

MWVG

Midwest Generation, LLC

Powerton Generating Station

2023 Structural Stability Assessment for Ash Surge Basin, Bypass Basin, & Former Ash Basin

Revision 0

October 13, 2023

Issue Purpose: Use

Project No.: A12661.174

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1.0 PURPOSE & SCOPE

1.1 PURPOSE

The Ash Surge Basin, Bypass Basin, and Former Ash Basin at Midwest Generation, LLC's (MWG) Powerton Generating Station ("Powerton" 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 an annual structural stability assessment that documents whether the design, construction, operation, and maintenance of the Ash Surge, Bypass, and Former Ash Basins are consistent with recognized and generally accepted engineering practices for the CCR surface impoundments' storage capacities.

This report documents the 2023 structural stability assessment conducted and completed in accordance with the Illinois CCR Rule by Sargent & Lundy (S&L) on behalf of MWG for the Ash Surge, Bypass, and Former Ash Basins at Powerton.

1.2 SCOPE

In addition to being regulated under the Illinois CCR Rule, Powerton's Ash Surge, Bypass, and Former Ash Basins 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." Per the 2016 Water Infrastructure Improvements for the Nation (WIIN) Act, the Ash Surge, Bypass, and Former Ash Basins 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. However, the scope of this 2023 structural stability assessment is strictly limited to demonstrating compliance with the Illinois CCR Rule. Pursuant to 40 CFR 257.73(f)(3), the next structural stability assessment for demonstrating compliance with the Federal CCR Rule is not required until 2026, five years after the last periodic assessment was completed (2021).

2.0 INPUTS, PREVIOUS RESULTS, & CURRENT OPERATIONS

2.1 INPUTS

The findings documented in this 2023 structural stability assessment for the Ash Surge, Bypass, and Former Ash Basins are based on visual observations made by S&L during a site visit on September 20, 2023;

discussions with MWG personnel; historical and recent aerial images obtained from Google Earth Pro (Ref. 3); and the following documents:

- Initial federal structural stability assessment for the Ash Surge and Bypass Basins (Ref. 4),
- Annual inspection reports for the Ash Surge and Bypass Basins (Refs. 5 through 11),
- History of construction for the Ash Surge and Bypass Basins (Ref. 12),
- Initial federal structural stability assessment for the Former Ash Basin (Ref. 13),
- Annual inspection reports for the Former Ash Basin (Refs. 14 through 20),
- History of construction for the Former Ash Basin (Ref. 21),
- 2022 annual structural stability assessment for the Ash Surge Basin, Bypass Basin, and Former Ash Basin (Ref. 22),
- 2023 annual safety factor assessment for the Ash Surge Basin, Bypass Basin, and Former Ash Basin (Ref. 23), and
- 2023 annual inflow design flood control system plan for the Ash Surge Basin, Bypass Basin, and Former Ash Basin (Ref. 24).

The initial federal structural stability assessment for the Ash Surge and Bypass Basins, which was completed in October 2016, is included in its entirety in Appendix A. The initial federal structural stability assessment for the Former Ash Basin, which was completed in April 2018, is included in its entirety in Appendix B.

2.2 2022 RECOMMENDED CORRECTIVE MEASURES

2.2.1 ASH SURGE BASIN AND BYPASS BASIN

The following corrective measures were recommended for the Ash Surge Basin and the Bypass Basin based on the findings documented in the 2022 annual structural stability assessment (Ref. 22):

- Mow or otherwise cut vegetation that is greater than 12-inches tall along the Bypass Basin's crest,
- Place rock fill in areas along the Ash Surge Basin's downstream slopes where erosion is present and continue monitoring performance,
- During retrofit construction activities for the Bypass Basin, conduct a visual surveillance program to verify that the Bypass Basin's discharge pipes are in good, working condition and are free of significant material defects that could compromise the pipes' integrities, and
- Prior to retrofit construction activities for the Ash Surge Basin, conduct a visual surveillance program to verify that the Ash Surge Basin's discharge pipes are in good, working condition and are free of significant material defects that could compromise the pipes' integrities.

