2021 USEPA CCR RULE PERIODIC CERTIFICATION REPORT §257.73(a)(2)-(3), (c), (d), (e) and §257.82 D BASIN

Zimmer Power Plant

Moscow, Ohio

Submitted to

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TABLE OF CONTENTS

Executive Summary ... 1
SECTION 1 Introduction and Background ... 3
1.1 DBSN Description ... 4
1.2 Report Objectives ... 6
SECTION 2 Comparison of Initial and Periodic Site Conditions ... 8
2.1 Overview ... 8
2.2 Review of Annual Inspection Reports ... 8
2.3 Review of Instrumentation Data ... 8
2.4 Comparison of Initial to Periodic Surveys ... 9
2.5 Comparison of Initial to Periodic Aerial Photography ... 9
2.6 Comparison of Initial to Periodic Site Visits ... 9
2.7 Interview with Power Plant Staff ... 10
SECTION 3 Hazard Potential Classification - §257.73(a)(2) ... 12
3.1 Overview of Initial HPC ... 12
3.2 Review of Initial HPC ... 12
3.3 Summary of Site Changes Affecting the Initial HPC ... 12
3.4 Periodic HPC ... 13
SECTION 4 Emergency Action Plan - §257.73(a)(3) ... 14
4.1 Overview of Initial EmAP ... 14
4.2 Review of Initial EmAP ... 14
4.3 Summary of Site Changes Affecting the Initial EmAP ... 15
4.4 Periodic EmAP ... 15
SECTION 5 History of Construction Report - §257.73(c) ... 16
5.1 Overview of Initial HoC ... 16
5.2 Summary of Site Affecting the Initial HoC ... 17
SECTION 6 Structural Stability Assessment - §257.73(d) ... 18
6.1 Overview of Initial SSA ... 18
6.2 Review of Initial SSA ... 18
6.3 Summary of Site Changes Affecting Initial SSA ... 19
6.4 Periodic SSA ... 19
SECTION 7 Safety Factor Assessment - §257.73(e)(1) ... 20
7.1 Overview of Initial SFA ... 20
7.2 Review of Initial SFA ... 20
7.3 Summary of Site Changes Affecting the Initial SFA ... 21
7.4 Periodic SFA ... 21

SECTION 8 Inflow Design Flood Control System Plan - §257.82 23
8.1 Overview of Initial IDF 23
8.2 Review of Initial IDF 23
8.3 Summary of Site Changes Affecting the Initial IDF 24
SECTION 9 Conclusions 25
SECTION 10 Certification Statement 26
SECTION 11 References 27

LIST OF FIGURES

Figure 1 Site Location Map
Figure 2 Site Plan

LIST OF TABLES

Table 1 Periodic Certification Summary
Table 2 Initial to Periodic Survey Comparison
Table 3 Factors of Safety from Periodic SFA

LIST OF DRAWINGS

Drawing 1 Initial to Periodic Survey Comparison Plan
Drawing 2 Survey Comparison Isopach
Drawing 3 Initial to Periodic Aerial Imagery Comparison

LIST OF ATTACHMENTS

Attachment A DBSN Piezometer Data Plots
Attachment B DBSN Site Visit Photolog
Attachment C Periodic Emergency Action Plan for Zimmer Power Plant
Attachment D Periodic Structural Stability and Safety Factor Assessment Analyses

EXECUTIVE SUMMARY

This Periodic United States Environmental Protection Agency (USEPA) Coal Combustion Residuals (CCR) Rule [1] certification report (Periodic Certification Report) for the D Basin (DBSN) at the Zimmer Power Plant (ZPP), also known as Zimmer Power Station), has been prepared in accordance with Rule 40, Code of Federal Regulations (CFR) §257, herein referred to as the "CCR Rule" [1]. The CCR Rule requires that initial certifications for existing CCR surface impoundment, completed in 2016 and subsequently posted on Zimmer Power Company, LLC (ZPC) CCR Website ([2], [3], [4], [5], [6], [7]) be updated on a five-year basis.

The initial certification reports developed in 2016 and 2017 ([2], [8], [3], [4], [9], [5], [6], [7]). were independently reviewed by Geosyntec. Additionally, field observations, interviews with plant staff, updated engineering analyses, and evaluations were performed to compare conditions in 2021 at the DBSN relative to the 2016 and 2017 initial certifications. These tasks determined that updates are not required for the Initial Hazard Potential Classification, History of Construction Report, and Initial Inflow Design Flood Control System Plan. However, due to changes at the site and technical review comments, updates were required and were performed for the Emergency Action Plan and Initial Safety Factor Assessment.

Geosyntec's evaluations of the initial certification reports and updated analyses identified that the DBSN meets all requirements for hazard potential classification, history of construction reporting, emergency action plan, structural stability, safety factor assessment, and hydrologic and hydraulic control. **Table 1** provides a summary of the initial 2016 certifications and the updated 2021 periodic certifications.

Table 1 – Periodic Certification Summary

	CCR Rule Reference	Requirement Summary	2016 Initial Certification		2021 Periodic Certification	
			Requirement Met?	Comments	Requirement Met?	Comments
Hazard Potential Classification						
3	§257.73(a)(2)	Document hazard potential classification	Yes	Impoundment was determined to have Significant hazard potential classification [2].	Yes	Updates were not determined to be necessary. Geosyntec recommends retaining the Significant hazard potential classifications.
Emergency Action Plan						
4	§257.73(a)(3)(iv)	Prepare written Emergency Action Plan	Yes	A written Emergency Action Plan was prepared [3].	Yes	An updated Emergency Action Plan was prepared and is provided in **Attachment C**.
History of Construction						
5	§257.73(c)(1)	Compile a history of construction	Yes	A history of Construction report was prepared for the DBSN, and Coal Pile Runoff Pond [4].	Yes	Updates were not determined to be necessary.
Structural Stability Assessment						
6	§257.73(d)(1)(i)	Stable foundations and abutments	Yes	Foundations were found to be stable, DBSN does not have abutments [9].	Yes	Foundations and abutments were found to be stable after performing updated slope stability analyses.
	§257.73(d)(1)(ii)	Adequate slope protection	Yes	Slope protection was adequate [9].	Yes	Vegetative slope protection is adequate. Few instances of erosion that will be addressed
	§257.73(d)(1)(iii)	Sufficiency of embankment compaction	Yes	Embankment compaction was sufficient for expected ranges in loading conditions [9].	Yes	Dike compaction was found to be sufficient after performing updated slope stability analyses.
	§257.73(d)(1)(iv)	Presence and condition of slope vegetation	Yes	Vegetation is present and is maintained [9].	Yes	Vegetative slope protection is adequate and maintained. Few instances of erosion that will be addressed
	§257.73(d)(1)(v)(A) and (B)	Adequacy of spillway design and management	Yes	Spillways are not present, but the DBSN adequately manages flow during 1,000-year flood without spillways [9].	Yes	No changes were identified that may affect this requirement.
	§257.73(d)(1)(vi)	Structural integrity of hydraulic structures	Not Applicable	Hydraulic structures penetrating the embankment of or underlying the base of the DBSN are not present [9].	Not Applicable	No changes were identified that may affect this requirement.
	§257.73(d)(1)(vii)	Stability of downstream slopes inundated by water body.	Yes	Downstream slopes adjacent to the Ohio river are expected to remain stable during inundation [9].	Yes	No changes to the perimeter embankments were observed, previous analyses are applicable.
Safety Factor Assessment						
7	§257.73(e)(1)(i)	Maximum storage pool safety factor must be at least 1.50	Yes	Safety factors were calculated to be 3.88 and higher [6].	Yes	Safety factors from updated slope stability analyses were calculated to be 3.67 and higher.
	§257.73(e)(1)(ii)	Maximum surcharge pool safety factor must be at least 1.40	Yes	Safety factors were calculated to be 2.63 and higher [6].	Yes	Safety factors from updated slope stability analyses were calculated to be 3.67 and higher.
	§257.73(e)(1)(iii)	Seismic safety factor must be at least 1.00	Yes	Safety factors were calculated to be 1.79 and higher [6].	Yes	Safety factors from updated slope stability analyses were calculated to be 1.63 and higher.
	§257.73(e)(1)(iv)	For embankment construction of soils that have susceptible to liquefaction, safety factor must be at least 1.20	Not Applicable	Embankment soils are not susceptible to liquefaction [6].	Not Applicable	No changes were identified that may affect this requirement.
Inflow Design Flood Control System Plan						
8	§257.82(a)(1), (2), (3)	Adequacy of inflow design control system plan.	Yes	The DBSN adequately manages inflow and peak discharge during the 1000-year, 24-hour Inflow Design Flood without a spillway system [7].	Yes	No changes were identified that may affect this requirement.
	§257.82(b)	Discharge from CCR Unit	Yes	Discharge from the CCR Unit is routed through a NPDES-permitted outfall during both (PMP/1000-year), 24-hour Inflow Design Flood conditions [7].	Yes	No changes were identified that may affect this requirement.

