MWG

Midwest Generation, LLC

Powerton Generating Station

2024 Structural Stability Assessment for Ash Surge Basin, Bypass Basin, & Former Ash Basin

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EXECUTIVE SUMMARY

This report presents the 2024 annual structural stability assessment for the Ash Surge Basin, Bypass Basin and Former Ash Basin at Midwest Generation, LLC's (MWG) Powerton Generating Station ("Powerton" or the "Station"). This annual assessment, prepared by Sargent & Lundy (S&L) on behalf of MWG, documents whether the design, construction, operation, and maintenance of the Ash Surge Basin, Bypass Basin, and Former Ash Basin are consistent with recognized and generally accepted engineering practices specified in 35 III. Adm. Code 845.450(a) for the basin's storage capacity. To complete this assessment, S&L performed a visual surveillance of the basins on August 22, 2024 (Ash Surge Basin and Former Ash Basin) and on September 25, 2024 (Bypass Basin), facilitated discussions with MWG personnel, and reviewed recent annual inspections and historical documentation for the basins.

Powerton has taken the Ash Surge Basin out of service and started dewatering the basin. MWG currently plans to retrofit the Ash Surge Basin with a new composite liner system and a new leachate collection and removal system (LCRS) upon receipt of a retrofit construction permit from the Illinois EPA in accordance with Subpart B of the Illinois CCR Rule. MWG submitted a retrofit construction permit application for retrofitting the Ash Surge Basin on July 27, 2023.

In 2024, Powerton retrofitted the Bypass Basin in accordance with 35 Ill. Adm. Code 845.770 and the July 3, 2024 construction permit issued by Illinois EPA. The retrofit design features a new composite liner system and LCRS over an existing geomembrane liner, which was left in-place as a supplemental liner for the retrofitted basin. Structural fill was placed over the supplemental liner to support the new liner and to provide the slopes required for the LCRS. In addition, different layers of granular fill (approximate total thickness of 1.5 feet) were placed over the new LCRS to protect the LCRS and basin slopes. Another 1.5 feet of granular fill was placed along the top of the basin's embankments, vertically expanding the dikes to accommodate the fill layers placed along the basin floor and sideslopes and to support vehicular traffic. Finally, the basin's emergency spillway was decommissioned, the basin's overflow weir elevation was maintained at its pre-retrofit / existing elevation, and a new 36-in.-diameter corrugated HPDE pipe was installed in the basin's north dike to divert non-CCR wastestreams away from the retrofitted Bypass Basin.

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. 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.

The 2023 structural stability assessment recommended several corrective actions, including placing rock fill along the downstream slope of the Ash Surge Basin's east dike, removing one woody plant, regular mowing of vegetation that was observed to be taller than 12 inches along the downstream slopes of the Ash Surge and Bypass Basins' east dikes, and conducting a visual surveillance of the Bypass Basin's discharge pipes prior to the 2024 retrofit construction to verify the pipes' integrities. During this year's assessment S&L noted that the Station had addressed these recommended corrective measures: rock fill had been placed in the noted areas, the single woody plant had been removed, and the Station had mowed vegetation along the basins' downstream slopes. However, although the vegetation had been mowed, S&L did observe vegetation taller than 12 inches in some areas of the Ash Surge Basin's dikes during our August 2024 site visit. Finally, the Station performed a visual surveillance of the Bypass Basin's discharge pipe to verify the pipe is in good, working condition and free of significant material defects that could compromise the pipe's integrity.

The findings of the 2024 structural stability assessment for the Ash Surge Basin, Bypass Basin and Former Ash Basin are summarized in Tables ES-1A, ES-2A, and ES-3A, respectively. Meanwhile, ES-1B, ES-2B, and ES-3B present the 2024 recommended corrective measures recommended for the Ash Surge Basin, Bypass Basin, and Former Ash Basin, respectively, in accordance with these findings.