2.2.2 FORMER ASH BASIN

Given the lack of necessary information due to the construction age of the Former Ash Basin, a full structural stability assessment meeting the requirements of 35 Ill. Adm. Code 845.450(a) could not be performed in 2022. Consequently, the 2022 annual structural stability assessment recommended that the Station continue with its plans to close the Former Ash Basin in accordance with the closure criteria promulgated by the Illinois CCR Rule.

2.3 CURRENT BASIN OPERATING CONDITIONS

In early October 2020, Powerton took the Bypass Basin out of service for routine cleaning. During a site visit in September 2021, it was noted that most of the CCR previously stored in the Bypass Basin had been removed and minimal surface water remained. During subsequent site visits by S&L in September 2022 and September 2023, it was noted that almost all of the CCR previously stored in the Bypass Basin had been removed and minimal surface water remained. MWG currently plans to retrofit the Bypass Basin with a new composite liner system and a new leachate collection and removal system (LCRS). A construction permit application for retrofitting the Bypass Basin was submitted to the Illinois EPA on July 15, 2022. Retrofit construction activities will commence at the basin upon receipt of a retrofit construction permit from the Illinois EPA in accordance with Subpart B of the Illinois CCR Rule.

Powerton continues to operate the Ash Surge Basin to manage the Station's ash dewatering bin effluent and various non-CCR wastestreams in accordance with 40 CFR 257.103(f)(1). Operating conditions at this basin have not changed since the basin's initial federal structural stability assessment was completed in 2016. MWG currently plans to retrofit the Ash Surge Basin with a new composite liner system and a new LCRS after the Bypass Basin has been retrofitted. A construction permit application for retrofitting the Ash Surge Basin was submitted to the Illinois EPA on July 27, 2023. Retrofit construction activities will commence at the basin after the Bypass Basin has been retrofitted and upon receipt of a retrofit construction permit from the Illinois EPA in accordance with Subpart B of the Illinois CCR Rule.

Finally, the Former Ash Basin is regulated by the Illinois CCR Rule as an inactive CCR surface impoundment and, therefore, is not used by the Station to manage any of Powerton's wastestreams. However, the basin still collects stormwater from direct precipitation and run-off from adjacent areas. During the basin's most recent annual inspection in July 2023 (Ref. 20), the volume of water impounded in the basin was estimated to be 20 acre-feet. MWG plans to close the Former Ash Basin upon receipt of a closure construction permit from the Illinois EPA in accordance with Subpart B of the Illinois CCR Rule. A construction permit application for the closure work was submitted to the Illinois EPA on October 26, 2022.

3.0 ASSESSMENT

3.1 ASH SURGE & BYPASS BASINS

3.1.1 STABLE FOUNDATIONS & ABUTMENTS

(35 Ill. Adm. Code 845.450(a)(1))

The Ash Surge and Bypass Basins are comprised of earthen dikes on all sides and do not have any abutments. Detailed information on the soils supporting the Ash Surge and Bypass Basins' dikes is provided in the basins' initial federal structural stability assessment in Appendix A. Based on reviews of the basins' annual inspection reports (Refs. 5 through 11) and Google Earth aerial images (Ref. 3), there have been no significant modifications to Ash Surge and Bypass Basins' geometries since their initial federal structural stability assessment was completed. Therefore, the details of the soils supporting the Ash Surge and Bypass Basins' dikes and corresponding conclusions documented in the basins' initial federal structural stability assessment remain valid for this 2023 assessment (see Appendix A). Thus, the soils supporting the Ash Surge and Bypass Basins' dikes are considered to be stable for the maximum volume of CCR and CCR wastewater which can be impounded therein.

3.1.2 SLOPE PROTECTION

(35 Ill. Adm. Code 845.450(a)(2) & (4))

The upstream slopes of the Ash Surge and Bypass Basins are lined with high-density polyethylene (HDPE) geomembrane. A layer of gravel has also been installed on a second geomembrane liner around the perimeter of the Ash Surge Basin near the crests of the basin's upstream slopes. These forms of cover protect the upstream slopes of the basins' dikes against surface erosion, wave action, and adverse effects of sudden (rapid) drawdown.

