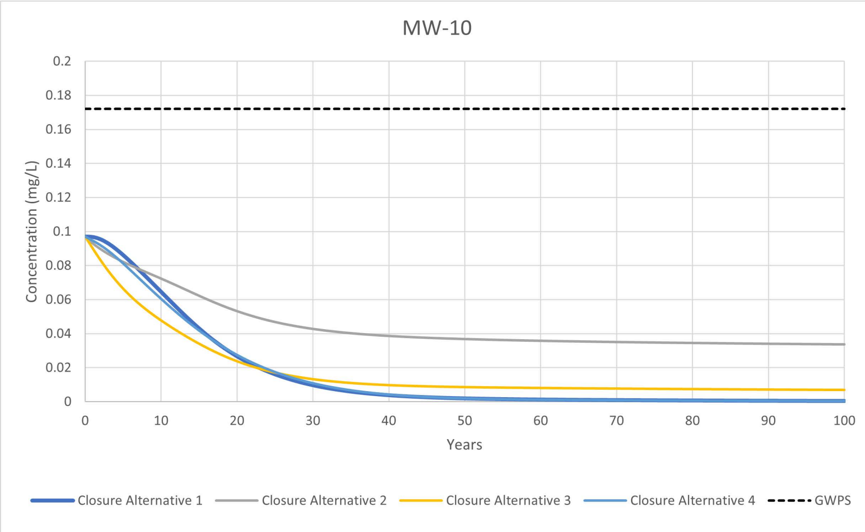

BAS GROUNDWATER CONSULTING

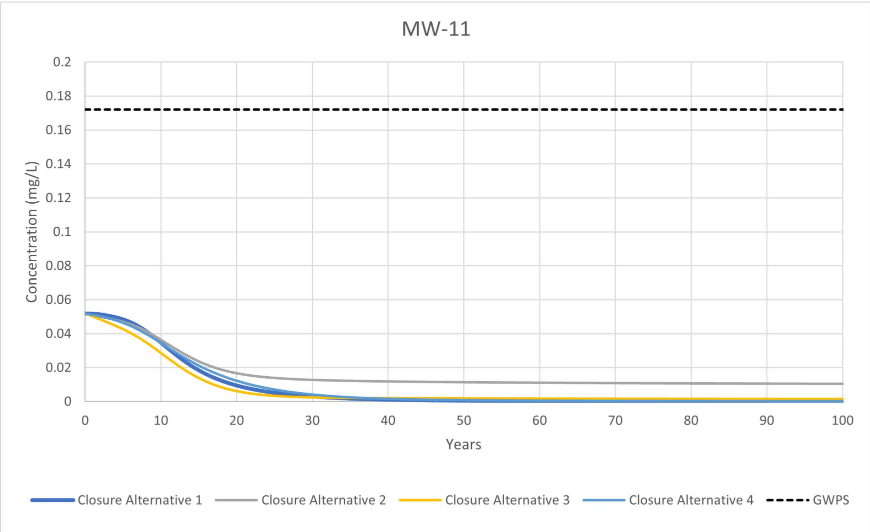
KPRG

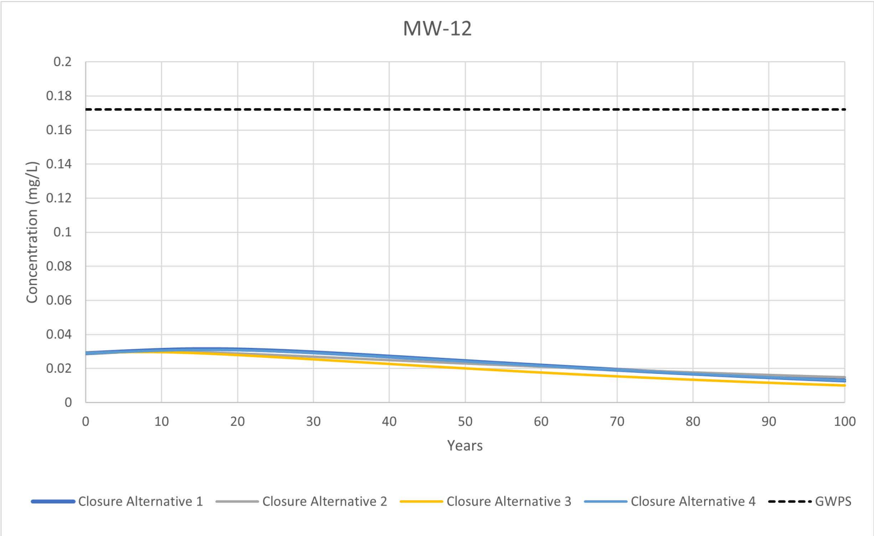
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | FIGURE: 40 | | |