Table ES-1A – 2024 Structural Stability Assessment Findings for the Ash Surge Basin at the Powerton Generating Station

Area	35 Ill. Adm. Code Ref.	Findings
Stable Foundations & Abutments	§ 845.450(a)(1)	• The soils supporting the Ash Surge Basin dikes are considered to be stable for the maximum volume of CCR and CCR wastewater which can be impounded therein.
Slope Protection	§ 845.450(a)(2) & (4)	• High-density polyethylene (HDPE) geomembrane liner protects the basin's upstream slopes against surface erosion, wave action, and adverse effects of sudden drawdown. • Vegetative cover and rock fill, where present, protect the downstream slopes of the basin's west, north, and east dikes against surface erosion, wave action, and adverse effects of sudden drawdown. • Riprap along the slope into the Bypass Basin protects the downstream slope of the basin's south dike against surface erosion, wave action, and adverse effects of sudden drawdown. • The Metal Cleaning Basin's HDPE geomembrane liner protects a portion of the downstream slope of the basin's west dike against surface erosion, wave action, and adverse effects of sudden drawdown. • Vegetation taller than 12 inches was observed in some areas along the downstream slopes of the basin's west, north, and east dikes. • Three local ruts in road surfacing material were observed. These ruts do not suggest the stability of the basin's dikes have been compromised.
Dike Compaction	§ 845.450(a)(3)	• The Ash Surge Basin's dikes are sufficiently compacted to withstand the range of original design conditions in the CCR surface impoundments and the substantially lower loading conditions present in the basin.
Spillways	§ 845.450(a)(5)	• The Ash Surge Basin is capable of containing a 1,000-year, 24-hour storm event without water overflowing into the basin's spillway. Therefore, the capacity of the basin's emergency spillway was not evaluated.

Table ES-1A – 2024 Structural Stability Assessment Findings for the Ash Surge Basin at the Powerton Generating Station

Area	35 Ill. Adm. Code Ref.	Findings
Embedded Hydraulic Structures	§ 845.450(a)(6)	• Pipe 2 through the basin's south dike was decommissioned and plugged with flowable fill during retrofit construction at the Bypass Basin. • Pipe 3 through the basin's east and north dikes was assessed prior to retrofit construction at the Bypass Basin and was found to be in good operational condition. • Pipe 6 through the basin's south dike was just installed during retrofit construction at the Bypass Basin in accordance with recognized and generally accepted engineering practices. • No visual surveillance programs for Pipes 4 and 5 through the basin's north dike have been performed since the initial video camera inspection in May 2016. • There were no visual signs of distress at the north dike surface 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 August 2024 site visit.
Low Pool & Rapid Drawdown Stability	§ 845.450(a)(7)	• The basin's downstream slopes are stable during low pool conditions at each of the basins that are adjacent to the Ash Surge Basin. • The downstream slopes of the basin's north and south dikes are stable during sudden (rapid) drawdown conditions at the Former Ash Basin and East Roof and Yard Runoff Basin, respectively. • The downstream slopes of the basin's west and east dikes are not considered to be susceptible to sudden (rapid) drawdown conditions.

Table ES-2B – 2024 Recommended Corrective Measures for the Ash Surge Basin at the Powerton Generating Station

Recommended Corrective Measure	Timeframe
Place crushed stone or gravel road surfacing material in the three ruts observed in the roads along the basin's dikes and monitor these areas.	Now
Continue mowing vegetation taller than 12 inches observed along the downstream slopes of the west, north, and east dikes.	Now, and as Required to Maintain Vegetative Cover Under 12 Inches
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

Table ES-2A – 2024 Structural Stability Assessment Findings for the Retrofitted Bypass Basin at the Powerton Generating Station

Area	35 Ill. Adm. Code Ref.	Findings
Stable Foundations & Abutments	§ 845.450(a)(1)	• The soils supporting the Bypass Basin dikes are considered to be stable for the maximum volume of CCR and CCR wastewater which can be impounded therein.
Slope Protection	§ 845.450(a)(2) & (4)	• Riprap protects the upstream slopes of the basin against surface erosion, wave action, and adverse effects of sudden drawdown. • The Ash Surge Basin's HDPE geomembrane liner protects the downstream slope of the basin's north dike against surface erosion, wave action, and adverse effects of sudden drawdown. • Vegetative cover and crushed rock, where present, protect the downstream slopes of the basin's south, west, and east dikes against surface erosion, wave action, and adverse effects of sudden drawdown.
Dike Compaction	§ 845.450(a)(3)	• The basin's dikes are sufficiently compacted to withstand the range of loading conditions in the CCR surface impoundment.
Spillways	§ 845.450(a)(5)	• The basin no longer has an emergency spillway.