Slope protection for the downstream slopes of the Ash Surge Basin consists of (1) the HDPE geomembrane liner of the Bypass Basin, (2) vegetative cover, or (3) a combination of rock and vegetative cover. Where present, the rock fill is generally along and near the crest of the given embankment. Similarly, the Bypass Basin's downstream slopes consist of either HDPE geomembrane liner of the Ash Surge Basin or vegetative cover. All three forms of cover protect the downstream slopes of the basins' dikes against surface erosion, wave action, and adverse effects of sudden (rapid) drawdown.

During our site visit on September 20, 2023, S&L noted that the Station placed rock fill in areas where erosion rills were observed along the Ash Surge Basin's downstream slopes during the 2022 structural stability assessment in accordance with the recommended corrective measures prescribed therein (see Section 2.2.1, Ref. 22). Based on our observations during our assessment, it appears that erosion has been

mitigated in the areas in which rock fill was placed. It is recommended that the Station continue to monitor the performance of this protective cover.

During our September 2023 site visit, S&L observed erosion rills along the downstream slope of the Ash Surge Basin's east dike. However, the erosion observed does not suggest that the stability of the subject dikes has been compromised. Consistent with the Station's maintenance practices for Powerton's CCR surface impoundments, it is recommended that the Station also place rock fill in erosion rills observed along the eastern face of the Ash Surge Basin's downstream slope and continue to monitor the performance of the protective cover.

The following observations were made regarding vegetation at the Ash Surge and Bypass Basins during S&L's walkdown in September 2023.

- Ash Surge Basin:
 - Vegetation was less than 12-inches tall and no woody vegetation was observed along the downstream slopes of the west and north dikes.
 - One woody plant was observed on the crest of the south dike. The woody plant had a diameter less than 0.5 inch.
 - Vegetation taller than 12 inches was observed along the downstream slope of the east dike. No woody vegetation was observed.
- Bypass Basin:
 - Vegetation was less than 12-inches tall and no woody vegetation was observed along the downstream slope of the east dike.
 - Vegetation taller than 12 inches was observed along the entire crest and along the downstream slope of the south dike.
 - Sparse woody vegetation was observed along the west dike. The woody vegetation observed was less than 0.5-inch in diameter.

In accordance with the Illinois CCR Rule (Ref. 1, §§ 845.430(b)(4) and 845.430(b)(5)), the Station should remove woody vegetation and mow or otherwise cut non-woody vegetation in the noted areas where vegetative cover was observed to be taller than 12 inches.

3.1.3 DIKE COMPACTION **(35 Ill. Adm. Code 845.450(a)(3))**

As documented in the Ash Surge and Bypass Basins' initial federal and 2023 safety factor assessments (Refs. 4 and 23), the basins' dikes are sufficiently compacted to withstand the range of loading conditions in the CCR surface impoundments.

3.1.4 SPILLWAYS

(35 Ill. Adm. Code 845.450(a)(5))

The Ash Surge Basin has an emergency spillway structure located at the northeast corner of the basin. Similarly, the Bypass Basin has an emergency overflow riser pipe located at the northeast corner of the basin. However, as documented in the basins' 2023 inflow design flood control system plan (Ref. 24), both basins are capable of containing the design flood event (1,000-year, 24-hour storm) without discharging water from their respective emergency spillway structures. Moreover, during S&L's September 2023 site visit, it was noted that the Bypass Basin's emergency overflow riser pipe had been filled with concrete, thereby preventing any flow through the pipe. Therefore, the capacities of these spillways were not evaluated for this 2023 assessment.

3.1.5 EMBEDDED HYDRAULIC STRUCTURES

(35 Ill. Adm. Code 845.450(a)(6))

There are four pipes that underlie or pass through the Ash Surge Basin's dikes that convey wastewater to or from the Ash Surge and Bypass Basins. Meanwhile the Bypass Basin has three discharge pipes that pass through the basin's dikes. The locations of these pipes are shown on Figure 2 of the basins' initial federal structural stability assessment in Appendix A. As documented in the initial federal assessment, visual surveillance of the pipes passing through the Ash Surge and Bypass Basins' dikes was performed in May 2016. No significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris that may negatively affect the basins were identified during the surveillance program.