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **MOLYBDENUM CONCENTRATIONS OVER TIME, POND 1S DOWNGRADIENT WELLS** |

Project File: Figure40_MolybdenumConcentrations1S.qgz




BAS GROUNDWATER CONSULTING

KPRG

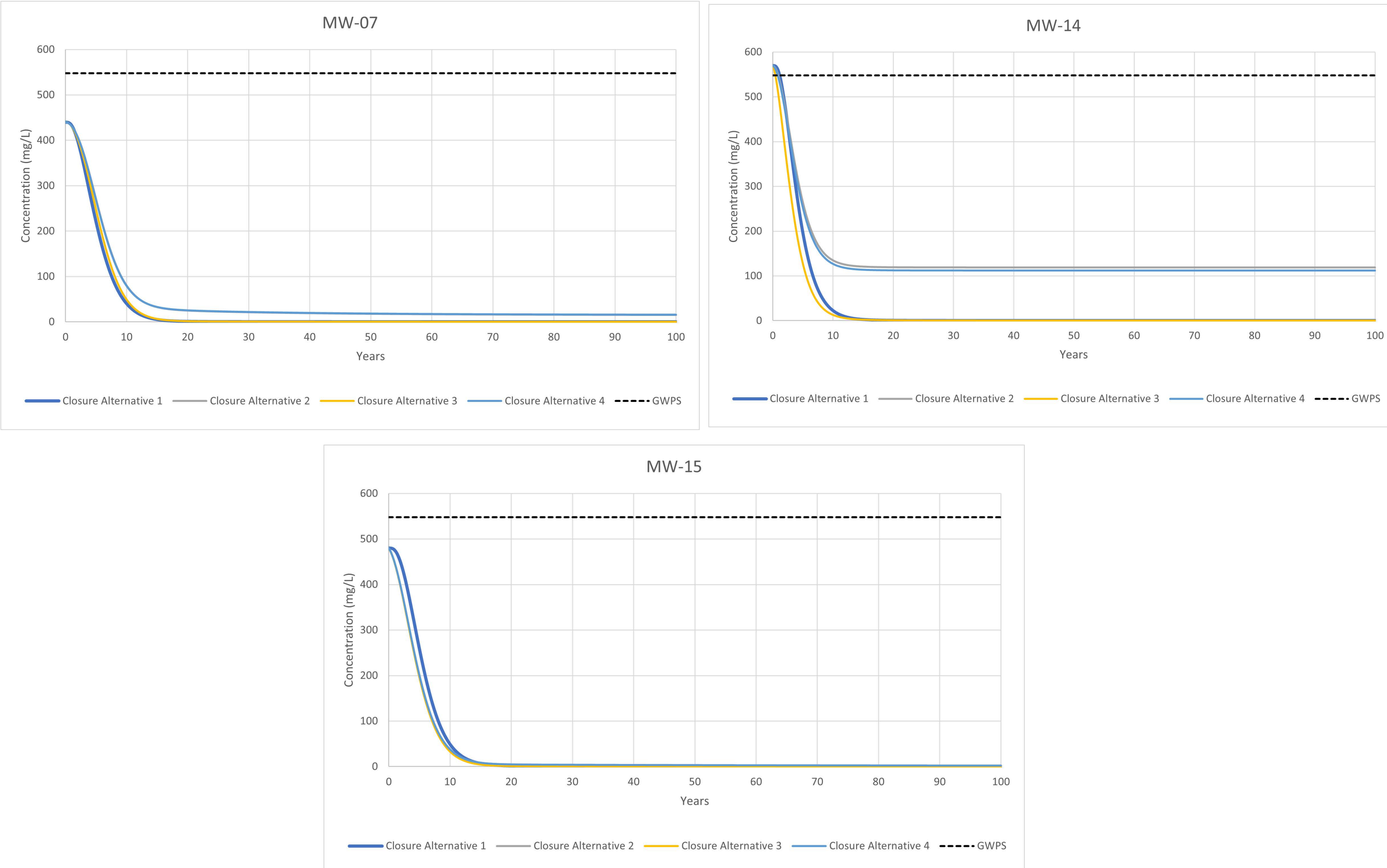
| SCALE AT ANSI A | DRAWN DZF 03/20/2023 |
|---|---|
| | CHECKED BAS 03/20/2023 |
| BAS PROJECT No. 21141501 | FIGURE: 41 |

