CARDINAL OPERATING COMPANY

Cardinal Power Plant

Inflow Design Flood Control System Plan for

Existing Bottom Ash Pond Complex

Issue Purpose: For Use, Rev. 0

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1 PURPOSE

In accordance with 40 CFR 257.82(a) this document provides the 2021 periodic inflow design flood control system plan for the existing Bottom Ash Pond Complex (BAPC) at the Cardinal Power Plant. The BAPC consists of two existing coal combustion residual (CCR) surface impoundments, the Bottom Ash Pond and Recirculation Pond, which are interconnected and are managed as a single CCR unit. The previous inflow design flood control system for the BAPC was completed and uploaded to the Plant Operating Record on October 9, 2016. Pursuant to 40 CFR 257.73(c)(4), this periodic inflow design flood control system was conducted and completed within five years of the previous assessment.

2 APPLICABLE CCR REGULATION

To develop the inflow design flood control system plan for the BAPC, the following excerpts from 40 CFR Part 257 Subpart D (Federal CCR Rule) are applicable:

- **§257.82(a):**
  "The owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment must design, construct, operate, and maintain an inflow design flood control system as specified in paragraphs (a)(1) and (2) of this section.
  (1) The inflow design flood control system must adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood specified in paragraph (a)(3) of this section.
  (2) The inflow design flood control system must adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood specified in paragraph (a)(3) of this section.
  (3) The inflow design flood is:
  (i) For a high hazard potential CCR surface impoundment, as determined under § 257.73(a)(2) or § 257.74(a)(2), the probable maximum flood;
  (ii) For a significant hazard potential CCR surface impoundment, as determined under § 257.73(a)(2) or § 257.74(a)(2), the 1,000-year flood;
  (iii) For a low hazard potential CCR surface impoundment, as determined under § 257.73(a)(2) or § 257.74(a)(2), the 100-year flood; or
  (iv) For an incised CCR surface impoundment, the 25-year flood."

- **§257.82(c):**
  "Inflow design flood control system plan –
  (1) Content of the plan. The owner or operator must prepare initial and periodic inflow design flood control system plans for the CCR unit according to the timeframes specified in paragraphs (c)(3) and (4) of this section. These plans must document how the inflow design flood control system has been designed and constructed to meet the requirements of this section. Each plan must be supported by appropriate engineering calculations. The owner or operator of the CCR unit has completed the inflow design flood control system plan when the plan has been placed in the facility's operating record as required by § 257.105(g)(4).
  (2) Amendment of the plan. The owner or operator of the CCR unit may amend the written inflow design flood control system plan at any time provided the revised plan is placed in the facility's operating record as required by § 257.105(g)(4). The owner or operator must amend the written inflow design flood control system plan whenever there is a change in conditions that would substantially affect the written plan in effect.
  (3) Timeframes for preparing the initial plan—
  (i) Existing CCR surface impoundments. The owner or operator of the CCR unit must prepare the initial inflow design flood control system plan no later than October 17, 2016.

(ii) New CCR surface impoundments and any lateral expansion of a CCR surface impoundment. The owner or operator must prepare the initial inflow design flood control system plan no later than the date of initial receipt of CCR in the CCR unit.

(4) Frequency for revising the plan. The owner or operator must prepare periodic inflow design flood control system plans required by paragraph (c)(1) of this section every five years. The date of completing the initial plan is the basis for establishing the deadline to complete the first periodic plan. The owner or operator may complete any required plan prior to the required deadline provided the owner or operator places the completed plan into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing a subsequent plan is based on the date of completing the previous plan. For purposes of this paragraph (c)(4), the owner or operator has completed an inflow design flood control system plan when the plan has been placed in the facility's operating record as required by § 257.105(g)(4).

(5) The owner or operator must obtain a certification from a qualified professional engineer stating that the initial and periodic inflow design flood control system plans meet the requirements of this section."

3 ASSESSMENT

3.1 CCR Unit Description

The surface impoundments of the BAPC were formed using diked embankments on the east and west sides, while the north and south boundaries of the complex are incised into the natural topography. An earthen dike was constructed to divide the complex into two impoundments. An outfall structure with an overflow weir was constructed in the Bottom Ash Pond which then discharges into the Recirculation Pond through a 36-inch diameter equalizing pipe. The inflows to the Recirculation Pond are either recycled back to the station for use as process water through the existing Recirculation Pumphouse or discharged to the Ohio River through an NPDES permitted overflow weir at Outfall 023.

3.2 Inflow Design Flood

The BAPC has been classified as a significant hazard potential CCR surface impoundment; therefore, pursuant to 40 CFR 257.82(a)(3), the design flood is the 1,000-year flood. However, the BAPC is also classified as a Class II dam in accordance with the Ohio Administrative Code (OAC). Pursuant to OAC 1501:21-13-02 (A) (2), the design storm for Class II dams shall consider fifty percent of the probable maximum flood. The more stringent ½ PMF value as required by the state of Ohio was used in the assessment.

3.3 Process Inflows

In addition to direct rainfall and stormwater runoff, the BAPC also receives pumped inflows from bottom ash sluicing operations and low volume wastewater. The design bottom ash transport water and low volume wastewater inflow into the BAPC is estimated to be approximately 18.86 MGD according to the plant's water balance.

3.4 Assessment Summary & Conclusion

The results from this assessment are summarized in the table below for the Bottom Ash Pond at the Cardinal Power Plant.

	Units	Bottom Ash Pond
Hazard Potential Classification	-	Significant
Design Flood Event	-	50% of PMF (>1,000-year flood)
Peak Stormwater Inflow	cfs	525.95
Process Water Inflow	cfs	18.86
Peak Estimated Inflow	cfs	544.81
Normal Operating Water Level	ft	665.00
Estimated Maximum Water Level	ft	666.33
Top of Surface Impoundment Dike Elevation	ft	670.00

The results from this assessment are summarized in the table below for the Recirculation Pond at the Cardinal Power Plant.

	Units	Recirculation Pond
Hazard Potential Classification	-	Significant
Design Flood Event	-	50% of PMF (>1,000-year flood)
Peak Stormwater Inflow	cfs	194.06
Peak Inflow from Bottom Ash Pond	cfs	27.50
Peak Estimated Inflow	cfs	221.56
Normal Operating Water Level	ft	664.00
Estimated Maximum Water Level	ft	665.17
Top of Surface Impoundment Dike Elevation	ft	670.00

The assessment shows that the BAPC can adequately manage the inflow design flood in accordance with 40 CFR 257.82(a), by retaining the peak inflow without overtopping the perimeter dikes.

4 CERTIFICATION

I certify that

- This inflow design flood control system plan was prepared by me or under my supervision,
- This inflow design flood control system plan meets the requirements of 40 CFR 275.82, and
- I am a registered professional engineer under the laws of the State of Ohio.

Certified by: **James T. Perry** Date: **09/13/2021**

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