Table ES-2A – 2024 Structural Stability Assessment Findings for the Retrofitted Bypass Basin at the Powerton Generating Station

Area	35 Ill. Adm. Code Ref.	Findings
Embedded Hydraulic Structures	§ 845.450(a)(6)	• Pipe 1 through the basin's east dike was decommissioned, plugged with flowable fill, and covered with structural fill when the basin was retrofitted. • Pipe 2 through the basin's north dike was decommissioned and plugged with flowable fill when the basin was retrofitted. • Pipe 3 through the basin's east dike was assessed prior to retrofit construction and reported to be in good operating condition. • Pipe 6 through the basin's north dike was just installed during retrofit construction in accordance with recognized and generally accepted engineering practices.
Low Pool & Rapid Drawdown Stability	§ 845.450(a)(7)	• The basin's downstream slopes are stable during low pool conditions at each of the basins that are adjacent to the Bypass Basin. • The downstream slope of the basin's west dike is stable during a sudden (rapid) drawdown condition at the East Roof and Yard Runoff Basin. • The downstream slopes of the basin's north, east, and south dikes are not considered to be susceptible to a sudden (rapid) drawdown loading condition.

Table ES-2B – 2024 Recommended Corrective Measures for the Retrofitted Bypass Basin at the Powerton Generating Station

Recommended Corrective Measure	Timeframe
Confirm adequate vegetative cover is established along re-seeded areas of basin's downstream slopes. Re-seed as necessary to address bare or thinly vegetated areas.	Post-Retrofit Construction
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.	Annually

Table ES-3A – 2024 Structural Stability Assessment Findings for the Former Ash Basin at the Powerton Generating Station

Area	35 Ill. Adm. Code Ref.	Findings
Stable Foundations & Abutments	§ 845.450(a)(1)	• Potential settlement of the foundation soils under the Former Ash Basin's north dike is not anticipated to impact the integrity of the embankment.
Slope Protection	§ 845.450(a)(2) & (4)	• Vegetative cover protects the upstream and downstream slopes of the basin's slopes from surface erosion, wave action, and adverse effects of sudden drawdown. • The stability of the basin's downstream slopes could not be analyzed due to a lack of necessary information for the basin. • Very dense, woody vegetation is present within the basin and along its slopes due to how long the basin has been inactive.
Dike Compaction	§ 845.450(a)(3)	• An assessment of the compacted density of the basin's north dike could not be performed due to a lack of necessary information for the basin.
Spillways	§ 845.450(a)(5)	• The basin does not have an emergency spillway.
Embedded Hydraulic Structures	§ 845.450(a)(6)	• There are no hydraulic structures known to be embedded in or under the Former Ash Basin.
Low Pool & Rapid Drawdown Stability	§ 845.450(a)(7)	• The low pool and rapid drawdown stability analyses could not be performed for the Former Ash Basin due to a lack of necessary information for the basin.

