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AECOM Project No.
60669161

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DRAFT Closure Alternatives Analysis for the East and West Ash Basins at the Waukegan Generating Station in Waukegan, IL

Dear Ms. Buckley,,

This letter report presents the Closure Alternatives Analysis (CAA) for the East and West Ash Basins located at the Midwest Generation, LLC (MWG) Waukegan Station located west of Lake Michigan in Waukegan, Illinois. The CAA for this project involved developing ash basin closure strategies and evaluating these options relative to each other to determine a cost-effective solution which is protective of the environment and addresses input from the community. After selection of the preferred alternative, a more detailed engineering and closure plan will be developed. The strategies discussed in the CAA are representative of the range of possible approaches for basin closure. The following sections of this letter report provide the project understanding, the considered closure options, approach used for the CAA, narratives addressing items listed in 35 IAC 845.710 regarding the different closure alternatives and ranking of closure options for each item.

Project Understanding

The MWG Waukegan Station is located adjacent to Lake Michigan in Waukegan, IL. The facility currently generates electricity through coal combustion as well as gas fired boilers. It is our understanding that coal fired generation is expected to cease at the facility in June of 2022. Under the 35 IAC 845 (Part 845) regulation, a number of submittals and permits are required for submission to the State of Illinois. As part of those submittals, a closure alternatives analysis, as presented in this letter report, of the East and West Ash Basins is required. The East and West Ash Basins are located south of the generating facilities at the station and are each approximately 11 acres in plan. Based on current Coal Combustion Residual (CCR) volumes present within each unit, we understand that the current plan for the facility is to close the West Basin by removal of all CCR and the basin will then be repurposed as a non-CCR low volume wastewater basin. The East Ash Basin will be closed by removal or closed in place based on the outcome of the Closure Alternatives Analysis required under 35 IAC 845.710. AECOM further understands that neither the West nor East Ash Basins exhibit Statistically Significant Levels (SSLs) of Appendix IV groundwater constituents which exceed Groundwater Protection Standards (GWPS).

Closure Options

For the MWG Waukegan Station, AECOM considered the following closure options for the East Ash Basin (EAB) and West Ash Basin (WAB):

- Option 1: WAB Closure by Removal
- Option 2: WAB Closure in Place
- Option 3: EAB Closure by Removal
- Option 4: EAB Closure in Place Option 1
- Option 5: EAB Closure in Place Option 2
- Option 6: EAP Closure in Place Option 3

In general, the options being considered for each ash basin are Closure-by-Removal or Closure-in-Place. For the Closure-by-Removal options, the in-place CCR material will be excavated and transported to a beneficial reuse facility or certified commercial landfill. Currently, MWG does not have an alternative offsite facility that can accept the existing CCR material and does not have enough space on site to accommodate the construction of a new CCR impoundment or landfill. After removal of all CCR material, the existing basin geomembrane liner would be decontaminated and reused for the non-CCR impoundment. For the West Ash Basin, MWG is considering reusing it as a stormwater and wastewater holding area. If this option is chosen, the basin would need to have a new geomembrane liner placed if the existing one is removed or not decontaminated.

For the Closure-in-Place options, the CCR material will be capped with a composite system consisting of either a geomembrane liner with cover soil or geomembrane liner with engineered turf. Drawings of the closure options for the East and West Ash Basins under consideration at the MWG Waukegan Station are provided as Attachment A. The grading plans and representative drawings included for Options 1 through 5 were developed by AECOM. The grading plan and representative drawings for Option 6 were developed by Sergeant & Lundy. After placement of the final cover system, placement of solar panels, native vegetation, or converting the surface to a park were considered for the long-term use of the closed CCR impoundment.

Closure Alternatives Analysis (CAA) Approach

For the CAA approach, each Regulatory Comparison Criteria (item) presented in 35 IAC 845.710 was addressed for the different closure options. A narrative for each item is presented in the following section. In general, the narratives respond to each item when considering Closure-in-place or Closure-by-removal for the West and East Ash Basins. After addressing each item identified in 35 IAC 845.710, a rank was given to each closure option. The ranking system gave each basin closure option a rank between 1 and 5, where 1 as the least desired and applicable and 5 as the most desired and applicable. The rankings for each item are presented on the spreadsheet included as Attachment D.

35 IAC 845.710 Comparison Criteria Narratives

Long- and Short-term Effectiveness and Protectiveness of Closure Method [845.710(b)(1)]

845.710(b)(1)(A)
Magnitude of reduction of existing risks

For CCR impoundments, the greatest risk to the surrounding environment is the release of material from structural or stability failure, or contaminant transport into the underlying groundwater system by infiltration through the base liner. For the Closure-by-Removal option, CCR material is removed from the site and the existing base liner system is removed or decontaminated. By removing the material and decontaminating the base liner, the contaminant source is removed, therefore the potential of environmental contamination by CCR is presumably eliminated. Also, for complete closure and removal of both basins, it is assumed that the interior and perimeter containment dikes will be removed, therefore the site would be graded with minimal surface relief and slope stability would not be an issue. For the instance where the closed basin is reused for stormwater or wastewater retention, the in-place decontaminated geomembrane liner would remain or be replaced. In regard to stability, the basin used for stormwater and wastewater retention would not change assuming similar loading conditions as when evaluated as a CCR impoundment.

For Closure-in-Place, the construction of an impervious barrier over the in-place CCR material would divert stormwater away from the impoundment, therefore decreasing the ability of contaminate transport by infiltration. The final cover would also be graded to divert stormwater away from the closed impoundment and eliminate the ability of water to pond on the cap. The cap system would be designed to be less permeable than the underlying liner system which would further reduce the infiltration of stormwater into the capped CCR. In addition, the existing groundwater monitoring plan would continue as part of the required 30-year post-closure plan. Regarding stability, the existing perimeter dikes would be evaluated against required minimum factors of safety presented in 35 IAC 845.460(a). It should be noted that global stability analyses for Closure-in-place were not performed as part of this CAA. It is assumed that the grades proposed for the final cover will not result in a factor of safety below the minimum required. Slopes of the proposed capping grades have been based on previous experience with other CCR closures. After the final closure plan is selected, a global stability analysis will be performed to evaluate factors of safety.

845.710(b)(1)(B)
Magnitude of residual risks in terms of likelihood of future releases of CCR.

Residual risk of future release of CCR material is eliminated at the site for the Closure-by-Removal option. For the Closure-in-Place, release from perimeter dike failure is present, but the risk is greatly reduced by maintaining minimum grades of the final cover and addition of vegetation or engineered turf to prevent erosion. Final design for the closure will evaluate the geotechnical stability of the proposed closure to ensure safety factors meet industry standards and regulatory requirements.

845.710(b)(1)(C)
Type and degree of long-term management required, including monitoring, operation, and maintenance.

For Closure-by-Removal options where perimeter and interior dikes are removed, maintenance is limited to surface cosmetic repair as applicable. If perimeter dikes remain and the basin is used for stormwater and wastewater containment, annual inspections of perimeter dikes and base geomembrane of pond interior would be implemented. For long-term maintenance, cleanout of drainage pipes, replacement of deteriorated drainage pipes, fixing potential erosion issues along exterior slopes, and compliance issues noted during the annual inspections would be addressed as needed.

For Closure-in-Place, long-term management of the closed CCR impoundment would include annual inspections of the cover and perimeter containment dike slopes for erosion and stability. If native grass is

used for the final cover, annual maintenance would include removal of woody vegetation or invasive species, revegetation, and repair of erosion or ponding of water.

845.710(b)(1)(D)
Short-term risks that might be posed to the community or the environment during implementation of such a closure, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal of contaminants.

For Closure-by-Removal, removal of the CCR material will follow procedures presented in 35 IAC 845.740. During construction, the in-place CCR material will need to be transported from the site to either a beneficial reuse facility or commercial landfill licensed to accept CCR and CCR impacted materials. During excavation and movement of material, there is an increased chance for CCR particulates entering the atmosphere, creating potential degradation to the local environment and worker respiratory health. To mitigate dispersion of particulates, CCR material will be sprayed with water to limit dust and be in a moist state during loading and transport. In addition, workers will wear appropriate personal protective equipment (PPE) for the task being completed. During transport of CCR material to the final receiving facility, potential for particulate release will be mitigated by covering the material with a tarp. Additionally, increased truck traffic will be present on the roadway in the surrounding communities during transport of material. This creates health risks to the public by an increase in air pollution from exhaust and exposure to particulates. This risk can be mitigated by utilizing truck routes that avoid communities and areas of normally high traffic. All material transported from the site will follow procedures presented in 35 IAC 845.740(c)(1).

For Closure-in-Place, capping of the CCR material will follow the procedures presented in 35 IAC 85.750. The proposed capping system for the final cover will consist of either a geocomposite with cover soil or a structured geomembrane with engineered turf protection. The final cover will be constructed to minimize or eliminate infiltration of liquids into the CCR material and be graded to promote surface drainage and avoid ponding. Since the CCR material will remain in-place, risk to environment and public health during transport of CCR material is eliminated. Health risks are limited to the workers performing construction operations during the closure process. To mitigate risk from exposure to particulates during movement of material, dust control efforts using water will be implemented. In addition, workers will wear appropriate PPE for the task being completed. After placement of the final cover, the interface between the CCR material and the atmosphere is removed, therefore release of CCR particulates to the atmosphere is eliminated.

For long-term final closure, addition of solar panels provides an alternative energy source at the facility. Health and environmental impacts to the local community are limited. Native vegetation added to the final cover reduces erosion of cover material and adds carbon sink to the landscape. If engineered turf is used as an alternative to native vegetation, potential for sediment transport from the cover to nearby waterways from stormwater flow is nearly eliminated. For the park after closure option, increase risk to public health includes interaction with nearby industrial facilities, resulting in exposure to air pollution and heavy equipment traffic.

845.710(b)(1)(E)
Time until closure and post-closure care or the completion of groundwater monitoring pursuant to Section 845.740(b) is completed.

For Closure-by-Removal, the following groundwater monitoring program will be implemented:

- Groundwater monitoring for three (3) years after completion of closure or for three years after groundwater monitoring does not show exceedance established under 35 IAC 845.600.

For Closure-in-Place, the following groundwater monitoring program will be implemented:

- Continuation of groundwater monitoring plan as outlined in 35 IAC 845.650 as part of the 30-year-post-closure care period.

845.710(b)(1)(F)
Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, containment, or changes in groundwater flow.

For Closure-by-Removal, CCR material will be removed, and the existing basin geomembrane liner will be decontaminated or replaced, therefore the source for CCR contamination has been removed. Regarding groundwater flow, infiltration of stormwater may affect flow paths if a geomembrane liner is no longer present. For the option where the ash basin is repurposed as a stormwater and wastewater containment basin, the geomembrane liner that would be installed would create an impervious layer, therefore groundwater flow would not be connected to the basin.

For Closure-in-Place, the CCR material will be covered with an impervious geomembrane liner and contained within the existing perimeter dikes. With the CCR material capped and contained, exposure after closure to the environment would only occur if the material were to be removed at a later date or in the unlikely event that a failure of the cap or perimeter dikes were to occur. With the addition of an impervious cap, groundwater flow may be affected due to infiltration from runoff. During current operations, rainwater is collected in the Ash Basin. With the placement of the cap, rainwater that was previously collected by the basin would now be diverted to nearby surfaces and infiltrate naturally or will be diverted into the stormwater collection system for the facility.

845.710(b)(1)(G)
Long-term reliability of the engineering and institutional controls, including an analysis of any off-site, nearby destabilizing activities.

For Closure-by-Removal, the in-place CCR material and basin base liner will be removed, decontaminated, or replaced, therefore no source of contamination will remain on site. Site groundwater will be monitored for three (3) years after completion of closure or until groundwater monitoring does not show exceedances as established under 35 IAC 845.600.

For Closure-in-Place, the following engineering and institutional controls will be implemented:

- Final cover will be designed to minimize infiltration and erosion as presented in 35 IAC 845.750(c)
- Final cover will be constructed in accordance with the procedures presented in 35 IAC 845.750.
- Final cover grades will consider potential settlement to maintain stable slopes.
- The geomembrane and soils used for the final cover system will be tested to verify conformance to the material properties presented in 35 IAC 845.750.
- During construction of the final cover, construction oversight will be performed by a third party for documentation and quality control purposes.
- After construction, the final cover will be inspected annually for erosion, grade reversals, and slope displacement. Any discrepancies will be brought to attention to the owner and the respective repairs will be completed as soon as possible.
- Groundwater monitoring will continue as part of the 30-year-post-closure care period.

For both closure types, no apparent destabilizing activities adjacent to the East and West Ash Basin footprints are made apparent. If destabilizing activities become apparent during the design, construction, and/or post closure phases, the destabilizing activity, and its effects on the closed CCR impoundment will be addressed accordingly to maintain stability and the regulatory requirements imposed at the time this CAA was performed.

845.710(b)(1)(H)
Potential need for future corrective action of the closure alternative.

For Closure-by-Removal, the CCR material and existing base liner will be removed, eliminating the source for CCR contamination. If the former ash basin is to be reused as a stormwater and wastewater containment basin, the existing geomembrane liner will be decontaminated or replaced. If the basin is repurposed for stormwater and wastewater containment, annual inspections of the geomembrane liner, water conveyance structures, and containment slops will be performed. Possible future corrective post Closure-by-Removal actions include geomembrane liner replacement, maintenance of divider dike slopes, and maintenance of stormwater and wastewater structures.

For Closure-in-Place, the CCR material will remain in-place and a final cover will be constructed to prevent infiltration of rainwater into the CCR material. Additionally, the final cover will be sloped to promote drainage away from covered material and avoid ponding of water on the cap. After construction, groundwater monitoring will be performed as part of the 30-year-post-closure plan. Annual inspections of the final cover and perimeter dike slopes for erosion and ponding will be completed. Possible future corrective actions include maintenance of the final cap slopes. In the event that groundwater contamination is detected, remedial actions, such as construction of bentonite barrier trenches or removal of material, will be completed as needed.

After construction of the final cover system, potential use options for the covered CCR impoundment space include installation of solar panels, native vegetation, or public park. Future corrective actions for solar panels include maintenance and replacement of solar structures as needed and infilling of cap ponding areas due to induced CCR settlement by additional cover loading. For the native vegetation, future corrective actions would likely only pertain to erosion or ponding on the final cover. For the public park, maintenance and replacement of structures and aesthetics would be future corrective actions to consider.

Controlling Future Releases [845.710(b)(2)]

845.710(b)(2)(A)
Extent to which containment practices will reduce further releases.

For Closure-by-Removal, the CCR material will be removed, and the basin base liner will be removed, decontaminated, or replaced, therefore the potential for future CCR release is eliminated.

For Closure-in-Place, the CCR material will remain on-site, but will be capped with an impervious final cover system. To reduce further release, the following will be implemented as part of the Closure-in-Place options:

- Slope stability analyses will be performed or revisited to identify if the proposed final cover system and perimeter dike slopes meet minimum required factors of safety as presented in 35 IAC 845.460(a).
- Final grades of the cover system will be constructed to account for settlement and maintain slopes that meet required minimum factors of safety presented in 35 IAC 845.460(a).
- After placement of the final cover system, a topsoil layer will be added with vegetation to decrease erosional affects.
- Any erosion to the cap of perimeter dikes identified during the annual inspections will be addressed accordingly.

845.710(b)(2)(B)
Extent to which treatment technologies may be used.

For Closure-by-Removal, the CCR material will be removed, and the basin liner system will be removed, decontaminated, or replaced with a new geomembrane. Since the CCR material is being removed from the site, no treatment technologies are anticipated.

For Closure-in-Place, the final cover system will create an impervious barrier between the impounded CCR material and the atmosphere. Additionally, the impervious barrier will prevent infiltration into the in-place CCR material, alleviating the potential for contaminant transfer to the underlying groundwater system. Further, before installation of the final cover, the CCR material will be dewatered and prepared for capping in accordance with the procedures presented in 35 IAC 845.750(b). Since the CCR material will be free of liquids and covered with an impervious barrier, no additional treatment technologies are anticipated.

Implementation of Potential Closure Method [845.710(b)(3)]

845.710(b)(3)(A)
Degree of difficulty associated with constructing the technology.

For Closure-by-Removal, anticipated construction challenges include dewatering, transport of CCR material, and avoiding puncture of existing geomembrane if it is to be decontaminated and reused for stormwater and wastewater containment. For dewatering of CCR material, contaminated water will need to be pumped from the basin in a manner that avoids environmental release and protects health of workers. Challenges regarding transport of material will be dependent on available routes and distance to the nearest certified beneficial reuse or disposal facility. If the geomembrane liner is punctured, repairs by a certified installer will be completed. If the geomembrane liner is replaced, the new liner will be installed by a certified installer. Of the mentioned challenges associated with Closure-by-Removal, the degree of difficulty is moderate to moderately hard.

For Closure-in-Place, anticipated construction challenges include dewatering CCR material, final grading, geosynthetic liner installation, and placement of final cover soils. For dewatering of CCR material, contaminated water will need to be pumped from the basin in a manner that avoids environmental release and protects health of workers. For final grading, fill material will need to be placed over the in-place CCR material prior to final capping. MWG has an available stockpile of sand material at the station which will be used for capping the CCR material in place and achieving the final closure grades for the site. For the final cover installation, the geomembrane liner will need to be installed by a certified installer and will depend on site weather conditions during construction. Of the mentioned challenges associated with Closure-in-Place, the degree of difficulty is moderate.

845.710(b)(3)(B)
Expected operational reliability of the technologies.

For Closure-by-Removal, CCR material and base liner system will be removed from site. If the basin is reused as a stormwater and wastewater containment basin, the existing geomembrane liner will be decontaminated or replaced. Regarding reliability, geomembranes exposed to ultraviolet radiation from direct sunlight have anticipated minimum life expectance of 30 years. The longevity increases dramatically if ultraviolet radiation from direct sunlight is avoided by covering with layer of soil or other material. Additionally, conformance testing will be performed on geomembrane used for the basin liner to ensure required material specifications are met. Implementation of an annual inspection of the geomembrane liner and perimeter containment dike slopes will identify potential issues that can be addressed accordingly.

For Closure-in-Place, the CCR material will be dewatered and caped with an impervious final cover system. The impervious final cover system will be a composite system consisting of a geomembrane liner

and final cover soil layer. Prior to installation, the geomembrane liner will be tested for conformance to required material specifications and the properties required by 35 IAC 845.750(c)(1)(B). During geomembrane liner installation, oversight for quality control will be performed to confirm installation is completed in accordance with applicable standards. Since the geomembrane liner will be covered with soil or alternative barrier system, longevity is anticipated to be a minimum of 400 years.

845.710(b)(3)(C)
Need to coordinate with and obtain necessary approvals and permits from other agencies.

The following approvals and permits are anticipated for each closure option:

---40 CFR---

- Written Closure Plan [257.102(b)]
- Amendments to written closure plan, as applicable [257.102(b)(3)].
- Owner or operator must prepare a notification of intent to close CCR unit [257.102(g)].
- Within 30 days of completion of closure of the CCR unit, owner or operator must prepare a notification of closure the CCR unit [257.102(h)].
- Following closure, owner or operator must update deed notifications [257.102(i)]

---35 IAC---

- Public notice and participation [845.260(a)]
- Agency issued construction permit needed prior to work [845.200(a)(4)]
- Operating permit must be maintained until the completion of the post-closure care when the CCR surface impoundment is closed with a final cover system [845.200(a)(5)(A)].
- Operating permit must be maintained until completion of groundwater monitoring under 35 IAC 845.740(b) when CCR surface impoundment is closed by removal [845.200(a)(5)(B)].

In addition to the above permits associated with the State and Federal CCR rules, a National Pollutant Discharge Elimination System (NPDES) Construction General Permit for stormwater management will also likely be required for the project. Modifications may also be necessary to the Site's NPDES Operating Permit.

845.710(b)(3)(D)
Availability of necessary equipment and specialists.

For Closure-by-Removal, the following contractors and equipment will be applicable:

- Earthwork contractor using excavators, dozers, and other applicable earth moving equipment.
- Equipment for dewatering CCR material prior to removal.
- Certified hauler for transporting CCRs and other materials to appropriate accepting facility. Material will be transported using dump trucks and/or tractor-trailers.
- If existing geomembrane liner remains in-place, decontamination contractor will be needed. If existing geomembrane liner is replaced, certified geomembrane liner installation contractor will be needed.
- Certified geosynthetic laboratory to perform material testing for conformance of the geomembrane liner.
- Construction oversight for documentation and quality control.

- Certifying engineer to ensure closure process was completed according to applicable specifications and regulations.

For Closure-in-Place, the following contractors and equipment will be applicable:

- Earthwork contractor using excavators, dozers, rollers, and other applicable earth moving equipment for grading of material.
- Equipment for dewatering CCR material prior to final grading and final cover system placement.
- Certified geomembrane liner installation contractor.
- Certified geosynthetic and soil laboratories for conformance testing.
- Construction oversight for documentation and quality control of grading material placement and compaction, installation of the geomembrane liner, and placement of final cover soils.
- Certifying engineer to ensure closure process was completed according to applicable specifications and regulations.

845.710(b)(3)(E)
Available capacity and location of needed treatment, storage, and disposal services.

For Closure-by-Removal, no other locations on site are available for consolidation or disposal. After dewatering of CCR material is completed, the materials will be transported to a beneficial reuse or certified commercial landfill facility. Handling and transport of the CCR and CCR contaminated materials will be performed following the procedures presented in 35 IAC 845.740(c).

For Closure-in-Place, the CCR material will remain at the facility, be dewatered, and capped with an impervious final cover system, therefore transport for beneficial reuse or disposal is not needed.

Local Community Impacts [845.710(b)(4)]

845.710(b)(4)
The degree to which the concerns of the residents living within communities where the CCR will be handled, transported, and disposed are addressed by the closure method.

For Closure-by-Removal, local communities will be affected by increased traffic and possible exposure to CCR particulates during transport of material. Mitigation efforts previously discussed include creating transport routes that avoid local community centers, and fugitive dust mitigation measures that include covering material during transport with a tarp.

For Closure-in-Place, transport of the CCR and CCR impacted materials is eliminated, therefore direct exposure to CCRs is limited to the local community near the Waukegan Station. During construction, there is potential of CCR material being released into the atmosphere and traveling to nearby residential areas by wind. To mitigate potential release, fugitive dust control measures, such as wetting, will be implemented during construction.

Additional Considerations – Transportation and Disposal [845.710(c)]

The following subsections address items the owner or operator of the CCR surface impoundment must consider in the CAA as presented in 35 IAC 845.710(c).

845.710(c)(1)
Analyze complete removal of the CCR as one closure alternative, along with the modes for transporting the removed CCR, including by rail, barge, low-polluting trucks, or a combination of these transportation modes.

For transport of CCR and CCR contaminated material, the preferred method is by truck. For Closure by Removal, the CCR and CCR contaminated material would be excavated and placed onto dump trucks and/or tractor-trailers for transport to the nearest beneficial reuse or commercial landfill facility. Alternative transport methods considered include heavy rail or barge. The MWG Waukegan Facility has rail spurs from the main railroad line. No commercial dock is available at the site. Based on the site's proximity to a CCR and CCR contaminated materials accepting facility, transport by truck is the preferred method. Hauling by rail may be viable, however, additional hauling, material handling, and coordination may be required that would make rail a less attractive alternative than hauling by truck. Barge transport of the material is not viable as a loading terminal is not available at the site.

845.710(c)(2)
Identify whether the facility has an onsite landfill with remaining capacity that can legally accept CCR, and, if not, whether constructing an onsite landfill is possible.

The MWG Waukegan Station currently does not have an on-site landfill that can legally accept CCR materials. Also, limited space and timing inhibits possible construction of a CCR landfill meeting legal requirements.

845.710(c)(3)
Include any other closure method in the alternatives analysis if requested by the Agency.

No additional alternative analysis requests by the Agency were provided at the time this letter report was written.

Additional Considerations – Cost Estimate, Groundwater, and Surface Waters [845.710(d)]

The following subsections address items the owner or operator of the CCR surface impoundment must consider in the CAA as presented in 35 IAC 845.710(d).

845.710(d)(1)
Meet or exceed a class 4 estimate under the AACE Classification Standard, incorporated by reference in Section 845.150, or a comparable classification practice as provided in the AACE Classification Standard.

For the CAA, an Association for the Advancement of Cost Engineering (AACE) Class 4 estimate for each closure option was completed. Per AACE, a Class 4 estimate is typically used for a feasibility study with level of project definition at 1 to 15 percent. Costs for each closure option using Class 4 level estimate criteria and the considerations outlined in this letter report are presented in Table 1. A breakdown of the costs for each option are included as Attachment B. Please note that the estimated costs for Closure-in-Place Options 2, 4, and 5 consider a final cover constructed with soils over the geomembrane and Option 6 considers a final cover consisting of a geomembrane liner with engineered turf.

Table 1. Summary of Current Estimates (AACE Class 4)

Option	Closure Option	Estimated Total Closure Cost (2021 US Dollars)	Estimated Total Post-Closure Cost[1] (2021 US Dollars)	Estimated Total Cost (2021 US Dollars)
1	West Ash Basin – Closure-by-Removal	$15,983,824	$206,250	$16,190,074
2	West Ash Basin – Closure-in-Place, final cover with soils	$13,229,065	$3,196,875	$16,425,940
3	East Ash Basin – Closure-by-Removal	$16,002,765	$206,250	$16,209,015
4	East Ash Basin – Closure-in-Place (Option 1), (final cover with soils)	$13,120,943	$3,196,875	$16,317,818
5	East Ash Basin – Closure-in-Place (Option 2), final cover with soils	$16,459,417	$3,196,875	$19,656,292
6	East Ash Basin – Closure-in-Place (Option 3), final cover with engineered turf	$16,300,238	$3,196,875	$19,497,133

Note:
1. Post-closure cost for "Closure by Removal" assumes 3-year post-closure-plan and "Closure in Place" assumes 30-year-post-closure plan.

845.710(d)(2)
Contain the results of groundwater contaminant transport modeling and calculations showing how the closure alternative will achieve compliance with the applicable groundwater protection standards.

A groundwater model depicting potential flow based on surface changes for each closure option was completed. The groundwater models considered were developed by KPRG and Associates, Inc. (KPRG) and BAS Groundwater Consulting (BAS). A summary of the groundwater modeling is provided as Attachment C.

845.710(d)(3)
Include a description of the fate and transport of contaminants with the closure alternative over time, including consideration of seasonal variations.

A summary by KPRG and BAS of contaminant transport based on the groundwater models developed for this letter report are included as Attachment C.

845.710(d)(4)
Assess impacts to waters in State

Based on available aerial images of the site, the East and West Ash Basins are situated adjacent to a possible wetland. Additionally, the Lake Michigan shoreline is located approximately 1,280 feet east and downslope of the East and West Ash Basin footprint.

For Closure-by-Removal, CCR material will be removed, and the base liner removed, decontaminated, or replaced, therefore no source for CCR contamination would be present.

For Closure-in-Place, the CCR material will be capped with an impervious final cover system, therefore runoff from storm events would not encounter CCR material. Additionally, the CCR material would be dewatered, and the cap would prevent infiltration from rain events, therefore connection between the CCR material and the underlying groundwater system would be limited. Additionally, with a groundwater

monitoring plan being implemented as part of the 30-year-post-closure plan, CCR contaminants would be detected, and the appropriate remediation measure could be implemented.

Discussion

Discussion related to comments received form the Public will be provided upon completion of the Public meetings scheduled for December 15 and 16, 2021.

Closing

We appreciate this opportunity to be of services to you. If there are any questions with regard to the information contained in this letter report, or if we may be of further assistance, please feel free to contact us.

Yours sincerely,

AECOM Technologies Inc.