SECTION 1

INTRODUCTION AND BACKGROUND

This Periodic United States Environmental Protection Agency (USEPA) Coal Combustion Residual (CCR) Rule [1] Certification Report was prepared by Geosyntec Consultants (Geosyntec) for Zimmer Power Company, LLC (ZPC) to document the periodic certification of the D Basin (DBSN) at the Zimmer Power Plant (ZPP), located at Cinergy Access Road, Moscow, Ohio, 45153. The location of ZPP is provided in **Figure 1**, and a site plan showing the location of the DBSN, among other open CCR units and non-CCR surface impoundments, is provided in **Figure 2**.

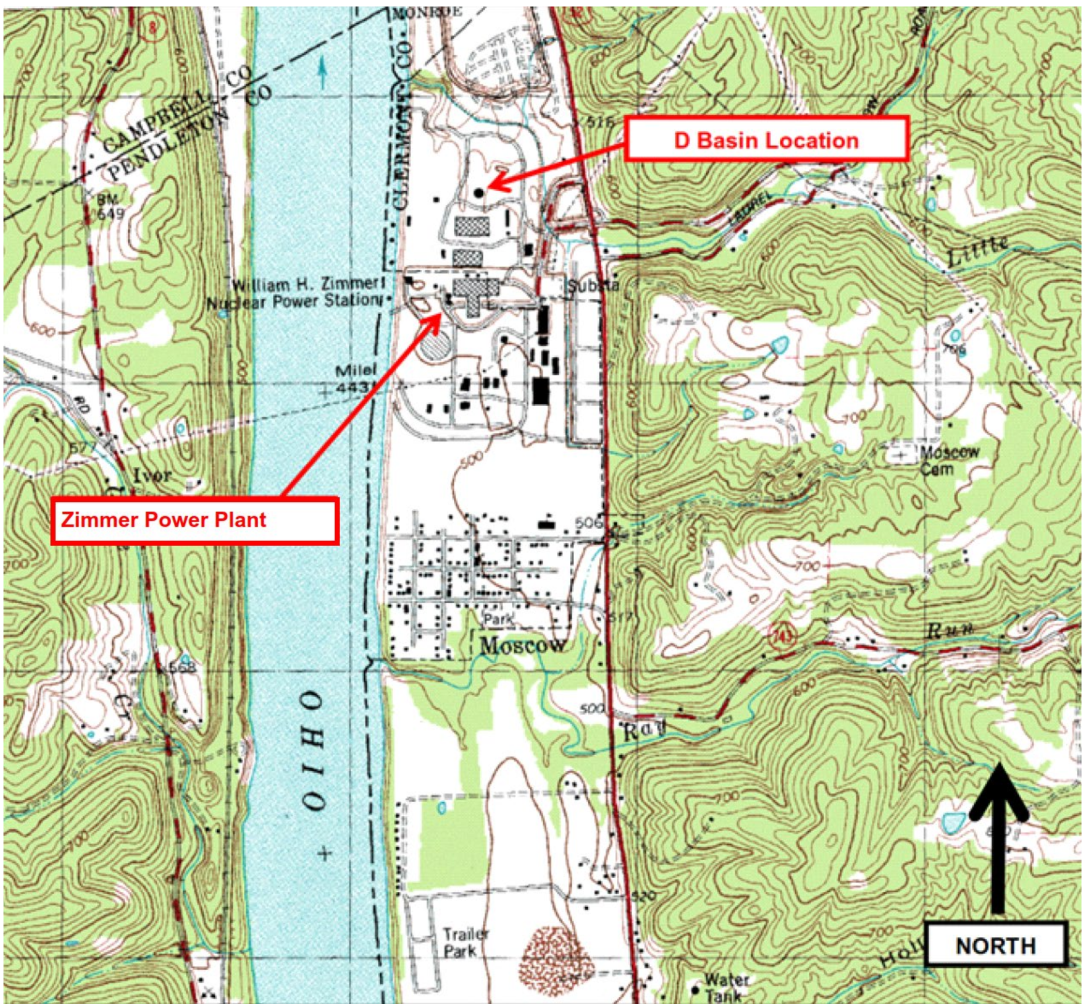


Figure 1 – Site Location Map (from AECOM, 2016 [9]**)**

(note that the U.S.G.S map incorrectly references the Zimmer Power Plant as a "nuclear power station")

Figure 2 – Site Plan (background aerial from Google Earth)

1.1 DBSN Description

The DBSN is part of the Wastewater Pond Complex. The Wastewater Pond Complex includes two CCR units (the DBSN and the Coal Pile Runoff Pond) and five non-CCR units (the A, B, and C Basins, the Wastewater Pond, and the Clearwater Pond). The non-CCR units are utilized as stormwater storage basins. All of the basins within the Wastewater Pond Complex are surrounded by a continuous shared perimeter embankment with a crest elevation ranging from 509 to 510 feet[1]. This continuous embankment separates the basins in the Wastewater Pond Complex from the surrounding area.

The various CCR and non-CCR units within the Wastewater Pond Complex are separated by interior embankments of varying crest elevation. The interior embankments are located completely within the limits of the shared perimeter embankment, and only separate the ponds from one another. The east and west embankments of the DBSN make up a portion of the shared perimeter

[1] All elevations are in the North American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

embankment for the Wastewater Pond Complex, while the north embankment (separating the DBSN from the C Basin) and the south embankment (separating the DBSN from the B Basin and the coal pile) have a much lower crest elevation of approximately 496 feet. Outflow from the Wastewater Pond Complex is discharged to the Ohio River via a NPDES-permitted outfall at the Clearwater Pond during normal conditions. Additional outflow is discharged during high-water conditions from emergency outfall structures that drain directly to the Ohio River or Little Indian Creek from the non-CCR A, B, and C Basins. These emergency outfall structures are also included in the NPDES permit for the Wastewater Pond Complex [9].

DBSN is used to temporarily store stacked ash, and it receives dredged CCR and other materials from the Coal Pile Runoff Pond, Wastewater Pond, and Clearwater Pond. The dredged materials enter the DBSN through an eight-inch diameter high density polyethylene (HDPE) pipe located along the bottom of the east embankment, and the material is dewatered within the DBSN. DBSN does not permanently impound free water; liquid from dewatering drains to the sump area of the DBSN and is then pumped to the Coal Pile Runoff Pond. A granular underdrain system, leading to the dewatering sump, is present under the entire footprint of DBSN, which also facilitates dewatering and drainage. Free water is only present in the pond during or after rainfall events, or in limited quantities during dewatering. Dewatered materials from the DBSN are excavated and removed periodically and taken to the offsite Zimmer Landfill for disposal [9].

