MWG

Midwest Generation, LLC
Waukegan Generating Station

2021 Structural Stability Assessment for East Ash Pond & West Ash Pond

Revision 0

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Issue Purpose: Use

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1.0 PURPOSE & SCOPE

1.1 PURPOSE

The East Ash Pond and West Ash Pond at Midwest Generation, LLC's (MWG) Waukegan Generating Station ("Waukegan" or the "Station") are existing coal combustion residual (CCR) surface impoundments that are regulated by the Illinois Pollution Control Board's "Standards for the Disposal of Coal Combustion Residuals in CCR Surface Impoundments." These regulations are codified in Part 845 to Title 35 of the Illinois Administrative Code (35 Ill. Adm. Code 845, Ref. 1) and are also referred to herein as the "Illinois CCR Rule." Pursuant to 35 Ill. Adm. Code 845.450(a), MWG must conduct and complete a structural stability assessment that documents whether the design, construction, operation, and maintenance of the East and West Ash Ponds are consistent with recognized and generally accepted engineering practices for the CCR surface impoundments' storage capacities.

The East and West Ash Ponds are also regulated by the U.S. Environmental Protection Agency's (EPA) "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," 40 CFR Part 257 Subpart D (Ref. 2), also referred to herein as the "Federal CCR Rule." Pursuant to 40 CFR 257.73(f)(3), the Federal CCR Rule requires MWG to conduct and complete a structural stability assessment in accordance with 40 CFR 257.73(d) for the East and West Ash Ponds every five years.

This report documents the 2021 structural stability assessment conducted and completed in accordance with the Illinois and Federal CCR Rules by Sargent & Lundy (S&L) on behalf of MWG for the East and West Ash Ponds at Waukegan.

1.2 SCOPE

Per the 2016 Water Infrastructure Improvements for the Nation (WIIN) Act, the East and West Ash Ponds will continue to be subject to both the Illinois and Federal CCR Rules until the U.S. EPA approves the Illinois EPA's CCR permit program. The Illinois EPA has yet to publish a timeline for submitting its proposed CCR permit program to the U.S. EPA for approval, and so MWG must conduct structural stability assessments pursuant to both sets of regulations at this time.

2.0 ASSESSMENT

2.1 INPUTS & 2021 ASH POND CONDITIONS

The findings documented in this 2021 structural stability assessment for the East and West Ash Ponds are based on visual observations made during a site visit by S&L on September 22, 2021; discussions with MWG personnel; historical and recent aerial images obtained from Google Earth Pro (Ref. 3); and the East and West Ash Ponds' initial structural stability assessment (Ref. 4), annual inspection reports (Refs. 5

through 8), and history of construction (Ref. 9). The initial structural stability assessment for the East and West Ash Ponds, which was completed in October 2016, is included in its entirety in Appendix A.

In June 2020, Waukegan took the West Ash Pond out of service for routine cleaning. During the September 2021 site visit, it was noted that most of the CCR previously stored in the West Ash Pond had been removed and minimal surface water remained in the pond. In April 2021, MWG filed a notice of intent to close the West Ash Pond in accordance with the Federal CCR Rule's closure criteria (Ref. 2, § 257.102). Closure construction activities will commence at the pond upon receipt of a closure construction permit from the Illinois EPA in accordance with Subpart B of the Illinois CCR Rule. After closing the West Ash Pond, MWG currently plans on subsequently repurposing the area as a new low volume waste pond for the Station. Meanwhile, Waukegan continues to operate the East Ash Pond to manage CCR wastestreams and various non-CCR wastestreams from the Station in accordance with 40 CFR 257.103(f)(1). Operating conditions at this pond have not changed since the pond's initial structural stability assessment was completed in 2016. MWG plans to close the East Ash Pond after repurposing the West Ash Pond as a new low volume waste pond for the non-CCR wastestreams currently being managed in the East Ash Pond.

2.2 STABLE FOUNDATIONS & ABUTMENTS

(35 Ill. Adm. Code 845.450(a)(1); 40 CFR 257.73(d)(1)(i))

The East and West Ash Ponds are comprised of earthen dikes on all sides and do not have any abutments. Detailed information on the soils supporting the East and West Ash Ponds' dikes is provided in the ponds' initial structural stability assessment in Appendix A. Based on reviews of the ponds' annual inspection reports (Refs. 5 through 8) and Google Earth aerial images (Ref. 3), there have been no significant modifications to East and West Ash Ponds' geometries since their initial structural stability assessment was completed. Therefore, the details of the soils supporting the East and West Ash Ponds' dikes and corresponding conclusions documented in the ponds' initial structural stability assessment remain valid for this 2021 assessment (see Appendix A). Thus, the soils supporting the East and West Ash Ponds' dikes are considered to be stable for the maximum volume of CCR and CCR wastewater which can be impounded therein.