Table ES-3B – 2024 Recommended Corrective Measures for the Former Ash Basin at the Powerton Generating Station

Recommended Corrective Measure	Timeframe
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. It is recommended that the Station continue with its plans to close the Former Ash Basin.	Upon Receipt of Permit from Illinois EPA

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 2024 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 2024 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 2024 structural stability assessment for the Ash Surge, Bypass, and Former Ash Basins are based on visual observations made by S&L during site visits on August 22, 2024 (Ash Surge Basin and Former Ash Basin) and on September 25, 2024 (Bypass Basin); 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 12),
- History of construction for the Ash Surge and Bypass Basins (Ref. 13),
- Initial federal structural stability assessment for the Former Ash Basin (Ref. 14),
- Annual inspection reports for the Former Ash Basin (Refs. 15 through 22),
- History of construction for the Former Ash Basin (Ref. 23),
- 2023 annual structural stability assessment for the Ash Surge Basin, Bypass Basin, and Former Ash Basin (Ref. 24),
- 2024 annual safety factor assessment for the Ash Surge Basin, Bypass Basin, and Former Ash Basin (Ref. 25), and
- 2024 annual inflow design flood control system plan for the Ash Surge Basin, Bypass Basin, and Former Ash Basin (Ref. 26).

2.2 2023 RECOMMENDED CORRECTIVE MEASURES

2.2.1 ASH SURGE BASIN AND BYPASS BASIN

Table 2-1 lists the corrective measures that were recommended for the Ash Surge Basin and the Bypass Basin based on the findings documented in the 2023 annual structural stability assessment (Ref. 24):

Table 2-1 – 2023 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 pipes' integrities.	During Retrofit Construction

Recommended Corrective Measure	Timeframe
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 pipes' integrities.	During Retrofit Construction

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 2023. Consequently, the 2023 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

2.3.1 ASH SURGE BASIN

Powerton has taken the Ash Surge Basin out of service and started dewatering the basin. MWG plans to retrofit the Ash Surge Basin with a new composite liner system and a new leachate collection and removal system (LCRS) upon receipt of a retrofit construction permit from the Illinois EPA in accordance with Subpart B of the Illinois CCR Rule. MWG submitted a retrofit construction permit application for retrofitting the Ash Surge Basin on July 27, 2023.

2.3.2 BYPASS BASIN

Since the 2023 structural stability assessment (Ref. 24), Powerton has retrofitted the Bypass Basin in accordance with 35 Ill. Adm. Code 845.770 and the July 3, 2024, construction permit issued by Illinois EPA. The retrofit design features a new composite liner system and LCRS over an existing geomembrane liner, which was left in-place as a supplemental liner for the retrofitted basin. Structural fill was placed over the supplemental liner to support the new liner and to provide the slopes required for the LCRS. In addition, different layers of granular fill were placed over the new LCRS to prevent CCR and non-CCR sediments from clogging the LCRS (sand filter layer), to provide a means of deflecting the force of CCR pumped into the basin (protective warning layer), and to protect against erosion (riprap and riprap bedding layer). The total combined thickness of these layers across the basin floor and sideslopes is 1.5 feet. Another 1.5 feet of granular fill was placed along the top of the basin's embankments, vertically expanding the dikes to

accommodate the fill layers placed along the basin floor and sideslopes and to support vehicular traffic. Finally, the basin's emergency spillway was decommissioned and plugged with flowable fill, its overflow weir elevation was maintained at its pre-retrofit / existing elevation of 465.31 feet above mean sea level (amsl), and a new 36-in.-diameter corrugated HPDE pipe was installed in the basin's north dike as a means of diverting non-CCR wastestreams away from the retrofitted Bypass Basin.

2.3.3 FORMER ASH BASIN

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 2024 (Ref. 22), the volume of water impounded in the basin was estimated to be 10 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 BASIN

3.1.1 STABLE FOUNDATIONS & ABUTMENTS

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

The Ash Surge Basin is comprised of earthen dikes on all sides and does not have any abutments. The following descriptions and analysis of the soils supporting the Ash Surge Basin's dikes is taken from the basin's initial federal structural stability assessment prepared by Geosyntec Consultants in October 2016 (Ref. 4):

> Previous subsurface investigations at [Powerton] indicate foundation materials underlying the embankments for the Ash Surge Basin and Bypass Basin generally consists [*sic*] of approximately 17 to 28 feet of fat and lean clay overlying approximately 35 to 40 feet of loose to very dense poorly graded sand and silty sand with some gravel associated with the Henry Formation.
>
> Elastic settlement of the clay and sand layers underlying the embankments likely occurred very soon after construction in the late 1970s and early 1980s. Because of the age of the embankments…the majority of consolidation and secondary compression settlement of the clay layer has likely already occurred…Further, the embankments of the [Ash Surge and Bypass] Basins were not constructed with abutments or separate engineered zones that would be susceptible to the adverse effects of differential settlement.