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Attachments

A – Closure Alternatives Analysis Drawings
B – CCR Impoundment Estimates for Waukegan Station
C – Groundwater Modeling and Transport Analysis
D – Alternatives Ranking Matrix

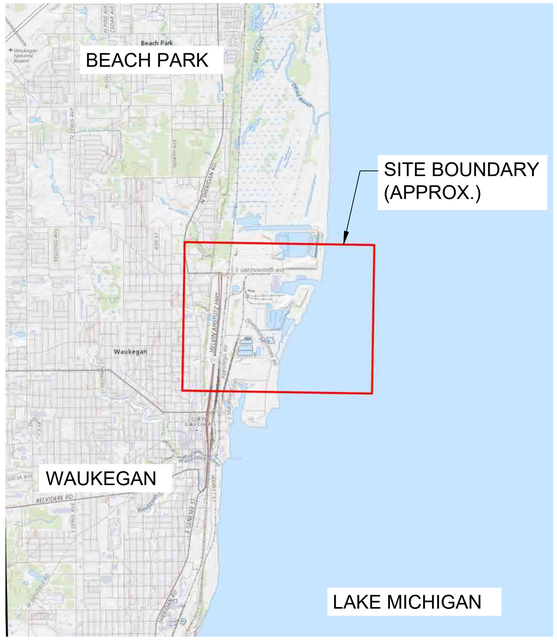
ATTACHMENT A

MIDWEST GENERATION, LLC
WAUKEGAN GENERATING STATION

CLOSURE ALTERNATIVES ANALYSIS DRAWINGS
WAUKEGAN, ILLINOIS

ISSUED FOR REVIEW

NOVEMBER 15, 2021



SITE LOCATION MAP

0 50,000 100,000 200,000

GRAPHIC SCALE (IN FEET)

N

DRAWING LIST	
DRAWING NO.	DRAWING TITLE
01	TITLE SHEET
02	ESTIMATED BOTTOM OF ASH GRADES
03	EXISTING CONDITIONS PLAN
04	WEST ASH BASIN - CLOSURE BY REMOVAL
05	WEST ASH BASIN - CLOSURE IN PLACE
06	EAST ASH BASIN - CLOSURE BY REMOVAL
07	EAST ASH BASIN - CLOSURE IN PLACE (OPTION 1)
08	EAST ASH BASIN - CLOSURE IN PLACE (OPTION 2)
09	CROSS SECTIONS - WEST ASH BASIN - CLOSURE BY REMOVAL
10	CROSS SECTIONS - WEST ASH BASIN - CLOSURE IN PLACE
11	CROSS SECTIONS - EAST ASH BASIN - CLOSURE BY REMOVAL
12	CROSS SECTIONS - EAST ASH BASIN - CLOSURE IN PLACE (OPTION 1)
13	CROSS SECTIONS - EAST ASH BASIN - CLOSURE IN PLACE (OPTION 2)
14	DETAILS

FOR EAST ASH BASIN - CLOSURE IN PLACE (OPTION #3) REFER TO SARGENT AND LUNDY DRAWINGS WKG-AP-CSK-008 AND WKG-AP-CSK-009

SITE OVERVIEW MAP

0 200 400 600

GRAPHIC SCALE (IN FEET)

N

NOT FOR CONSTRUCTION

PREPARED FOR:
MIDWEST GENERATION, LLC

PREPARED BY:
AECOM

REV	DATE	JOB NO.	PROJECT TYPE	DES	DFTR	CHKD	ENG		DESCRIPTION

AECOM

TITLE SHEET

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

FOR **ISSUED FOR REVIEW**

SEAL

DRAFT

SCALE: **AS SHOWN**	DES: **MR**
DWG TYPE: **.DWG**	DFTR: **PK**
JOB NO: **60669161**	CHKD: **RB**
DATE: **11/02/2021**	ENGR: **JT**
FILENAME: **COVER SHEET.DWG**	APPD: **JT**

DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	01	A

01 REV. A

LEGEND

- 600 — EXISTING MAJOR TOPOGRAPHIC CONTOUR
- EXISTING MINOR TOPOGRAPHIC CONTOUR
- ASH BASIN WASTE BOUNDARY (APPROX.)
- 600 — ESTIMATED BOTTOM OF ASH MAJOR TOPOGRAPHIC CONTOUR
- ESTIMATED BOTTOM OF ASH MINOR TOPOGRAPHIC CONTOUR

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.

REFERENCES

1. ESTIMATED BOTTOM OF ASH GRADES ARE BASED ON INFORMATION FOUND IN THE HISTORY OF CONSTRUCTION REPORT, PREPARED BY GEOSYNTEC CONSULTANTS AND DATED OCTOBER 2016.
2. SEE SHEET 03 FOR ADDITIONAL DRAWING REFERENCES.

N

0 60 120 180
GRAPHIC SCALE (IN FEET)

NOT FOR CONSTRUCTION

AECOM

ESTIMATED BOTTOM OF ASH GRADES

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

FOR ISSUED FOR REVIEW

SEAL

DRAFT

SCALE: AS SHOWN	DES: MR
DWG TYPE: .DWG	DFTR: PK
JOB NO: 60669161	CHKD: RB
DATE: 11/15/2021	ENGR: JT
FILENAME: ESTIMATED BOTTOM OF ASH GRADES.DWG	APPD: JT

DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	02	A

0 INCHES 1 2 3 — TENTHS 10 20 30

LEGEND

- 600 — EXISTING MAJOR TOPOGRAPHIC CONTOUR
- EXISTING MINOR TOPOGRAPHIC CONTOUR
- ASH BASIN WASTE BOUNDARY (APPROX.)

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.

REFERENCES

1. AERIAL IMAGE WAS OBTAINED FROM MICROSOFT BING (2021).
2. ASH BASIN WASTE BOUNDARY IS BASED ON AERIAL IMAGERY AND IS APPROXIMATE.
3. EXISTING TOPOGRAPHY IS BASED ON 2017 LIDAR DATA OBTAINED FROM THE STATE OF ILLINOIS GEOSPATIAL DATA CLEARINGHOUSE.

N

0 60 120 180
GRAPHIC SCALE (IN FEET)

NOT FOR CONSTRUCTION

AECOM

EXISTING CONDITIONS PLAN

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

FOR ISSUED FOR REVIEW

SEAL

DRAFT

SCALE: AS SHOWN		DES:	MR
DWG TYPE: .DWG		DFTR:	PK
JOB NO: 60669161		CHKD:	RB
DATE: 11/15/2021		ENGR:	JT
FILENAME: EXISTING CONDITIONS PLAN.DWG		APPD:	JT
DWG SIZE	DRAWING NO.		REVISION
ANSI D 22.0"x34.0"	03		A

03 REV. A

LEGEND

- 600 — EXISTING MAJOR TOPOGRAPHIC CONTOUR
- EXISTING MINOR TOPOGRAPHIC CONTOUR
- ASH BASIN WASTE BOUNDARY (APPROX.)
- 600 — PROPOSED MAJOR TOPOGRAPHIC CONTOUR
- PROPOSED MINOR TOPOGRAPHIC CONTOUR
- DRAINAGE ARROWS

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.
2. PROPOSED GRADING REPRESENTS CLOSURE BY REMOVAL GRADES (I.E., ESTIMATED BOTTOM OF ASH GRADES) IN THE WEST ASH BASIN.
3. CUT SLOPES SHOWN ARE 2.5H:1V.
4. SEE SHEET 10 FOR CROSS SECTIONS.
5. QUANTITIES WERE ESTIMATED BY COMPARING EXISTING GRADES TO PROPOSED GRADES UTILIZING AUTOCAD CIVIL 3D (VERSION 2018).

REFERENCES

1. SEE SHEET 03 FOR DRAWING REFERENCES.

ESTIMATED QUANTITIES	
CCR MATERIAL TO BE REMOVED	93,000 CY

N

0 60 120 180
GRAPHIC SCALE (IN FEET)

NOT FOR CONSTRUCTION

AECOM

WEST ASH BASIN - CLOSURE BY REMOVAL

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

FOR ISSUED FOR REVIEW

SEAL

DRAFT

SCALE: AS SHOWN	DES: MR
DWG TYPE: .DWG	DFTR: PK
JOB NO: 60669161	CHKD: RB
DATE: 11/15/2021	ENGR: JT
FILENAME: WEST BASIN CBR.DWG	APPD: JT

DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	04	A

LEGEND

- 600 — EXISTING MAJOR TOPOGRAPHIC CONTOUR
- EXISTING MINOR TOPOGRAPHIC CONTOUR
- ASH BASIN WASTE BOUNDARY (APPROX.)
- 600 — PROPOSED MAJOR TOPOGRAPHIC CONTOUR
- PROPOSED MINOR TOPOGRAPHIC CONTOUR
- DRAINAGE ARROWS

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.
2. PROPOSED GRADING REPRESENTS TOP OF CLOSURE IN PLACE GRADES FOR THE WEST ASH BASIN.
3. CUT AND FILL SLOPES ARE 6H:1V UNLESS OTHERWISE NOTED.
4. SEE SHEET 11 FOR CROSS SECTIONS.
5. QUANTITIES WERE ESTIMATED BY COMPARING EXISTING GRADES TO PROPOSED GRADES UTILIZING AUTOCAD CIVIL 3D (VERSION 2018) AND ASSUMING A 3-FOOT THICK FINAL COVER SYSTEM.

REFERENCES

1. SEE SHEET 03 FOR DRAWING REFERENCES.

ESTIMATED QUANTITIES

ASH TO BE REGRADED	5,000 CY
ADDITIONAL FILL NEEDED TO ACHIEVE SUBGRADE GRADES	68,000 CY
FILL NEEDED FOR FINAL COVER SYSTEM	50,000 CY
FINAL COVER SYSTEM GEOSYNTHETICS	50,000 SY

N

0 60 120 180
GRAPHIC SCALE (IN FEET)

NOT FOR CONSTRUCTION

AECOM

WEST ASH BASIN - CLOSURE IN PLACE

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

FOR: ISSUED FOR REVIEW

SEAL

DRAFT

SCALE: AS SHOWN		DES:	MR
DWG TYPE: .DWG		DFTR:	PK
JOB NO: 60669161		CHKD:	RB
DATE: 11/15/2021		ENGR:	JT
FILENAME: WEST BASIN CIP.DWG		APPD:	JT
DWG SIZE	DRAWING NO.		REVISION
ANSI D 22.0"x34.0"	05		A

04 REV. A

0 INCHES 1 2 3 TENTHS 10 20 30

LEGEND

- EXISTING MAJOR TOPOGRAPHIC CONTOUR (600)
- EXISTING MINOR TOPOGRAPHIC CONTOUR
- ASH BASIN WASTE BOUNDARY (APPROX.)
- PROPOSED MAJOR TOPOGRAPHIC CONTOUR (600)
- PROPOSED MINOR TOPOGRAPHIC CONTOUR
- DRAINAGE ARROWS

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.
2. PROPOSED GRADING REPRESENTS CLOSURE BY REMOVAL GRADES (I.E., ESTIMATED BOTTOM OF ASH GRADES) IN THE EAST ASH BASIN.
3. CUT SLOPES SHOWN ARE 2.5H:1V.
4. SEE SHEET 12 FOR CROSS SECTIONS.
5. QUANTITIES WERE ESTIMATED BY COMPARING EXISTING GRADES TO PROPOSED GRADES UTILIZING AUTOCAD CIVIL 3D (VERSION 2018).

REFERENCES

1. SEE SHEET 03 FOR DRAWING REFERENCES.

ESTIMATED QUANTITIES

CCR MATERIAL TO BE REMOVED	70,000 CY

N

0 60 120 180
GRAPHIC SCALE (IN FEET)

NOT FOR CONSTRUCTION

AECOM

EAST ASH BASIN - CLOSURE BY REMOVAL

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

FOR: ISSUED FOR REVIEW

SEAL

DRAFT

SCALE: AS SHOWN	DES: MR
DWG TYPE: .DWG	DFTR: PK
JOB NO: 60669161	CHKD: RB
DATE: 11/15/2021	ENGR: JT
FILENAME: EAST BASIN CBR.DWG	APPD: JT

DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	06	A

06 REV. A

LEGEND

- 600 — EXISTING MAJOR TOPOGRAPHIC CONTOUR
- EXISTING MINOR TOPOGRAPHIC CONTOUR
- ASH BASIN WASTE BOUNDARY (APPROX.)
- 600 — PROPOSED MAJOR TOPOGRAPHIC CONTOUR
- PROPOSED MINOR TOPOGRAPHIC CONTOUR
- DRAINAGE ARROWS

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.
2. PROPOSED GRADING REPRESENTS TOP OF CLOSURE IN PLACE GRADES FOR THE EAST ASH BASIN.
3. CUT AND FILL SLOPES ARE 6H:1V UNLESS OTHERWISE NOTED.
4. SEE SHEET 13 FOR CROSS SECTIONS.
5. QUANTITIES WERE ESTIMATED BY COMPARING EXISTING GRADES TO PROPOSED GRADES UTILIZING AUTOCAD CIVIL 3D (VERSION 2018) AND ASSUMING A 3-FOOT THICK FINAL COVER SYSTEM.

REFERENCES

1. SEE SHEET 03 FOR DRAWING REFERENCES.

ESTIMATED QUANTITIES

FILL NEEDED TO ACHIEVE SUBGRADE GRADES	108,000 CY
FILL NEEDED FOR FINAL COVER SYSTEM	51,000 CY
FINAL COVER SYSTEM GEOSYNTHETICS	51,000 SY

N

0 60 120 180
GRAPHIC SCALE (IN FEET)

NOT FOR CONSTRUCTION

AECOM

EAST ASH BASIN - CLOSURE IN PLACE (OPTION 1)

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

FOR: ISSUED FOR REVIEW

SEAL

DRAFT

SCALE: AS SHOWN	DES:	MR
DWG TYPE: _DWG	DFTR:	PK
JOB NO: 60669161	CHKD:	RB
DATE: 11/15/2021	ENGR:	JT
FILENAME: EAST BASIN CIP MINIMUM.DWG	APPD:	JT

DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	07	A

07 REV. A

LEGEND

- EXISTING MAJOR TOPOGRAPHIC CONTOUR
- EXISTING MINOR TOPOGRAPHIC CONTOUR
- ASH BASIN WASTE BOUNDARY (APPROX.)
- PROPOSED MAJOR TOPOGRAPHIC CONTOUR
- PROPOSED MINOR TOPOGRAPHIC CONTOUR
- DRAINAGE ARROWS

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.
2. PROPOSED GRADING REPRESENTS TOP OF CLOSURE IN PLACE GRADES FOR THE EAST ASH BASIN.
3. CUT AND FILL SLOPES ARE 6H:1V UNLESS OTHERWISE NOTED.
4. SEE SHEET 14 FOR CROSS SECTIONS.
5. QUANTITIES WERE ESTIMATED BY COMPARING EXISTING GRADES TO PROPOSED GRADES UTILIZING AUTOCAD CIVIL 3D (VERSION 2018) AND ASSUMING A 3-FOOT THICK FINAL COVER SYSTEM.

REFERENCES

1. SEE SHEET 03 FOR DRAWING REFERENCES.

ESTIMATED QUANTITIES

FILL NEEDED TO ACHIEVE SUBGRADE GRADES	368,000 CY
FILL NEEDED FOR FINAL COVER SYSTEM	53,000 CY
FINAL COVER SYSTEM GEOSYNTHETICS	53,000 SY

N

0 60 120 180
GRAPHIC SCALE (IN FEET)

NOT FOR CONSTRUCTION

AECOM

EAST ASH BASIN - CLOSURE IN PLACE (OPTION 2)

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

FOR: ISSUED FOR REVIEW

SEAL

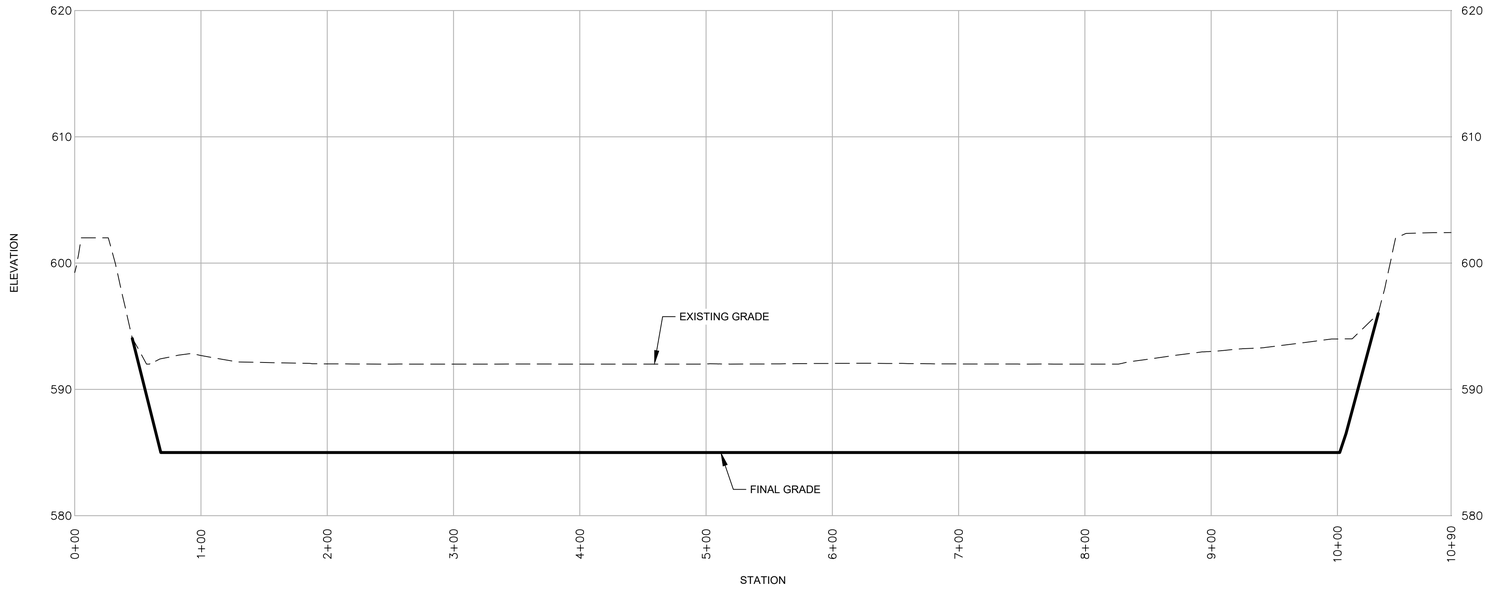
DRAFT

SCALE: AS SHOWN	DES:	MR
DWG TYPE: _DWG	DFTR:	PK
JOB NO: 60669161	CHKD:	RB
DATE: 11/15/2021	ENGR:	JT
FILENAME: EAST BASIN CIP MAXIMUM.DWG	APPD:	JT

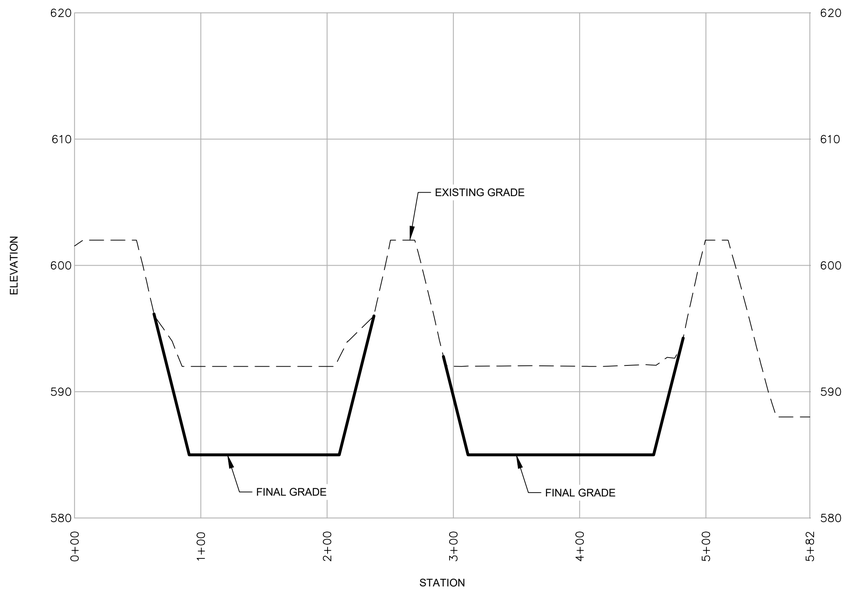
DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	08	A

08 REV. A

0 INCHES 1 2 3 — TENTHS 10 20 30



West Ash Basin A-A



West Ash Basin B-B

LEGEND

- EXISTING GRADE
- FINAL GRADE
- ESTIMATED BOTTOM OF ASH GRADE

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.

REFERENCES

1. SEE SHEETS 02 AND 03 FOR DRAWING REFERENCES.

0 6 12 18
VERTICAL SCALE (IN FEET)

0 60 120 180
HORIZONTAL SCALE (IN FEET)

NOT FOR CONSTRUCTION

AECOM

CROSS SECTIONS - WEST ASH BASIN - CLOSURE BY REMOVAL

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

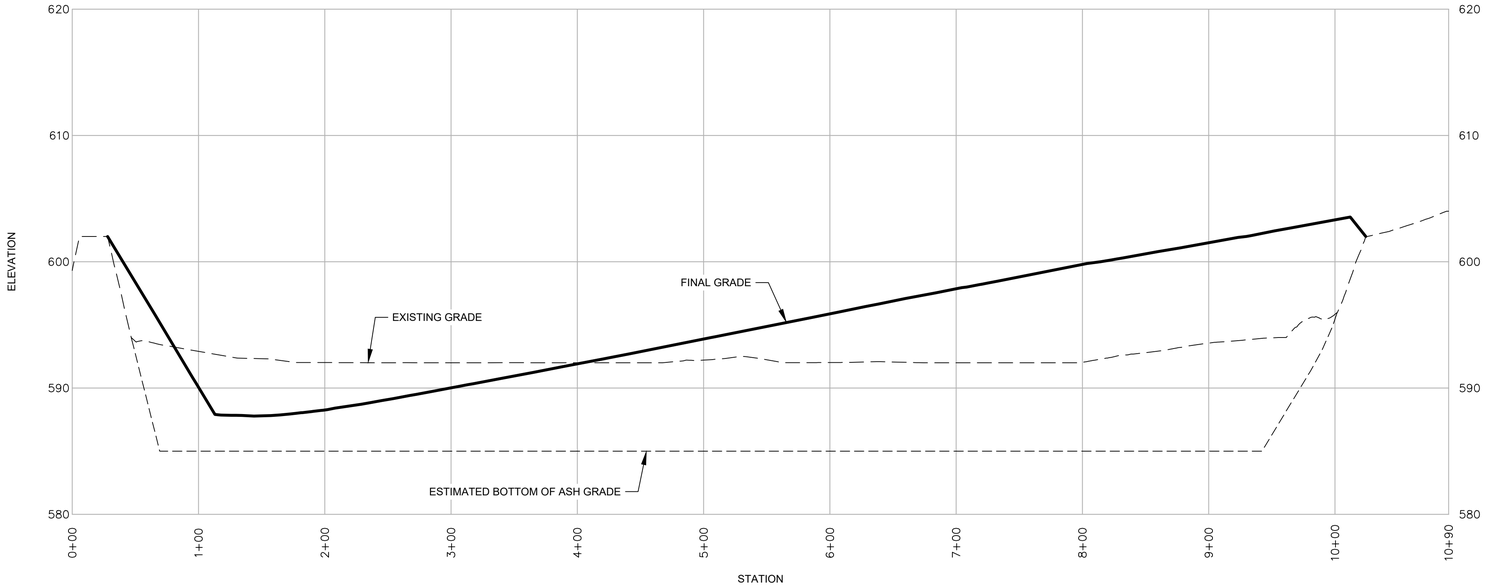
FOR: ISSUED FOR REVIEW

SEAL

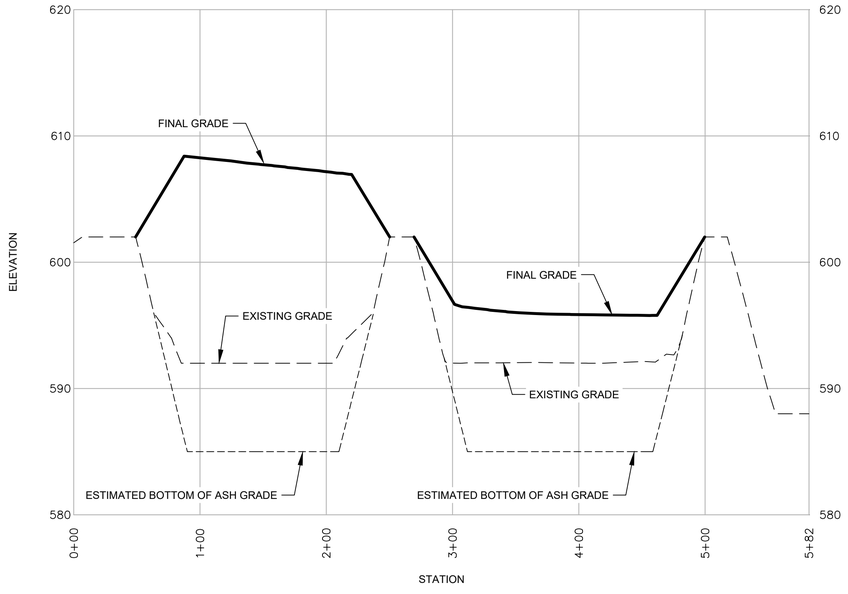
DRAFT

SCALE: AS SHOWN	DES:	MR
DWG TYPE: .DWG	DFTR:	PK
JOB NO: 60669161	CHKD:	RB
DATE: 11/15/2021	ENGR:	JT
FILENAME: CROSS SECTIONS.DWG	APPD:	JT

DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	09	A



West Ash Basin C-C



West Ash Basin D-D

LEGEND

- EXISTING GRADE
- FINAL GRADE
- ESTIMATED BOTTOM OF ASH GRADE

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.

REFERENCES

1. SEE SHEETS 02 AND 03 FOR DRAWING REFERENCES.

0 6 12 18
VERTICAL SCALE (IN FEET)

0 60 120 180
HORIZONTAL SCALE (IN FEET)

NOT FOR CONSTRUCTION

AECOM

CROSS SECTIONS - WEST ASH BASIN - CLOSURE IN PLACE

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

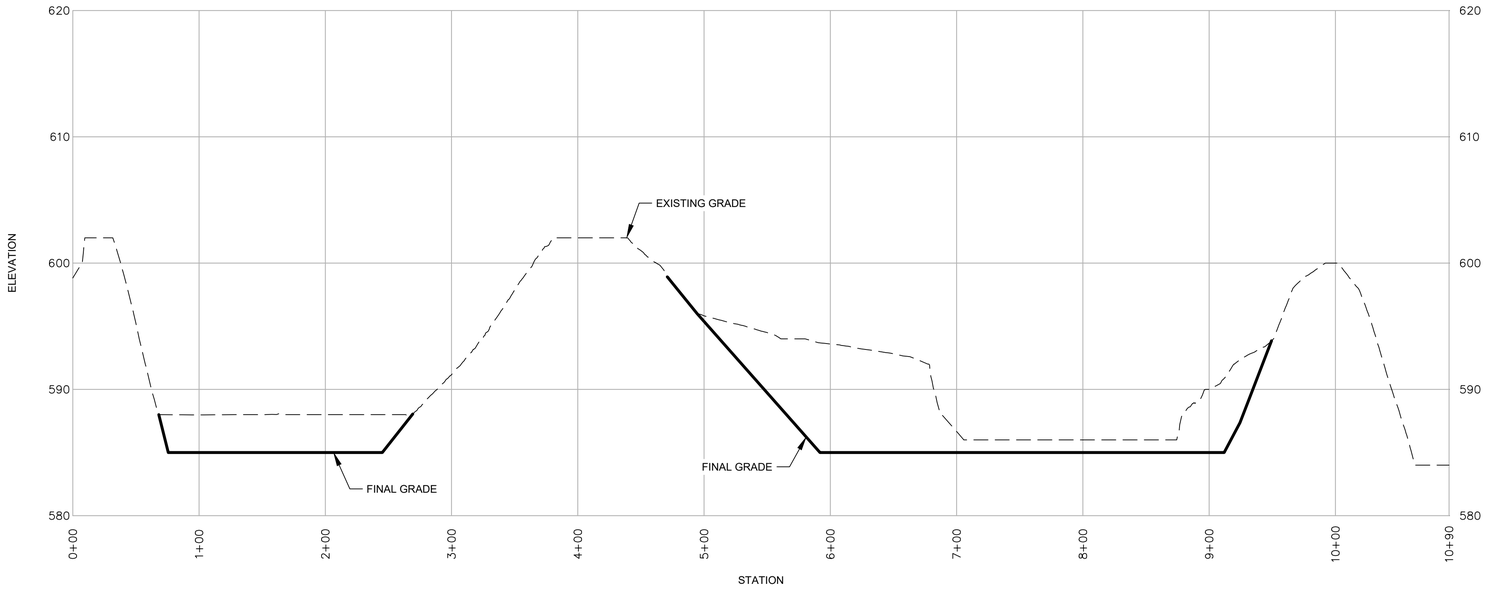
FOR: ISSUED FOR REVIEW

SEAL

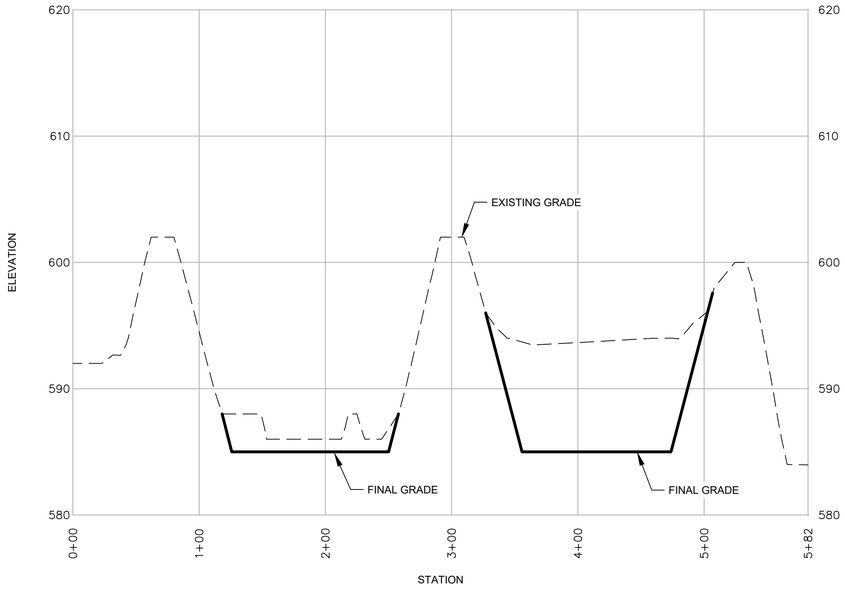
DRAFT

SCALE: AS SHOWN		DES:	MR
DWG TYPE: .DWG		DFTR:	PK
JOB NO: 60669161		CHKD:	RB
DATE: 11/15/2021		ENGR:	JT
FILENAME: CROSS SECTIONS.DWG		APPD:	JT
DWG SIZE	DRAWING NO.		REVISION
ANSI D 22.0"x34.0"	10		A

11 REV. A



East Ash Basin E-E



East Ash Basin F-F

LEGEND

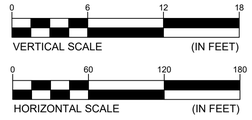
- EXISTING GRADE
- FINAL GRADE
- ESTIMATED BOTTOM OF ASH GRADE

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.