CLIENT: MIDWEST GENERATION

SITE: WILL COUNTY
529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE: **MOLYBDENUM CONCENTRATIONS OVER TIME, PONDS 2S/3S DOWNGRADIENT WELLS**

Project File: Figure41_MolybdenumConcentrations2S3S.qgz



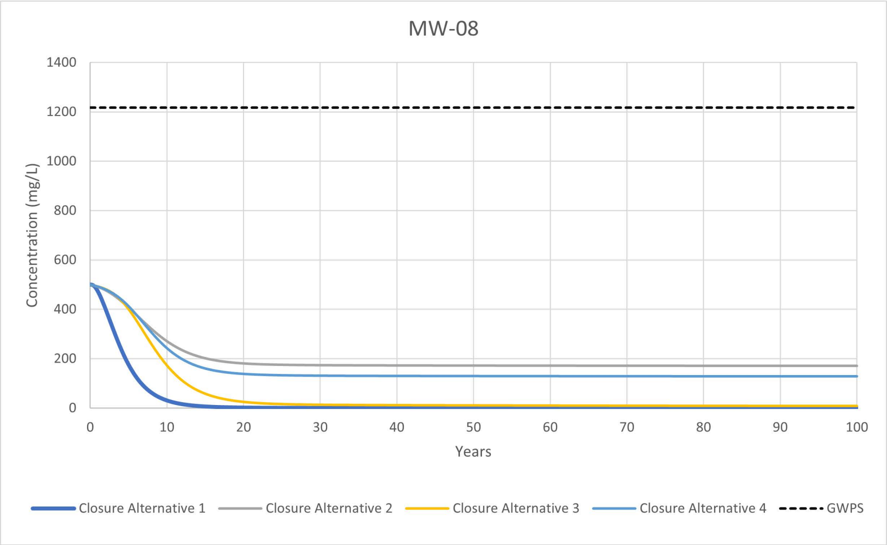

BAS GROUNDWATER CONSULTING

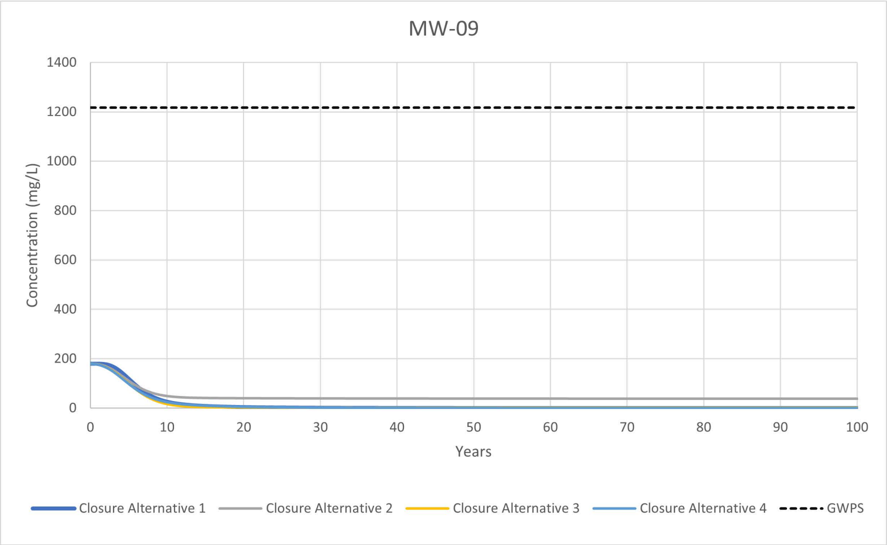
KPRG

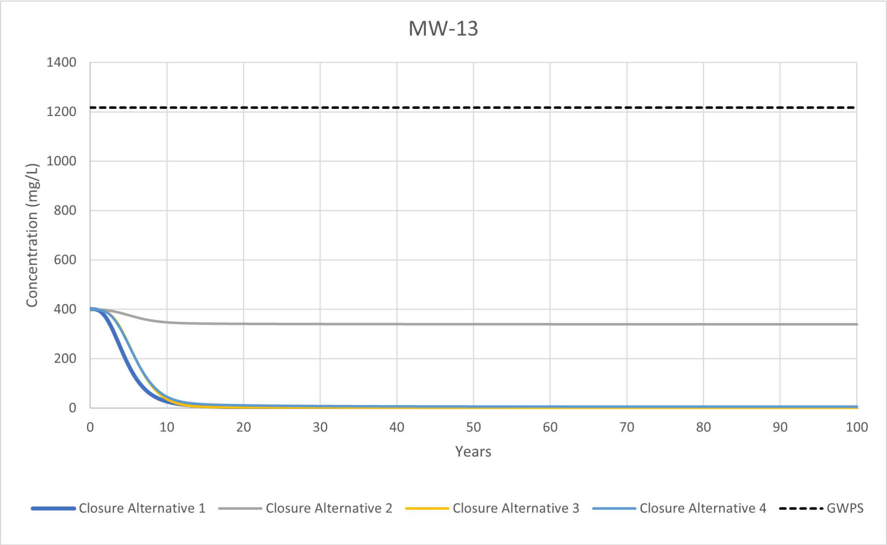
| | | | |
|---|---|---|---|
| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: **42** | |