Based on reviews of the basin's annual inspection reports (Refs. 5 through 12) and Google Earth aerial images (Ref. 3), there have been no significant modifications to the Ash Surge Basin's dikes since its initial federal structural stability assessment was completed. Therefore, the details of the soils supporting the Ash Surge Basin's dikes and corresponding conclusions documented in the basin's initial federal structural stability assessment remain valid for this 2024 assessment. In addition, as documented in the Ash Surge Basin's initial federal and 2024 safety factor assessments (Refs. 4 and 25), liquefaction triggering analyses of saturated soils underlying the embankments show that liquefaction and associated post-liquefaction shear strength loss is unlikely for the design seismic event.

Based on the preceding discussion, the soils supporting the Ash Surge Basin's 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 Basin 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 basin's 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) riprap along the slope into the Bypass Basin, (2) the HDPE geomembrane liner of the Metal Cleaning Basin, (3) vegetative cover, or (4) a combination of rock and vegetative cover. Where present, the rock fill is generally along and near the crest of the given embankment. 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 S&L's site visit on August 22, 2024, S&L noted that the Station had addressed the suggested recommended corrective measures stated in the 2023 structural stability assessment for the Ash Surge Basin's downstream slopes (see Table 2-1, Ref. 24). Rock fill had been placed in areas where erosion rills were observed along the downstream slope of the Ash Surge Basin's eastern dike, and the single woody plant identified in the 2023 assessment had been removed from the crest of the basin's southern dike. 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.

Although the Station has mowed the vegetation along the downstream slopes of the Ash Surge Basin's west, north, and east dikes, S&L did observe vegetation taller than 12 inches in some areas during our walkdown

in August 2024. However, no woody vegetation was observed. It is recommended that the Station continue mowing grassy vegetation, increasing the frequency as needed to maintain vegetative cover less than 12 inches in accordance with the Illinois CCR Rule (Ref. 1, §§ 845.430(b)(4) and 845.430(b)(5)).

Finally, S&L noted three ruts in the road surfacing material along the Ash Surge Basin's dikes: two along the east dike and one along the north dike. These ruts were local depressions (i.e., did not extend along the entire width of the embankment), and no washout of embankment material was observed. Therefore, the observed ruts do not suggest that the stability of the basin's dikes have been compromised. However, it is recommended that the Station backfill these ruts with crushed stone or gravel road surfacing material and monitor these areas.

3.1.3 DIKE COMPACTION

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

As documented in the Ash Surge Basin's initial federal and 2024 safety factor assessments (Refs. 4 and 25), the basin's dikes are sufficiently compacted to withstand the range of loading conditions in the CCR surface impoundment.

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. However, as documented in the basin's 2024 inflow design flood control system plan (Ref. 26), the basin is capable of containing the design flood event (1,000-year, 24-hour storm) without discharging water from its emergency spillway structure. Therefore, the capacity of the spillway was not evaluated in this assessment.

3.1.5 EMBEDDED HYDRAULIC STRUCTURES

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

As shown on Figure 1, there are four active pipes and one decommissioned pipe that underlie or pass through the Ash Surge Basin's dikes. Pipe 4 is the Ash Surge Basin's outlet pipe to the Ash Surge Basin Sump. Pipe 5 is the common header into which the three pumps in the Ash Surge Basin Sump pump water to the wastewater building identified on Figure 1. Refer to Section 3.2.5 for a discussion of Pipes 2, 3, and 6.