REFERENCES

1. SEE SHEETS 02 AND 03 FOR DRAWING REFERENCES.



NOT FOR CONSTRUCTION

AECOM

CROSS SECTIONS - EAST ASH BASIN - CLOSURE BY REMOVAL

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

FOR: **ISSUED FOR REVIEW**

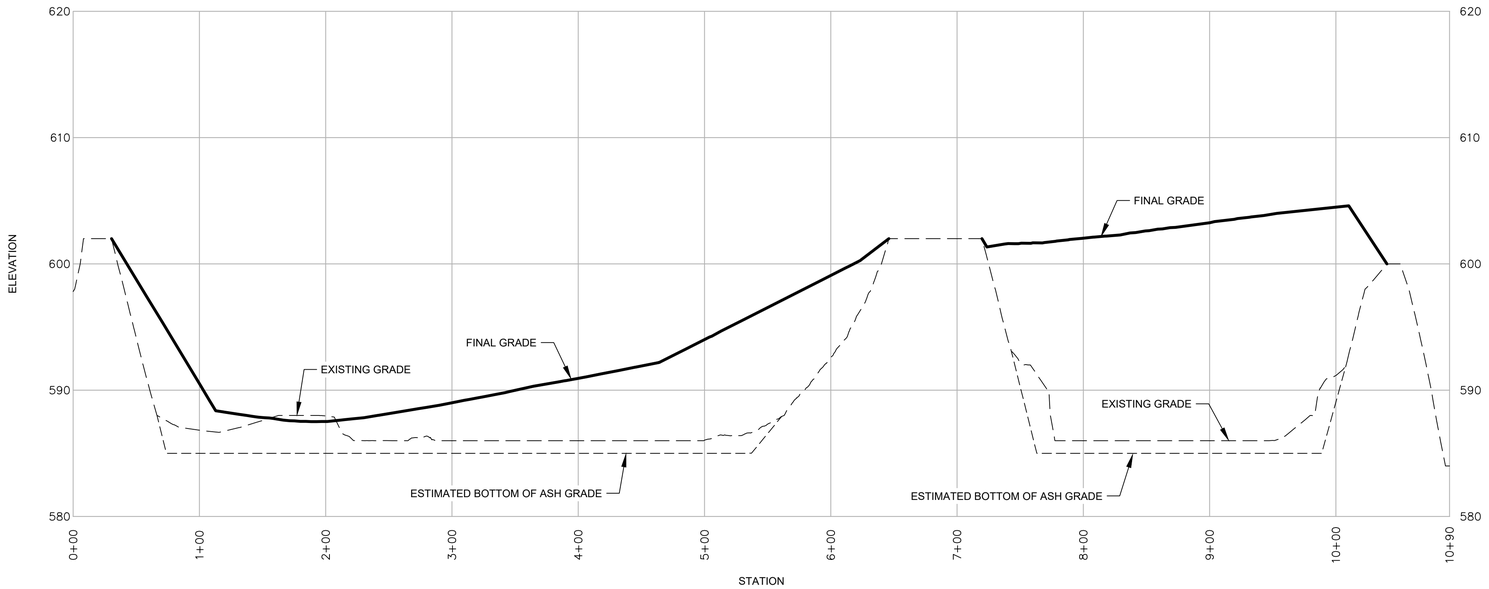
SEAL

DRAFT

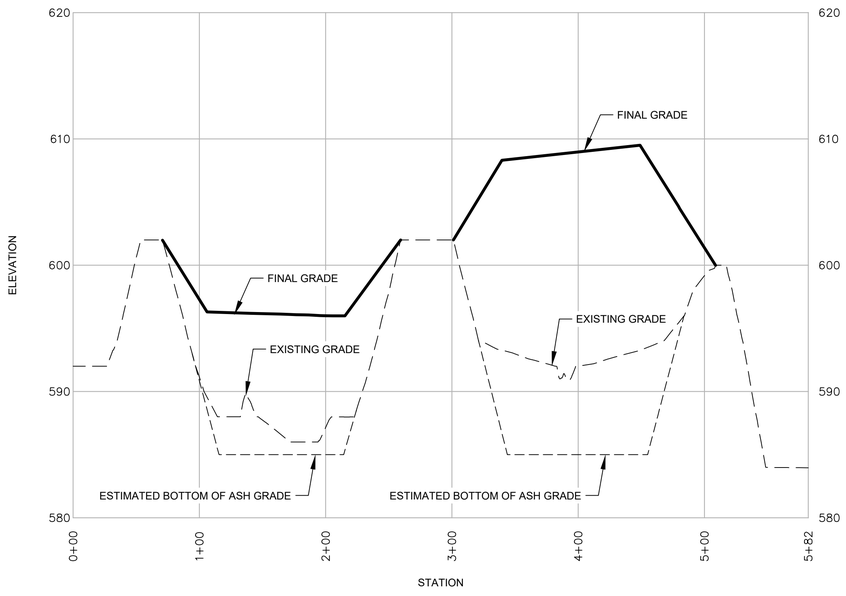
SCALE: **AS SHOWN**	DES:	**MR**
DWG TYPE: **.DWG**	DFTR:	**PK**
JOB NO: **60669161**	CHKD:	**RB**
DATE: **11/15/2021**	ENGR:	**JT**
FILENAME: **CROSS SECTIONS.DWG**	APPD:	**JT**

DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	**11**	**A**

12 REV. A



East Ash Basin G-G



East Ash Basin H-H

LEGEND

- EXISTING GRADE
- FINAL GRADE
- ESTIMATED BOTTOM OF ASH GRADE

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.

REFERENCES

1. SEE SHEETS 02 AND 03 FOR DRAWING REFERENCES.

0 6 12 18
VERTICAL SCALE (IN FEET)

0 60 120 180
HORIZONTAL SCALE (IN FEET)

NOT FOR CONSTRUCTION

AECOM

CROSS SECTIONS - EAST ASH BASIN - CLOSURE IN PLACE (OPTION 1)

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

FOR: ISSUED FOR REVIEW

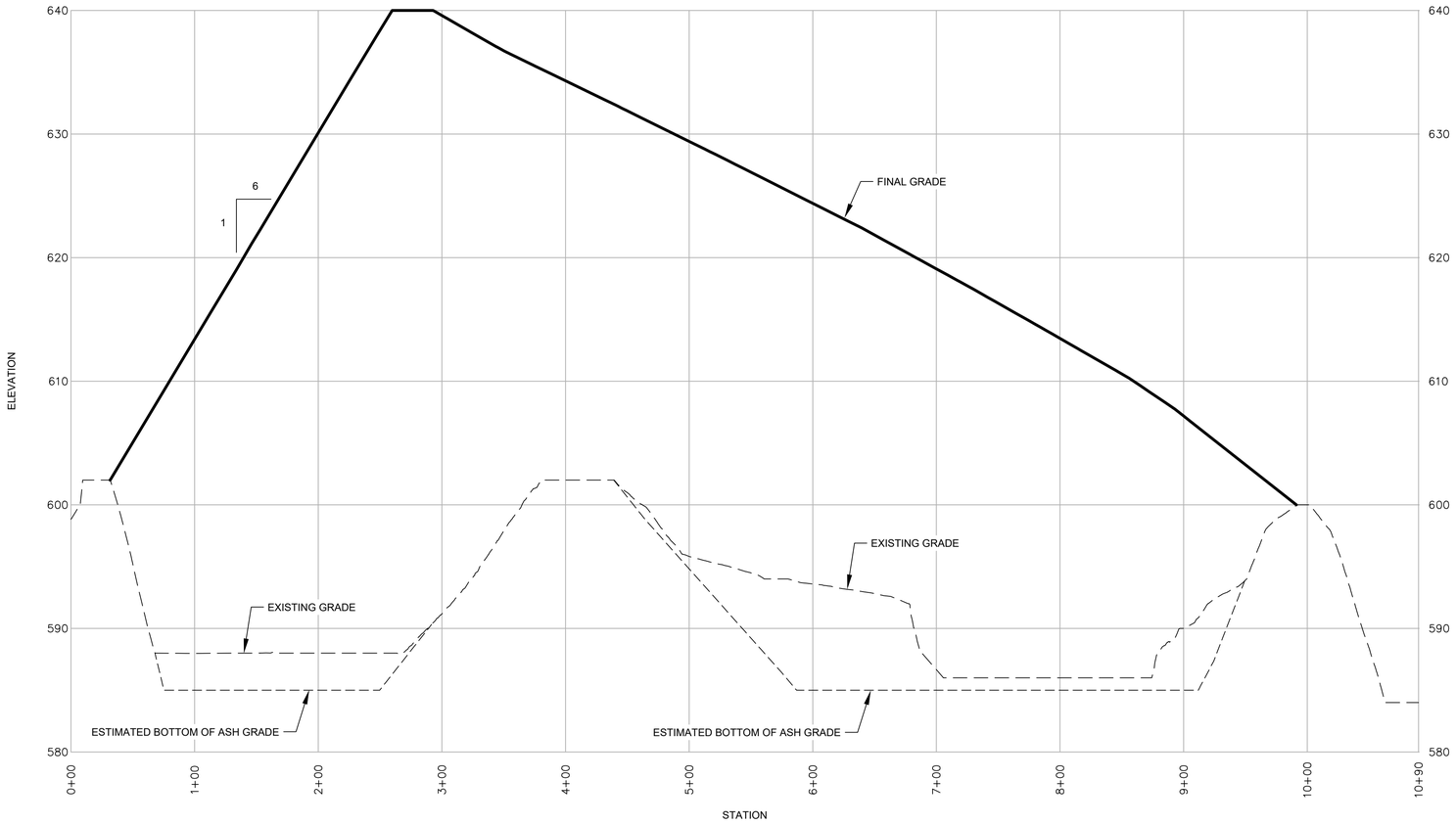
SEAL

DRAFT

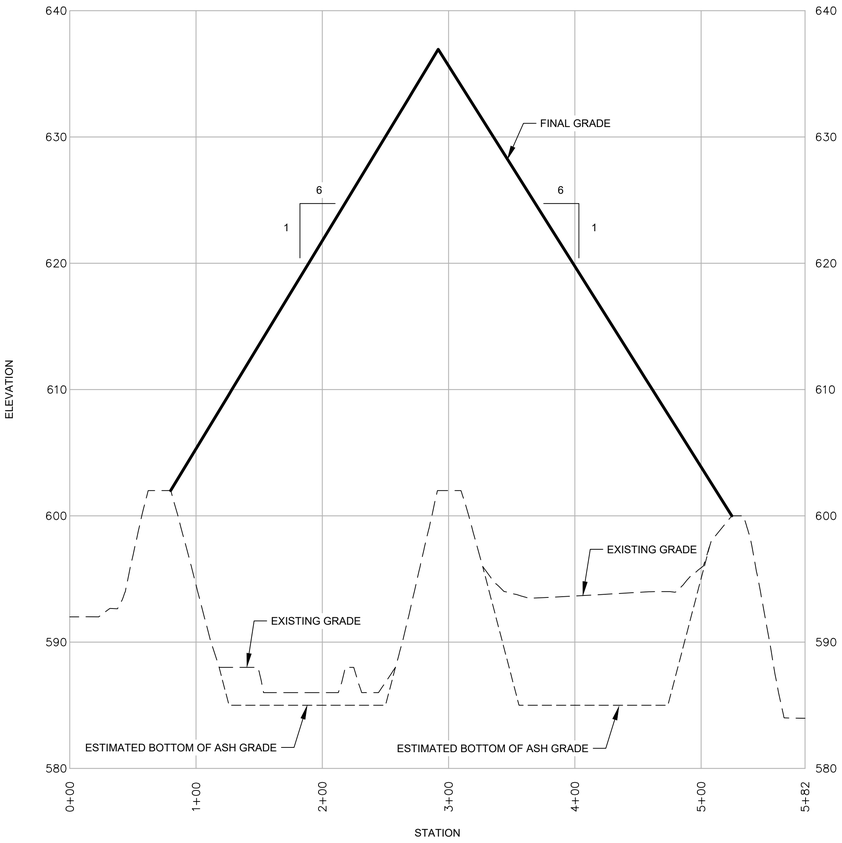
SCALE: AS SHOWN	DES:	MR
DWG TYPE: .DWG	DFTR:	PK
JOB NO: 60669161	CHKD:	RB
DATE: 11/15/2021	ENGR:	JT
FILENAME: CROSS SECTIONS.DWG	APPD:	JT

DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	12	A

13 REV. A



East Ash Basin I-I



East Ash Basin J-J

LEGEND

- EXISTING GRADE
- FINAL GRADE
- ESTIMATED BOTTOM OF ASH GRADE

NOTES

1. BASIS OF BEARINGS: NAD83 ILLINOIS STATE PLANES, EAST ZONE. ELEVATIONS ARE BASED ON NAVD88.

REFERENCES

1. SEE SHEETS 02 AND 03 FOR DRAWING REFERENCES.

VERTICAL SCALE (IN FEET) 0 6 12 18

HORIZONTAL SCALE (IN FEET) 0 60 120 180

NOT FOR CONSTRUCTION

AECOM

CROSS SECTIONS - EAST ASH BASIN - CLOSURE IN PLACE (OPTION 2)

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

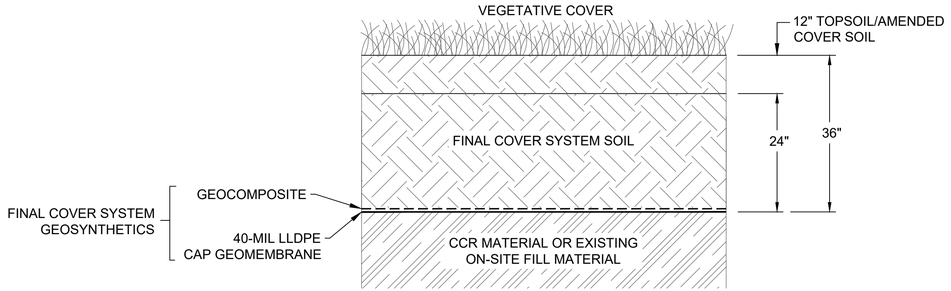
FOR ISSUED FOR REVIEW

SEAL

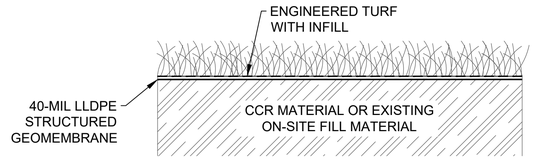
DRAFT

SCALE: AS SHOWN	DES:	MR
DWG TYPE: .DWG	DFTR:	PK
JOB NO: 60669161	CHKD:	RB
DATE: 11/15/2021	ENGR:	JT
FILENAME: CROSS SECTIONS.DWG	APPD:	JT

DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	13	A



1 / 16 TYPICAL FINAL COVER SYSTEM
NOT TO SCALE



2 / 16 TYPICAL FINAL COVER SYSTEM - ENGINEERED TURF
NOT TO SCALE

NOT FOR CONSTRUCTION

AECOM

DETAILS

WAUKEGAN GENERATING STATION
CLOSURE ALTERNATIVES ANALYSIS
WAUKEGAN, ILLINOIS

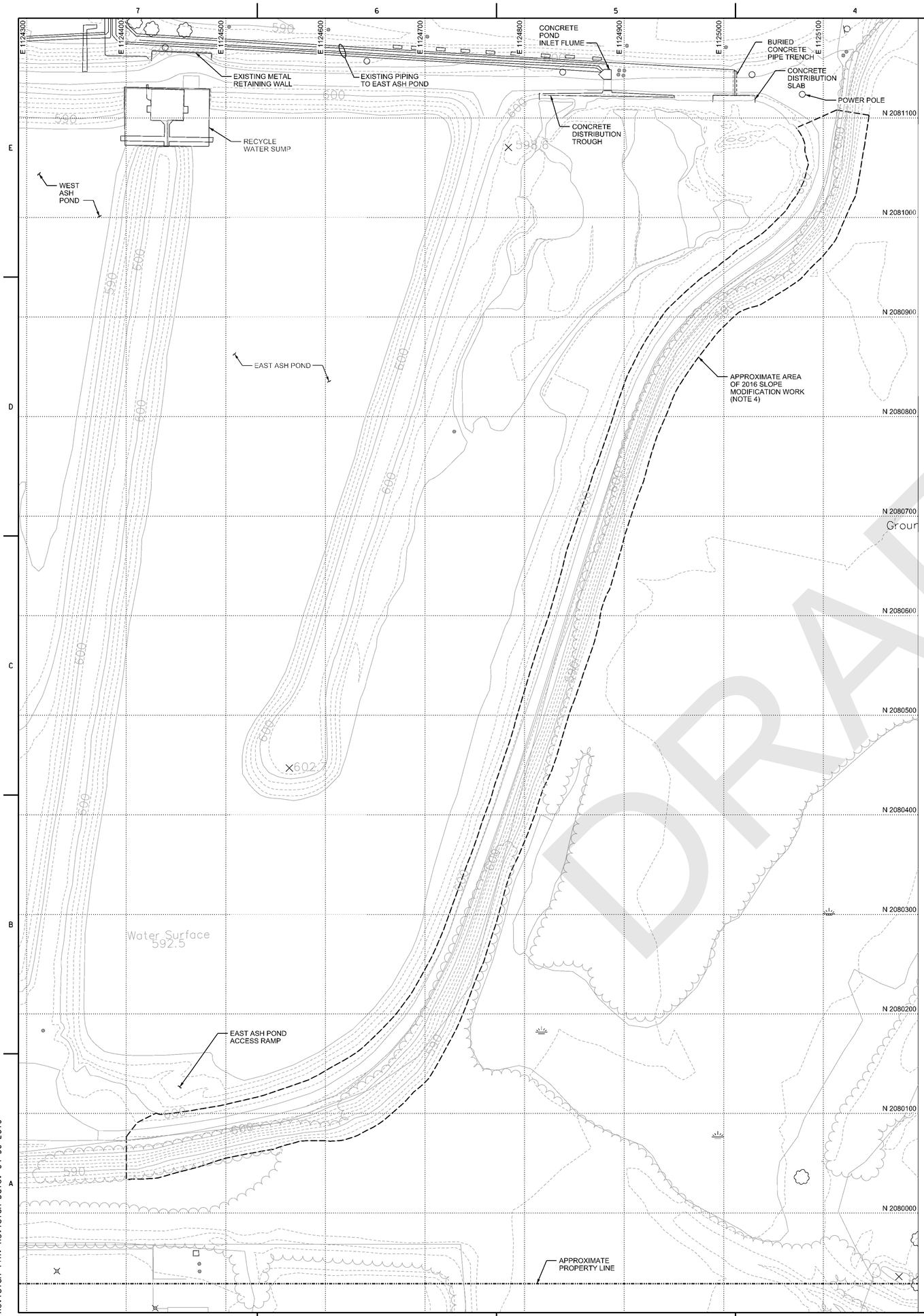
FOR **ISSUED FOR REVIEW**

SEAL

DRAFT

SCALE: **AS SHOWN**	DES:	**MR**
DWG TYPE: **.DWG**	DFTR:	**PK**
JOB NO: **60669161**	CHKD:	**RB**
DATE: **11/15/2021**	ENGR:	**JT**
FILENAME: **DETAILS.DWG**	APPD:	**JT**

DWG SIZE	DRAWING NO.	REVISION
ANSI D 22.0"x34.0"	**14**	**A**



FOR PERMIT
NOT FOR CONSTRUCTION

HOLD INFORMATION	
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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
A	11-11-2021	FOR CLIENT COMMENT

ISSUE PURPOSE: CLIENT COMMENT
SPECIFICATION: W-7900
PROJECT NO.: 12661-098

CAD FILE NAME: WKG-AP-CSK-006.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN / D. NIELSON
APPROVED BY: --

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY, IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY.

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE FURNISHED AND INSTALLED BY SPECIFICATION W-7900 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING WKG-AP-CSK-002.
3. EXISTING CONDITIONS FOR THE EAST ASH POND ARE BASED ON TOPOGRAPHIC DATA COLLECTED IN 2014. PRIOR TO BEGINNING ANY POND CLOSURE WORK, THE CONTRACTOR SHALL MAKE A TOPOGRAPHIC ASSESSMENT TO VERIFY THE ACCURACY OF THE EXISTING CONDITIONS SHOWN PER NOTE 10 ON DRAWING WKG-AP-CSK-002.
4. IN 2016, THE DOWNSTREAM SLOPE OF THE EAST ASH POND'S EAST DIKE WAS LOWERED TO AN APPROXIMATE CREST ELEVATION OF 600 FEET AND REGRADED TO A FLATTER GRADE THAN SHOWN. SEE GEOSYNTEC DRAWINGS SW0251-11-01 - 07 FOR THE 2016 SLOPE MODIFICATION DESIGN PLANS, SECTIONS, AND DETAILS.

REFERENCE DRAWINGS

5082-C-5006	ASH POND DETAIL PLAN
5082-C-5007	ASH POND SECTIONS AND DETAILS
5082-C-5001	WASTE WATER TREATMENT FACILITIES ASH POND SUMP PLAN, SECTIONS AND DETAILS
5082-C-5502	ASH POND SUMP WEIR PLAN, SECTIONS & DETAILS
5082-C-5503	ASH POND SUMP AND WEIR MISCELLANEOUS SECTIONS AND DETAILS
5082-C-5507	ASH POND INLET FLUME & DISTRIBUTION TROUGH DETAILS
B739	EAST AND WEST ASH POND LINER REPLACEMENT PLANS, SECTIONS AND DETAILS
SW0251-11-01 - 07	EAST ASH BASIN SLOPE MODIFICATION

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NORTH

40' 0' 40' 80'
GRAPHIC SCALE

Sargent & Lundy LLC
SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation LLC.

PROJECT

MIDWEST GENERATION, LLC
WAUKEGAN
GENERATING STATION
ASH POND CLOSURE PROJECT

DRAWING TITLE

EAST ASH POND
EXISTING CONDITIONS

DRAWING NUMBER	REVISION
WKG-AP-CSK-006	A
SHEET 1 OF 1	

PL12793/OM1864/S:#2-1
Form 00C-0401-01-08. ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A. Revision Date: 04-30-2010

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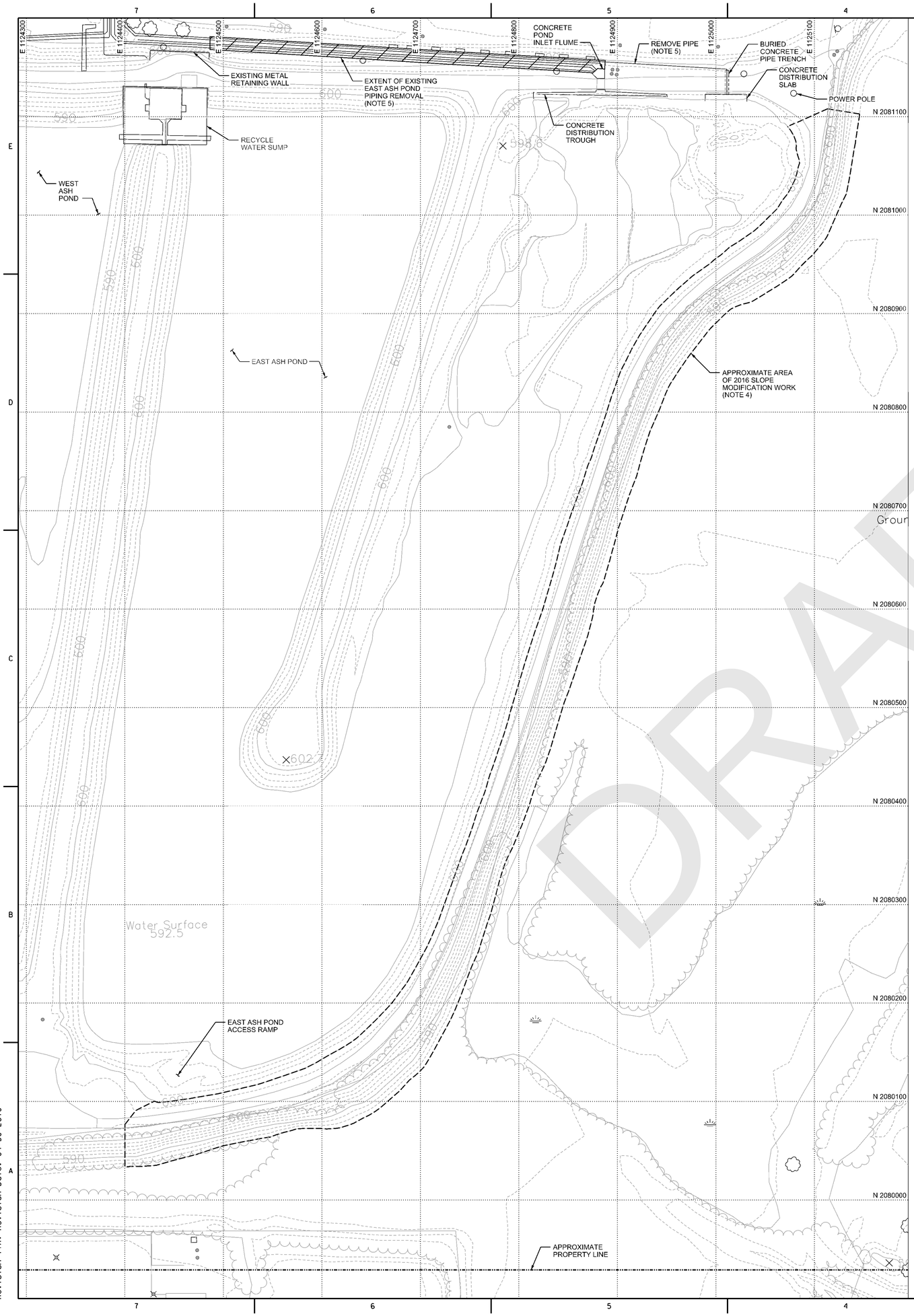

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REV.	DATE	DESCRIPTION
A	11-11-2021	FOR CLIENT COMMENT

ISSUE PURPOSE: CLIENT COMMENT
SPECIFICATION: W-7900
PROJECT NO.: 12661-098

CAD FILE NAME: WKG-AP-CSK-007.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN / D. NIELSON
APPROVED BY: --

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5. DISCONNECT ALL PIPES FROM INLET FLUME, REMOVE PIPE SLEEVES, AND REMOVE PIPES TO LIMITS OF FINAL COVER SYSTEM SHOWN ON DRAWING WKG-AP-CSK-008. CAP ENDS OF PIPES REMAINING IN PLACE. PLACE REMOVED PIPE SLEEVES AND PIPE SECTIONS IN ONSITE STOCKPILE AREA DESIGNATED BY OWNER.

REFERENCE DRAWINGS

5082-C-5006	ASH POND DETAIL PLAN
5082-C-5007	ASH POND SECTIONS AND DETAILS
5082-C-5001	WASTE WATER TREATMENT FACILITIES ASH POND SUMP PLAN, SECTIONS AND DETAILS
5082-C-5502	ASH POND SUMP WEIR PLAN, SECTIONS & DETAILS
5082-C-5503	ASH POND SUMP AND WEIR MISCELLANEOUS SECTIONS AND DETAILS
5082-C-5507	ASH POND INLET FLUME & DISTRIBUTION TROUGH DETAILS
B739	EAST AND WEST ASH POND LINER REPLACEMENT PLANS, SECTIONS AND DETAILS
SW0251-11-01 - 07	EAST ASH BASIN SLOPE MODIFICATION

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NORTH

40' 0' 40' 80'
GRAPHIC SCALE

Sargent & Lundy LLC
SARGENT & LUNDY LLC
55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

MWG
Midwest Generation LLC.