No similar pipe 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 S&L's September 2023 site visit. Moreover, since the Bypass Basin has been taken out of service and has minimal surface water remaining in it, the Bypass Basin's pipes that pass through or underlie the Ash Surge and Bypass Basins' dikes are not expected to convey water again until the basin has been retrofitted with a new composite liner system and a new LCRS. In addition, and as previously mentioned, the discharge pipe from the Bypass Basin's emergency overflow riser pipe ("Pipe 2" on Figure 2 in Appendix A) has been filled with concrete, thereby preventing the flow of water.

It is recommended that the Station conduct a visual surveillance program to confirm the Bypass Basin's discharge pipes are in good, working condition and are free of significant material defects that could impact the pipes' integrities as a part of the planned retrofit construction activities for the basin. It is also recommended that the Station conduct a similar visual surveillance program for the Ash Surge Basin's discharge pipes as a part of the planned retrofit construction activities for the basin.

3.1.6 LOW POOL & RAPID DRAWDOWN STABILITY **(35 Ill. Adm. Code 845.450(a)(7))**

As documented in the Ash Surge and Bypass Basins' initial federal safety factor assessment (Ref. 4), the results of which were revalidated in the 2023 safety factor assessment (Ref. 23), the structural stabilities of the basins' downstream slopes are maintained during low pool conditions at each of the basins that are adjacent to the Ash Surge and Bypass Basins. These basins are:

- Metal Cleaning Basin,
- East Roof and Yard Runoff Basin,
- Limestone Basin, and
- Former Ash Basin.

The Ash Surge and Bypass Basins' initial federal safety factor assessment also concluded that the structural stabilities of the basins' downstream slopes are maintained during sudden (rapid) drawdown conditions at the East Roof and Yard Runoff Basin and the Former Ash Basin. Because the Metal Cleaning Basin is lined with an HDPE geomembrane, a sudden (rapid) drawdown condition was determined to not be an applicable loading condition for the basins since the Metal Cleaning Basin's liner precludes the infiltration of water into the Ash Surge and Bypass Basin dikes. A sudden (rapid) drawdown condition was also not evaluated in the Limestone Basin since the basin is not used as a part of Station operations, only contains minimal surface water (if any) from direct precipitation, and does not have an outlet structure that could create a sudden (rapid) drawdown condition for the Ash Surge Basin's eastern dike.

Based on reviews of the Ash Surge and Bypass Basins' annual inspection reports (Refs. 5 through 11) and Google Earth aerial images (Ref. 3), there have been no significant modifications to the Metal Cleaning Basin, East Roof and Yard Runoff Basin, Limestone Basin, and Former Ash Basin since the Ash Surge and Bypass Basins' initial federal structural stability assessment was completed. Therefore, the conclusions documented therein regarding the stability of the basins' dikes during low pool and sudden (rapid) drawdown conditions (where applicable) at the identified basins remain valid for this 2023 assessment (see Appendix A).

3.2 FORMER ASH BASIN

3.2.1 STABLE FOUNDATIONS & ABUTMENTS

(35 Ill. Adm. Code 845.450(a)(1))

The Former Ash Basin is comprised of one earthen dike along its northern edge (“northern dike”) and is effectively incised into the adjacent topography elsewhere. The basin does not have any abutments. Detailed information on the soils supporting the Former Ash Basin’s dike is provided in the basin’s initial federal structural stability assessment in Appendix B. Based on reviews of the basin’s annual inspection reports (Refs. 14 through 20) and Google Earth aerial images (Ref. 3), there have been no significant modifications to the Former Ash Basin’s geometry since its initial federal structural stability assessment was completed. Therefore, the details of the soils supporting the Former Ash Basin’s northern dike and corresponding conclusions documented in the basin’s initial federal structural stability assessment remain valid for this 2023 assessment (see Appendix A).

3.2.2 SLOPE PROTECTION

(35 Ill. Adm. Code 845.450(a)(2) & (4))

Slope protection for the upstream slopes of the Former Ash Basin consists of vegetation which protects the basin’s interior slopes from surface erosion, wave action, and the adverse effects of sudden (rapid) drawdown. Similarly, the downstream slopes of the basin’s northern dike are vegetated which offers protection from surface erosion. However, given the lack of necessary information due to the construction age of the basin, an assessment of the downstream slopes’ stability against wave action or after sudden (rapid) drawdown could not be performed.