As documented in the Ash Surge Basin's initial federal structural stability assessment (Ref. 4), visual surveillance of the pipes passing through the Ash Surge Basin's 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 for Pipes 4 and 5 since the initial video camera inspection in May 2016. However, no visual signs of distress at the north dike surface 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 August 2024 site visit. Moreover, the Ash Surge Basin has been taken out of service and is being actively dewatered. Following dewatering, only intermittent flow is expected in Pipe 4. However, it is recommended that the Station conduct a visual surveillance program to confirm this pipe is in good, working condition and is free of significant material defects that could impact the pipe's integrities 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 Basin's initial federal safety factor assessment (Ref. 4), the results of which were revalidated in the 2024 safety factor assessment (Ref. 25), the structural stabilities of the basin's downstream slopes are maintained during low pool conditions at each of the basins that are adjacent to the Ash Surge Basin. These basins are:

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

The Ash Surge Basin's initial federal safety factor assessment also concluded that the structural stabilities of the basin's 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 Ash Surge Basin since the Metal Cleaning Basin's liner precludes the infiltration of water into the Ash Surge Basin's western dike. 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 Basin's annual inspection reports (Refs. 5 through 12) 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 Basin's initial federal structural stability assessment was completed. Therefore, the conclusions documented therein (Ref. 4) regarding the stability of the basin's dikes during low pool and sudden (rapid) drawdown conditions (where

applicable) at the identified basins remain valid for this 2024 assessment. Finally, a sudden (rapid) drawdown condition is not possible for the downstream slope of the Ash Surge Basin's southern dike because the retrofitted Bypass Basin is lined with a supplemental HDPE geomembrane liner under a composite liner system consisting of a lower geosynthetic clay liner and an upper HDPE geomembrane liner; each of these geosynthetic materials precludes the infiltration of water into the Ash Surge Basin's southern dike.

3.2 RETROFITTED BYPASS BASIN

3.2.1 STABLE FOUNDATIONS & ABUTMENTS

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

The Bypass Basin is comprised of earthen dikes on all sides and does not have any abutments. Refer to Section 3.1.1 for descriptions and analysis of the soils supporting the Bypass Basin's dikes, which was taken from the basin's initial federal structural stability assessment prepared by Geosyntec Consultants in October 2016 (Ref. 4).

Because the Bypass Basin's existing geomembrane liner was left in-place as a supplemental liner in the retrofit design, the basin's foundation soils were not altered during retrofit activities. Although approximately 1.5 feet of granular fill was placed on the basin floor and sideslopes, this material replaced about 1.5 feet of granular fill above the basin's existing geomembrane liner that was removed when the existing liner was decontaminated; this fill material also occupies an area along the basin's sideslopes that was previously used for storing CCR and process wastewater. Moreover, because the overflow weir elevation in the Bypass Basin was not adjusted during retrofit activities, the fill material placed within the basin has reduced the volume available for storing CCR and process wastewater relative to the basin's pre-retrofit condition. Given this reduction in storage capacity and the basin's age (almost 45 years since its original construction), the soils supporting the Bypass Basin are not considered to be susceptible to settlement detrimental to the CCR surface impoundment's performance as a result of the retrofit construction.

Based on the preceding discussion and the conclusions in the Bypass Basin's 2024 safety factor assessment (Ref. 25), the basin's foundational soils can withstand the range of loading conditions in the CCR surface impoundment. Thus, the soils supporting the Bypass Basin's dikes are considered to be stable for the maximum volume of CCR and CCR wastewater which can be impounded therein.

3.2.2 SLOPE PROTECTION

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

The upstream slopes of the retrofitted Bypass Basin are covered with riprap, which protects 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 retrofitted Bypass Basin consists of (1) the HDPE geomembrane liner for the Ash Surge Basin, (2) vegetative cover, or (3) a combination of crushed rock and vegetative cover. Where present, the crushed rock fill is generally along and near the crest of the given embankment. All three forms of cover protect the downstream slopes of the basin's dikes against surface erosion, wave action, and adverse effects of sudden (rapid) drawdown.