A spillway system is not present at the DBSN, as the DBSN only receives minimal amounts of water from dredging and precipitation that falls directly into the basin. An emergency spillway culvert leading to the C Basin is present, but it is not relied upon during the Inflow Design Flood (see **Section 8**). Water from dewatering operations as well as surface water runoff enters a sump structure (sump) located at the inboard toe of the D Basin west embankment. The sump is a 27.5-feet tall, square, reinforced concrete riser structure, with interior dimensions to 10 feet by 10 feet. Surface water inflow enters the structure through twin gated 12-inch pipes (invert elevation 492.0 feet), which are located at the bottom of the DBSN. Additional inflow from the underdrain system enters the sump via four 10-inch underdrain pipes (invert elevation 488.3 feet).

The sump is also equipped with a weir and gate structure that could allow free water in the DBSN to be maintained at elevations ranging from 496.8 feet to 501.7 feet. This function of the sump is not used, as typical operations do not include impounding free water in the DBSN. The DBSN sump discharges into the Coal Pile Runoff Pond through dual 500 gallon per minute (gpm) submersible pumps, installed in the interior of the sump at El. 482.2 feet. The pumps feed into dual six-inch discharge pipes, which are stainless steel inside the sump structure and transition to HDPE outside the sump structure [9].

The DBSN is lined with, from bottom to top, a 3-foot compacted lower clay liner layer, a upper clay liner layer (1-foot thick on the side slopes and 2.5-foot thick the pond bottom), geotextile fabric, a granular underdrain layer (1 foot on the side slopes and 2.0 feet across the pond bottom), a second layer of geotextile fabric, and a 2-foot thick bottom ash protection layer [9].

Together, the divider embankments and shared perimeter embankment form a continuous ring embankment structure around the DBSN. The surface area of the DBSN is approximately 6.5 acres, and the perimeter embankment and embankments have a total combined length of approximately 3,000 feet and a maximum height above the exterior grade of 13 feet. The embankment and divider embankments were constructed as homogenous earthen structures with well-compacted sand and gravel fill. The interior and exterior have 3H:1V (horizontal to vertical) slopes. Embankment crest widths range from approximately 25 feet for the east and west embankments and 15 feet for the north and south embankments. The east and west embankment crests are covered with paved access roads and the north and south embankment crests are covered with vegetation [9]. Additional details about the geometry and configuration of the DBSN are provided in the history of construction [4].

Initial certifications for the DBSN for Hazard Potential Classification (§257.73(a)(2)), the Emergency Action Plan (§257.73(a)(3)), History of Construction (§257.73(c)), Structural Stability Assessment (§257.73(d)), Safety Factor Assessment (§257.73(e)(1)), and Inflow Design Flood Control System Plan (§257.82) were completed by Stantec and AECOM in 2016 and 2017 and subsequently posted to ZPC's CCR Website ([2], [3], [4], [5], [6], [7]). Additional documentation for the initial certifications included a detailed operating record reports containing calculations and other information prepared for the hazard potential classification by Stantec [8] and for the structural stability assessment, safety factor assessment, and inflow design flood control system plan by AECOM [9].

1.2 Report Objectives

These following objectives are associated with this report:

- Compare site conditions from 2015/2016, when the initial certifications were developed, to site conditions in 2020/2021, when data for the periodic certification was obtained, and evaluate if updates are required to the:
  - §257.73(a)(2) Hazard Potential Classification [2];
  - §257.73(a)(3) Emergency Action Plan [3];
  - §257.73(c) History of Construction [4];
  - §257.73(d) Structural Stability Assessment [5];
  - §257.73(e) Safety Factor Assessment [6], and/or
  - §257.82 Inflow Design Flood Control System Plan [7].
- Independently review the Hazard Potential Classification ([2], [8]), Emergency Action Plan [3], Structural Stability Assessment ([5], [9]), Safety Factor Assessment ([6], [9]),

and Inflow Design Flood Control System Plan ([7], [9]) reports to determine if updates may be required based on technical considerations.

  - The History of Construction report [4] was not independently reviewed for technical considerations, as this report contained historical information primarily developed prior to promulgation of the CCR Rule [1] for the CCR units at ZPP, and did not include calculations or other information used to certify performance and/or integrity of the impoundments under §257.73(a)(2)-(3), §257.73(c)-(e), or §257.82.

- If updates are required, they will be performed and documented within this report.

- Confirm that the DBSN meets all of the requirements associated with §257.73(a)(2)-(3), (c), (d), (e), and §257.82, or, if the DBSN does not meet any of the requirements, provide recommendations for compliance with these sections of the CCR Rule [1].

SECTION 2

COMPARISON OF INITIAL AND PERIODIC SITE CONDITIONS

2.1 Overview

This section describes the comparison of conditions at the DBSN between the start of the initial CCR certification program in 2015 and 2016 (initial conditions) and subsequent collection of periodic certification site data in 2020 and 2021 (periodic conditions).

2.2 Review of Annual Inspection Reports

Annual onsite inspections for the DBSN were performed between 2016 and 2020 ([10], [11], [12], [13], [14]) and were certified by a licensed professional engineer in accordance with §257.83(b). Each inspection report stated the following information, relative to the previous inspection:

- A statement that no changes in geometry of the impounding structure were observed since the previous inspection;
- Information on maximum recorded instrumentation readings and water levels;
- Approximate volumes of impounded water and CCR at the time of inspection;
- A statement that no appearances of actual or potential structural weakness or other disruptive conditions were observed; and
- A statement that no other changes which may have affected the stability or operation of the impounding structure were observed.

In summary, the reports did not indicate any significant changes to the DBSN between 2015 and 2020. No signs of instability, structural weakness, or changes which may have affected the operation or stability of the DBSN were noted in the inspection reports.

2.3 Review of Instrumentation Data

Two piezometers, P001 and P002, are present at the DBSN and were monitored monthly by ZPC between November 2015 and March 2021. Geosyntec reviewed the piezometer data to evaluate if significant fluctuations, partially increases in phreatic levels, may have occurred between development of the initial structural stability and factor of safety certifications ([9], [5], [6]) and March 2021. Available piezometer readings are plotted in **Attachment A**.

In summary, the peak measured groundwater levels for P001 and P002 were 498.6 ft and 486.7 ft, respectively. These peak values occurred at the same time in April 2018. These measured levels are greater than 4 ft higher than the values considered during the initial certification.

2.4 Comparison of Initial to Periodic Surveys

The initial survey of the DBSN, conducted by ESP Associated, P.A. (ESP) in 2014 [15], was compared to the periodic survey of the DBSN, conducted by S&ME/IBI Group (S&ME/IBI) in 2021 [16], using AutoCAD Civil3D 2021 software. This comparison quantified changes in the volume of CCR placed within the DBSN and considered volumetric changes above and below the starting water surface elevation (SWSE) used for the 2016 §257.82 inflow design flood control plan hydraulic analysis [9]. Potential changes to embankment geometry were also evaluated. This comparison is presented in side-by-side views of each survey in **Drawing 1**, and a plan view isopach map denoting changes in ground surface elevation in **Drawing 2**. A summary of the water elevations and changes in CCR volumes is provided in **Table 2**.