PROJECT

MIDWEST GENERATION, LLC
WAUKEGAN
GENERATING STATION
ASH POND CLOSURE PROJECT

DRAWING TITLE

EAST ASH POND
DEMOLITION & REMOVAL PLAN

DRAWING NUMBER	REVISION
WKG-AP-CSK-007	A
SHEET 1 OF 1	

PL:12793/OM1864/S:#2-1
Form CDC-0401-01-08. ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A. Revision Date: 04-30-2010

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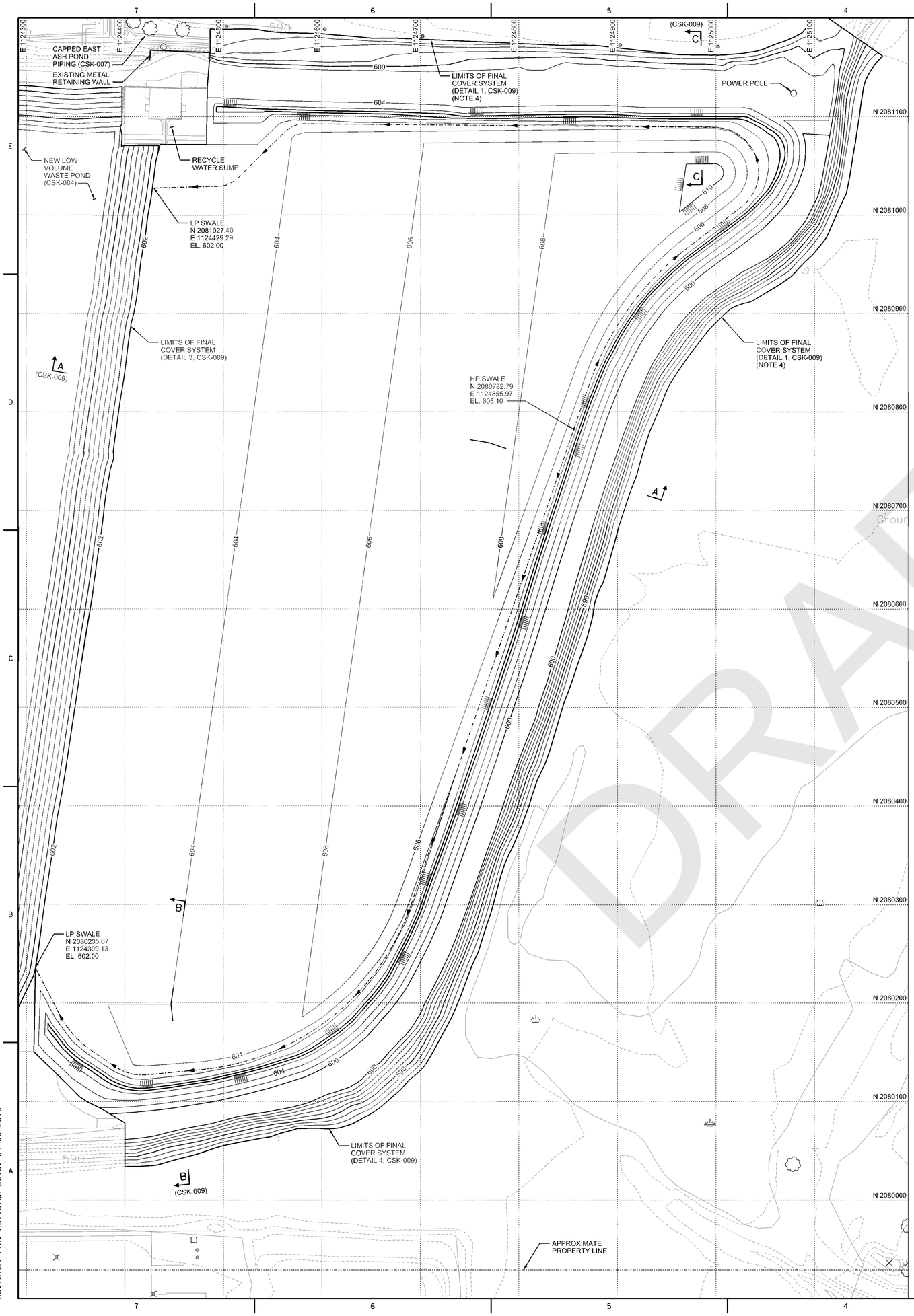

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
A	11-11-2021	FOR CLIENT COMMENT

ISSUE PURPOSE: CLIENT COMMENT
SPECIFICATION: W-7900
PROJECT NO.: 12661-098

CAD FILE NAME: WKG-AP-CSK-008.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN / D. NIELSON
APPROVED BY: --

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LEGEND

- 610 — MAJOR CONTOUR (10')
- 608 — MINOR CONTOUR (2')
- DRAINAGE PATH

NOTES

1. ALL WORK SHOWN ON THIS DRAWING SHALL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION W-7900 UNLESS NOTED OTHERWISE.
2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING WKG-AP-CSK-002.
3. INSTALL FINAL COVER SYSTEM OVER EAST ASH POND PER DETAIL 1 ON DRAWING WKG-AP-CSK-009.
4. AT TOES OF EAST ASH POND DIKES, FINAL COVER SYSTEM COMPONENTS SHALL BE ANCHORED IN ANCHOR TRENCHES PER DETAIL 2 ON DRAWING WKG-AP-CSK-009.

REFERENCE DRAWINGS

B739	EAST AND WEST ASH POND LINER REPLACEMENT PLANS, SECTIONS AND DETAILS
CSK-004	WEST ASH POND EXCAVATION PLAN
CSK-009	EAST ASH POND FINAL COVER SYSTEM SECTIONS & DETAILS

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PROJECT

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WAUKEGAN
GENERATING STATION
ASH POND CLOSURE PROJECT

DRAWING TITLE

EAST ASH POND
FINAL COVER SYSTEM
GRADING PLAN

DRAWING NUMBER	REVISION
WKG-AP-CSK-008	A
SHEET 1 OF 1	

PL12793/OM1864/S:#2-1
Form 000-0401-01-08. ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A. Revision Date: 04-30-2010
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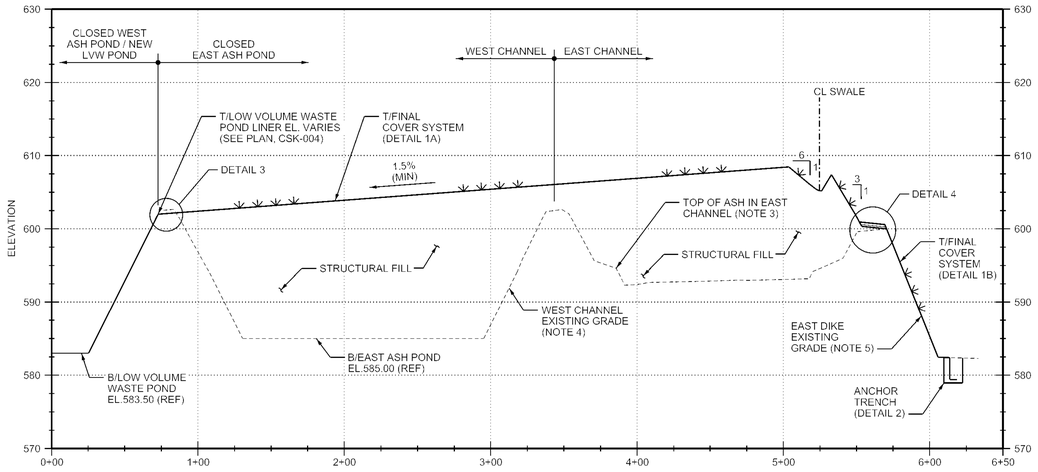
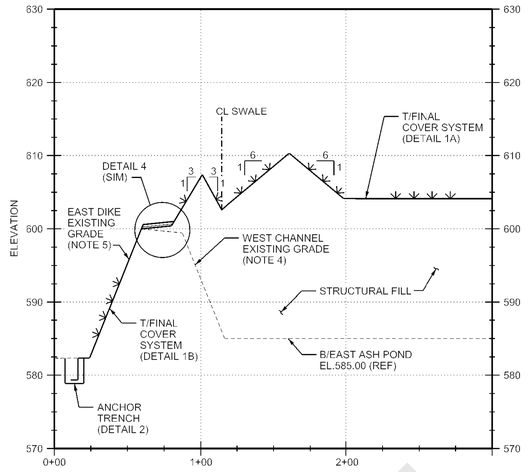


SECTION A
HORIZONTAL SCALE 1"=40'
VERTICAL SCALE 1"=5'
(CSK-008)



SECTION B
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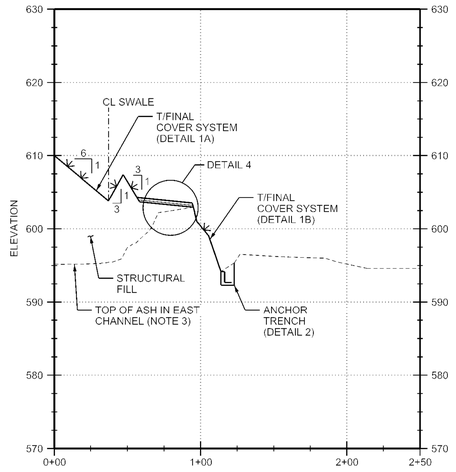
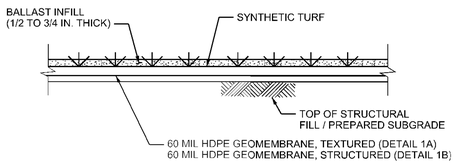
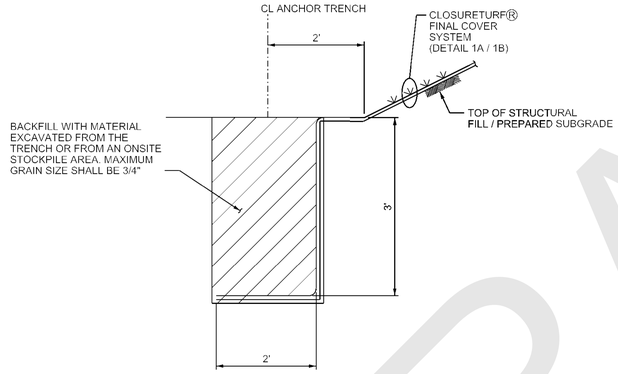
VERTICAL SCALE 1"=5'
(CSK-008)



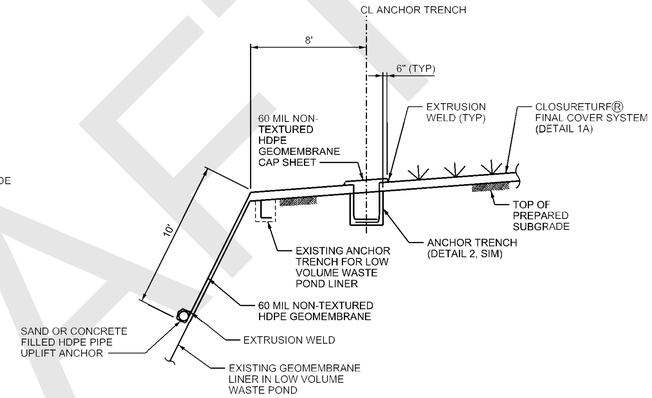
SECTION C
HORIZONTAL SCALE 1"=40'
VERTICAL SCALE 1"=5'
(CSK-008)



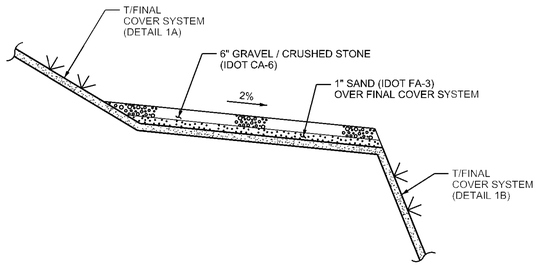
CLOSURETURF®
FINAL COVER SYSTEM
DETAIL 1
N.T.S.



TYPICAL ANCHOR TRENCH
DETAIL 2
N.T.S.



GEOMEMBRANE LINER TRANSITION AT
NEW LOW VOLUME WASTE POND
DETAIL 3
N.T.S.



FINAL COVER ACCESS ROAD
DETAIL 4
N.T.S.

NOTES

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2. FOR GENERAL NOTES, ABBREVIATIONS, AND SYMBOLS, SEE DRAWING WKG-AP-CSK-002.
3. TOP-OF-ASH SURFACE SHOWN IN THE EAST CHANNEL REPRESENTS THE ASH STORED IN THE POND DURING THE 2014 SURVEY OF THE SITE AND MAY NOT BE REPRESENTATIVE OF CURRENT CONDITIONS.
4. EXISTING GRADE SHOWN IN THE WEST CHANNEL REPRESENTS THE FLOOR AND SIDE SURFACES OF THE WEST CHANNEL THAT ARE ASSUMED TO HAVE BEEN INSTALLED BASED ON THE EAST ASH POND'S HISTORY OF CONSTRUCTION (GEOSYNTEC, 2016).
5. EXISTING GRADE SHOWN FOR THE DOWNSTREAM SLOPE OF THE EAST ASH POND'S EAST DIKE REPRESENTS THE SIDE SURFACE ASSUMED TO HAVE BEEN INSTALLED IN ACCORDANCE WITH THE SLOPE MODIFICATION WORK DONE IN 2016 (REF. DWGS. SW0251-11-01 THROUGH -07).

REFERENCE DRAWINGS

B739	EAST AND WEST ASH POND LINER REPLACEMENT PLANS, SECTIONS AND DETAILS
CSK-008	EAST ASH POND FINAL COVER SYSTEM GRADING PLAN
SW0251-11-01 - 07	EAST ASH BASIN SLOPE MODIFICATION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
A	11-11-2021	FOR CLIENT COMMENT

ISSUE PURPOSE: CLIENT COMMENT
SPECIFICATION: W-7900
PROJECT NO.: 12661-098

CAD FILE NAME: WKG-AP-CSK-009.DGN
PREPARED BY: J. CHAVEZ
REVIEWED BY: T. DEHLIN / D. NIELSON
APPROVED BY: --

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MIDWEST GENERATION, LLC
WAUKEGAN
GENERATING STATION
ASH POND CLOSURE PROJECT

DRAWING TITLE

EAST ASH POND
FINAL COVER SYSTEM
SECTIONS & DETAILS

DRAWING NUMBER	REVISION
WKG-AP-CSK-009	A
SHEET 1 OF 1	

PL12793/OM1864/S:*2-1
Form GDC-0401-01-08. ANSI (Imperial) MicroStation Border - Size E - 34 x 44
Revision 11A. Revision Date: 04-30-2010

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...*@Drawings*WKG-AP-CSK-009.dgn

ATTACHMENT B

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG Waukegan**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-by-Removal	**SHEET:** Cost Summary	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** West Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY: **Cost Summary: Close-by-Removal Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** West - Closure-by-Removal	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/4/2021	**REVIEWED BY:** Rob Boeing

Waukegan West Ash Basin: Closure by Removal
Closure & Post-Closure Cost Summary

Close-by-Removal Tasks	Cost (2021 Dollars)
Mobilization / Site Prep / Demobilization	**$1,247,924**
Achieve Closure-by-Removal / Convey Material	**$7,245,000**
Stormwater Management / E&S Controls / Site Restoration	**$294,135**
Contingency (25%)	**$2,196,765**
Engineering Support (Design & CQA)	**$5,000,000**
Total Closure Cost of CCR Impoundment =	**$15,983,824**

Post-Closure Tasks	Cost (2021 Dollars)
Groundwater Monitoring	**$150,000**
Operations & Maintenance (O&M)	**$0**
Contingency (25%)	**$37,500**
Engineering Costs (10%)	**$18,750**
Total Post-Closure of CCR Impoundment =	**$206,250**

Total Closure & Post-Closure of CCR Impoundment Cost =	**$16,190,074**

AECOM CALCULATION SHEET	PROJECT: CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG Waukegan	PLANT NAME: Waukegan	CLOSURE TYPE: Closure-by-Removal	SHEET: Close-by-Removal Costs	REV. NO.: A
	SUBJECT: Preliminary Project Costs Sheets	IMPOUNDMENT NAME: West Ash Basin			AECOM JOB NO.: 60669161
	ACTIVITY: Close-by-Removal Costs: Closure-by-Removal Cost Estimate for CCR Impoundment	CLOSURE OPTION: West - Closure-by-Removal	LAST UPDATED BY: PAK	DATE LAST MODIFIED: 11/04/21	REVIEWED BY: Rob Boeing

BASIS OF THE ESTIMATE				
YEAR COST BASIS	2021		AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)	6
TOTAL AREA TO BE RESTORED (AC)	11		AVG. DEPTH OF FREE WATER (FT)	2
TOTAL CLOSURE-BY-REMOVAL AREA (AC)	11		VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)	3,910,000
VOLUME OF ASH IN CLOSURE-BY-REMOVAL AREA (CY)	93,000		PERIMETER OF CLOSURE-BY-REMOVAL AREA (L.F.)	3,000

	CLOSE-BY-REMOVAL ESTIMATED COSTS						
	TASK	ITEM	UNIT	QUANTITY	INSTALLED UNIT COST	IMPOUNDMENT CLOSURE COST	NOTES
MOBILIZATION / SITE PREP / DEMOBILIZATION	**MOBILIZATION / SITE PREP / DEMOBILIZATION**						
	1	MOBILIZATION / DEMOBILIZATION	LS	1	$97,924	$97,924	Mob/Demob & insurance: (1% of Total EPC Bid Price) includes administration (mtgs, health & safety, trailer, phone/fax/electricity, temporary facilities, utilities, roll off boxes, waste disposal, and cleanup).
	2	MODIFICATIONS OF OUTLET STRUCTURES / PIPING	LS	1	$250,000	$250,000	Assume outlet structures and piping will be modified.
	3	REMOVAL & FILTRATION OF FREE WATER	MONTHS	9	$100,000	$900,000	Based on Initiation time
ACHIEVE CLOSURE-BY-REMOVAL / CONVEY MATERIAL	**ACHIEVE CLOSURE-BY-REMOVAL / CONVEY MATERIAL**						
	4	REMOVAL & TREATMENT OF PORE WATER WITHIN ASH	MONTHS	12	$100,000	$1,200,000	STEP 1: Start dewaterting for Construction time. Based on Construction Time.
	5	EXCAVATE ASH FOR CLOSURE-BY-REMOVAL / STOCKPILE ASH	CY	93,000	$8.00	$744,000	Step 2: Assume CCR material must be stockpiled within impoundment area to decant prior to loading. Done in conjunction with Step 1. Decant water collected and treated along with pore water from Step 1.
	8	EXCAVATE / LOAD / HAUL CCR MATERIAL (OFF-SITE LF)	CY	93,000	$57.00	$5,301,000	Assume disposal of CCRs at an off-site landfill (assume density of 1.2 tons/cy).
	STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION						
STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION	9	SITE EROSION AND SEDIMENT CONTROL	ACRE	11	$2,000	$22,000	Assume total area to be restored will require site erosion and sediment control.
	10	TOPSOIL	CY	17,746	$13.00	$230,698	Assume 12 inches of top soil needed (obtained off-site) to establish vegetative stabilization over total closed-by-removal area and not covered by the Industrial Landfill
	11	SEED / FERTILIZE / MULCH	ACRE	11	$3,767.00	$41,437	Assume total area of disturbance will be mulched, fertilized, and seeded.

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG Waukegan**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-by-Removal	**SHEET:** Close-by-Removal Costs	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** West Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY **Close-by-Removal Costs: Closure-by-Removal Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** West - Closure-by-Removal	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

BASIS OF THE ESTIMATE				
YEAR COST BASIS	**2021**		**AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)**	**6**
TOTAL AREA TO BE RESTORED (AC)	**11**		**AVG. DEPTH OF FREE WATER (FT)**	**2**
TOTAL CLOSURE-BY-REMOVAL AREA (AC)	**11**		**VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)**	**3,910,000**
VOLUME OF ASH IN CLOSURE-BY-REMOVAL AREA (CY)	**93,000**		**PERIMETER OF CLOSURE-BY-REMOVAL AREA (L.F.)**	**3,000**

CLOSE-BY-REMOVAL ESTIMATED COSTS

	TASK	ITEM	UNIT	QUANTITY	INSTALLED UNIT COST	IMPOUNDMENT CLOSURE COST	NOTES
CONTINGENCY / ENGINEERING SUPPORT	**CONTINGENCY / ENGINEERING SUPPORT**						
	12	CONTINGENCY (25%)	LS	1	$2,196,765	$2,196,765	
	13	ENGINEERING SUPPORT (DESIGN AND CQA 10%)	LS	1	$1,103,253	$1,103,253	
POST-CLOSURE	**POST-CLOSURE**						
	14	GROUNDWATER MONITORING	ANNUAL	3	$50,000	$150,000	Annual groundwater monitoring costs for each CCR impoundment are based on current groundwater monitoring system.
	15	OPERATIONS & MAINTENANCE (O&M)	ANNUAL	0	$27,500	$0	Annual O&M costs are $2500/acre/yr (includes leachate collection system maintenance). Based on Q3 2018 Post Closure Maintenance data.
POST CLOSURE CONTINGENCY / ENGINEERING COST	**CONTINGENCY / ENGINEERING COST**						
	16	CONTINGENCY (25%)	LS	1	$37,500	$37,500	
	17	ENGINEERING COST (10%)	LS	1	$18,750	$18,750	
		TOTAL				**$12,293,327**	

AECOM CALCULATION SHEET	PROJECT **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG Waukegan**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-by-Removal	**SHEET** Close-by-Removal Assumptions	**REV. NO.** A
	SUBJECT Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** West Ash Basin			**AECOM JOB NO.** 60669161
	ACTIVITY **Close-by-Removal Assumptions**	**CLOSURE OPTION:** West - Closure-by-Removal	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

KEY ASSUMPTIONS

The following key assumptions and limitations are associated with the project design, implementation and performance:

1	The cost estimates were prepared using 2021 dollars and do not include any escalation.
2	A 25% contingency has been included for this cost estimate.
3	Engineering design and CQA cost has been included for this cost estimate based on reasonable assumptions.
4	Interstitial water treatment was assumed to continue until construction is completed.
5	Assumed all CCR material excavated must be stockpiled in close proximity to the impoundment to be decanted. After decanting, the material will be excavated, loaded, and hauled off-site for disposal.
6	Groundwater monitoring costs are for a reduced groundwater network system as compared to the existing system. Groundwater monitoring costs do not include costs incurred for any additional well installation. Maintenance costs for wells are included in post-closure O&M costs.
7	O&M costs include, but are not limited to, the maintenance/repair of the groundwater monitoring system and general maintenance of the former CCR impoundment area.
8	Statements of Probable Construction Cost prepared by AECOM represent AECOM's judgment as a design professional familiar with the construction industry. It is recognized, however, that neither AECOM nor the Owner has control over the cost of labor, materials or equipment nor over the contractor's methods of determining the bid price or other competitive bidding, market, or negotiating conditions. Accordingly, AECOM cannot and does not warrant or represent that proposals, bids or actual construction costs will not vary from any statement of Probable Construction Cost or other estimates or evaluations prepared by AECOM.

AECOM CALCULATION SHEET	PROJECT: CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN	PLANT NAME: Waukegan	CLOSURE TYPE: Closure-in-Place	SHEET: Cost Summary	REV. NO.: A
	SUBJECT: Preliminary Project Costs Sheets	IMPOUNDMENT NAME: West Ash Basin			AECOM JOB NO.: 60669161
	ACTIVITY: Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment	CLOSURE OPTION: Close-in-Place	LAST UPDATED BY: PAK	DATE LAST MODIFIED: 11/4/2021	REVIEWED BY: Rob Boeing

Waukegan West Ash Basin: Close-in-Place Closure & Post-Closure Cost Summary

Close-in-Place Tasks	Cost (2021 Dollars)
Mobilization / Site Prep	$1,242,064
Dewatering / Earthwork / Subgrade Prep.	$2,348,700
Closure System Construction	$1,158,751
Stormwater Management / E&S Controls / Site Restoration	$3,513,737
Contingency (25%)	$2,065,813
Engineering Support (Design & CQA)	$2,900,000
Total Closure Cost of CCR Impoundment =	**$13,229,065**

Post-Closure Tasks	Cost (2021 Dollars)
Groundwater Monitoring	$1,500,000
Operations & Maintenance (O&M)	$825,000
Contingency (25%)	$581,250
Engineering Costs (10%)	$290,625
Total Post-Closure of CCR Impoundment =	**$3,196,875**

Total Closure & Post-Closure of CCR Impoundment Cost =	**$16,425,940**

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET:** Close-in-Place Costs	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** West Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY: **Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** Close-in-Place	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

BASIS OF THE ESTIMATE				
YEAR COST BASIS	**2021**		**AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)**	**3**
TOTAL AREA TO BE RESTORED (AC)	**11**		**AVG. DEPTH OF FREE WATER (FT)**	**2**
TOTAL IMPOUNDMENT AREA (AC)	**11**		**VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)**	**3,910,000**
VOLUME OF ASH IN IMPOUNDMENT (CY)	**93,000**		**PERIMETER OF IMPOUNDMENT (L.F.)**	**3,100**

	CLOSE-IN-PLACE ESTIMATED COSTS						
	TASK	**ITEM**	**UNIT**	**QUANTITY**	**INSTALLED UNIT COST**	**IMPOUNDMENT CLOSURE COST**	**NOTES**
MOBILIZATION / SITE PREP	**MOBILIZATION / SITE PREP**						
	1	MOBILIZATION	LS	1	$92,064	$92,064	Mob/Demob & insurance: (1% of Total EPC Bid Price includes administration (mtgs, health & safety, trailer, phone/fax/electricity, temporary facilities, utilities, roll off boxes, waste disposal, and cleanup).
	2	MODIFY OUTLET STRUCTURES / PIPING	LS	1	$250,000	$250,000	Final existing outlet structures and piping.
	3	REMOVAL & FILTRATION OF FREE WATER	MONTHS	9	$100,000	$900,000	
DEWATERING / EARTHWORK / SUBGRADE PREP	**DEWATERING / EARTHWORK / SUBGRADE PREP**						
	4	REMOVAL & TREATMENT OF PORE WATER WITHIN ASH	MONTHS	12	$100,000	$1,200,000	Based on Construction Time
	5	ASH REGRADING TO ESTABLISH CROWN	CY	117,000	$9.50	$1,111,500	Quantity of earthwork (cut-to-fill) using existing ash to achieve positive slope prior to installation of closure system. Quantity calculated using AutoCAD.
	6	PERIMETER DITCH / TEMP. DIVERSION BERM GRADING	L.F.	3,100	$12.00	$37,200	Linear feet around the perimeter of impoundment.
	7	CONTACT STORM WATER TREATMENT	GAL				
CLOSURE SYSTEM CONSTRUCTION	**CLOSURE SYSTEM CONSTRUCTION**						
	8	24" FINAL COVER SOIL	CY	35,493	$11.00	$390,427	24 inches of common soil placed over close-in-place area (assume on-site soils available)
	9	12" TOPSOIL	CY	17,747	$13.00	$230,707	12 inches of topsoil (obtained off-site) placed over closure-by-removal area.
	10	FLEXIBLE MEMBRANE LINER (FML)	SQ. FT.	527,076	$0.42	$221,372	Alternate Cap System Only: Flexible membrane liner placed over close-in-place area. Assume quantity needed is 10% more than close-in-place area.
	11	GEOCOMPOSITE DRAINAGE LAYER	SQ. FT.	527,076	$0.60	$316,246	Alternate Cap System Only: Geocomposite drainage layer placed over close-in-place area. Assume quantity needed is 10% more than close-in-place area.

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET:** Close-in-Place Costs	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** West Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY: **Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** Close-in-Place	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

BASIS OF THE ESTIMATE				
YEAR COST BASIS	**2021**		**AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)**	**3**
TOTAL AREA TO BE RESTORED (AC)	**11**		**AVG. DEPTH OF FREE WATER (FT)**	**2**
TOTAL IMPOUNDMENT AREA (AC)	**11**		**VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)**	**3,910,000**
VOLUME OF ASH IN IMPOUNDMENT (CY)	**93,000**		**PERIMETER OF IMPOUNDMENT (L.F.)**	**3,100**

	CLOSE-IN-PLACE ESTIMATED COSTS						
	TASK	**ITEM**	**UNIT**	**QUANTITY**	**INSTALLED UNIT COST**	**IMPOUNDMENT CLOSURE COST**	**NOTES**
STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION	**STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION**						
	12	SITE EROSION AND SEDIMENT CONTROL	ACRE	11	$2,000	$22,000	Assume total area to be restored will require site erosion and sediment control.
	13	STORMWATER MANAGEMENT / CHANNELS / LET-DOWNS	L.F.	4,650	$742	$3,450,300	Assume rip-rap lined stormwater conveyance channels and rip-rap lined let-downs off of cap. Assume 3500 LF of stormwater channels / let downs.
	14	SEED / FERTILIZE / MULCH	ACRE	11	$3,767	$41,437	Assume total area to be restored will be mulched, fertilized, and seeded.
CONTINGENCY / ENGINEERING SUPPORT	**CONTINGENCY / ENGINEERING SUPPORT**						
	15	CONTINGENCY (25%)	LS	1	$2,065,813	$2,065,813	
	16	ENGINEERING SUPPORT (DESIGN AND CQ 10%)	LS	1	$1,035,237	$1,035,237	
POST-CLOSURE	**POST-CLOSURE**						
	17	GROUNDWATER MONITORING FOR ASH BASIN	ANNUAL	30	$50,000	$1,500,000	Annual groundwater monitoring costs for each CCR impoundment
	18	OPERATIONS & MAINTENANCE (O&M) FOR CLOSURE-IN-PLACE CAP AREA	ANNUAL	30	$27,500	$825,000	Annual O&M costs are $2500/acre/yr for the total closed area with cap.
POST CLOSURE CONTINGENCY / ENGINEERING COST	**POST CLOSURE CONTINGENCY / ENGINEERING COST**						
	19	CONTINGENCY (25%)	LS	1	$581,250	$581,250	
	20	ENGINEERING COST (10%)	LS	1	$290,625	$290,625	
		TOTAL				**$14,561,177**	

AECOM CALCULATION SHEET	PROJECT **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET** Close-in-Place Assumptions	**REV. NO.** A
	SUBJECT Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** West Ash Basin			**AECOM JOB NO.** 60669161
	ACTIVITY **Close-in-Place Assumptions**	**CLOSURE OPTION:** Close-in-Place	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

KEY ASSUMPTIONS

The following key assumptions and limitations are associated with the project design, implementation and performance:

1	The cost estimates were prepared using 2021 dollars and do not include any escalation.
2	A 25% contingency has been included for this cost estimate.
3	Engineering design and CQA cost has been included for this cost estimate based on reasonable assumptions.
4	Interstitial water treatment was assumed to continue until construction is completed.
5	To establish the positive slopes, assume existing ash will be utilized to establish crown.
6	Cap cross section for the CCR impoundment will consist of flexible membrane liner, geocomposite drianage layer, and 24-inches of final cover soil overlain by 12-inches of topsoil.
7	Final cover soil assumed to be available onsite and topsoil would come from offsite
8	Groundwater monitoring costs are for the existing network system. Groundwater monitoring costs do not include costs incurred for any additional well installation. Maintenance costs for wells are included in post-closure O&M costs.
9	O&M costs include, but are not limited to, the monitoring and maintenance/repair of the groundwater monitoring system, cap system, and storm water controls.
10	Statements of Probable Construction Cost prepared by AECOM represent AECOM's judgment as a design professional familiar with the construction industry. It is recognized, however, that neither AECOM nor the Owner has control over the cost of labor, materials or equipment nor over the contractor's methods of determining the bid price or other competitive bidding, market, or negotiating conditions. Accordingly, AECOM cannot and does not warrant or represent that proposals, bids or actual construction costs will not vary from any statement of Probable Construction Cost or other estimates or evaluations prepared by AECOM.