2.3 SLOPE PROTECTION

(35 Ill. Adm. Code 845.450(a)(2) & (4); 40 CFR 257.73(d)(1)(ii) & (iv))

The upstream slopes of the East and West Ash Ponds are lined with high-density polyethylene (HDPE) geomembrane. This form of cover protects the upstream slopes of the ponds' dikes against surface erosion, wave action, and adverse effects of sudden (rapid) drawdown.

Slope protection for the downstream slopes of the East and West Ash Ponds consists of vegetative cover which provides protection against surface erosion, wave action, and adverse effects of sudden (rapid) drawdown. It should be noted that the ponds' downstream slopes are unlikely to be inundated by surface water of an adjacent water body. Thus, these slopes are not expected to be subject to wave action or sudden (rapid) drawdown.

During the September 2021 site visit, vegetation greater than 12 inches and woody vegetation were observed along portions of the ponds' downstream slopes. Pursuant to the Illinois CCR Rule (Ref. 1, §§ 845.430(b)(4) and 845.430(b)(5)), the Station should remove the woody vegetation and mow the areas where the height of vegetative cover exceeds 12 inches.

It should be noted that the Federal CCR Rule requirement that vegetation on slopes of dikes and surrounding areas not exceed a height of six inches (Ref. 2, § 257.73(d)(1)(iv)) was vacated by the U.S. Court of Appeals, District of Columbia Circuit after the provision was challenged following publication of the Federal CCR Rule in April 2015. See *USWAG et al.* v. *EPA*, No. 15-1219 (D.C. Circ. 2015). The U.S. EPA has yet to finalize a rule that re-establishes federal limitations for the height of vegetation above the surfaces of CCR surface impoundment dikes.

2.4 DIKE COMPACTION

(35 Ill. Adm. Code 845.450(a)(3); 40 CFR 257.73(d)(1)(iii))

As documented in the East and West Ash Ponds' initial and 2021 safety factor assessments (Refs. 4 and 10), the ponds' dikes are sufficiently compacted to withstand the range of loading conditions in the CCR surface impoundments.

2.5 SPILLWAYS

(35 Ill. Adm. Code 845.450(a)(5); 40 CFR 257.73(d)(1)(v))

The East and West Ash Ponds do not have spillways. As documented in the ponds' 2021 inflow design flood control system plan, each pond is capable of managing the design flood event (1000-year, 24-hour storm) without a spillway.

2.6 EMBEDDED HYDRAULIC STRUCTURES

(35 Ill. Adm. Code 845.450(a)(6); 40 CFR 257.73(d)(1)(vi))

The West Ash Pond has a reinforced concrete distribution trough along the upstream slope of its northern dike that, when the pond was operating, received wastewater from a reinforced concrete inlet trench that passes through the pond's northern dike. The East Ash Pond has a similar reinforced concrete distribution

trough that receives wastewater from two reinforced concrete inlet trenches that pass through the pond's northern dike. Meanwhile, portions of three discharge pipes from the Recycle Water Sump located between the East and West Ash Ponds also pass through the ponds' northern dikes. The locations of these hydraulic structures are shown on Figure 2 of the ponds' initial structural stability assessment in Appendix A.

As documented in the initial assessment, visual surveillance of the hydraulic structures passing through the East and West Ash Ponds' northern dikes was performed in June 2016. No significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris that may negatively affect the ponds were identified during the surveillance program except for two isolated locations in two of the discharge pipes from the Recycle Water Sump (labeled Pipes 4E and 4W in Figure 2 of Appendix A). The Station subsequently repaired the deficient portions of these pipes that were identified by the surveillance program.