During our site visit on September 25, 2024, S&L noted that some of the vegetation and topsoil along the downstream slope of the Bypass Basin's east embankment had been stripped to support ongoing resurfacing work on top of the embankments. The contractor performing the retrofit work had temporary erosion and sediment controls installed around the noted area. Moreover, the contractor will be re-stabilizing and re-seeding this area after all construction work is complete at the site. It is recommended that the Station monitor this area to verify that adequate vegetative cover is established following re-seeding.

3.2.3 DIKE COMPACTION

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

As documented in the Bypass Basin's 2024 safety factor assessment (Ref. 25), the basin's dikes are sufficiently compacted to withstand the range of loading conditions in the CCR surface impoundment.

3.2.4 SPILLWAYS

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

When it was first built, the Bypass Basin had an emergency overflow riser pipe located at the northeast corner of the basin. However, this riser pipe and the downstream 30-in.-diameter corrugated metal pipe into the Ash Surge Basin (identified as Pipe 2 in Figure 1) were decommissioned and plugged with flowable fill during retrofit construction activities. As documented in the basins' 2024 inflow design flood control system plan (Ref. 26), 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))

As shown on Figure 1, there are two active pipes and two decommissioned pipes that underlie or pass through the Bypass Basin's dikes. Pipe 3 is a 36-in.-diameter reinforced concrete pipe (RCP) that conveys effluent from the Bypass Basin's discharge structure in its southeastern corner to the Ash Surge Basin Sump. Meanwhile, Pipe 6 is a new 36-in.-diameter corrugated HPDE (CHPDE) pipe that was installed during the retrofit of the Bypass Basin to divert non-CCR wastestreams away from the retrofitted Bypass Basin. As previously stated in Section 3.2.4, Pipe 2, which was a 30-in.-diameter corrugated metal pipe within the northern embankment of the Bypass Basin, was decommissioned and plugged with flowable fill during retrofit construction activities. Finally, Pipe 1, which was a 15-in.-diameter RCP located in the basin's outlet structure, was also filled with flowable fill during retrofit construction activities. After the pipe was plugged, structural fill was placed over the decommissioned pipe to support installation of the basin's new composite liner system.

In accordance with the recommended corrective measure stated in the 2023 structural stability assessment for the Bypass Basin (see Table 2-1, Ref. 24), Pipe 3 was assessed in 2024 to prepare for the Bypass Basin retrofit construction. The results of this assessment verified that the discharge pipe is in good operational condition, and no significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris that may negatively affect the basin were identified.

The new Pipe 6 installed in the Bypass Basin's north dike was installed by excavating a trench, placing a coarse aggregate bedding layer, placing the pipe, and backfilling the trench with well-graded crushed stone / gravel. All fill material under and around Pipe 6 was compacted to 95% of the material's maximum dry density, as determined by ASTM D1557 (i.e., modified Proctor). Given the pipe is new and was installed in accordance with recognized and generally accepted engineering practices, Pipe 6 is in good operational condition, and there are no significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris that may negatively affect the basin.

In accordance with 35 Ill. Adm. Code 845.450(a)(6), it is recommended that the Station continue to perform visual inspections of the Bypass Basin's discharge pipe (Pipe 3) and the new CHDE pipe for non-CCR wastewater (Pipe 6) to confirm that the pipes' structural integrities continue to be maintained.

3.2.6 LOW POOL & RAPID DRAWDOWN STABILITY

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

As documented in the Bypass Basin's 2024 safety factor assessment (Ref. 25), the structural stabilities of the basin's downstream slopes are maintained during low pool conditions at each of the basins that are adjacent to the Bypass Basin. These basins are:

- East Roof and Yard Runoff Basin, and
- Ash Surge Basin.

In addition, the Bypass Basin's initial 2016 federal safety factor assessment (Ref. 4) also concluded that the structural stability of the downstream slope of the basin's west dike is maintained during a sudden (rapid) drawdown condition at the East Roof and Yard Runoff Basin. Since the Ash Surge Basin is lined with an HDPE geomembrane, a sudden (rapid) drawdown condition was determined to not be an applicable loading condition for the basin since the Ash Surge Basin's liner precludes the infiltration of water into the Bypass Basin's northern dike.