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-by-removal	**SHEET:** Cost Summary	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY: **Cost Summary: Close-by-Removal Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** East - Closure-by-Removal	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/4/2021	**REVIEWED BY:** Rob Boeing

Waukegan East Ash Basin: Closure-by-Removal
Closure & Post-Closure Cost Summary

Close-by-Removal Tasks	Cost (2021 Dollars)
Mobilization / Site Prep / Demobilization	**$1,248,093**
Achieve Closure-by-Removal / Convey Material	**$7,259,984**
Stormwater Management / E&S Controls / Site Restoration	**$294,135**
Contingency (25%)	**$2,200,553**
Engineering Support (Design & CQA)	**$5,000,000**
Total Closure Cost of CCR Impoundment =	**$16,002,765**

Post-Closure Tasks	Cost (2021 Dollars)
Groundwater Monitoring	**$150,000**
Operations & Maintenance (O&M)	**$0**
Contingency (25%)	**$37,500**
Engineering Costs (10%)	**$18,750**
Total Post-Closure of CCR Impoundment =	**$206,250**

Total Closure & Post-Closure of CCR Impoundment Cost =	**$16,209,015**

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-by-removal	**SHEET:** Close-by-Removal Costs	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY **Close-by-Removal Costs: Closure-by-Removal Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** East - Closure-by-Removal	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

BASIS OF THE ESTIMATE				
YEAR COST BASIS	**2021**	**AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)**		**3**
TOTAL AREA TO BE RESTORED (AC)	**11**	**AVG. DEPTH OF FREE WATER (FT)**		**1.5**
TOTAL CLOSURE-BY-REMOVAL AREA (AC)	**11**	**VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)**		**2,000,000**
VOLUME OF ASH IN CLOSURE-BY-REMOVAL AREA (CY)	**70,000**	**PERIMETER OF CLOSURE-BY-REMOVAL AREA (L.F.)**		**3,100**

CLOSE-BY-REMOVAL ESTIMATED COSTS

	TASK	ITEM	UNIT	QUANTITY	INSTALLED UNIT COST	IMPOUNDMENT CLOSURE COST	NOTES
MOBILIZATION / SITE PREP / DEMOBILIZATION	**MOBILIZATION / SITE PREP / DEMOBILIZATION**						
	1	MOBILIZATION / DEMOBILIZATION	LS	1	$98,093	$98,093	Mob/Demob & insurance: (1% of Total EPC Bid Price) includes administration (mtgs, health & safety, trailer, phone/fax/electricity, temporary facilities, utilities, roll off boxes, waste disposal, and cleanup).
	2	MODIFICATIONS OF OUTLET STRUCTURES / PIPING	LS	1	$250,000	$250,000	Assume outlet structures and piping will be modified.
	3	REMOVAL & FILTRATION OF FREE WATER	MONTHS	9	$100,000	$900,000	
ACHIEVE CLOSURE-BY-REMOVAL / CONVEY MATERIAL	**ACHIEVE CLOSURE-BY-REMOVAL / CONVEY MATERIAL**						
	4	REMOVAL & TREATMENT OF PORE WATER WITHIN ASH	MONTHS	12	$225,832	$2,709,984	STEP 1: Start dewatering for Construction time. Based on Construction Time.
	5	EXCAVATE ASH FOR CLOSURE-BY-REMOVAL / STOCKPILE ASH	CY	70,000	$8.00	$560,000	Step 2: Assume CCR material must be stockpiled within impoundment area to decant prior to loading. Done in conjunction with Step 1. Decant water collected and treated along with pore water from Step 1.
	6	EXCAVATE / LOAD / HAUL CCR MATERIAL (OFF-SITE LF)	CY	70,000	$57.00	$3,990,000	Assume disposal of CCRs at an off-site landfill (assume density of 1.2 tons/cy).

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-by-removal	**SHEET:** Close-by-Removal Costs	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY **Close-by-Removal Costs: Closure-by-Removal Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** East - Closure-by-Removal	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

BASIS OF THE ESTIMATE				
YEAR COST BASIS	**2021**		**AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)**	**3**
TOTAL AREA TO BE RESTORED (AC)	**11**		**AVG. DEPTH OF FREE WATER (FT)**	**1.5**
TOTAL CLOSURE-BY-REMOVAL AREA (AC)	**11**		**VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)**	**2,000,000**
VOLUME OF ASH IN CLOSURE-BY-REMOVAL AREA (CY)	**70,000**		**PERIMETER OF CLOSURE-BY-REMOVAL AREA (L.F.)**	**3,100**

CLOSE-BY-REMOVAL ESTIMATED COSTS

	TASK	ITEM	UNIT	QUANTITY	INSTALLED UNIT COST	IMPOUNDMENT CLOSURE COST	NOTES
STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION	**STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION**						
	7	SITE EROSION AND SEDIMENT CONTROL	ACRE	11	$2,000	$22,000	Assume total area to be restored will require site erosion and sediment control.
	8	TOPSOIL	CY	17,746	$13.00	$230,698	Assume 12 inches of top soil needed (obtained off-site) to establish vegetative stabilization over total closed-by-removal area and not covered by the Industrial Landfill
	9	SEED / FERTILIZE / MULCH	ACRE	11	$3,767	$41,437	Assume total area of disturbance will be mulched, fertilized, and seeded.
CONTINGENCY / ENGINEERING SUPPORT	**CONTINGENCY / ENGINEERING SUPPORT**						
	10	CONTINGENCY (25%)	LS	1	$2,200,553	$2,200,553	
	11	ENGINEERING SUPPORT (DESIGN AND CQA)	LS	1	$1,105,145	$1,105,145	
POST-CLOSURE	**POST-CLOSURE**						
	12	GROUNDWATER MONITORING	ANNUAL	3	$50,000	$150,000	Annual groundwater monitoring costs for each CCR impoundment are based on current groundwater monitoring system.
	13	OPERATIONS & MAINTENANCE (O&M)	ANNUAL	0	$27,500	$0	Annual O&M costs are $2,500/acre/yr for the landfill cap area (includes leachate collection system maintenance). Based on Q3 2018 Post Closure Maintenance data.
POST CLOSURE CONTINGENCY / ENGINEERING COST	**CONTINGENCY / ENGINEERING COST**						
	14	CONTINGENCY (25%)	LS	1	$37,500	$37,500	
	15	ENGINEERING COST (10%)	LS	1	$18,750	$18,750	
		TOTAL				**$12,314,160**	

AECOM CALCULATION SHEET	PROJECT **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-by-removal	**SHEET** Close-by-Removal Assumptions	**REV. NO.** A
	SUBJECT Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.** 60669161
	ACTIVITY **Close-by-Removal Assumptions**	**CLOSURE OPTION:** East - Closure-by-Removal	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

KEY ASSUMPTIONS

The following key assumptions and limitations are associated with the project design, implementation and performance:

1	The cost estimates were prepared using 2021 dollars and do not include any escalation.
2	A 25% contingency has been included for this cost estimate.
3	Engineering design and CQA cost has been included for this cost estimate based on reasonable assumptions.
4	Interstitial water treatment was assumed to continue until construction is completed.
5	Assumed all CCR material excavated must be stockpiled in close proximity to the impoundment to be decanted. After decanting, the material will be excavated, loaded, and hauled off-site for disposal.
6	Groundwater monitoring costs are for a reduced groundwater network system as compared to the existing system. Groundwater monitoring costs do not include costs incurred for any additional well installation. Maintenance costs for wells are included in post-closure O&M costs.
7	O&M costs include, but are not limited to, the maintenance/repair of the groundwater monitoring system and general maintenance of the former CCR impoundment area.
8	Statements of Probable Construction Cost prepared by AECOM represent AECOM's judgment as a design professional familiar with the construction industry. It is recognized, however, that neither AECOM nor the Owner has control over the cost of labor, materials or equipment nor over the contractor's methods of determining the bid price or other competitive bidding, market, or negotiating conditions. Accordingly, AECOM cannot and does not warrant or represent that proposals, bids or actual construction costs will not vary from any statement of Probable Construction Cost or other estimates or evaluations prepared by AECOM.

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET:** Cost Summary	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY: **Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** Option 1 - Close-in-Place	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/4/2021	**REVIEWED BY:** Rob Boeing

Waukegan East Ash Basin: Close-in-Place Option 1
Closure & Post-Closure Cost Summary

Close-in-Place Tasks	Cost (2021 Dollars)
Mobilization / Site Prep	**$1,241,067**
Dewatering / Earthwork / Subgrade Prep.	**$2,263,200**
Closure System Construction	**$1,158,751**
Stormwater Management / E&S Controls / Site Restoration	**$3,513,737**
Contingency (25%)	**$2,044,189**
Engineering Support (Design & CQA)	**$2,900,000**
Total Closure Cost of CCR Impoundment =	**$13,120,943**

Post-Closure Tasks	Cost (2021 Dollars)
Groundwater Monitoring	**$1,500,000**
Operations & Maintenance (O&M)	**$825,000**
Contingency (25%)	**$581,250**
Engineering Costs (10%)	**$290,625**
Total Post-Closure of CCR Impoundment =	**$3,196,875**

Total Closure & Post-Closure of CCR Impoundment Cost =	**$16,317,818**

AECOM	PROJECT: CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN	PLANT NAME: Waukegan	CLOSURE TYPE: Closure-in-Place	SHEET: Close-in-Place Costs	REV. NO.: A
CALCULATION SHEET	SUBJECT: Preliminary Project Costs Sheets	IMPOUNDMENT NAME: East Ash Basin			AECOM JOB NO.: 60669161
	ACTIVITY: Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment	CLOSURE OPTION: Option 1 - Close-in-Place	LAST UPDATED BY: PAK	DATE LAST MODIFIED: 11/04/21	REVIEWED BY: Rob Boeing

BASIS OF THE ESTIMATE				
YEAR COST BASIS	2021		AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)	3
TOTAL AREA TO BE RESTORED (AC)	11		AVG. DEPTH OF FREE WATER (FT)	1.5
TOTAL IMPOUNDMENT AREA (AC)	11		VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)	2,000,000
VOLUME OF ASH IN IMPOUNDMENT (CY)	70,000		PERIMETER OF IMPOUNDMENT (L.F.)	3,100

CLOSE-IN-PLACE ESTIMATED COSTS

	TASK	ITEM	UNIT	QUANTITY	INSTALLED UNIT COST	IMPOUNDMENT CLOSURE COST	NOTES
MOBILIZATION / SITE PREP	**MOBILIZATION / SITE PREP**						
	1	MOBILIZATION	LS	1	$91,067	$91,067	Mob/Demob & insurance: (1% of Total EPC Bid Price includes administration (mtgs, health & safety, trailer, phone/fax/electricity, temporary facilities, utilities, roll off boxes, waste disposal, and cleanup).
	2	MODIFY OUTLET STRUCTURES / PIPING	LS	1	$250,000	$250,000	Modify existing outlet structures and piping.
	3	REMOVAL & FILTRATION OF FREE WATER	MONTHS	9	$100,000	$900,000	
DEWATERING / EARTHWORK / SUBGRADE PREP	**DEWATERING / EARTHWORK / SUBGRADE PREP**						
	4	REMOVAL & TREATMENT OF PORE WATER WITHIN ASH	MONTHS	12	$100,000	$1,200,000	Based on Construction Time
	5	ASH REGRADING TO ESTABLISH CROWN	CY	108,000	$9.50	$1,026,000	Quantity of earthwork (cut-to-fill) using existing ash to achieve positive slope prior to installation of closure system. Quantity calculated using AutoCAD.
	6	PERIMETER DITCH / TEMP. DIVERSION BERM GRADING	L.F.	3,100	$12.00	$37,200	Linear feet around the perimeter of impoundment.
	7	CONTACT STORM WATER TREATMENT	GAL				
CLOSURE SYSTEM CONSTRUCTION	**CLOSURE SYSTEM CONSTRUCTION**						
	8	24" FINAL COVER SOIL	CY	35,493	$11.00	$390,427	24 inches of common soil placed over close-in-place area (assume on-site soils available)
	9	12" TOPSOIL	CY	17,747	$13.00	$230,707	12 inches of topsoil (obtained off-site) placed over closure-by-removal area.
	10	FLEXIBLE MEMBRANE LINER (FML)	SQ. FT.	527,076	$0.42	$221,372	Alternate Cap System Only: Flexible membrane liner placed over close-in-place area. Assume quantity needed is 10% more than close-in-place area.
	11	GEOCOMPOSITE DRAINAGE LAYER	SQ. FT.	527,076	$0.60	$316,246	Alternate Cap System Only: Geocomposite drainage layer placed over close-in-place area. Assume quantity needed is 10% more than close-in-place area.

AECOM	PROJECT: CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN	PLANT NAME: Waukegan	CLOSURE TYPE: Closure-in-Place	SHEET: Close-in-Place Costs	REV. NO.: A
CALCULATION SHEET	SUBJECT: Preliminary Project Costs Sheets	IMPOUNDMENT NAME: East Ash Basin			AECOM JOB NO.: 60669161
	ACTIVITY: Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment	CLOSURE OPTION: Option 1 - Close-in-Place	LAST UPDATED BY: PAK	DATE LAST MODIFIED: 11/04/21	REVIEWED BY: Rob Boeing

BASIS OF THE ESTIMATE				
YEAR COST BASIS	2021		AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)	3
TOTAL AREA TO BE RESTORED (AC)	11		AVG. DEPTH OF FREE WATER (FT)	1.5
TOTAL IMPOUNDMENT AREA (AC)	11		VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)	2,000,000
VOLUME OF ASH IN IMPOUNDMENT (CY)	70,000		PERIMETER OF IMPOUNDMENT (L.F.)	3,100

CLOSE-IN-PLACE ESTIMATED COSTS

	TASK	ITEM	UNIT	QUANTITY	INSTALLED UNIT COST	IMPOUNDMENT CLOSURE COST	NOTES
STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION	**STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION**						
	12	SITE EROSION AND SEDIMENT CONTROL	ACRE	11	$2,000	$22,000	Assume total area to be restored will require site erosion and sediment control.
	13	STORMWATER MANAGEMENT / CHANNELS / LET-DOWNS	L.F.	4,650	$742	$3,450,300	Assume rip-rap lined stormwater conveyance channels and rip-rap lined let-downs off of cap. Assume 1.5* length of peremeter LF of stormwater channels / let downs.
	14	SEED / FERTILIZE / MULCH	ACRE	11	$3,767	$41,437	Assume total area to be restored will be mulched, fertilized, and seeded.
CONTINGENCY / ENGINEERING SUPPORT	**CONTINGENCY / ENGINEERING SUPPORT**						
	15	CONTINGENCY (25%)	LS	1	$2,044,189	$2,044,189	
	16	ENGINEERING SUPPORT (DESIGN AND CQA 10%)	LS	1	$1,021,000	$1,021,000	
POST-CLOSURE	**POST-CLOSURE**						
	17	GROUNDWATER MONITORING FOR ASH BASIN	ANNUAL	30	$50,000	$1,500,000	Annual groundwater monitoring costs for each CCR impoundment
	18	OPERATIONS & MAINTENANCE (O&M) FOR CLOSURE-IN-PLACE CAP AREA	ANNUAL	30	$27,500	$825,000	Annual O&M costs are $2500/acre/yr for the total closed area with cap. Based on Q3 2018 Post Closure Maintenance data
CONTINGENCY / ENGINEERING COST	**CONTINGENCY / ENGINEERING COST**						
	19	CONTINGENCY (25%)	LS	1	$581,250	$581,250	
	20	ENGINEERING COST (10%)	LS	1	$290,625	$290,625	
		TOTAL				**$14,438,818**	

AECOM CALCULATION SHEET	PROJECT **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET** Close-in-Place Assumptions	**REV. NO.** A
	SUBJECT Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.** 60669161
	ACTIVITY **Close-in-Place Assumptions**	**CLOSURE OPTION:** Option 1 - Close-in-Place	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

KEY ASSUMPTIONS

The following key assumptions and limitations are associated with the project design, implementation and performance:

1	The cost estimates were prepared using 2021 dollars and do not include any escalation.
2	A 25% contingency has been included for this cost estimate.
3	Engineering design and CQA cost has been included for this cost estimate based on reasonable assumptions.
4	Interstitial water treatment was assumed to continue until construction is completed.
5	To establish positive slopes, assume existing ash and on-site fill will be utilized to establish crown
6	Cap cross section for the CCR impoundment will consist of flexible membrane liner, geocomposite drianage layer, and 24-inches of final cover soil overlain by 12-inches of topsoil.
7	Final cover soil assumed to be available onsite and topsoil would come from offsite.
8	Groundwater monitoring costs are for the existing network system. Groundwater monitoring costs do not include costs incurred for any additional well installation. Maintenance costs for wells are included in post-closure O&M costs.
9	O&M costs include, but are not limited to, the monitoring and maintenance/repair of the groundwater monitoring system, cap system, and storm water controls.
10	Statements of Probable Construction Cost prepared by AECOM represent AECOM's judgment as a design professional familiar with the construction industry. It is recognized, however, that neither AECOM nor the Owner has control over the cost of labor, materials or equipment nor over the contractor's methods of determining the bid price or other competitive bidding, market, or negotiating conditions. Accordingly, AECOM cannot and does not warrant or represent that proposals, bids or actual construction costs will not vary from any statement of Probable Construction Cost or other estimates or evaluations prepared by AECOM.

AECOM CALCULATION SHEET	PROJECT: CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN	PLANT NAME: Waukegan	CLOSURE TYPE: Closure-in-Place	SHEET: Cost Summary	REV. NO.: A
	SUBJECT: Preliminary Project Costs Sheets	IMPOUNDMENT NAME: East Ash Basin			AECOM JOB NO.: 60669161
	ACTIVITY: Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment	CLOSURE OPTION: Option 2 - Close-in-Place	LAST UPDATED BY: PAK	DATE LAST MODIFIED: 11/4/2021	REVIEWED BY: Rob Boeing

Waukegan East Ash Basin: Close-in-Place Option 2
Closure & Post-Closure Cost Summary

Close-in-Place Tasks	Cost (2021 Dollars)
Mobilization / Site Prep	$1,270,846
Dewatering / Earthwork / Subgrade Prep.	$4,904,200
Closure System Construction	$1,158,751
Stormwater Management / E&S Controls / Site Restoration	$3,513,737
Contingency (25%)	$2,711,883
Engineering Support (Design & CQA)	$2,900,000
Total Closure Cost of CCR Impoundment =	**$16,459,417**

Post-Closure Tasks	Cost (2021 Dollars)
Groundwater Monitoring	$1,500,000
Operations & Maintenance (O&M)	$825,000
Contingency (25%)	$581,250
Engineering Costs (10%)	$290,625
Total Post-Closure of CCR Impoundment =	**$3,196,875**

Total Closure & Post-Closure of CCR Impoundment Cost =	**$19,656,292**

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET:** Close-in-Place Costs	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY: **Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** Option 2 - Close-in-Place	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

BASIS OF THE ESTIMATE				
YEAR COST BASIS	**2021**		**AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)**	**3**
TOTAL AREA TO BE RESTORED (AC)	**11**		**AVG. DEPTH OF FREE WATER (FT)**	**1.5**
TOTAL IMPOUNDMENT AREA (AC)	**11**		**VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)**	**2,000,000**
VOLUME OF ASH IN IMPOUNDMENT (CY)	**70,000**		**PERIMETER OF IMPOUNDMENT (L.F.)**	**3,100**

CLOSE-IN-PLACE ESTIMATED COSTS

	TASK	ITEM	UNIT	QUANTITY	INSTALLED UNIT COST	IMPOUNDMENT CLOSURE COST	NOTES
MOBILIZATION / SITE PREP	**MOBILIZATION / SITE PREP**						
	1	MOBILIZATION	LS	1	$120,846	$120,846	Mob/Demob & insurance: (1% of Total EPC Bid Price includes administration (mtgs, health & safety, trailer, phone/fax/electricity, temporary facilities, utilities, roll off boxes, waste disposal, and cleanup).
	2	MODIFY OUTLET STRUCTURES / PIPING	LS	1	$250,000	$250,000	Modify existing outlet structures and piping.
	3	REMOVAL & FILTRATION OF FREE WATER	MONTHS	9	$100,000	$900,000	
DEWATERING / EARTHWORK / SUBGRADE PREP	**DEWATERING / EARTHWORK / SUBGRADE PREP**						
	4	REMOVAL & TREATMENT OF PORE WATER WITHIN ASH	MONTHS	12	$100,000	$1,200,000	Based on Construction Time
	5	ASH REGRADING TO ESTABLISH CROWN	CY	386,000	$9.50	$3,667,000	Quantity of earthwork (cut-to-fill) using existing ash to achieve positive slope prior to installation of closure system. Quantity calculated using AutoCAD.
	6	PERIMETER DITCH / TEMP. DIVERSION BERM GRADING	L.F.	3,100	$12.00	$37,200	Linear feet around the perimeter of impoundment.
	7	CONTACT STORM WATER TREATMENT	GAL				
CLOSURE SYSTEM CONSTRUCTION	**CLOSURE SYSTEM CONSTRUCTION**						
	8	24" FINAL COVER SOIL	CY	35,493	$11.00	$390,427	24 inches of common soil placed over close-in-place area (assume on-site soils available)
	9	12" TOPSOIL	CY	17,747	$13.00	$230,707	12 inches of topsoil (obtained off-site) placed over closure-by-removal area.
	10	FLEXIBLE MEMBRANE LINER (FML)	SQ. FT.	527,076	$0.42	$221,372	Alternate Cap System Only: Flexible membrane liner placed over close-in-place area. Assume quantity needed is 10% more than close-in-place area.
	11	GEOCOMPOSITE DRAINAGE LAYER	SQ. FT.	527,076	$0.60	$316,246	Alternate Cap System Only: Geocomposite drainage layer placed over close-in-place area. Assume quantity needed is 10% more than close-in-place area.

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET:** Close-in-Place Costs	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY: **Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** Option 2 - Close-in-Place	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

BASIS OF THE ESTIMATE				
YEAR COST BASIS	**2021**		**AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)**	**3**
TOTAL AREA TO BE RESTORED (AC)	**11**		**AVG. DEPTH OF FREE WATER (FT)**	**1.5**
TOTAL IMPOUNDMENT AREA (AC)	**11**		**VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)**	**2,000,000**
VOLUME OF ASH IN IMPOUNDMENT (CY)	**70,000**		**PERIMETER OF IMPOUNDMENT (L.F.)**	**3,100**

CLOSE-IN-PLACE ESTIMATED COSTS

	TASK	ITEM	UNIT	QUANTITY	INSTALLED UNIT COST	IMPOUNDMENT CLOSURE COST	NOTES
STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION	**STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION**						
	12	SITE EROSION AND SEDIMENT CONTROL	ACRE	11	$2,000	$22,000	Assume total area to be restored will require site erosion and sediment control.
	13	STORMWATER MANAGEMENT / CHANNELS / LET-DOWNS	L.F.	4,650	$742	$3,450,300	Assume rip-rap lined stormwater conveyance channels and rip-rap lined let-downs off of cap. Assume 1.5* length of peremeter LF of stormwater channels / let downs.
	14	SEED / FERTILIZE / MULCH	ACRE	11	$3,767	$41,437	Assume total area to be restored will be mulched, fertilized, and seeded.
CONTINGENCY / ENGINEERING SUPPORT	**CONTINGENCY / ENGINEERING SUPPORT**						
	15	CONTINGENCY (25%)	LS	1	$2,711,883	$2,711,883	
	16	ENGINEERING SUPPORT (DESIGN AND CQA 10%)	LS	1	$1,357,869	$1,357,869	
POST-CLOSURE	**POST-CLOSURE**						
	17	GROUNDWATER MONITORING FOR ASH BASIN	ANNUAL	30	$50,000	$1,500,000	Annual groundwater monitoring costs for each CCR impoundment
	18	OPERATIONS & MAINTENANCE (O&M) FOR CLOSURE-IN-PLACE CAP AREA	ANNUAL	30	$27,500	$825,000	Annual O&M costs are $2500/acre/yr for the total closed area with cap.
POST CLOSURE CONTINGENCY / ENGINEERING COST	**POST CLOSURE CONTINGENCY / ENGINEERING COST**						
	19	CONTINGENCY (25%)	LS	1	$581,250	$581,250	
	20	ENGINEERING COST (10%)	LS	1	$290,625	$290,625	
		TOTAL				**$18,114,161**	

AECOM CALCULATION SHEET	PROJECT **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET** Close-in-Place Assumptions	**REV. NO.** A
	SUBJECT Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.** 60669161
	ACTIVITY **Close-in-Place Assumptions**	**CLOSURE OPTION:** Option 2 - Close-in-Place	**LAST UPDATED BY:** PAK	**DATE LAST MODIFIED:** 11/04/21	**REVIEWED BY:** Rob Boeing

KEY ASSUMPTIONS

The following key assumptions and limitations are associated with the project design, implementation and performance:

1	The cost estimates were prepared using 2021 dollars and do not include any escalation.
2	A 25% contingency has been included for this cost estimate.
3	Engineering design and CQA cost has been included for this cost estimate based on reasonable assumptions.
4	Interstitial water treatment was assumed to continue until construction is completed.
5	To establish the posititve slopes, assume existing ash and on-site fill will be utilized to establish crown.
6	Cap cross section for the CCR impoundment will consist of flexible membrane liner, geocomposite drianage layer, and 24-inches of final cover soil overlain by 12-inches of topsoil.
7	Final cover soil assumed to be available onsite and topsoil would come from offsite
8	Groundwater monitoring costs are for the existing network system. Groundwater monitoring costs do not include costs incurred for any additional well installation. Maintenance costs for wells are included in post-closure O&M costs.
9	O&M costs include, but are not limited to, the monitoring and maintenance/repair of the groundwater monitoring system, cap system, and storm water controls.
10	Statements of Probable Construction Cost prepared by AECOM represent AECOM's judgment as a design professional familiar with the construction industry. It is recognized, however, that neither AECOM nor the Owner has control over the cost of labor, materials or equipment nor over the contractor's methods of determining the bid price or other competitive bidding, market, or negotiating conditions. Accordingly, AECOM cannot and does not warrant or represent that proposals, bids or actual construction costs will not vary from any statement of Probable Construction Cost or other estimates or evaluations prepared by AECOM.