No similar visual surveillance programs have been performed since the initial video camera inspection in June 2016. However, no visual signs of distress at the dike surfaces that could be indicative of deterioration, failure, deformation, *etc*. (*e.g.*, soft spots caused by leaking water, distortions in dike alignment) were observed during the September 2021 site visit. Moreover, since the West Ash Pond has been taken out of service and had minimal surface water remaining in it as of the September 2021 site visit, the hydraulic structures passing through the West Ash Pond's northern dikes are not expected to convey water again until the pond has been closed and subsequently repurposed as a new low volume waste pond for the Station. Therefore, it is recommended that the Station conduct a visual surveillance program to confirm the hydraulic structures passing through the West Ash Pond's northern dikes are in good, working condition and are free of significant material defects that could impact the structures' integrities prior to repurposing the pond as a new low volume waste pond. Finally, it is recommended that the Station remove the hydraulic structures passing through the East Ash Pond's northern dike as part of the pond's closure construction activities.

2.7 LOW POOL & RAPID DRAWDOWN STABILITY

(35 Ill. Adm. Code 845.450(a)(7); 40 CFR 257.73(d)(1)(vii))

As documented in the East and West Ash Ponds' initial safety factor assessment (Ref. 4), the results of which were revalidated in their 2021 safety factor assessment (Ref. 10), the structural stabilities of the ponds' downstream slopes are maintained during low pool conditions in the unnamed channel south of the ponds. As previously mentioned, the ponds' downstream slopes are unlikely to be inundated by surface water of an adjacent water body, including the unnamed channel south of the ponds. Thus, the East and West Ash Ponds are not considered to be susceptible to a sudden (rapid) drawdown loading condition.

Based on reviews of the East and West Ash Ponds' annual inspection reports (Refs. 5 through 8) and Google Earth aerial images (Ref. 3), there have been no significant modifications to either pond since their initial structural stability assessment was completed. Therefore, the conclusions documented therein

regarding the stability of the ponds' southern dikes during low pool conditions at the unnamed channel south of the ponds remain valid for this 2021 assessment (see Appendix A).

3.0 RECOMMENDED CORRECTIVE MEASURES

(35 Ill. Adm. Code 845.450(b)(1); 40 CFR 257.73(d)(1)(2))

Based on the findings documented in this 2021 structural stability assessment, the following corrective measures are recommended:

- Mow vegetation that is greater than 12-inches tall along the East and West Ash Ponds' downstream slopes,
- Remove woody vegetation in accordance with 35 Ill. Adm. Code 845.430(b)(4),
- Conduct a visual surveillance program to verify that the hydraulic structures passing through the West Ash Pond's northern dikes are in good, working condition and are free of significant material defects that could compromise the structures' integrities prior to repurposing the pond as a new low volume waste pond, and
- Remove the hydraulic structures passing through the East Ash Pond's northern dikes as part of the pond's closure construction activities.

4.0 CERTIFICATION

I certify that:

- This structural stability assessment was prepared by me or under my direct supervision.
- The work was conducted in accordance with the requirements of 35 Ill. Adm. Code 845.450 and with the requirements of 40 CFR 257.73(d).
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin Date: October 14, 2021

Seal:

Th. Dehlin
10/14/2021
Exp. 11/30/2021

5.0 REFERENCES

1. Illinois Pollution Control Board. “Standards for Disposal of Coal Combustion Residuals in CCR Surface Impoundments.” 35 Ill. Adm. Code 845. Accessed October 12, 2021.
2. U.S. Environmental Protection Agency. “Standards for Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.” 40 CFR Part 257 Subpart D. https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-257/subpart-D. Accessed October 12, 2021.
3. Google Earth Pro v7.3.0.3832. Accessed October 12, 2021.
4. Geosyntec Consultants. “Structural Stability and Factor of Safety Assessment, East and West Ash Basins, Waukegan Station.” October 2016.
5. Geosyntec Consultants. “Annual Inspection Report, West and East Ash Basins, Waukegan Station.” October 9, 2017.
6. Civil & Environmental Consultants, Inc. “Annual Inspection Report, East Ash Pond and West Ash Pond, Waukegan Station.” October 16, 2018.
7. Civil & Environmental Consultants, Inc. “Annual Inspection Report, East Ash Pond and West Ash Pond, Waukegan Station.” October 16, 2019.
8. Civil & Environmental Consultants, Inc. “Annual Inspection Report, East Ash Pond and West Ash Pond, Waukegan Station.” October 9, 2020.
9. Geosyntec Consultants. “History of Construction, East and West Ash Basins, Waukegan Station.” October 2016.
10. Sargent & Lundy. “2021 Safety Factor Assessment for East Ash Pond & West Ash Pond.” S&L Project No. 12661-123. October 2021.

APPENDIX A: 2016 EAST & WEST ASH PONDS STRUCTURAL STABILITY ASSESSMENT