CARDINAL OPERATING COMPANY

Cardinal Power Plant

Inflow Design Flood Control System Plan for

Retrofitted Bottom Ash Pond of the Bottom Ash Pond Complex

Issue Purpose: For Use, Rev. 0

Issue Date: January 5, 2022

Project No.: 13770-005/006

PREPARED BY:

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1 PURPOSE

The Bottom Ash Pond Complex (BAPC) at the Cardinal Power Plant initially consisted of two surface impoundments known as the Bottom Ash Pond (North Pond) and the Recirculation Pond (South Pond), which were interconnected and managed as a single CCR unit. The South Pond of the BAPC was recently retrofitted with a CCR-compliant liner system and will continue to receive bottom ash in accordance with 40 CFR 257.102(k). Upon completion of the retrofit, the South Pond's name was changed from the former "Recirculation Pond" to the retrofitted "Bottom Ash Pond."

In accordance with 40 CFR 257.82(a) and 40 CFR 257.82(c)(2) this document provides the revised inflow design flood control system plan for the retrofitted Bottom Ash Pond of the BAPC at the Cardinal Power Plant.

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 retrofitted Bottom Ash Pond was formed using diked embankments on the east and west sides, while the south boundary of the pond is incised into the natural topography. An earthen dike was constructed on the north side of the pond to separate the South Pond from the North Pond. Pipes were constructed to transport bottom ash transport water from Units 1, 2 and 3 at the Cardinal Station which then discharges into the retrofitted Bottom Ash Pond. The inflows to the retrofitted Bottom Ash Pond are recycled back to the station for use as process water through the existing Recirculation Pumphouse.

3.2 Inflow Design Flood

The retrofitted Bottom Ash Pond 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 retrofitted Bottom Ash Pond 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 retrofitted Bottom Ash Pond also receives pumped inflows from bottom ash sluicing operations. The design bottom ash transport water into the retrofitted Bottom Ash Pond is estimated to be approximately 4.14 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 retrofitted Bottom Ash Pond at the Cardinal Power Plant.

	Units	Retrofitted Bottom Ash Pond
Hazard Potential Classification	-	Significant
Design Flood Event	-	50% of PMF (>1,000-year flood)
Peak Stormwater Inflow	cfs	266.65
Process Water Inflow	cfs	6.41
Peak Estimated Inflow	cfs	273.06
Normal Operating Water Level	ft	665.00
Estimated Maximum Water Level	ft	666.26
Top of Surface Impoundment Dike Elevation	ft	670.00

The assessment shows that the retrofitted Bottom Ash Pond 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. The assessment can be seen in its entirety attached to this document.

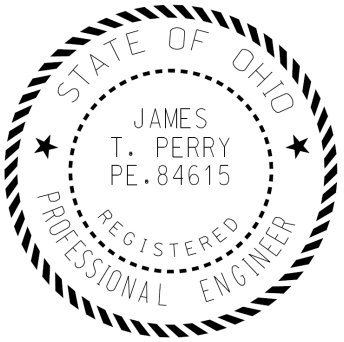
4 CERTIFICATION

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: 01/05/2022

Seal:



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ATTACHMENT A

Hydrology & Hydraulics Calculation for Retrofitted Bottom Ash Pond

Cardinal_H&H Calc_RBAP_Rev2_12-22-2021.pdf