Based on reviews of the Bypass Basin's annual inspection reports (Refs. 5 through 12) and Google Earth aerial images (Ref. 3), there have been no significant modifications to the East Roof and Yard Runoff Basin and Ash Surge Basin since the Bypass Basin's initial federal structural stability assessment was completed. Therefore, the conclusions documented therein (Ref. 4) regarding the stabilities of the Bypass Basins' dikes during low pool and sudden (rapid) drawdown conditions (where applicable) remain valid for this 2024 assessment.

3.3 FORMER ASH BASIN

3.3.1 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. The following descriptions and analysis of the soils supporting the Former Ash Basin's dike is taken from the basin's initial federal structural stability assessment prepared by Geosyntec Consultants in October 2016 (Ref. 14):

> Subsurface investigations performed at the [Former Ash Basin] for the installation of the railway, and exploratory sampling performed in 2016 indicate foundation materials underlying the embankments for the [Former Ash Basin] consist of clay fills, clayey sand, and gravel with sand and clay. A loose clayey sand layer was observed from 8 to 18 ft-[below ground surface (bgs)] on the North Pond. From 18 to 50 ft-bgs, poor-graded gravel with sand and clay is present consist with river sediments.

Elastic settlement of the clay and sand layers underlying the embankments likely occurred very soon after construction. Because of the age of the embankments, most consolidation and secondary compression settlement of the clay layer has likely already occurred. There are no proposed changes in operation which would increase loading conditions on the foundation materials; therefore, no significant settlement of the foundation materials underlying the embankments is anticipated to occur in the future. Further, the embankment was not constructed with abutments or separate engineered zones that would be most susceptible to the adverse effects of differential settlement. Therefore, potential settlement of the foundation is not anticipated to impact the integrity of the impoundment embankments.

Based on reviews of the basin's annual inspection reports (Refs. 15 through 22) 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 (Ref. 14) remain valid for this 2024 assessment.

3.3.2 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 August 2024 site visit, vegetation greater than 12 inches was observed along portions of the basin'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.

3.3.3 DIKE COMPACTION

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

As documented in the Former Ash Basin's initial federal and 2024 safety factor assessments (Refs. 14 and 25), 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.

3.3.4 SPILLWAYS

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

The Former Ash Basin does not have spillways. As documented in the basin's 2024 inflow design flood control system plan (Ref. 26), the basin is capable of containing the design flood event (1,000-year, 24-hour storm) without a spillway.

3.3.5 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.

3.3.6 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 2024 structural stability assessment.

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

Recommended Corrective Measure	Timeframe
Ash Surge Basin	
Place crushed stone or gravel road surfacing material in the three ruts observed in the roads along the basin's dikes and monitor these areas.	Now
Continue mowing vegetation taller than 12 inches observed along the downstream slopes of the west, north, and east dikes.	Now, and as Required to Maintain Vegetative Cover Under 12 Inches
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	
Confirm adequate vegetative cover is established along re-seeded areas of basin's downstream slopes. Re-seed as necessary to address bare or thinly vegetated areas.	Post-Retrofit Construction
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.	Annually

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. Notably, MWG submitted a construction permit application to the Illinois EPA on October 26, 2022, 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, 2024

Seal:

Digitally signed by
Thomas Dehlin
Date: 2024.10.13
11:29:47-05'00'

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24. Sargent & Lundy. “2023 Structural Stability Assessment for Ash Surge Basin, Bypass Basin, & Former Ash Basin.” S&L Project No. A12661.174. October 2023.
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FIGURE 1

EMBEDDED PIPES AT ASH SURGE & BYPASS BASINS

POWERTON GENERATING STATION

PIPE LEGEND

ACTIVE

DECOMMISSIONED

NOTE: PIPE LOCATIONS & LENGTHS ARE APPROXIMATE.

MWG

Midwest Generation, LLC

Sargent & Lundy