Table 2 – Initial to Periodic Survey Comparison

Initial Surveyed Pool Elevation (ft)	NA
Periodic Surveyed Pool Elevation (ft)	488.9
Initial §257.82 Starting Water Surface Elevation (SWSE) (ft)	506.0
Total Change in CCR Volume (CY)	-11,846
Change in CCR Volume Above SWSE (CY)	-11,884
Change in CCR Volume Below SWSE (CY)	37

The comparison indicated that approximately 11,846 CY of CCR was removed from the DBSN between the initial and periodic surveys, therefore the peak water surface elevation (PWSE) would be unlikely to increase during the inflow design 1,000-year flood event. No significant changes to embankment geometry appeared to have occurred between the initial and periodic surveys.

2.5 Comparison of Initial to Periodic Aerial Photography

Initial aerial photographs of the CPRP were prepared from Google Earth [17] imagery dated October 2015 and were compared to periodic aerial photographs prepared from Google Earth [17] imagery dated October 2020 to visually evaluate if potential site changes (i.e., changes to the embankment, outlet structures, limits of CCR, other appurtenances) may have occurred. A comparison of these aerial photographs is provided in **Drawing 3.** The basin appeared to be dry during the 2015 photograph and has since been flooded. No other significant changes were noted.

2.6 Comparison of Initial to Periodic Site Visits

An initial site visit to the DBSN was conducted by AECOM in 2015 and documented with a Site Visit Summary and corresponding photographs [18]. A periodic site visit was conducted by Geosyntec on June 2, 2021, with Panos Andonyadis conducting the site visit. The site visit was intended to evaluate potential changes at the site since the initial certifications were prepared (i.e., modification to the embankment, outlet structures or other appurtenances, limits of CCR, maintenance programs, repairs), in addition to performing visual observations of the DBSN to evaluate if the structural stability requirements (§257.73(d)) were met. The site visit included walking the perimeter of the DBSN, visually observing conditions, recording filed notes, and collecting photographs. The site visit is documented in a field observation form and photographic log provided in **Attachment B**. A summary of significant findings from the periodic site visit is provided below:

- The perimeter embankments appear to be structurally stable as no signs of structural or foundation instability were observed.
- The perimeter embankments appear to have adequate vegetative cover with only isolated locations demonstrating signs of erosion that are planned for maintenance before October 2021.
- No significant changes were observed since the previous certification.

2.7 Interview with Power Plant Staff

An interview with Sean Behm and Desiree Loveless of the ZPP was conducted by Panos Andonyadis of Geosyntec on June 02, 2021 Mr. Behm was employed at MIA between 2020 and 2021 and Ms. Loveless was employed with Vistra between 2015 and 2021. The interview included a discussion of included a discussion of potential changes that that may have occurred at the DBSN since development of the initial certifications ([2], [3], [4], [5], [6], [7]). A summary of the interview is provided below.

- Were any construction projects completed for the DBSN since 2015, and, if so, are design drawings and/or details available?
    - No construction projects completed since 2015.
- Were there any changes to the purpose of the DBSN since 2015?
    - No.
- Were there any changes to the to the instrumentation program and/or physical instruments for the DBSN since 2015?
    - No.
- Have area-capacity curves for the DBSN been prepared since 2015?
    - No known area-capacity curves have been developed.
- Were there any changes to spillways and/or diversion features for the DBSN completed since 2015?

  - No changes to the spillway were made.

- Were there any changes to construction specifications, surveillance, maintenance, and repair procedures for the DBSN since 2015?
  - No changes were made.

- Were there any instances of embankment and/or structural instability for the DBSN since 2015?
  - No known instability has occurred.

- Are updates required to Initial Emergency Action Plan for the DBSN [3], including, but not limited to, plant and site staff roles/responsibilities, contact information, emergency equipment and material sources, emergency preparedness information, or other portions of the Initial emergency Action Plan?
  - Staff personnel should be updated to reflect recent personnel changes.

SECTION 3

HAZARD POTENTIAL CLASSIFICATION - §257.73(a)(2)

3.1 Overview of Initial HPC

The Initial Hazard Potential Classification (Initial HPC) was prepared by Stantec Consulting Services, Inc. (Stantec) in 2016 ([2], [8]), following the requirements of §257.73(a)(2). The Initial HPC included the following information:

- Performing a visual analysis to evaluate potential hazards associated with a failure of the DBSN perimeter embankment.
- Evaluation of potential breach flow paths were evaluated using elevation data and aerial imagery to evaluate potential impacts to downstream structures, infrastructure, frequently occupied facilities/areas, and waterways [2].
- While a breach map is not included within the Initial HPC, it is included within the Initial Emergency Action Plan (Initial EmAP) [3] required by §257.73(a)(3).

The visual analysis indicated that none of the breach scenarios appeared to impact occupied structures, although a breach of the west embankment could impact the Ohio River. The Initial HPC concluded that neither breach would be likely to result in a probable loss of human life, although the breach could cause CCR to be released into the Ohio River, thereby causing environmental damage. The Initial HPC therefore recommended a “Significant” hazard potential classification for the DBSN [2].

3.2 Review of Initial HPC

Geosyntec performed a review of the Initial HPC ([2], [8]), in terms of technical approach, input parameters, assessment of the results, and applicable requirements of the CCR Rule [1]. No significant technical issues were noted within the technical review, although a detailed review (e.g., check) of the calculations was not performed.

3.3 Summary of Site Changes Affecting the Initial HPC

Geosyntec did not identify any changes at the site that may affect the HPC. No new structures, infrastructure, frequently occupied facilities/areas, or waterways were present in the probable breach area indicated in the Initial EmAP [3]. Additionally, no significant changes to the topography in the probable breach were identified.

3.4 Periodic HPC

Geosyntec recommends retaining the "Significant" hazard potential classification for the DBSN, per §257.73(A)(2), based on the lack of site changes potentially affecting the Initial HPC occurring since the initial HPC was developed, as described in **Section 3.3**, and the lack of significant review comments, as described in **Section 3.2**. Updates to the Initial HPC reports ([2], [8]) are not recommended at this time.

SECTION 4

EMERGENCY ACTION PLAN - §257.73(a)(3)

4.1 Overview of Initial EmAP

The Initial EmAP was prepared by Stantec in 2017 [3], following the requirements of §257.73(a)(3). The Initial EmAP included the following information:

- A statement of purpose,
- Site maps showing the location of the DBSN,
- Communication procedures for various response levels,
- A notification flowchart,
- A process decision tree,
- Contact information and roles/responsibilities for ZPP personnel,
- Contact information and roles/responsibilities for both local and state emergency responders,
- A summary of dam safety events and response levels,
- Recommended actions for dam-safety related conditions,
- Tables describing how to procure emergency supplies and equipment,
- A description of the DBSN, and
- A map of the expected breach area.

4.2 Review of Initial EmAP

Geosyntec performed a review of the Initial EmAP [3] in terms of approach, being up-to-date, and completeness. The review included the following tasks:

- Reviewing of appropriateness of event triggers for emergency response,
- Reviewing data in the EmAP for consistency with the HPC,

- Reviewing listed emergency management agencies for appropriateness based on the location of the DBSN, and
- Reviewing the contents vs. the applicable CCR Rule requirements [1].

No significant technical issues were noted within the technical review.

4.3 Summary of Site Changes Affecting the Initial EmAP

Several changes at the site were that occurred after development of the Initial EmAP were identified. These changes required an update to the Initial EmAP. Each change is described below.

- Changes in onsite staff with the responsibility of managing the CPRP and other CCR surface impoundments at ZPP have occurred.
- Contact information for local and state emergency management agencies and sources for equipment and emergency response materials may be outdated.

4.4 Periodic EmAP

The EmAP was updated with updated position titles and personnel contact information. The Periodic EmAP for ZPP is provided in **Attachment C**.