During S&L’s September 2023 site visit, vegetation greater than 12 inches was observed along portions of the pond’s interior slopes and the northern dike’s downstream slopes. Very dense, woody vegetation was also prevalent within the basin and along its slopes due to how long the basin has been inactive.

3.2.3 DIKE COMPACTION

(35 Ill. Adm. Code 845.450(a)(3))

As documented in the Former Ash Basin’s initial federal and 2023 safety factor assessments (Refs. 13 and 23), an engineering analysis to calculate the safety factors for the basin’s northern dike could not be performed given the lack of necessary information due to the construction age of the basin. Therefore, an assessment of the compacted density of the basin’s northern dike could not be performed.

3.2.4 SPILLWAYS

(35 Ill. Adm. Code 845.450(a)(5))

The Former Ash Basin does not have spillways. As documented in the basin's 2023 inflow design flood control system plan (Ref. 24), the basin is capable of containing the design flood event (1,000-year, 24-hour storm) without a spillway.

3.2.5 EMBEDDED HYDRAULIC STRUCTURES

(35 Ill. Adm. Code 845.450(a)(6))

No hydraulic structures are known to underlie the base of the Former Ash Basin or pass through the basin's northern dike.

3.2.6 LOW POOL & RAPID DRAWDOWN STABILITY

(35 Ill. Adm. Code 845.450(a)(7))

As previously stated, an engineering analysis to calculate the safety factors for the Former Ash Basin's northern dike could not be performed given the lack of necessary information due to the construction age of the basin. Therefore, an assessment to determine whether the basin's northern dike remains stable during low pool and sudden (rapid) drawdown conditions could not be performed.

4.0 RECOMMENDED CORRECTIVE MEASURES

(35 Ill. Adm. Code 845.450(b)(1))

4.1 ASH SURGE BASIN AND BYPASS BASIN

Table 4-1 lists the corrective measures recommended for the Ash Surge and Bypass Basin in accordance with the findings documented in this 2023 structural stability assessment.

Table 4-1 – Recommended Corrective Measures for Ash Surge & Bypass Basins

Recommended Corrective Measure	Timeframe
Ash Surge Basin	
Place rock fill in areas along the downstream slope of the basin’s east dike.	Now
Remove the single woody plant on the crest of the south dike and mow vegetation taller than 12 inches observed along the downstream slope of the east dike.	Now
Conduct a visual surveillance program to verify the Ash Surge Basin’s discharge pipes are in good, working condition and are free of significant material defects that could compromise the pipe’s integrities.	During Retrofit Construction
Bypass Basin	
Mow or otherwise cut vegetation taller than 12 inches along the entire crest and along the downstream slope of the south dike. Remove the sparse and small woody vegetation along the west dike.	Now
Conduct a visual surveillance program to verify the basin’s discharge pipes are in good, working condition and are free of significant material defects that could compromise the pipe’s integrities.	During Retrofit Construction

4.2 FORMER ASH BASIN

Given the lack of necessary information due to the construction age of the Former Ash Basin, a full structural stability assessment meeting the requirements of 35 Ill. Adm. Code 845.450(a) could not be performed. Consequently, it is recommended that the Station continue with its plans to close the Former Ash Basin in accordance with the closure criteria promulgated by the Illinois CCR Rule. It is noted that MWG has submitted a construction permit application to the Illinois EPA to close the Former Ash Basin and plans to close the basin upon receipt of the closure construction permit.

5.0 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.
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas J. Dehlin

Date: October 13, 2023

Seal:



6.0 REFERENCES

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23. Sargent & Lundy. "2023 Safety Factor Assessment for Ash Surge Basin, Bypass Basin, & Former Ash Basin." S&L Project No. A12661.174. October 2023.
24. Sargent & Lundy. "2023 Inflow Design Flood Control System Plan for Ash Surge Basin, Bypass Basin, & Former Ash Basin." S&L Project No. A12661.174. October 2023.

**APPENDIX A: 2016 FEDERAL STRUCTURAL STABILITY
ASSESSMENT FOR ASH SURGE & BYPASS BASINS**



**APPENDIX B: 2018 FEDERAL STRUCTURAL STABILITY
ASSESSMENT FOR FORMER ASH BASIN**