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET:** Cost Summary	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY: **Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** Option 3 - Close-in-Place	**LAST UPDATED BY:** MLB	**DATE LAST MODIFIED:** 11/23/2021	**REVIEWED BY:** Jeremy Thomas

Waukegan East Ash Basin: Close-in-Place Option 3
Closure & Post-Closure Cost Summary

Close-in-Place Tasks	Cost (2021 Dollars)
Mobilization / Site Prep	**$1,268,991**
Dewatering / Earthwork / Subgrade Prep.	**$4,372,200**
Closure System Construction	**$1,617,165**
Stormwater Management / E&S Controls / Site Restoration	**$3,461,834**
Contingency (25%)	**$2,680,048**
Engineering Support (Design & CQA)	**$2,900,000**
Total Closure Cost of CCR Impoundment =	**$16,300,238**

Post-Closure Tasks	Cost (2021 Dollars)
Groundwater Monitoring	**$1,500,000**
Operations & Maintenance (O&M)	**$825,000**
Contingency (25%)	**$581,250**
Engineering Costs (10%)	**$290,625**
Total Post-Closure of CCR Impoundment =	**$3,196,875**

Total Closure & Post-Closure of CCR Impoundment Cost =	**$19,497,113**

AECOM CALCULATION SHEET	PROJECT: **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET:** Close-in-Place Costs	**REV. NO.:** A
	SUBJECT: Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.:** 60669161
	ACTIVITY: **Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment**	**CLOSURE OPTION:** Option 3 - Close-in-Place	**LAST UPDATED BY:** MLB	**DATE LAST MODIFIED:** 11/23/21	**REVIEWED BY:** Jeremy Thomas

BASIS OF THE ESTIMATE				
YEAR COST BASIS	**2021**		**AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)**	**3**
TOTAL AREA TO BE RESTORED (AC)	**11**		**AVG. DEPTH OF FREE WATER (FT)**	**1.5**
TOTAL IMPOUNDMENT AREA (AC)	**11**		**VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)**	**2,000,000**
VOLUME OF ASH IN IMPOUNDMENT (CY)	**70,000**		**PERIMETER OF IMPOUNDMENT (L.F.)**	**3,100**

CLOSE-IN-PLACE ESTIMATED COSTS

	TASK	ITEM	UNIT	QUANTITY	INSTALLED UNIT COST	IMPOUNDMENT CLOSURE COST	NOTES
MOBILIZATION / SITE PREP	**MOBILIZATION / SITE PREP**						
	1	MOBILIZATION	LS	1	$118,991	$118,991	Mob/Demob & insurance: (1% of Total EPC Bid Price includes administration (mtgs, health & safety, trailer, phone/fax/electricity, temporary facilities, utilities, roll off boxes, waste disposal, and cleanup).
	2	MODIFY OUTLET STRUCTURES / PIPING	LS	1	$250,000	$250,000	Modify existing outlet structures and piping.
	3	REMOVAL & FILTRATION OF FREE WATER	MONTHS	9	$100,000	$900,000	
DEWATERING / EARTHWORK / SUBGRADE PREP	**DEWATERING / EARTHWORK / SUBGRADE PREP**						
	4	REMOVAL & TREATMENT OF PORE WATER WITHIN ASH	MONTHS	12	$100,000	$1,200,000	Based on Construction Time
	5	ASH REGRADING TO ESTABLISH CROWN	CY	330,000	$9.50	$3,135,000	Quantity of earthwork (cut-to-fill) using existing ash to achieve positive slope prior to installation of closure system. Quantity calculated using AutoCAD.
	6	PERIMETER DITCH / TEMP. DIVERSION BERM GRADING	L.F.	3,100	$12.00	$37,200	Linear feet around the perimeter of impoundment.
	7	CONTACT STORM WATER TREATMENT	GAL				
CLOSURE SYSTEM CONSTRUCTION	**CLOSURE SYSTEM CONSTRUCTION**						
	8	FINAL COVER SYSTEM - ENGINEERED TURF	SF	588,060	$2.75	$1,617,165	

AECOM CALCULATION SHEET	PROJECT: CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN	PLANT NAME: Waukegan	CLOSURE TYPE: Closure-in-Place	SHEET: Close-in-Place Costs	REV. NO.: A
	SUBJECT: Preliminary Project Costs Sheets	IMPOUNDMENT NAME: East Ash Basin			AECOM JOB NO.: 60669161
	ACTIVITY: Cost Summary: Close-in-Place Cost Estimate for CCR Impoundment	CLOSURE OPTION: Option 3 - Close-in-Place	LAST UPDATED BY: MLB	DATE LAST MODIFIED: 11/23/21	REVIEWED BY: Jeremy Thomas

BASIS OF THE ESTIMATE				
YEAR COST BASIS	2021		AREA OF OPEN FREE WATER IN IMPOUNDMENT (AC)	3
TOTAL AREA TO BE RESTORED (AC)	11		AVG. DEPTH OF FREE WATER (FT)	1.5
TOTAL IMPOUNDMENT AREA (AC)	11		VOLUME OF FREE WATER IN IMPOUNDMENT (GAL)	2,000,000
VOLUME OF ASH IN IMPOUNDMENT (CY)	70,000		PERIMETER OF IMPOUNDMENT (L.F.)	3,100

CLOSE-IN-PLACE ESTIMATED COSTS

	TASK	ITEM	UNIT	QUANTITY	INSTALLED UNIT COST	IMPOUNDMENT CLOSURE COST	NOTES
STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION	**STORMWATER MANAGEMENT / E&S CONTROLS / SITE RESTORATION**						
	9	SITE EROSION AND SEDIMENT CONTROL	ACRE	2	$2,000	$4,000	Assume total area to be restored will require site erosion and sediment control.
	10	STORMWATER MANAGEMENT / CHANNELS / LET-DOWNS	L.F.	4,650	$742	$3,450,300	Assume rip-rap lined stormwater conveyance channels and rip-rap lined let-downs off of cap. Assume 1.5* length of peremeter LF of stormwater channels / let downs.
	11	SEED / FERTILIZE / MULCH	ACRE	2	$3,767	$7,534	Assume total area to be restored will be mulched, fertilized, and seeded.
CONTINGENCY / ENGINEERING SUPPORT	**CONTINGENCY / ENGINEERING SUPPORT**						
	12	CONTINGENCY (25%)	LS	1	$2,680,048	$2,680,048	
	13	ENGINEERING SUPPORT (DESIGN AND CQA 10%)	LS	1	$1,297,900	$1,297,900	
POST-CLOSURE	**POST-CLOSURE**						
	14	GROUNDWATER MONITORING FOR ASH BASIN	ANNUAL	30	$50,000	$1,500,000	Annual groundwater monitoring costs for each CCR impoundment
	15	OPERATIONS & MAINTENANCE (O&M) FOR CLOSURE-IN-PLACE CAP AREA	ANNUAL	30	$27,500	$825,000	Annual O&M costs are $2500/acre/yr for the total closed area with cap.
POST CLOSURE CONTINGENCY / ENGINEERING COST	**POST CLOSURE CONTINGENCY / ENGINEERING COST**						
	16	CONTINGENCY (25%)	LS	1	$581,250	$581,250	
	17	ENGINEERING COST (10%)	LS	1	$290,625	$290,625	
		TOTAL				**$17,895,013**	

AECOM CALCULATION SHEET	PROJECT **CCR IMPOUNDMENT CLOSURE ESTIMATES FOR MWG WAUKEGAN**	**PLANT NAME:** Waukegan	**CLOSURE TYPE:** Closure-in-Place	**SHEET** Close-in-Place Assumptions	**REV. NO.** A
	SUBJECT Preliminary Project Costs Sheets	**IMPOUNDMENT NAME:** East Ash Basin			**AECOM JOB NO.** 60669161
	ACTIVITY **Close-in-Place Assumptions**	**CLOSURE OPTION:** Option 3 - Close-in-Place	**LAST UPDATED BY:** MLB	**DATE LAST MODIFIED:** 11/23/21	**REVIEWED BY:** Jeremy Thomas

KEY ASSUMPTIONS

The following key assumptions and limitations are associated with the project design, implementation and performance:

1	The cost estimates were prepared using 2021 dollars and do not include any escalation.
2	A 25% contingency has been included for this cost estimate.
3	Engineering design and CQA cost has been included for this cost estimate based on reasonable assumptions.
4	Interstitial water treatment was assumed to continue until construction is completed.
5	To establish the positive slopes, assume existing ash and on-site fill will be utilized to establish crown.
6	Cap cross section for the CCR impoundment will consist of flexible membrane liner, geocomposite drianage layer, and 24-inches of final cover soil overlain by 6-inches of topsoil.
7	Final cover soil assumed to be available onsite and topsoil would come from offsite
8	Groundwater monitoring costs are for the existing network system. Groundwater monitoring costs do not include costs incurred for any additional well installation. Maintenance costs for wells are included in post-closure O&M costs.
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ATTACHMENT C

Midwest Generation Groundwater Modeling Waukegan, IL

NOVEMBER, 2021

BAS GROUNDWATER CONSULTING

KPRG

ENVIRONMENTAL CONSULTATION & REMEDIATION

KPRG and Associates, Inc.

Model Scenarios

DRAFT

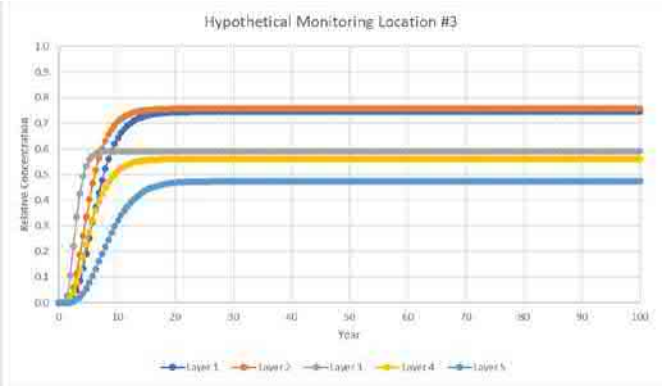
- Starting Conditions:
  - Defined a surrogate source of "1" beneath Ash Ponds, forward run for 100 years with advection and dispersion (=1 as in LSQ modeling)
- Model Scenarios:
  - Initial conditions: the calibrated, steady-state flow system and the 100-year equilibrated mass from the constant source model run:
    1. Closure by removal: Remove the source. Assume the liners are removed, assign natural/background recharge to pond footprint. Run for 100 years.
    2. Closure by removal: Remove the source. Assume the liner beneath the east pond is removed and assign natural/background recharge to east pond footprint. Assume a liner on the west pond with a vertical permeability of 10^{-13} cm/s, assign recharge 5 OM < background. Run for 100 years.
    3. Closure by capping: Dewater ash, cover ash with cap system. Assign low recharge through the pond footprints to represent a cap. Assume cap has vertical permeability of 10^{-13} cm/s, assign recharge 5 OM < background. Run for 100 years.
    4. Closure by removal for the west pond, Closure by capping for the east pond: Remove the source from beneath the west pond, assume a liner on the west pond with a vertical permeability of 10^{-13} cm/s, assign recharge 5 OM < background. Dewater ash within the east pond, cover with cap system, assume cap has vertical permeability of 10^{-13} cm/s, assign low (5 OM <background) recharge through east pond footprint. Run for 100 years.

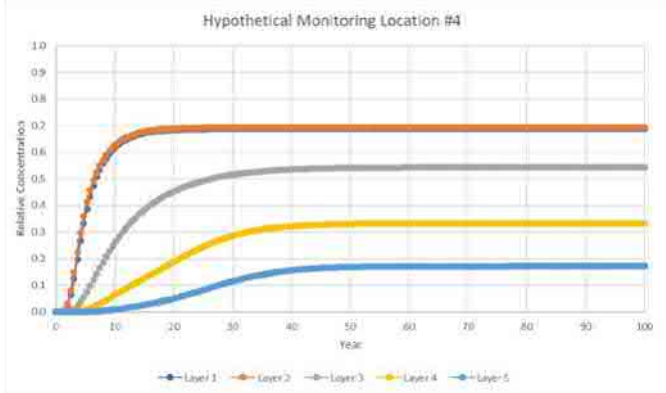
*OM = orders of magnitude

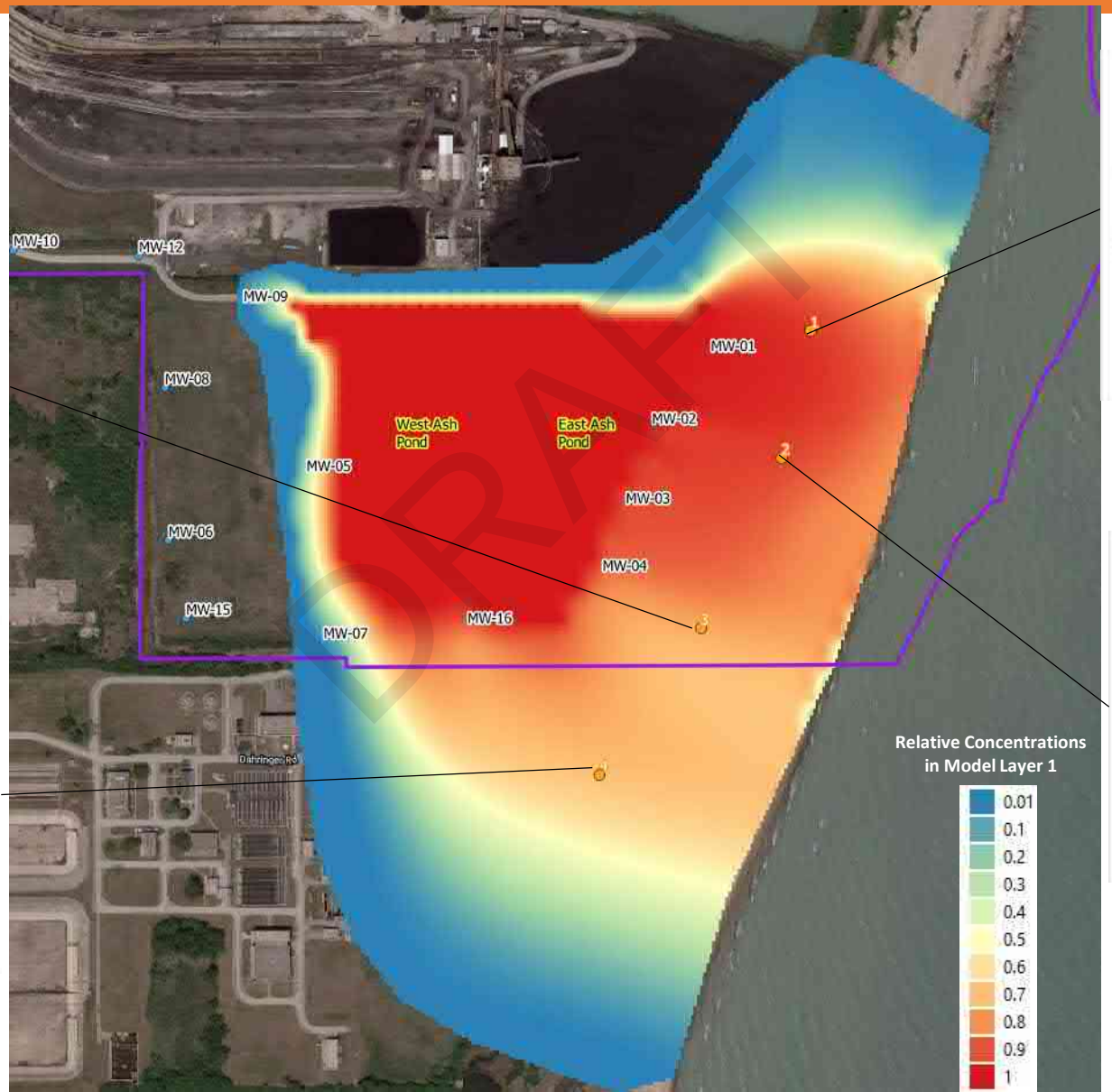
Model Scenarios Starting Conditions

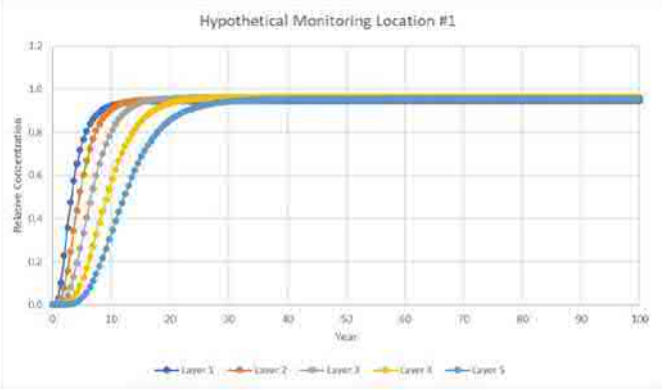
DRAFT

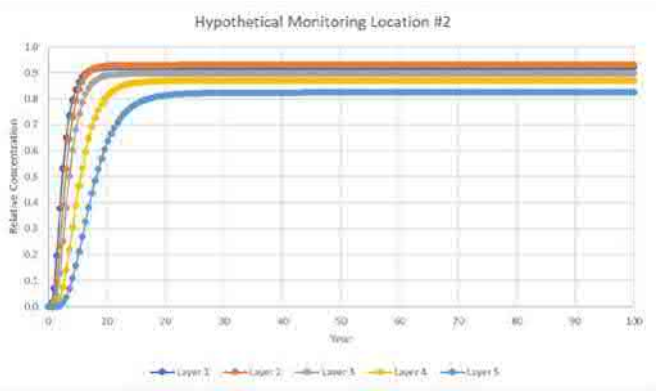
- Starting Conditions: Defined a surrogate source of “1” beneath Ash Ponds, forward run for 100 years with advection and dispersion











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Model Scenario #1

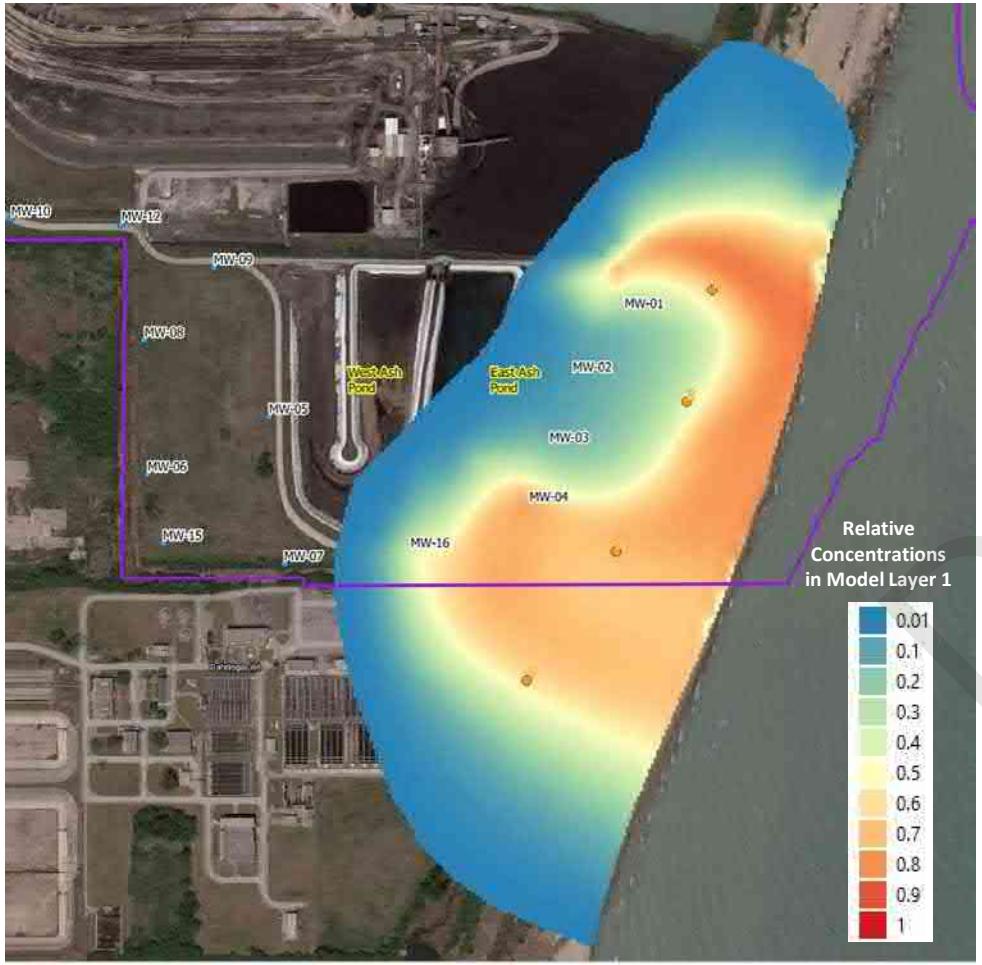
DRAFT

- Model Scenarios:
  - Initial conditions: the calibrated, steady-state flow system and the 100-year equilibrated mass from the constant source model run:
    1. Closure by removal: Remove the source. Assume the liners are removed, assign natural/background recharge to pond footprint. Run for 100 years.