SECTION 5

HISTORY OF CONSTRUCTION REPORT - §257.73(c)

5.1 Overview of Initial HoC

The Initial History of Construction report (Initial HoC) was prepared by AECOM in 2016 [4], following the requirements of §257.73(c), and included information on all CCR surface impoundments at ZPP, including the DBSN and the Coal Pile Runoff Pond. The Initial HoC included the following information for each CCR surface impoundment:

- The name and address of the owner/operator,
- Location maps,
- Statements of purpose,
- The names and size of the surrounding watershed,
- A description of the foundation and abutment materials,
- A description of the embankment materials,
- Approximate dates and stages of construction,
- Available design and engineering drawings,
- A summary of instrumentation,
- A statement that area-capacity curves are not available,
- Information on spillway structures,
- Construction specifications,
- Inspection and surveillance plans,
- Information on operational and maintenance procedures, and
- A statement that historical structural instability had not occurred at any of the CCR surface impoundments.

5.2 Summary of Site Affecting the Initial HoC

No material changes at the site occurred after development of the initial HoC report was identified. Therefore, the HoC report [4] does not require an update as it pertains to the DBSN.

SECTION 6

STRUCTURAL STABILITY ASSESSMENT - §257.73(d)

6.1 Overview of Initial SSA

The Initial Structural Stability Assessment (Initial SSA) was prepared by AECOM in 2016 ([5], [9]), following the requirements of §257.73(d)(1), and included the following evaluations:

- Stability of embankment foundations, embankment abutments, slope protection, embankment compaction, and slope vegetation,
- Spillway stability including capacity, structural stability and integrity; and
- Downstream slope stability under sudden drawdown conditions for a downstream water body.

The Initial SSA concluded that the DBSN met all structural stability requirements for §257.73(d)(1)(i)-(v) and (vii).

The Initial SSA referenced the results of the Initial Structural Factor Assessment (Initial SFA) ([6], [9]), to demonstrate stability of the stability of foundations and abutments (§257.73(d)(1)(i)) and sufficiency of dike compaction (§257.73(d)(1)(iii)) portions of the SSA criteria. This included stating that slope stability analyses for slip surfaces passing through the foundation met or exceeded the criteria listed in §257.73(e)(1), for the stability of foundations and abutments. For the sufficiency of dike compaction, this included stating that slope stability analyses for slip surfaces passing through the dike also met or exceeded the §257.73(e)(1) criteria.

Additionally, the Initial SSA included a sudden drawdown slope stability analysis to evaluate the effect of a drawdown event in the adjacent Ohio River from the 100-year flood pool (El. 505 ft) to an empty-pool condition, as required by §257.73(3)(1)(vii) for CCR units where the downstream slopes are inundated by an adjacent water body. The minimum acceptable factor of safety for this loading condition was assumed to be 1.3 based on US Army Corps of Engineers guidance [19].

6.2 Review of Initial SSA

Geosyntec performed a review of the Initial SSA ([5], [9]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing photographs collected in 2015 and used to demonstrate compliance with §257.73(d)(1)(i)-(vii).

- Reviewing geotechnical calculations used to demonstrate the stability of foundations, per §257.73(d)(1)(i) and sufficiency of embankment compaction, per §257.73(d)(1)(iii), in terms of supporting geotechnical investigation and testing data, input parameters, analysis methodology, selection of critical cross-sections, and loading conditions.

- Review of the methodology used to demonstrate that a downstream water body that could induce a sudden drawdown condition, per §257.73(d)(1)(vii), is not present.

One review comment and corresponding recommended technical update was identified during review of the geotechnical analyses supporting the sufficiency of dike compaction (§257.73(d)(1)(ii)), foundation and abutment stability (§257.73(d)(1)(iii), and downstream slope inundation/stability (§257.73(d)(1)(vii)) portions of the Initial SSA. The review comment and subsequent updates to the Initial SFA are discussed in **Section 7.4**.

6.3 Summary of Site Changes Affecting Initial SSA

One change at the site that occurred after the development of the Initial SSA was identified. The Initial SSA utilized the slope stability analysis results of the Initial Safety Factor Assessment (SFA) as part of the compliance demonstration for the stability of foundations and abutments (§257.73(d)(1)(i)) and sufficiency of dike compaction (§257.73(d)(1)(iii)) as discussed in **Section 6.1**. The Initial SSA also utilized sudden drawdown slope stability analyses performed using the same cross-sections and input data as the Initial SFA to demonstrate compliance with downstream slope inundation/stability (§257.73(d)(1)(vii). The Initial SFA slope stability analyses, including the sudden drawdown analyses, were subsequently updated to develop a Periodic SFA, based on site changes, as discussed in **Section 8.3**.

6.4 Periodic SSA

The Periodic SFA (**Section 7**) indicates that foundations and abutments are stable and dike compaction is sufficient for expected ranges in loading conditions, as slope stability factors of safety were found to meet or exceed the requirements of §257.73(e)(1), including for static maximum storage pool conditions, static maximum surcharge pool loading conditions, seismic loading conditions, post-earthquake (i.e., liquefaction) loading conditions considering seismically-induced strength loss in the foundation soils. Therefore, the requirements of §257.73(d)(1)(i) and §257.73(d)(1)(iii) are met for the Periodic SSA.

The Periodic IDF (**Section 8**) indicates that spillways are adequately designed and constructed to adequately manage flow during the PMF flood, as the spillways can adequately manage flow during peak discharge from the PMP storm event without overtopping of the embankments. Therefore, the requirements of §257.73(d)(1)(v)(A)-(B) are met for the Periodic SSA.

SECTION 7

SAFETY FACTOR ASSESSMENT - §257.73(e)(1)

7.1 Overview of Initial SFA

The Initial Safety Factor Assessment (Initial SFA) was prepared by AECOM in 2016 ([6], [9]), following the requirements of §257.73(e)(1). The Initial SFA included the following information:

- A geotechnical investigation program with in-situ and laboratory testing;
- An assessment of the potential for liquefaction in the embankment and foundation soils;
- The development of one slope stability cross-sections for limit equilibrium stability analysis utilizing GeoStudio SLOPE/W software; and
- The analysis of the cross-section for maximum storage pool, maximum surcharge pool, and seismic loading conditions.
- Liquefaction loading conditions were not evaluated as liquefaction-susceptible soil layers were not identified in the either the embankments or foundation soils.

The Initial SFA concluded that the DBSN met all safety factor requirements, per §257.73(e), as all calculated safety factors were equal to or higher than the minimum required values.

7.2 Review of Initial SFA

Geosyntec performed a review of the Initial SFA ([6], [9]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included reviewing geotechnical calculations used to demonstrate the acceptable safety factors, per §257.73(e)(1), in terms of:

- Completeness and adequacy of supporting geotechnical investigation and testing data;
- Completeness and approach of liquefaction triggering assessments; and
- Input parameters, analysis methodology, selection of critical cross-sections, and loading conditions utilized for slope stability analyses.

One review comment was identified during review of the Initial SFA. The review comments required updates to the Initial SFA and is described below:

- The Initial SFA utilized a pool elevation of 487.2 ft for geotechnical slope stability analyses performed for the maximum storage pool and seismic loading conditions, in addition to the post-earthquake liquefaction and sudden drawdown loading conditions referenced by the Initial SSA.

- o This pool elevation essentially assumes the DBSN is empty, which is representative of typical conditions.
- o However, the Initial Inflow Design Flood Control System Plan ([7], [9]), assumed as SWSE of 506 ft in the DBSN; this is 7.9 ft higher than the pool elevation used in the Initial SFA analyses and is equal to a 100-year flood event in the Ohio River and subsequent backwater conditions within the DBSN.
- o However, the Initial Inflow Design Flood Control System Plan ([7], [9]), assumed as SWSE of 506 ft in the DBSN; this is 7.9 ft higher than the pool elevation used in the Initial SFA analyses and is equal to a 100-year flood event in the Ohio River and subsequent backwater conditions within the DBSN.
- o Therefore, there is some potential that the DBSN could have a higher pool level than was considered in the Initial SFA, for some time during and/or after an Ohio River flood event.