| | |
|---|---|
| CLIENT | MIDWEST GENERATION |
| SITE | WILL COUNTY<br>529 OLD ROMEO RD, ROMEOVILLE, IL |
| TITLE | **SULFATE CONCENTRATIONS OVER TIME, POND 1N DOWNGRADIENT WELLS** |

Project File: Figure42_SulfateConcentrations1N.qgz




BAS GROUNDWATER CONSULTING

KPRG

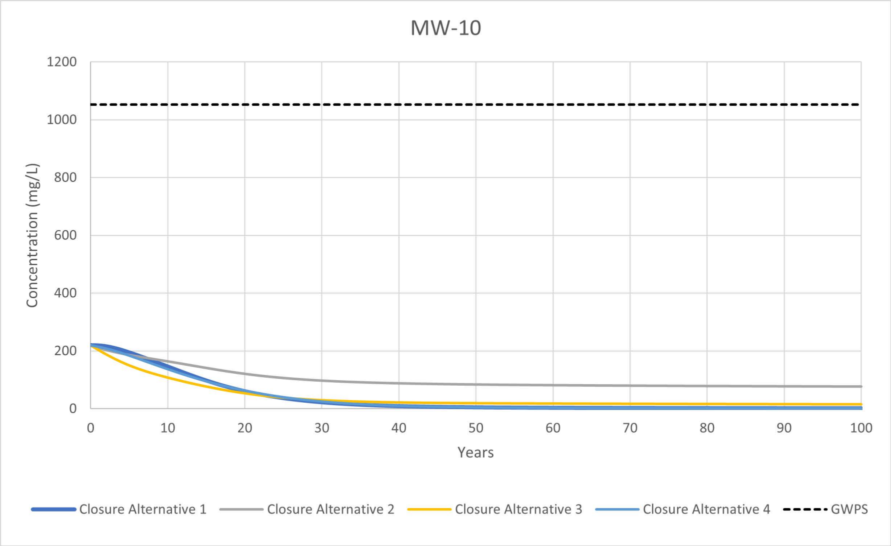
| SCALE AT ANSI A | DRAWN DZF 03/20/2023 |
|---|---|
| | CHECKED BAS 03/20/2023 |
| BAS PROJECT No. 21141501 | FIGURE: 43 |