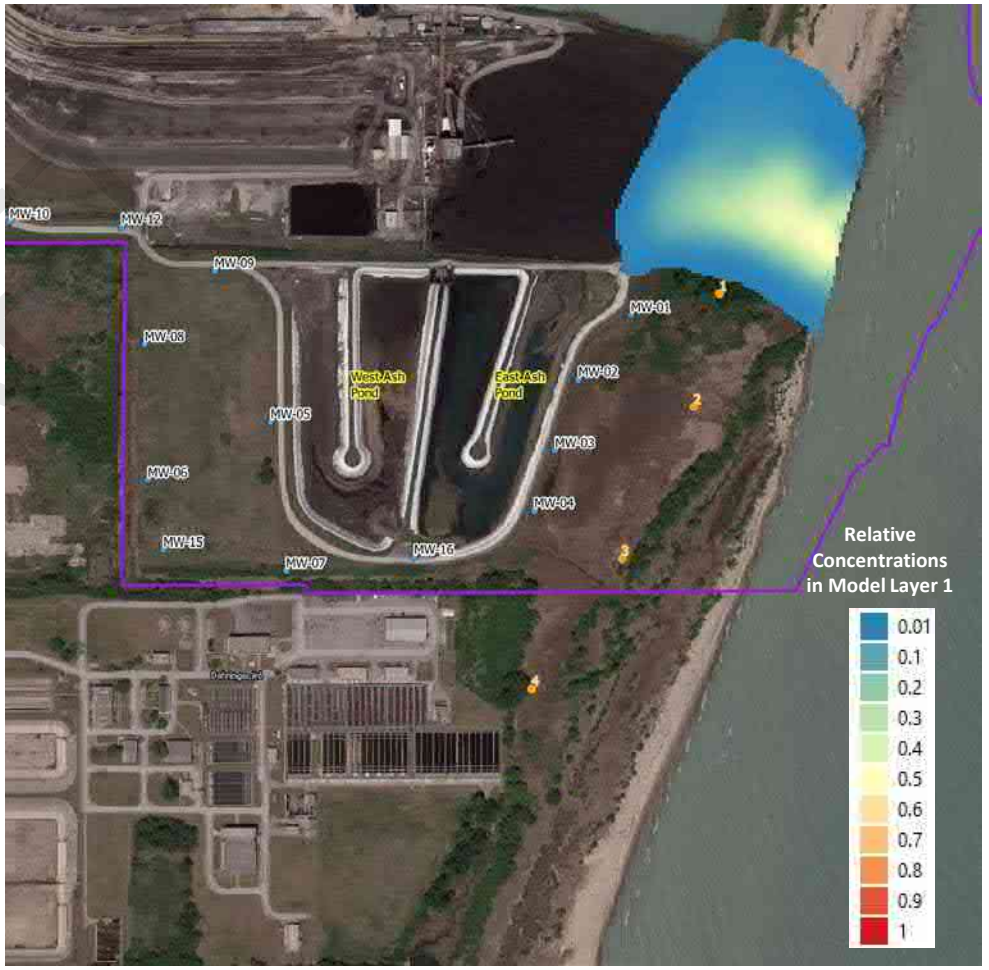
5- and 25-year plume distributions

DRAFT

- 5 YEAR, Model Layer 1, Scenario 1



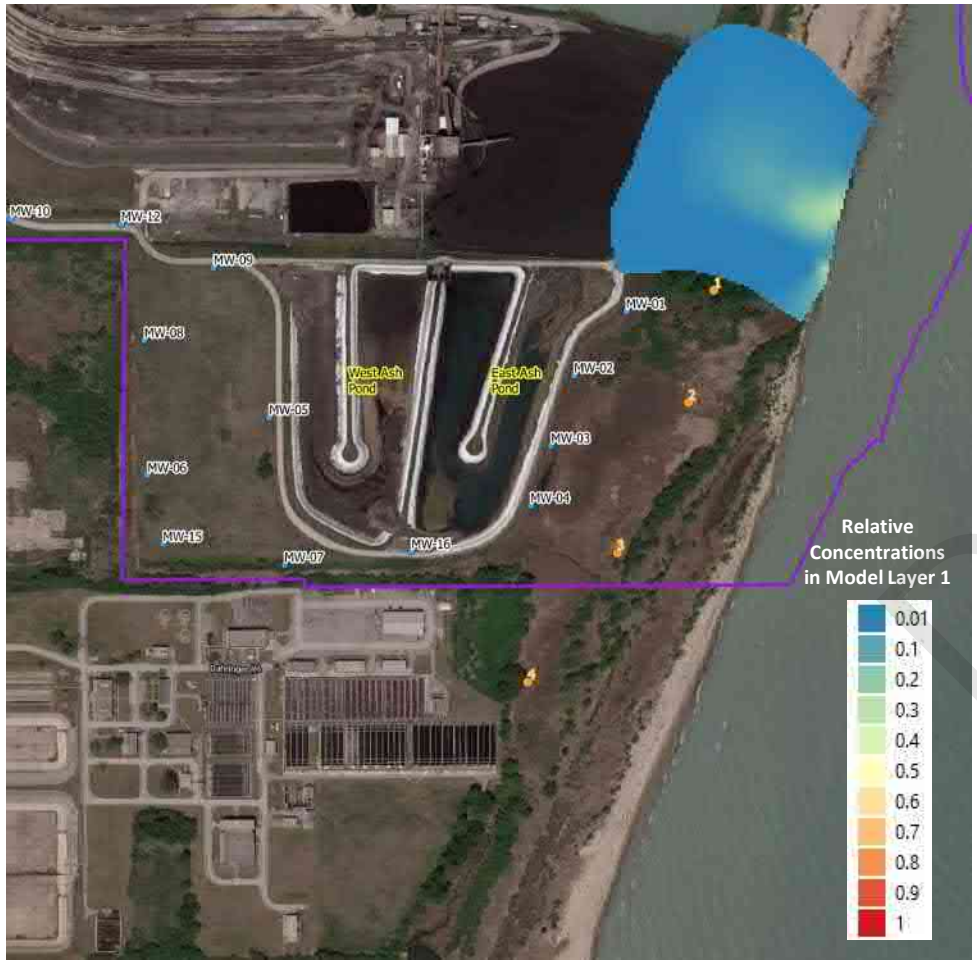
- 25 YEAR, Model Layer 1, Scenario 1



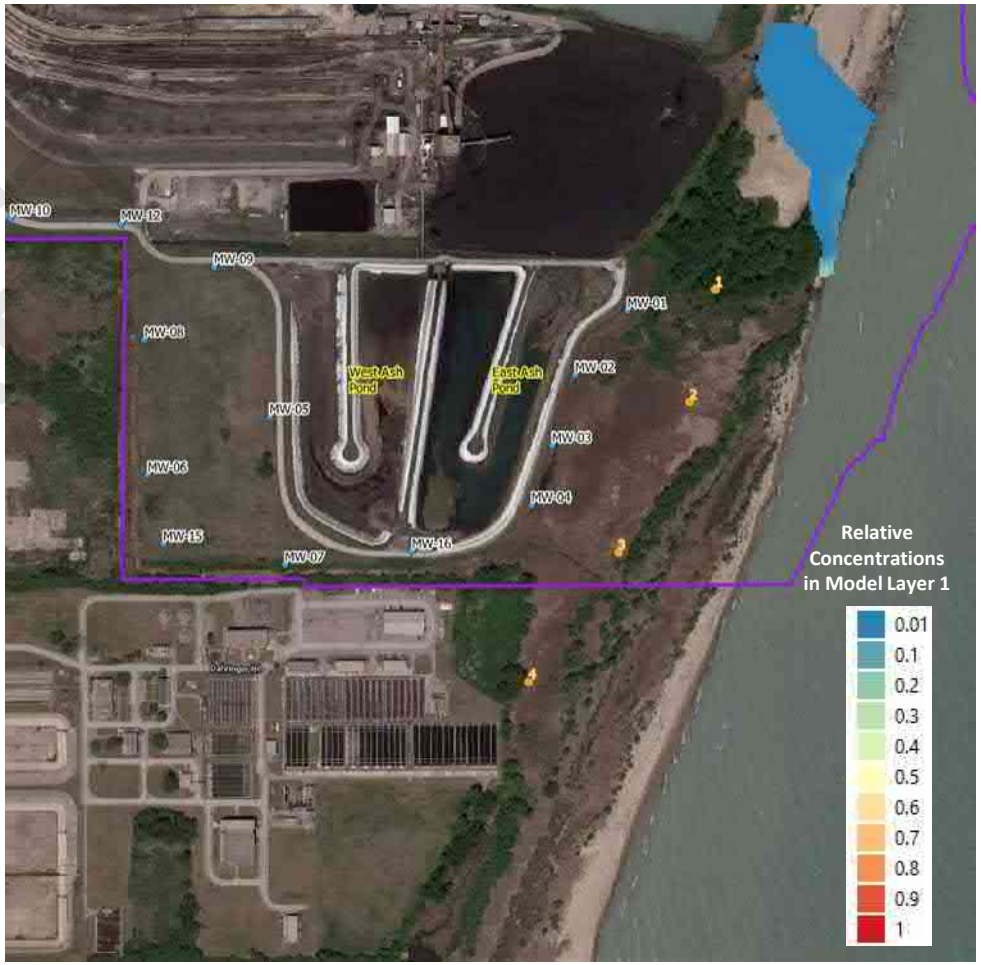
50- and 100-year plume distributions

DRAFT

- 50 YEAR, Model Layer 1, Scenario 1



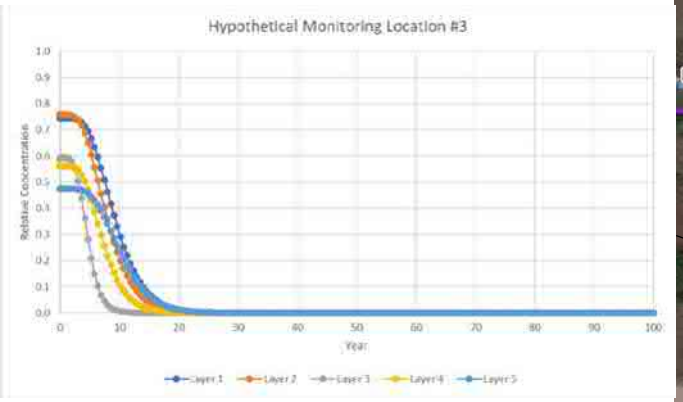
- 100 YEAR, Model Layer 1, Scenario 1

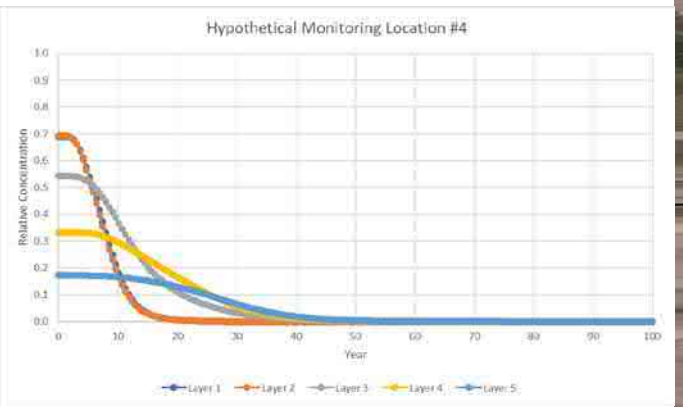


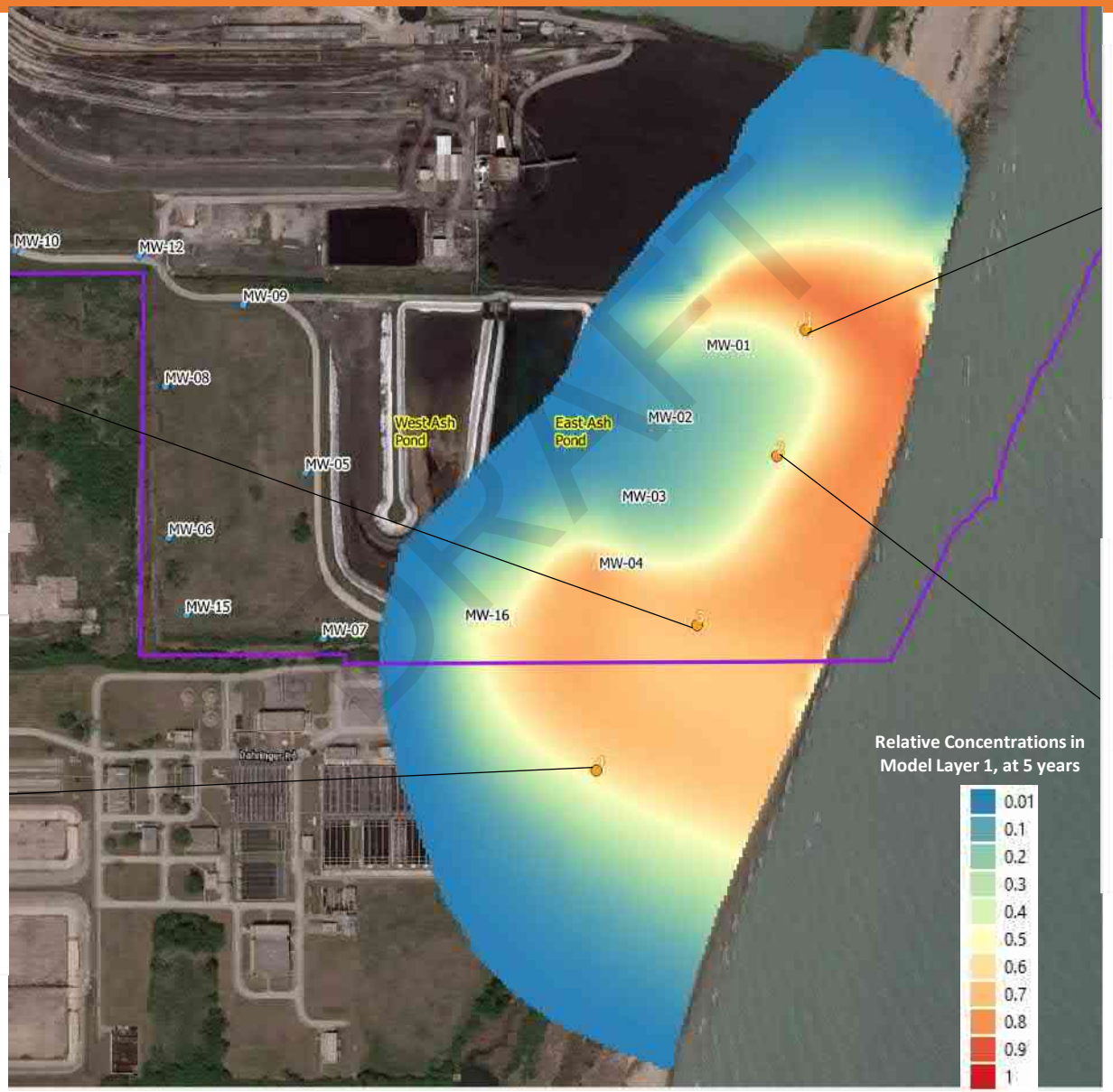
Model Scenario #1

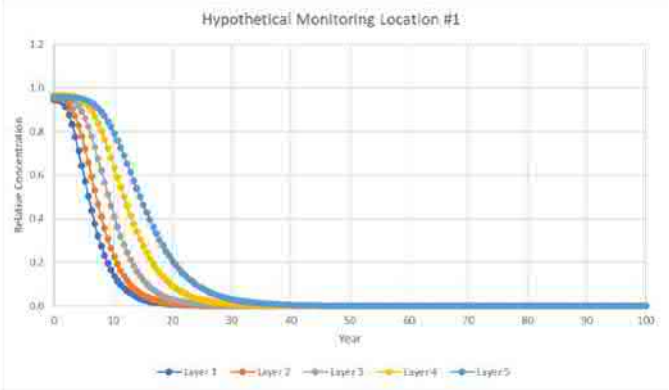
DRAFT

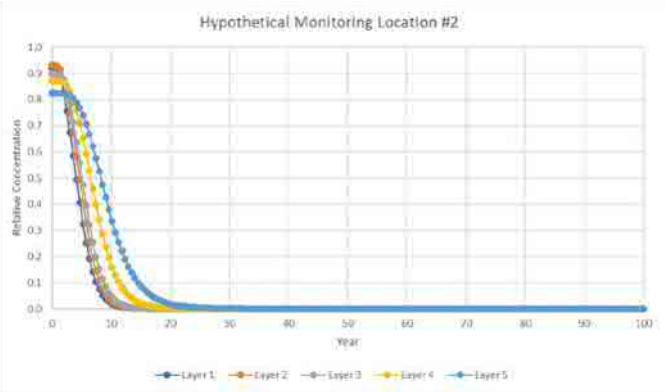
- Starting Conditions: Constant source distribution at 100 years











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Model Scenario #2

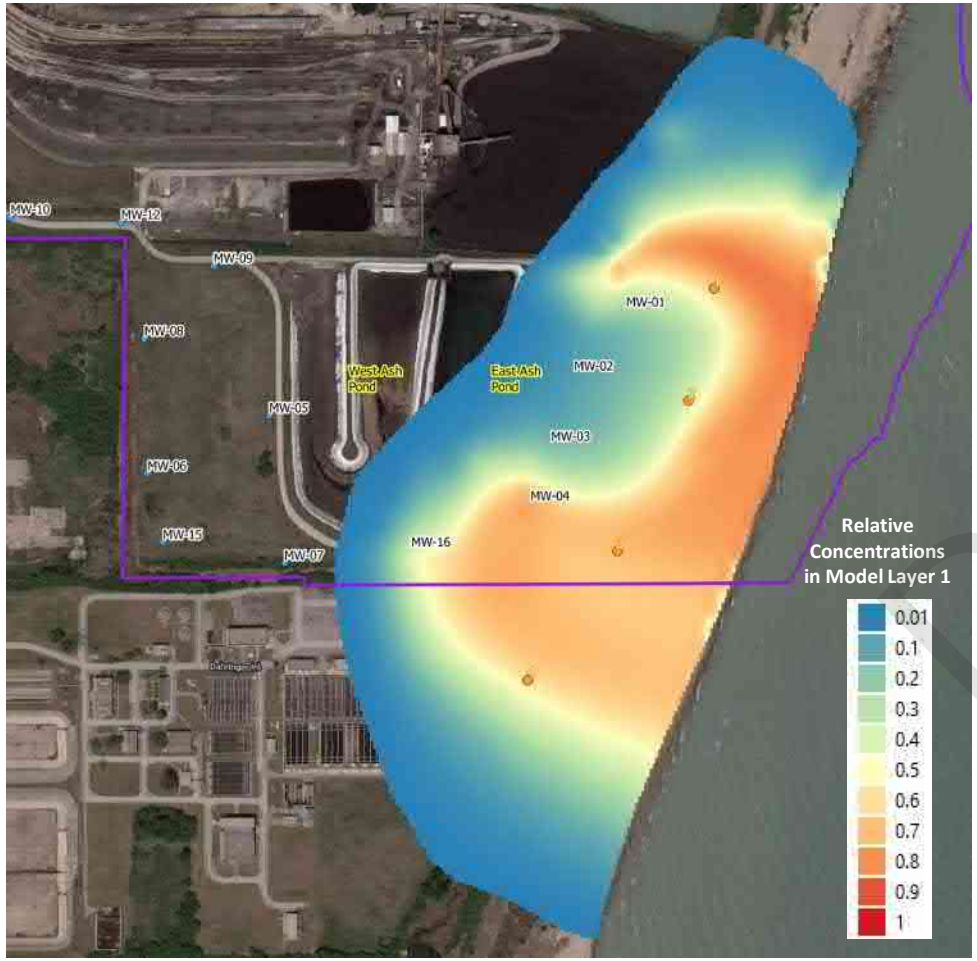
DRAFT

- Model Scenarios:
  - Initial conditions: the calibrated, steady-state flow system and the 100-year equilibrated mass from the constant source model run:
    2. Closure by removal: Remove the source. Assume the liner beneath the east pond is removed and assign natural/background recharge to east pond footprint. Assume a liner on the west pond with a vertical permeability of 10^{-13} cm/s, assign recharge 5 OM < background. Run for 100 years.

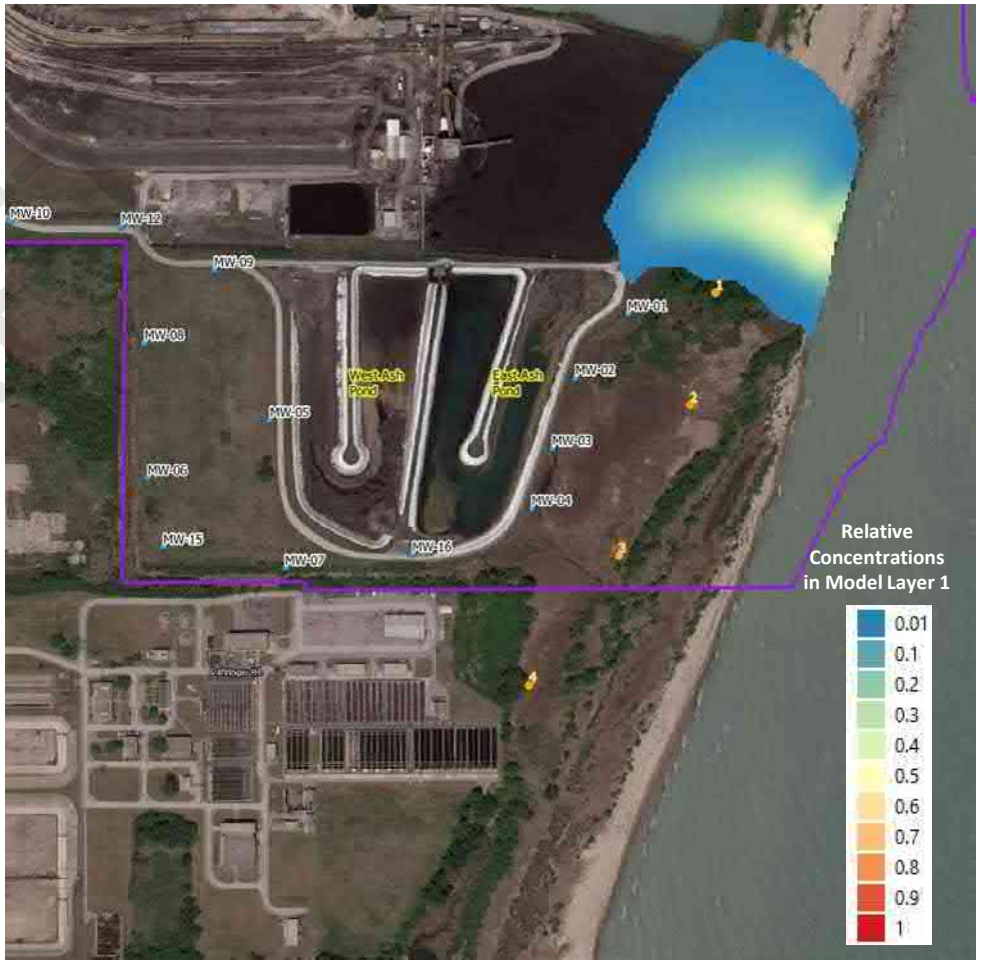
5- and 25-year plume distributions

DRAFT

- 5 YEAR, Model Layer 1, Scenario 2



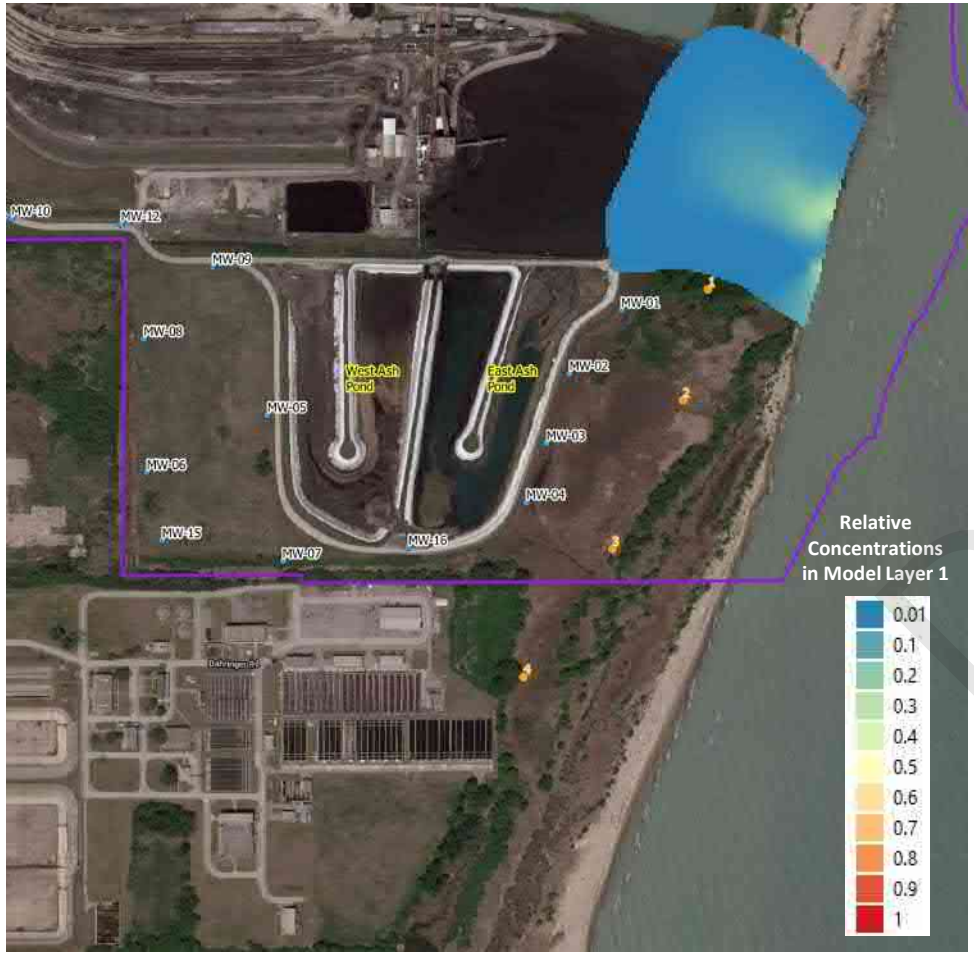
- 25 YEAR, Model Layer 1, Scenario 2



50- and 100-year plume distributions

DRAFT

- 50 YEAR, Model Layer 1, Scenario 2

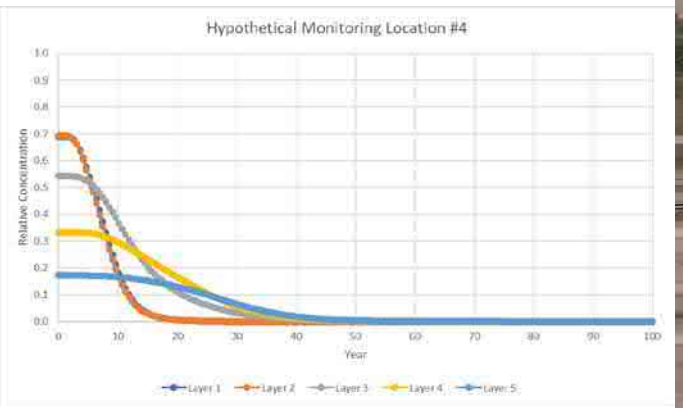


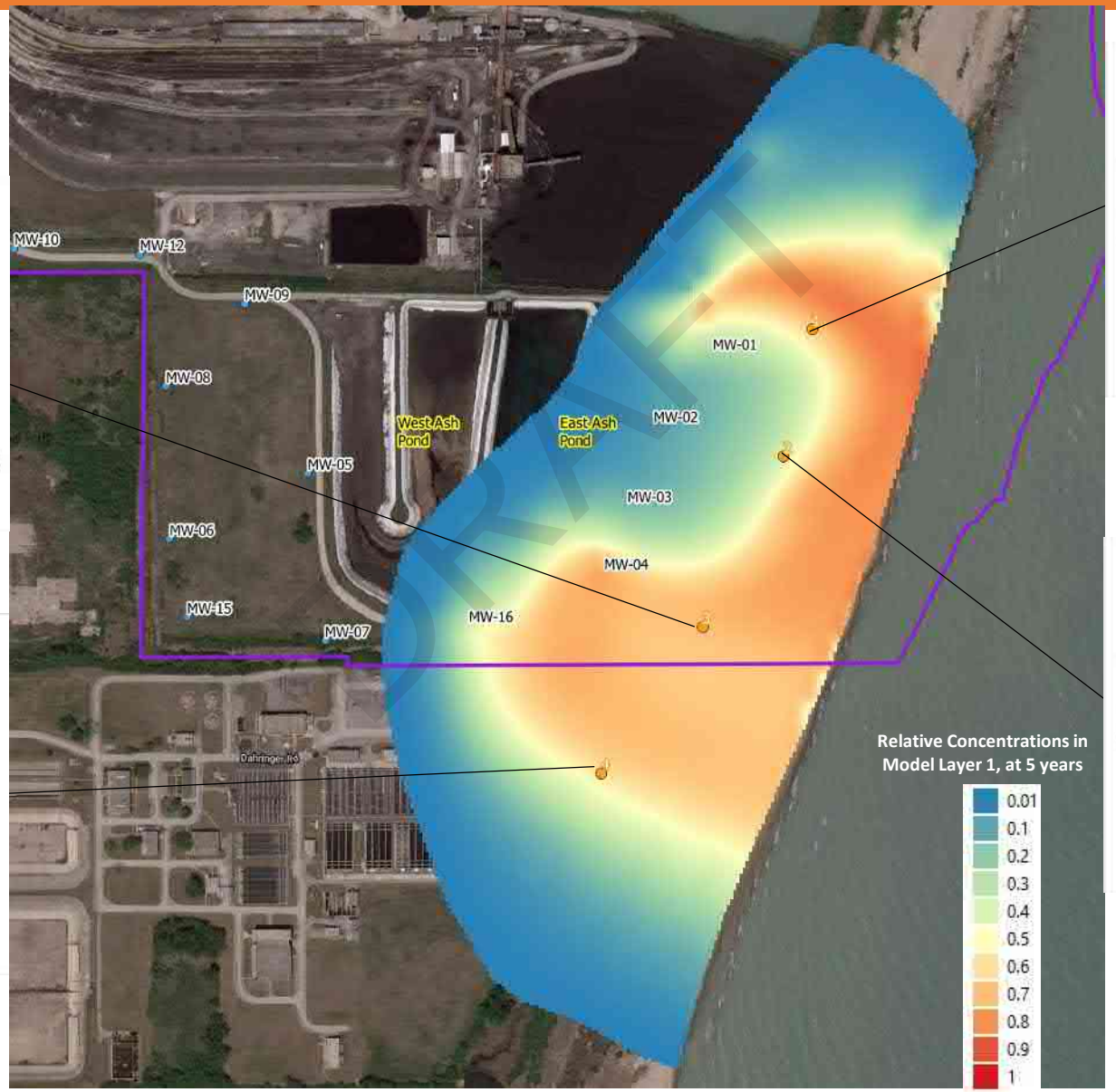
- 100 YEAR, Model Layer 1, Scenario 2

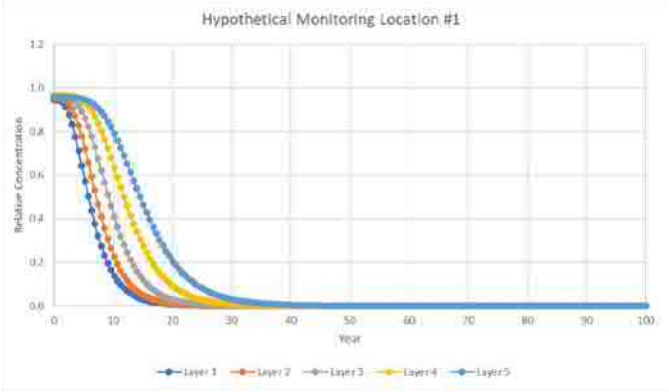
Model Scenario #2

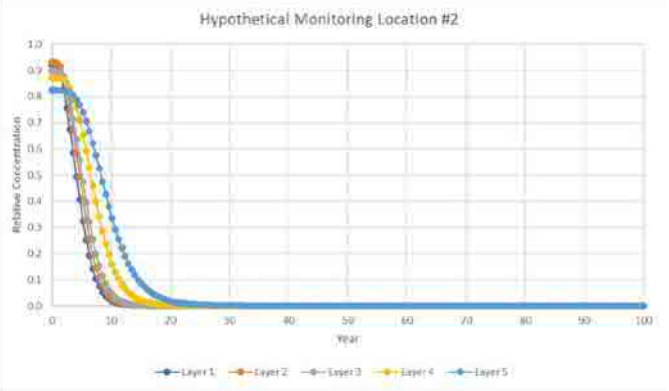
DRAFT

- Starting Conditions: Constant source distribution at 100 years









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Model Scenario #3

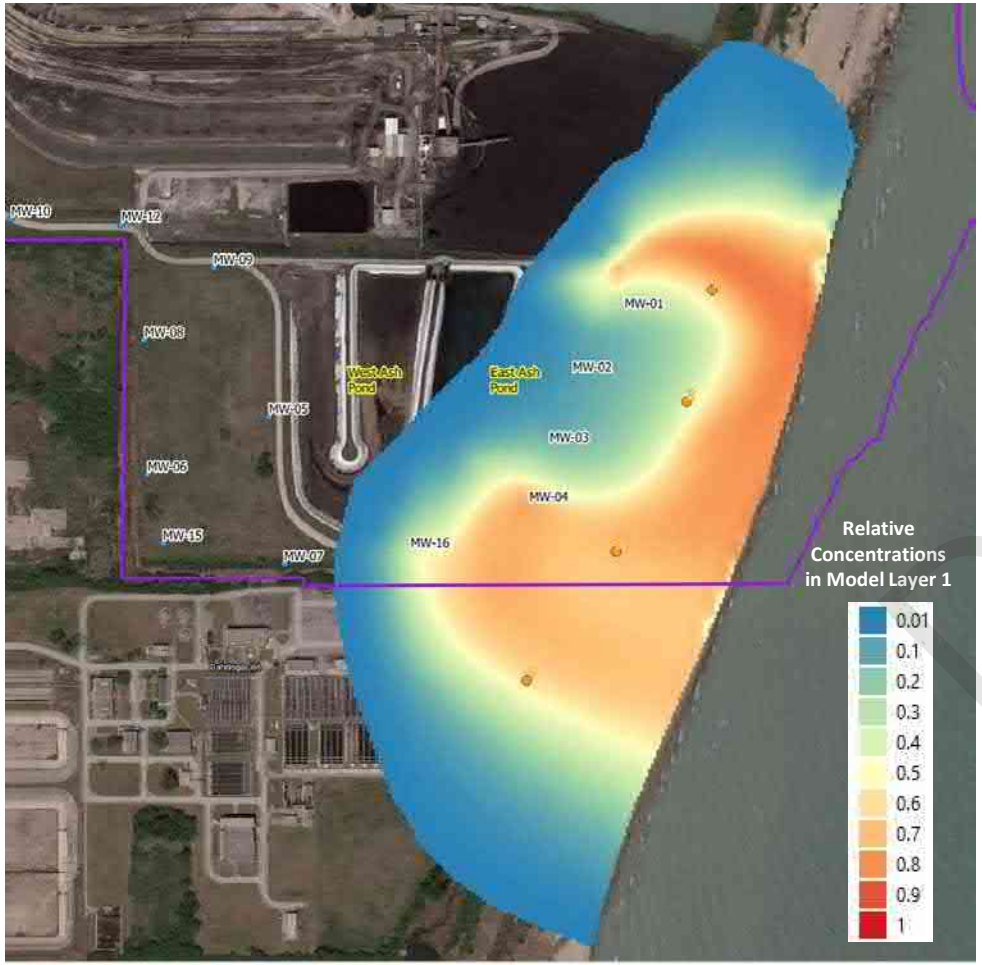
DRAFT

- Model Scenarios:
  - Initial conditions: the calibrated, steady-state flow system and the 100-year equilibrated mass from the constant source model run:
    3. Closure by capping: Hydraulically isolate (dewater ash) the source from the water table. Both pond liners remain. Assign low recharge through the pond footprints to represent a cap. Assume cap has vertical permeability of 10^{-13} cm/s, assign recharge 5 OM < background. Run for 100 years.