7.3 Summary of Site Changes Affecting the Initial SFA

- One change at the site that occurred after development of the Initial SSA was identified. The piezometric levels measured since (Section 2.3) appears to be between 4 ft to 8 ft higher than the piezometric conditions assumed for the western embankment during the Initial SFA ([6], [9]). Piezometric conditions for the Initial SFA were based on a finite-element seepage analysis.

7.4 Periodic SFA

Geosyntec revised existing slope stability analyses associated with the Initial SFA ([6], [9]) to account for potential increased normal pool loading above conditions assumed in the Initial SFA and observed higher piezometric levels, as described in **Sections 7.2 and 7.3**. This included revising the slope stability analyses evaluating sudden drawdown conditions in the adjacent Ohio River that were utilized as part of the Initial SSA (**Section 6**). The following approach and input data were used to revise the analyses:

- The Initial SFA utilized a single cross-section (1); this cross section was maintained.
- The Initial SFA utilized the GeoStudio 2007 software package [20]. This software package is no longer supported by GeoStudio, and licensing was unavailable to update the Initial SFA analyses within GeoStudio 2007. Therefore, the analysis was updated to utilize GeoStudio 2012 software [21], for which licensing was available.

- The finite-element seepage analysis was removed and piezometric conditions were represented with a piezometric line. The location of the piezometric line was based on observed upper end piezometric data collected since 2015.

- Water levels within the DBSN were assumed to be El. 506.0 for the maximum storage pool, seismic, liquefaction (i.e., post-earthquake), and sudden drawdown loading conditions, in order to be consistent with the Initial IDF ([7], [9]),

- All other input data and settings from the Initial SFA were utilized, including, but not limited to, subsurface stratigraphy and soil strengths, phreatic conditions, ground surface geometry, slip surface search routines and methods, input data for the seismic analyses, and Ohio River pool levels.

Factors of safety from the Periodic SFA and Initial SFA, including factors for safety for loading conditions required by the Initial and Periodic SSA, are summarized in **Table 3**. The factors of safety confirm that the DBSN meets the requirements of §257.73(e)(1). Slope stability analyses associated with the Initial SFA are provided in **Attachment D**.

Table 3 – Factors of Safety from Periodic SFA

	Structural Stability Assessment (§257.73(d)) and Safety Factor Assessment (§257.73(e))				Structural Stability Assessment (§257.73(d))	
Cross-Section	**Maximum Storage Pool §257.73(e)(1)(i) Minimum Required = 1.50**	**Maximum Surcharge Pool[1] §257.73(e)(1)(ii) Minimum Required = 1.40**	**Seismic §257.73(e)(1)(iii) Minimum Required = 1.00**	**Dike Liquefaction §257.73(e)(1)(iv) Minimum Required = 1.20**	**Foundation Liquefaction §257.73(d)(1)(i) Minimum Required = 1.20**	**Downstream Slope Sudden Drawdown (§257.73(d)(1)(iv) Minimum Required = 1.1**
1	3.67	3.67	1.63	N/A	2.54	2.40

Notes:
N/A – Loading condition is not applicable.

SECTION 8

INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN - §257.82

8.1 Overview of Initial IDF

The Initial Inflow Design Flood Control System Plan (Initial IDF) was prepared by AECOM in 2016 ([7], [9]), following the requirements of §257.82. The Initial IDF included the following information:

- A hydraulic and hydrologic analysis, performed for the 1,000-year design flood event because of the hazard potential classification of "significant", which corresponded to 9.13 inches of rainfall over a 24-hour period.
- The Initial IDF utilized a HydroCAD Version 10 model to evaluate spillway flows and pool level increases during the design flood, with a SWSE of 506 ft.
- The SWSE was equal to the 100-year flood elevation of the adjacent Ohio River. Therefore, the IDF assumed that a 100-year Ohio River flood was occurring at the same time as the 1,000-year design flood event, in order to account for potentially elevated downstream tailwater conditions.

The Initial IDF concluded that the DBSN met the requirements of §257.82, as the peak water surface estimated by the HydroCAD model was El. 506.8 ft, relative to a minimum DBSN embankment crest elevation of 509 ft. Therefore, overtopping was not expected.

8.2 Review of Initial IDF

Geosyntec performed a review of the Initial IDF ([7], [9]) in terms of technical approach, calculation input parameters and methodology, recommendations, and completeness. The review included the following tasks:

- Reviewing the return interval used vs. the hazard potential classification;
- Reviewing the rainfall depth and distribution for appropriateness;
- Performing a high-level review of the inputs to the hydrological modeling;
- Reviewing the hydrologic model parameters for spillway parameters, starting pool elevation, and storage vs. the reference data; and
- Reviewing the overall Initial IDF vs. the applicable requirements of the CCR Rule [1].

No significant technical issues were noted within the technical review, although a detailed review (e.g., check) of the calculations was not performed.

8.3 Summary of Site Changes Affecting the Initial IDF

No changes since development of the Initial IDF were identified that would require updates to the Initial IDF ([7], [9]).

SECTION 9

CONCLUSIONS

The DBSN at ZPP was evaluated relative to the USEPA CCR Rule periodic assessment requirements for:

- Hazard potential classification (§257.73(a)(2)),
- Emergency action plan development (§257.73(a)(3)),
- History of Construction reporting (§257.73(d)),
- Structural stability assessment (§257.73(d)),
- Safety factor assessment (§257.73(e)), and
- Inflow design flood control system planning (§257.82).

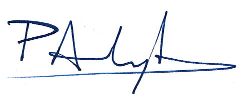
Based on the evaluations presented herein, the referenced requirements are satisfied.

SECTION 10

CERTIFICATION STATEMENT

CCR Unit: Zimmer Power Company LLC, Zimmer Power Plant, D Basin

I, Panos Andonyadis, being a Registered Professional Engineer in good standing in the State of Ohio, do hereby certify, to the best of my knowledge, information, and belief that the information contained in this 2021 USEPA CCR Rule Periodic Certification Report, has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the periodic assessment of the hazard potential classification, history of construction report, emergency action plan, structural stability, safety factors, and inflow design flood control system planning, dated October 2021, were conducted in accordance with the requirements of 40 CFR §257.73(a)(2), (a)(3), (c), (d), (e), and §257.82.



Panos Andonyadis

October 11, 2021

Date

Exp. 11/30/2021

SECTION 11

REFERENCES

[1] United States Environmental Protection Agency, 40 CFR Parts 257 and 261; Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, 2015.

[2] Stantec Consulting Services Inc., "Initial Hazard Potential Classification Assessment, EPA Final CCR Rule, D Basin, Zimmer Power Station, Clermont County, Ohio," Fenton, MO, October 12, 2016.

[3] Stantec Consulting Services Inc, "Dynegy Midwestern Generation, LLC, Zimmer Power Station, Moscow, Clermont County, OH, Emergency Action Plan, Coal Pile Runoff Pond (NID # OH01393), D Basin (NID # OH01393)," Fenton, MO, April 13, 2017.

[4] AECOM, "History of Construction, USEPA Final CCR Rule, Zimmer Power Station, Moscow, Ohio," October 2016.

[5] AECOM, "CCR Rule Report: Initial Structural Stability Assessment For D Basin At Zimmer Power Station," St. Louis, MO, October 2016.

[6] AECOM, "CCR Rule Report: Initial Safety Factor Assessment For D Basin At Zimmer Power Station," St. Louis, MO, October 2016.