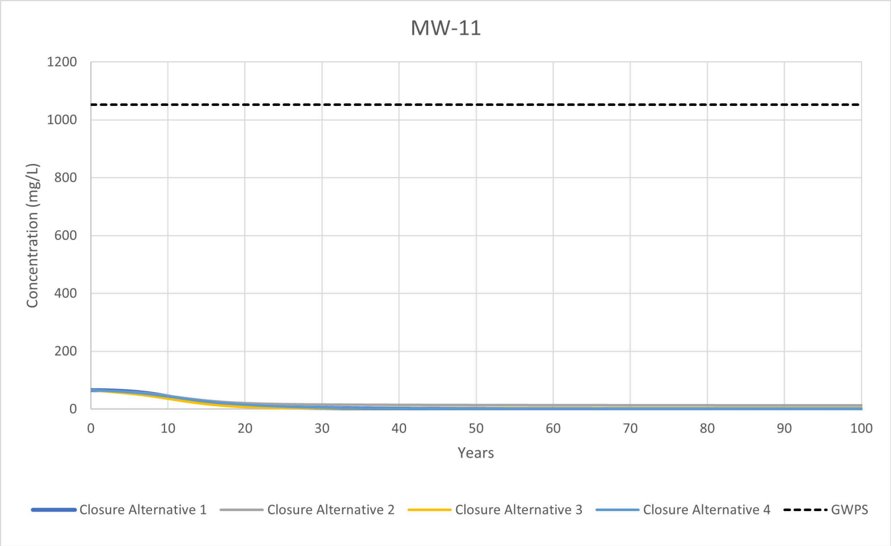
CLIENT: MIDWEST GENERATION

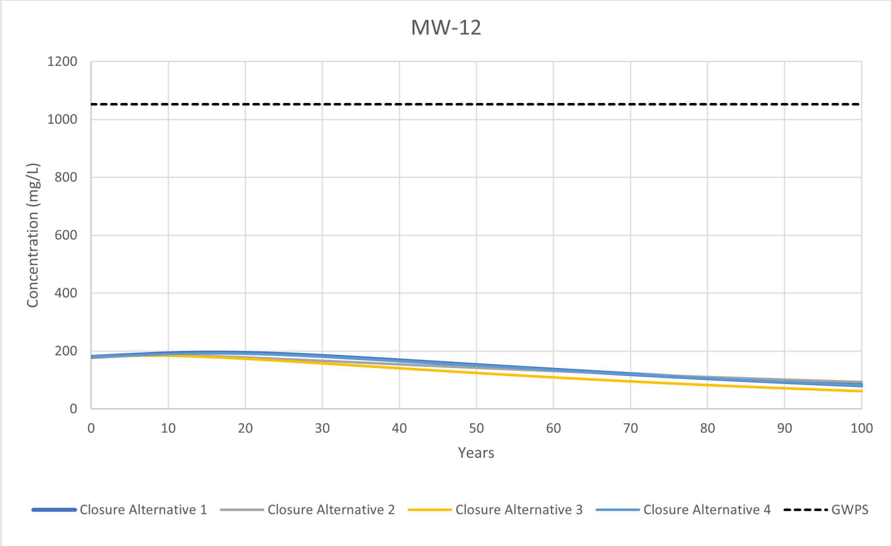
SITE: WILL COUNTY
529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE: **SULFATE CONCENTRATIONS OVER TIME, POND 1S DOWNGRADIENT WELLS**

Project File: Figure43_SulfateConcentrations1S.qgz




BAS GROUNDWATER CONSULTING

KPRG

| SCALE AT ANSI A | DRAWN | DZF | 03/20/2023 |
|---|---|---|---|
| | CHECKED | BAS | 03/20/2023 |
| BAS PROJECT No. 21141501 | | FIGURE: 44 | |

CLIENT: MIDWEST GENERATION

SITE: WILL COUNTY, 529 OLD ROMEO RD, ROMEOVILLE, IL

TITLE: **SULFATE CONCENTRATIONS OVER TIME, PONDS 2S/3S DOWNGRADIENT WELLS**

Project File: Figure44_SulfateConcentrations2S3S.qgz