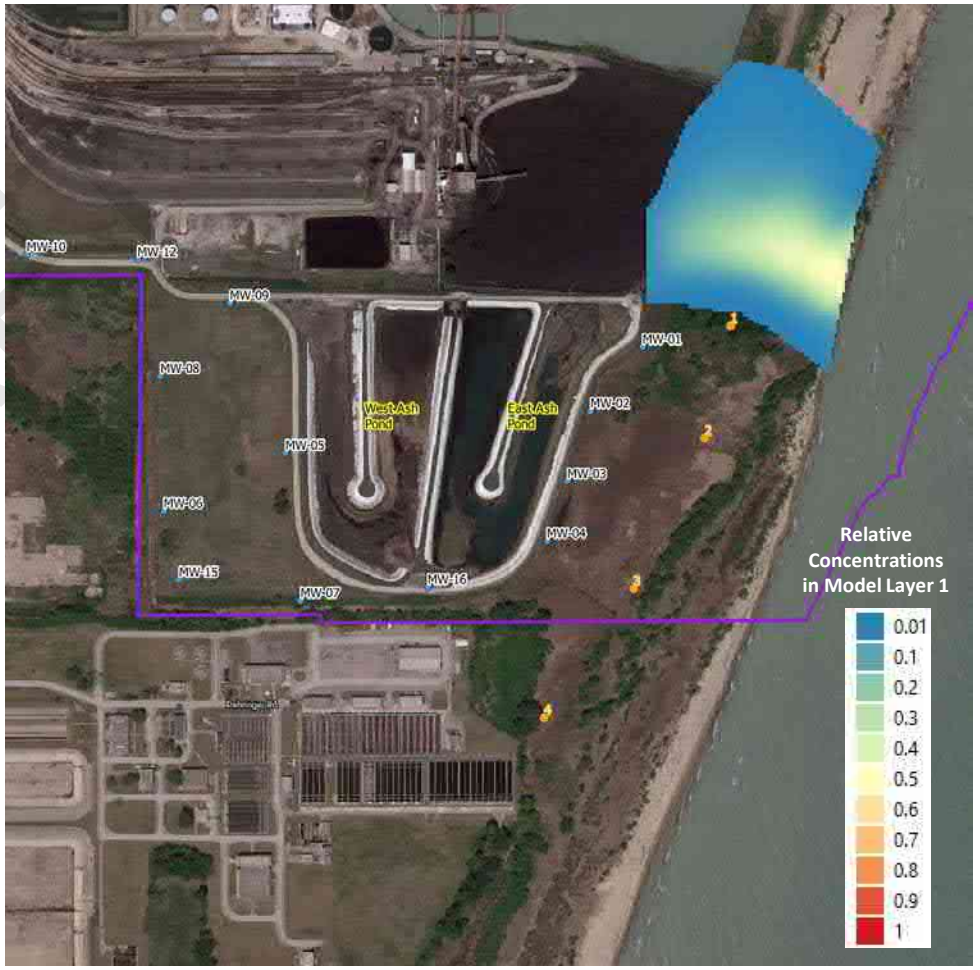
5- and 25-year plume distributions

DRAFT

- 5 YEAR, Model Layer 1, Scenario 3



- 25 YEAR, Model Layer 1, Scenario 3

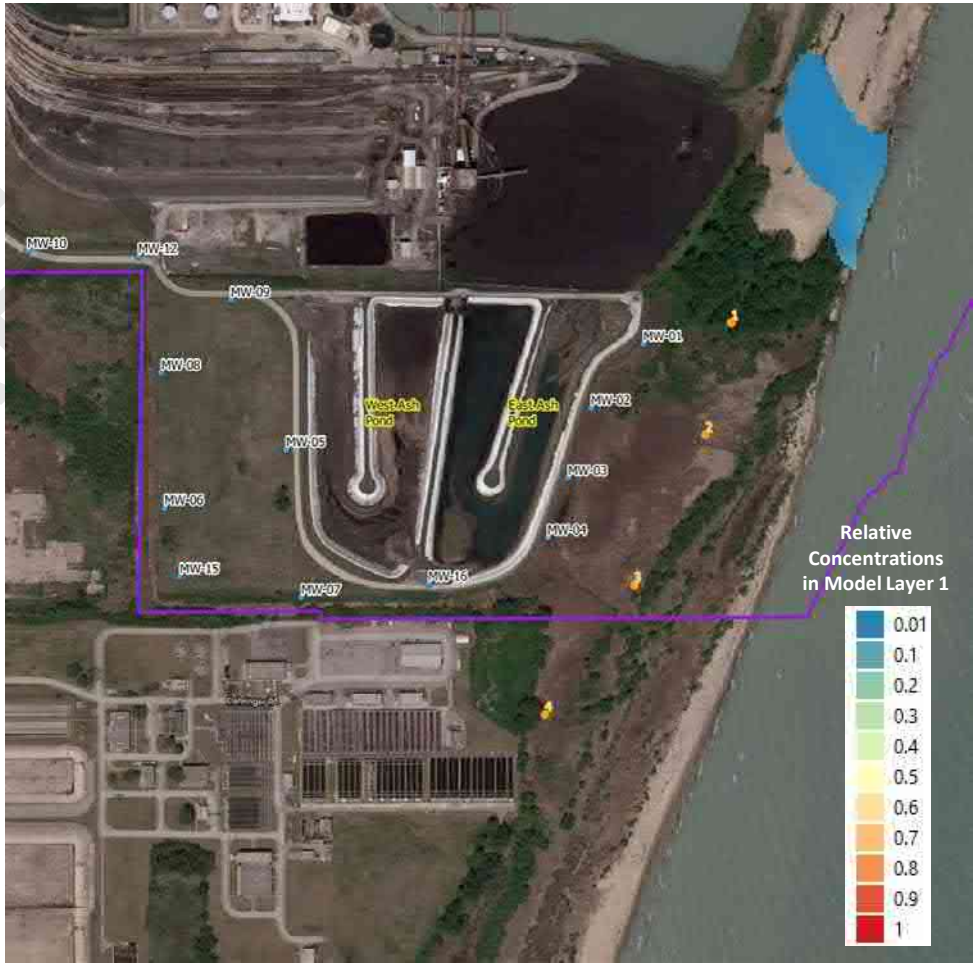


50- and 100-year plume distributions

DRAFT

- 50 YEAR, Model Layer 1, Scenario 3

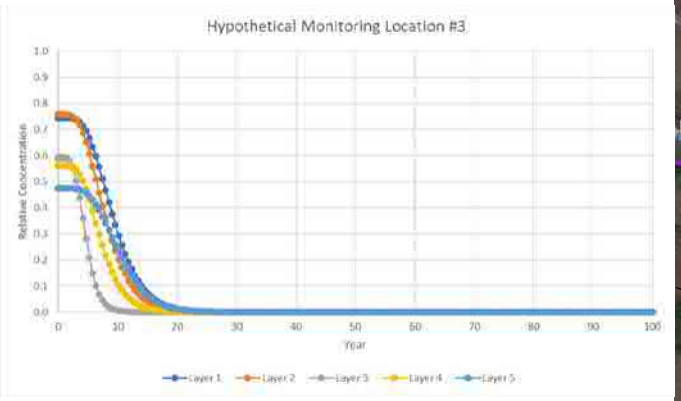
- 100 YEAR, Model Layer 1, Scenario 3

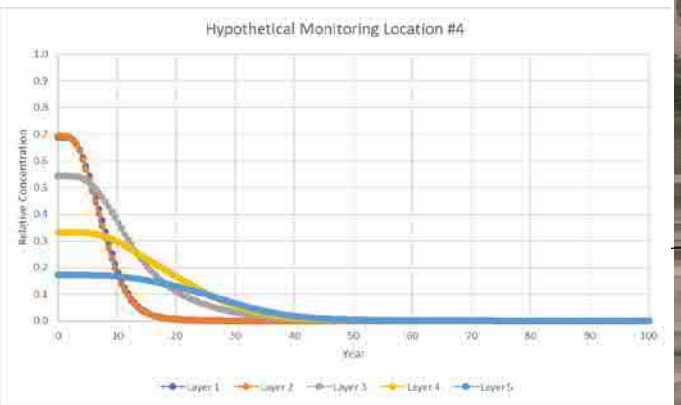


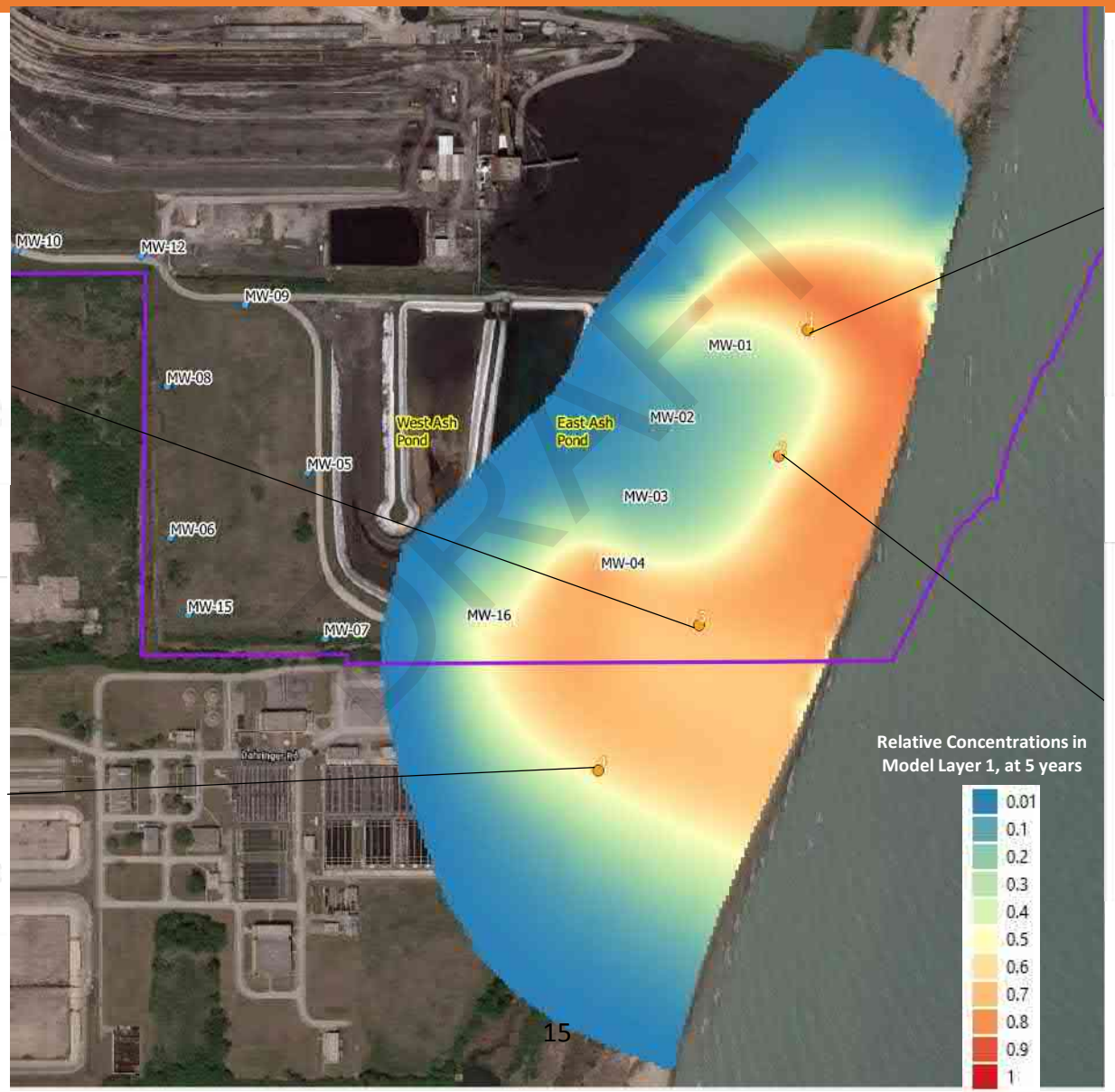
Model Scenario #3

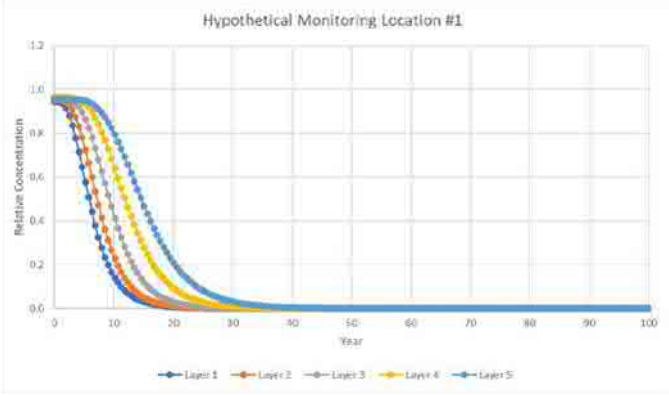
DRAFT

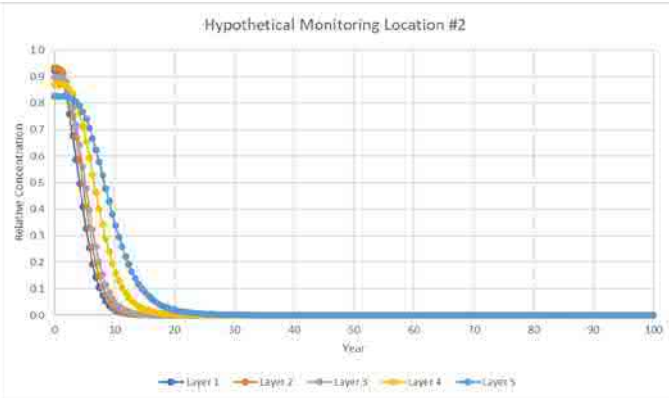
- Starting Conditions: Constant source distribution at 100 years











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Model Scenario #4

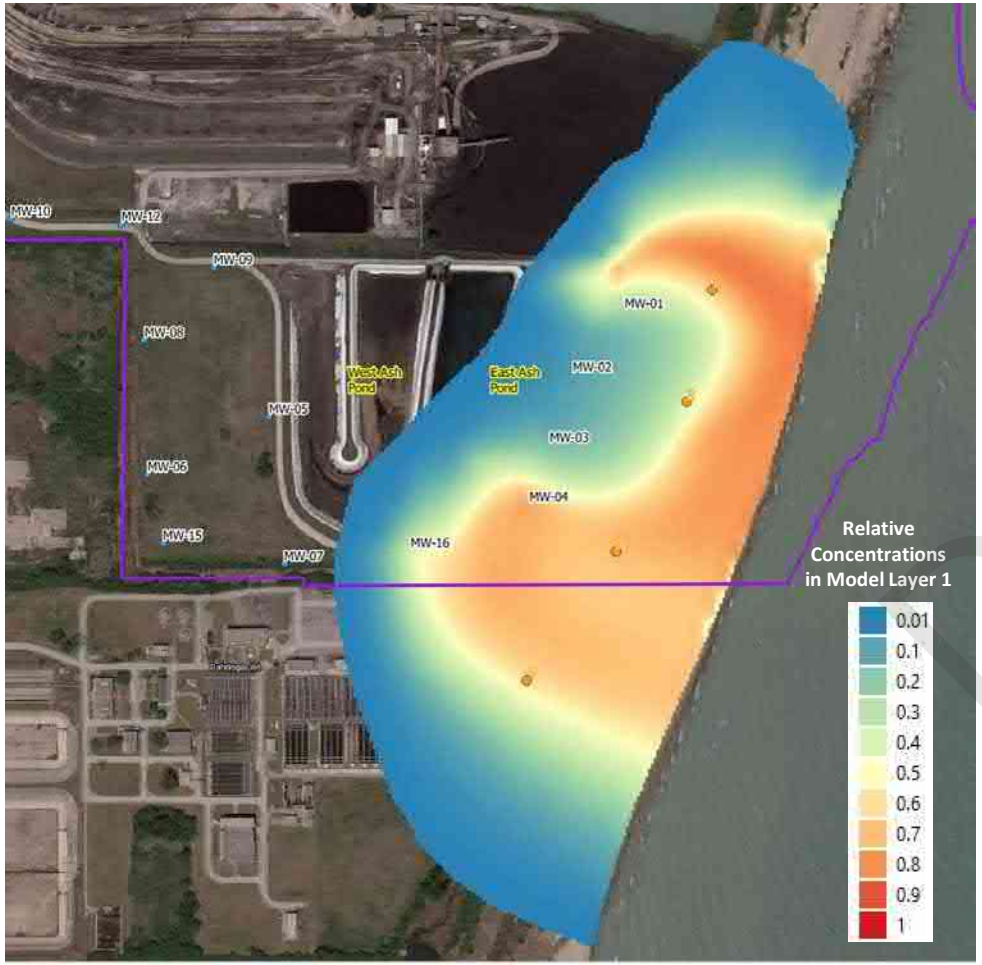
DRAFT

- Model Scenarios:
  - Initial conditions: the calibrated, steady-state flow system and the 100-year equilibrated mass from the constant source model run:
    4. Closure by removal for the west pond with a liner, closure by capping for the east pond: remove the source from beneath the west pond, assume a liner on the west pond with a vertical permeability of 10^{-13} cm/s, assign low (5 OM <background) recharge through west pond footprint. Hydraulically isolate (dewater ash) the source in the east pond from the water table, cover ash with cap system. Assign low recharge through east pond to represent a cap. Assume cap has vertical permeability of 10^{-13} cm/s, assign low (5 OM <background) recharge through east pond footprint. Run for 100 years.

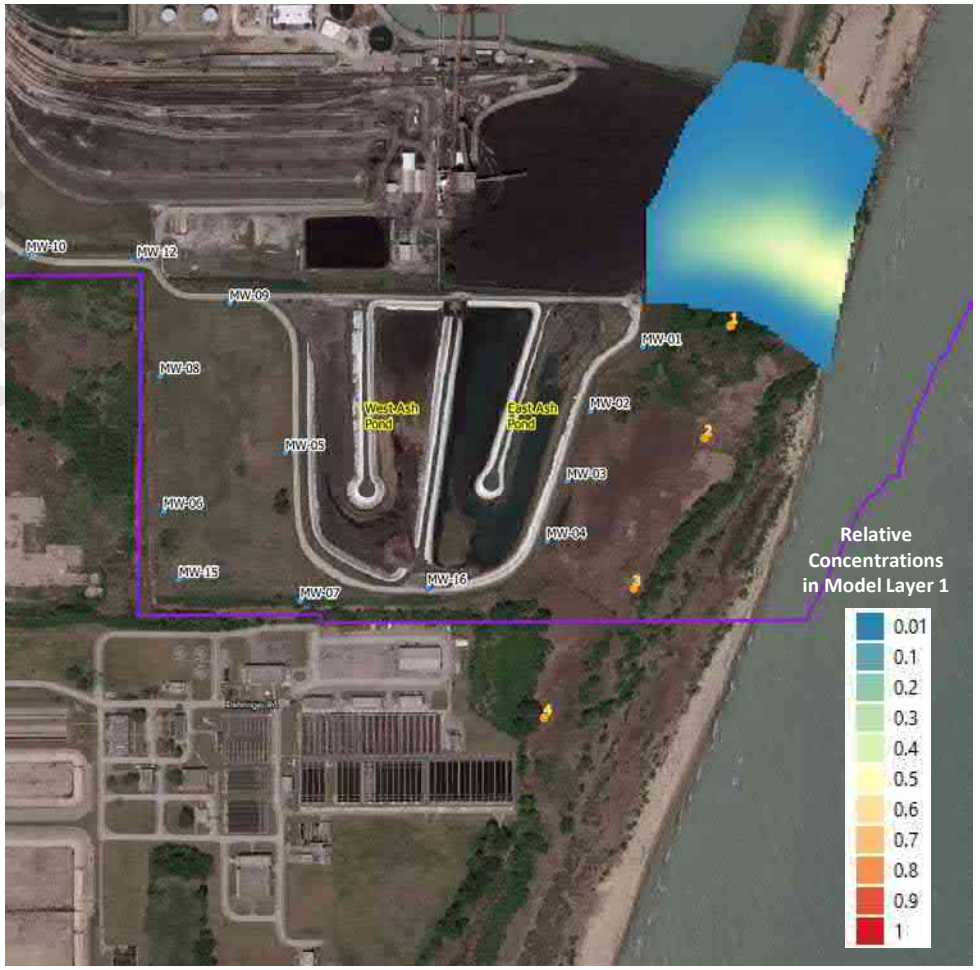
5- and 25-year plume distributions

DRAFT

- 5 YEAR, Model Layer 1, Scenario 4



- 25 YEAR, Model Layer 1, Scenario 4

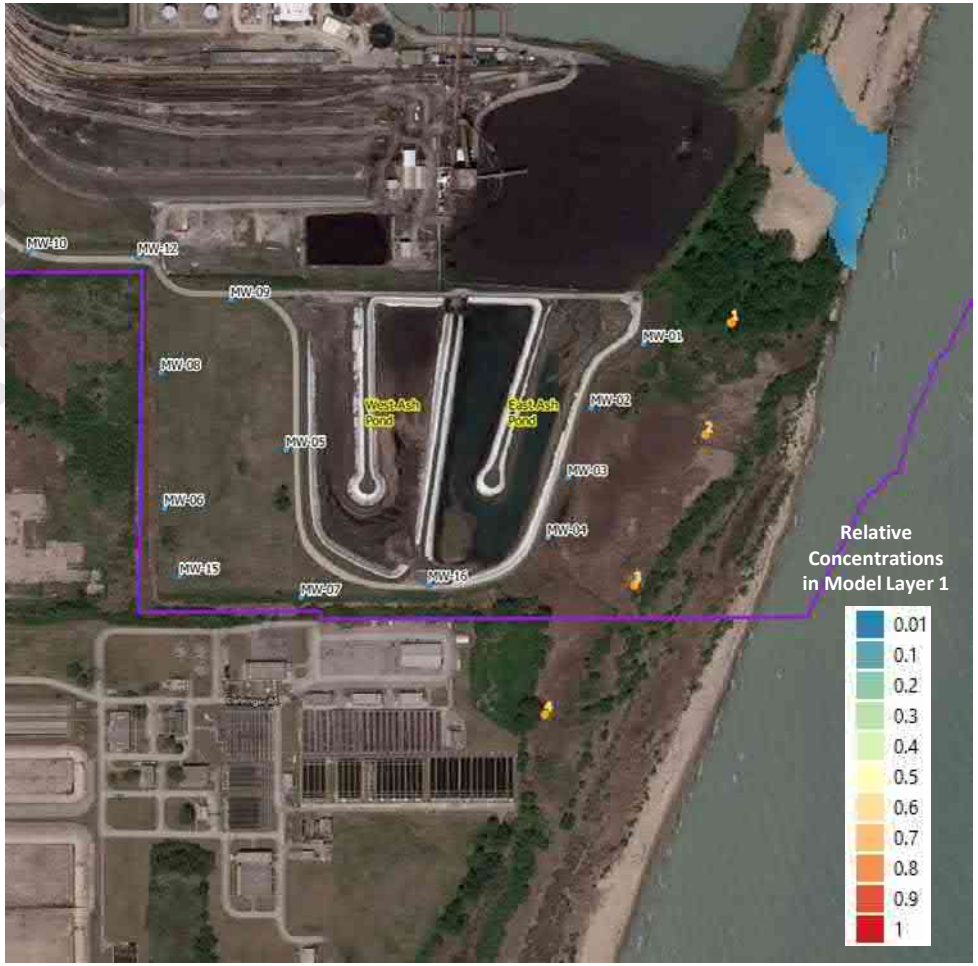


50- and 100-year plume distributions

DRAFT

- 50 YEAR, Model Layer 1, Scenario 4

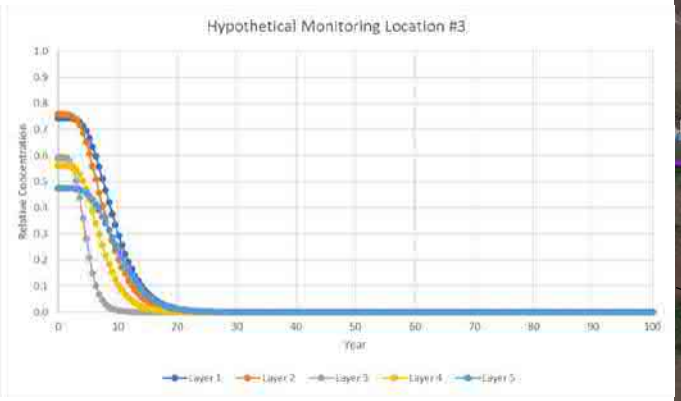
- 100 YEAR, Model Layer 1, Scenario 4

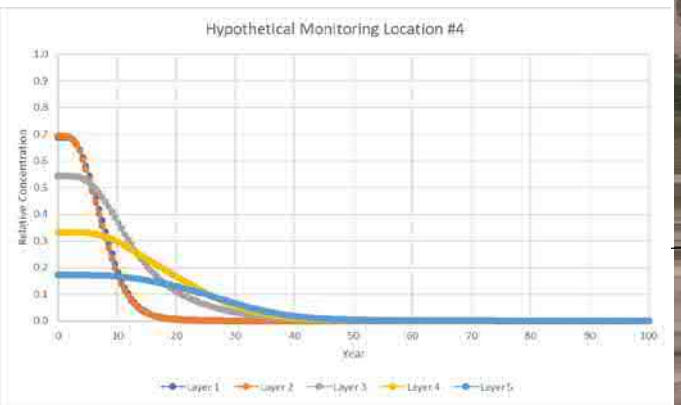


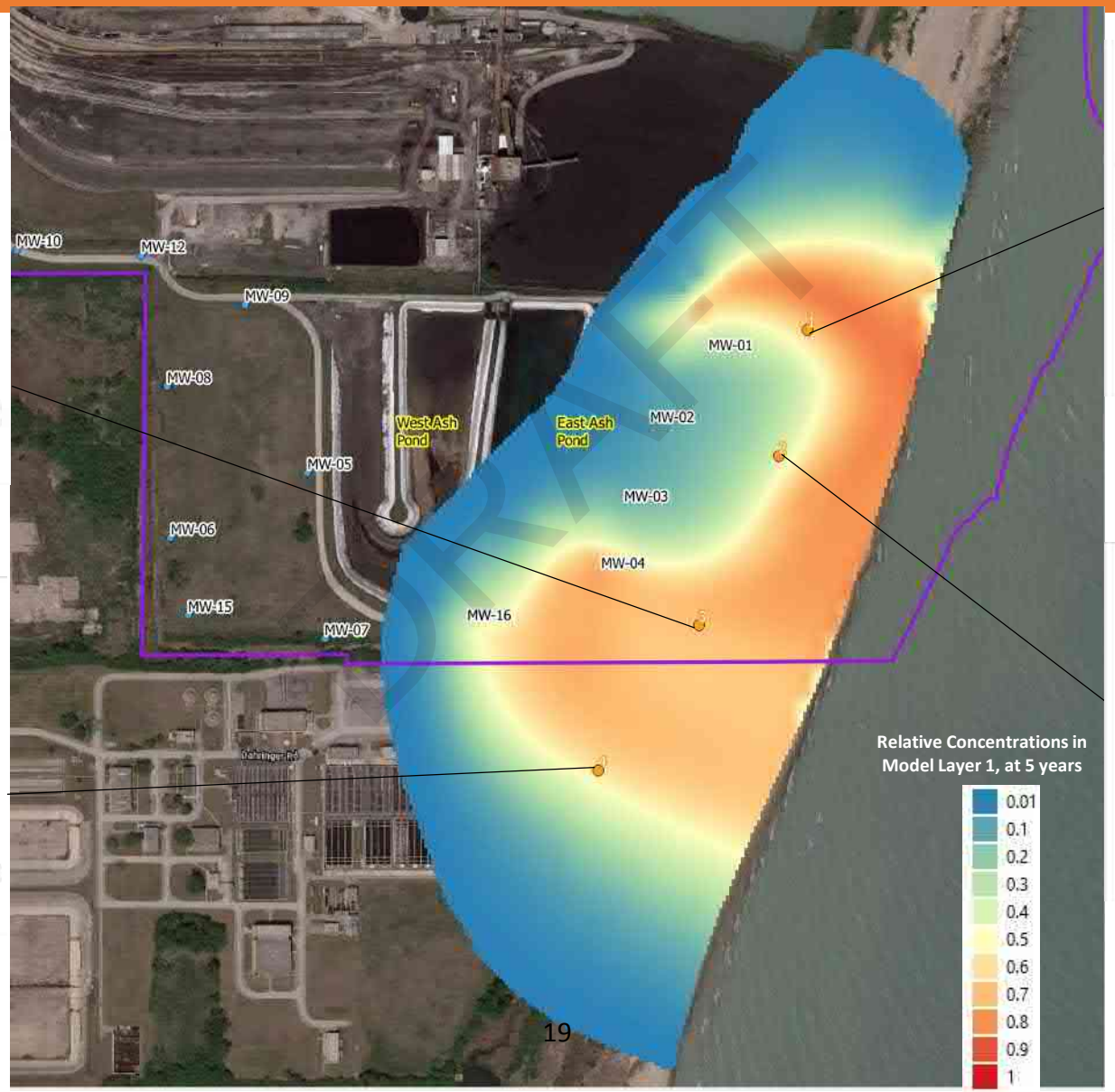
Model Scenario #4

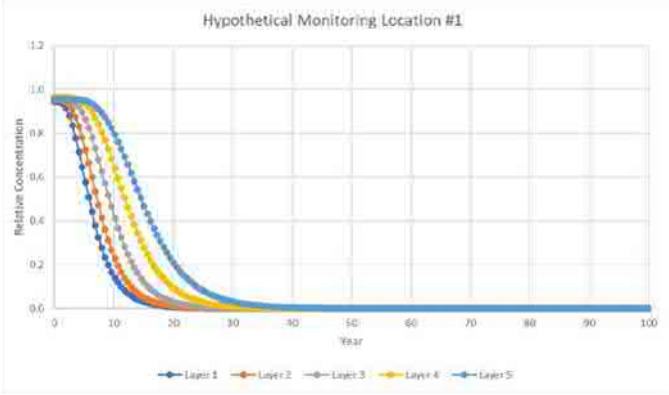
DRAFT

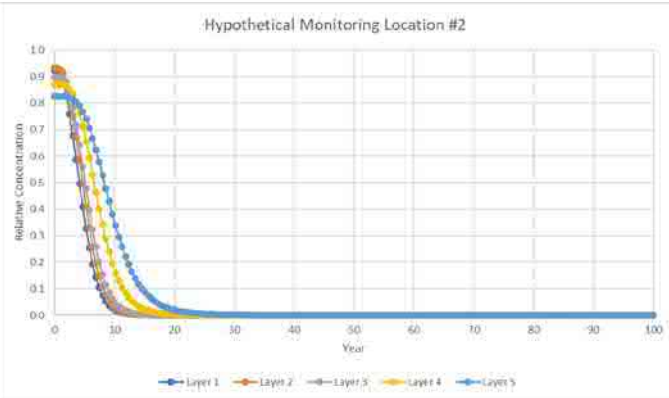
- Starting Conditions: Constant source distribution at 100 years











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ATTACHMENT D

CLOSURE ALTERNATIVES RANKING MATRIX
MWG WAUKEGAN STATION
WAUKEGAN, ILLINOIS

Options
1) West Ash Basin -- Closure by Removal
2) West Ash Basin -- Closure in Place
3) East Ash Basin -- Closure by Removal
4) East Ash Basin -- Closure in Place (Option 1)
5) East Ash Basin -- Closure in Place (Option 2)
6) East Ash Basin -- Closure in Place (Option 3)

Part 845 Reference Section	Regulatory Comparison Criteria	Ranking					
		Option 1	*Option 2*	*Option 3*	*Option 4*	*Option 5*	*Option 6*
845.710(b)(1)(A)	Magnitude of reduction of existing risks.	5	4	5	4	4	4
845.710(b)(1)(B)	Magnitude of residual risks in terms of likelihood of future releases of CCR.	5	4	5	4	4	4
845.710(b)(1)(C)	Type and degree of long-term management required, including monitoring, operation, and maintenance.	5	4	5	4	4	4
845.710(b)(1)(D)	Short-term risks that might be posed to the community or the environment during implementation of such a closure, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal of contaminants.	4	5	4	5	5	5
845.710(b)(1)(E)	Time until closure and post-closure care or the completion of groundwater monitoring pursuant to Section 845.740(b) is completed.	5	4	5	4	4	4
845.710(b)(1)(F)	Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, containment or changes in groundwater flow.	4	5	4	5	5	5
845.710(b)(1)(G)	Long-term reliability of the engineering and institutional controls, including an analysis of any off-site, nearby destabilizing activities.	5	4	5	4	4	4
845.710(b)(1)(H)	Potential need for future corrective action of the closure alternative.	5	4	5	4	4	4
845.710(b)(2)(A)	Extent to which containment practices will reduce further releases.	5	4	5	4	4	4
845.710(b)(2)(B)	Extent to which treatment technologies may be used.	4	5	4	5	5	5
845.710(b)(3)(A)	Degree of difficulty associated with constructing the technology.	4	5	4	5	5	5
845.710(b)(3)(B)	Expected operational reliability of the technologies.	5	4	5	4	4	4
845.710(b)(3)(C)	Need to coordinate with and obtain necessary approvals and permits from other agencies.	5	5	5	5	5	5
845.710(b)(3)(D)	Availability of necessary equipment and specialists.	5	4	5	4	4	4
845.710(b)(3)(E)	Available capacity and location of needed treatment, storage, and disposal services.	4	5	4	5	5	5
845.710(b)(4)	The degree to which the concerns of the residents living within communities where the CCR will be handled, transported and disposed are addressed by the closure method.	4	5	4	5	5	5
845.710(d)(1)	Analyze complete removal of the CCR as one closure alternative, along with the modes for transporting the removed CCR, including by rail, barge, low-polluting trucks, or a combination of these transportation modes.	4	5	4	5	5	5
845.710(d)(2)	Identify whether the facility has an onsite landfill with remaining capacity that can legally accept CCR, and, if not, whether constructing an onsite landfill is possible.	4	5	4	5	5	5
845.710(d)(3)	Include any other closure method in the alternatives analysis if requested by the Agency.	-	-	-	-	-	-
845.710(d)(1)	Meet or exceed a class 4 estimate under the AACE Classification Standard, incorporated by reference in Section 845.150, or a comparable classification practice as provided in the AACE Classification Standard.	5	2	4	3	1	1
845.710(d)(2)	Contain the results of groundwater contaminant transport modeling and calculations showing how the closure alternative will achieve compliance with the applicable groundwater protection standards.	5	4	5	4	4	4
845.710(d)(3)	Include a description of the fate and transport of contaminants with the closure alternative over time, including consideration of seasonal variations.	5	4	5	4	4	4
845.710(d)(4)	Assess impacts to waters in State.	5	4	5	4	4	4
	Total	102	95	101	96	94	94