[7] AECOM, "CCR Rule Report: Initial Inflow Design Flood Control System Plan For D Basin At Zimmer Power Station," St. Louis, MO, October 2016.

[8] Stantec Consulting Services, Inc., "Documentation of Initial Hazard Potential Classification Assessment, D Basin, Zimmer Power Station, Moscow, Ohio," October 12, 2016.

[9] AECOM, "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for D Basin at Zimmer Power Station," St. Louis, MO, October 2016.

[10] J. Knutelski and J. Campbell, *Annual CCR Surface Impoundment Inspection Report (per 40 CFR 257.83(b)(2)), Zimmer Power Station, D Basin,* January 18, 2016.

[11] J. Knutelski and J. Campbell, *Annual CCR Surface Impoundment Inspection Report (per 40 CFR 257.83(b)(2)), Zimmer Power Station, D Basin,* February 7, 2018.

[12] S. Arends, *Annual Inspection by a Qualified Professional Engineer, 40 CFR §257.83(b), Zimmer Power Station, D Basin,* January 15, 2019.

[13] J. Knutelski, *Annual Inspection by a Qualified Professional Engineer, 40 CFR 257.83(b), Zimmer Power Station, D Basin,* January 8, 2020.

[14] J. Knutelski, *Annual Inspection by a Qualified Professional Engineer, 40 CFR §257.83(b), Zimmer Power Station, D Basin,* January 6, 2021.

[15] ESP Associated, P.A., "Topographic Survey of the Duke Ash Ponds At Zimmer Power Station," Charlotte, NC, September 2014.

[16] S&ME/IBI Group, "Bathymetric and Aerial Topographic Map," Cincinnati, OH, February 11, 2021.

[17] Google, LLC, "Google Earth Pro," 2020.

[18] AECOM, "Draft CCR Unit Initial Site Visit Summary, Dynegy CCR Compliance Program," September 30, 2015.

[19] U.S. Army Corps of Engineers, "Slope Stability, EM 1110-2-1920," October 31, 2003.

[20] GeoSlope International, "GeoStudio 2007, Version 7.23," Calgary, Alberta, Canada, 2007.

[21] GeoSlope International, "GeoSudio 2012, August 2015 Release, Version 8.15.6.13446," Calgary, Alberta, Canada, 2015.

DRAWINGS

INITIAL SURVEY
09-05-2014 TOPOGRAPHY

PERIODIC SURVEY
02-11-2021 TOPOGRAPHY

0 200
SCALE IN FEET

NOTES:

1. INITIAL SURVEY OBTAINED FROM LIDAR DATA PRESENTED AS A BARE-EARTH DIGITAL ELEVATION MODEL (DEM) PROVIDED BY THE OHIO DEPARTMENT OF NATURAL RESOURCES (ODNR) GIS AND MAPPING SERVICES (HTTPS://OHIODNR.GOV/WPS/PORTAL/GOV/ODNR/BUSINESS-AND-INDUSTRY/SERVICES-TO-BUSINESS-INDUSTRY/GIS-MAPPING-SERVICES/). THE DATA WAS COLLECTED IN THE FIELD ON MARCH AND MAY OF 2007 AND DOWNLOADED BY GEOSYNTEC IN MAY OF 2021.
2. THE PERIODIC SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "BATHYMETRIC AND AERIAL TOPOGRAPHIC MAP", PREPARED BY S&ME/IBI GROUP, DATED FEBRUARY 11, 2021.
3. ALL SURVEY DATA WAS COLLECTED IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND NORTH AMERICAN DATUM OF 1983 (NAD83) FOR VERTICAL AND HORIZONTAL COORDINATES, RESPECTIVELY.

INITIAL TO PERIODIC SURVEY COMPARISON
D BASIN
ZIMMER POWER PLANT
MOSCOW, OHIO

Geosyntec consultants

GLP8027.10	JUNE 2021	DRAWING 1

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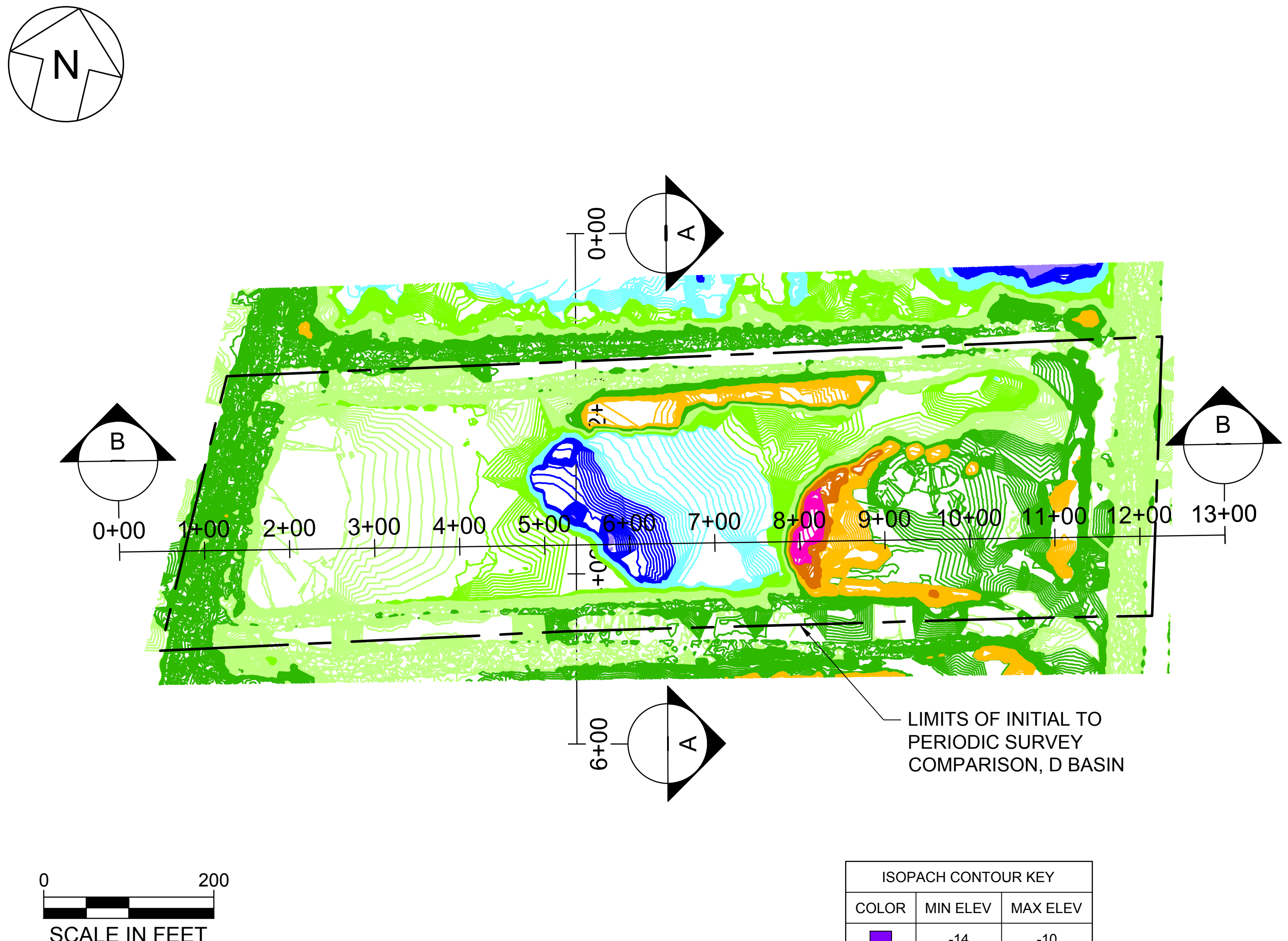
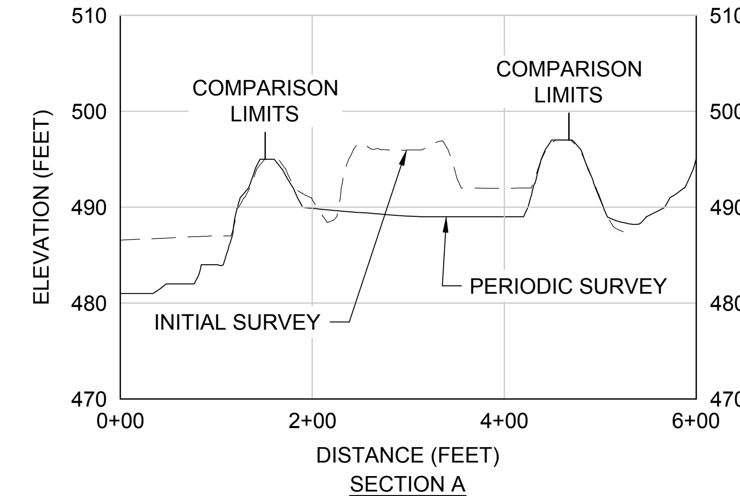
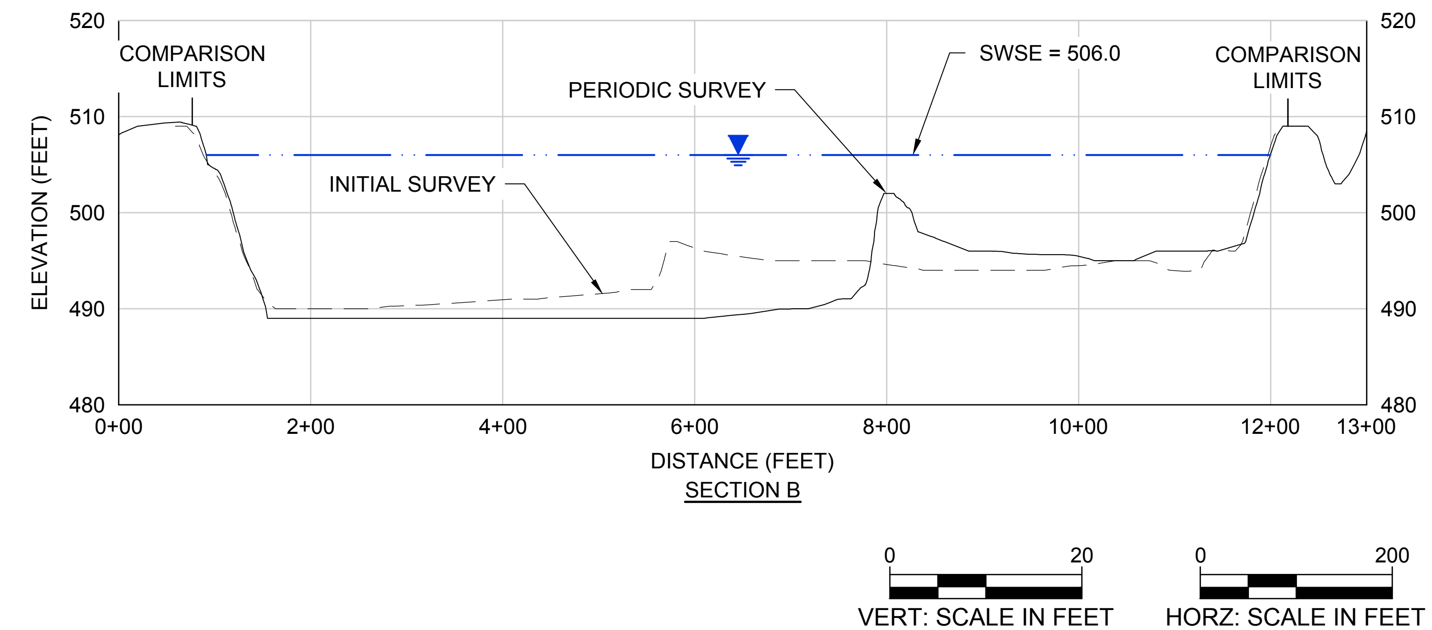






ISOPACH CONTOUR KEY		
COLOR	MIN ELEV	MAX ELEV
	-14	-10
	-10	-8
	-8	-6
	-6	-4
	-4	-2
	-2	0
	0	2
	2	4
	4	6
	6	8

NOTES:

1. INITIAL SURVEY OBTAINED FROM LIDAR DATA PRESENTED AS A BARE-EARTH DIGITAL ELEVATION MODEL (DEM) PROVIDED BY THE OHIO DEPARTMENT OF NATURAL RESOURCES (ODNR) GIS AND MAPPING SERVICES (HTTPS://OHIODNR.GOV/WPS/PORTAL/GOV/ODNR/BUSINESS-AND-INDUSTRY/SERVICES-TO-BUSINESS-INDUSTRY/GIS-MAPPING-SERVICES/). THE DATA WAS COLLECTED IN THE FIELD ON MARCH AND MAY OF 2007 AND DOWNLOADED BY GEOSYNTEC IN MAY OF 2021.
2. THE PERIODIC SURVEY WAS TAKEN FROM THE DRAWING PACKAGE TITLED "BATHYMETRIC AND AERIAL TOPOGRAPHIC MAP", PREPARED BY S&ME/IBI GROUP, DATED FEBRUARY 11, 2021.
3. ALL SURVEY DATA WAS COLLECTED IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND NORTH AMERICAN DATUM OF 1983 (NAD83) FOR VERTICAL AND HORIZONTAL COORDINATES, RESPECTIVELY.
4. THE STARTING WATER SURFACE ELEVATION OF THE D BASIN IS EL. 506.0 FT, AS NOTED IN THE REPORT TITLED "CCR CERTIFICATION REPORT: INITIAL STRUCTURAL STABILITY ASSESSMENT, INITIAL SAFETY FACTOR ASSESSMENT, AND INITIAL INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN FOR D BASIN AT ZIMMER POWER STATION", PREPARED BY AECOM, DATED OCTOBER, 2016.

INITIAL TO PERIODIC SURVEY COMPARISON SUMMARY			
SURFACE IMPOUNDMENT	CUT	FILL	NET (CU. YD.)
D BASIN	18,183	6,336	11,846 (CUT)
ABOVE SWSE	18,079	6,195	11,884 (CUT)
BELOW SWSE	106	143	37 (FILL)

SURVEY COMPARISON ISOPACH
ZIMMER POWER PLANT
MOSCOW, OHIO

Geosyntec consultants

GLP8027.10	JUNE 2021	DRAWING 2

P:\CADD\PROJECTS\VISTRA PONDS\ZIMMER\FIGURES\GLP802710F04 - Last Saved by: KHanavec on 7/12/21

INITIAL AERIAL
10-2015 IMAGERY

PERIODIC AERIAL
10-2020 IMAGERY

0 200
SCALE IN FEET

NOTES:

1. THE INITIAL IMAGERY WAS TAKEN FROM GOOGLE EARTH, IMAGE DATED OCTOBER 2015, DOWNLOADED 12 JULY 2021.
2. THE PERIODIC IMAGERY WAS TAKEN FROM GOOGLE EARTH, IMAGE DATED OCTOBER 2020, DOWNLOADED 12 JULY 2021.

INITIAL TO PERIODIC AERIAL IMAGERY COMPARISON
D BASIN
ZIMMER POWER PLANT
MOSCOW, OHIO

Geosyntec consultants

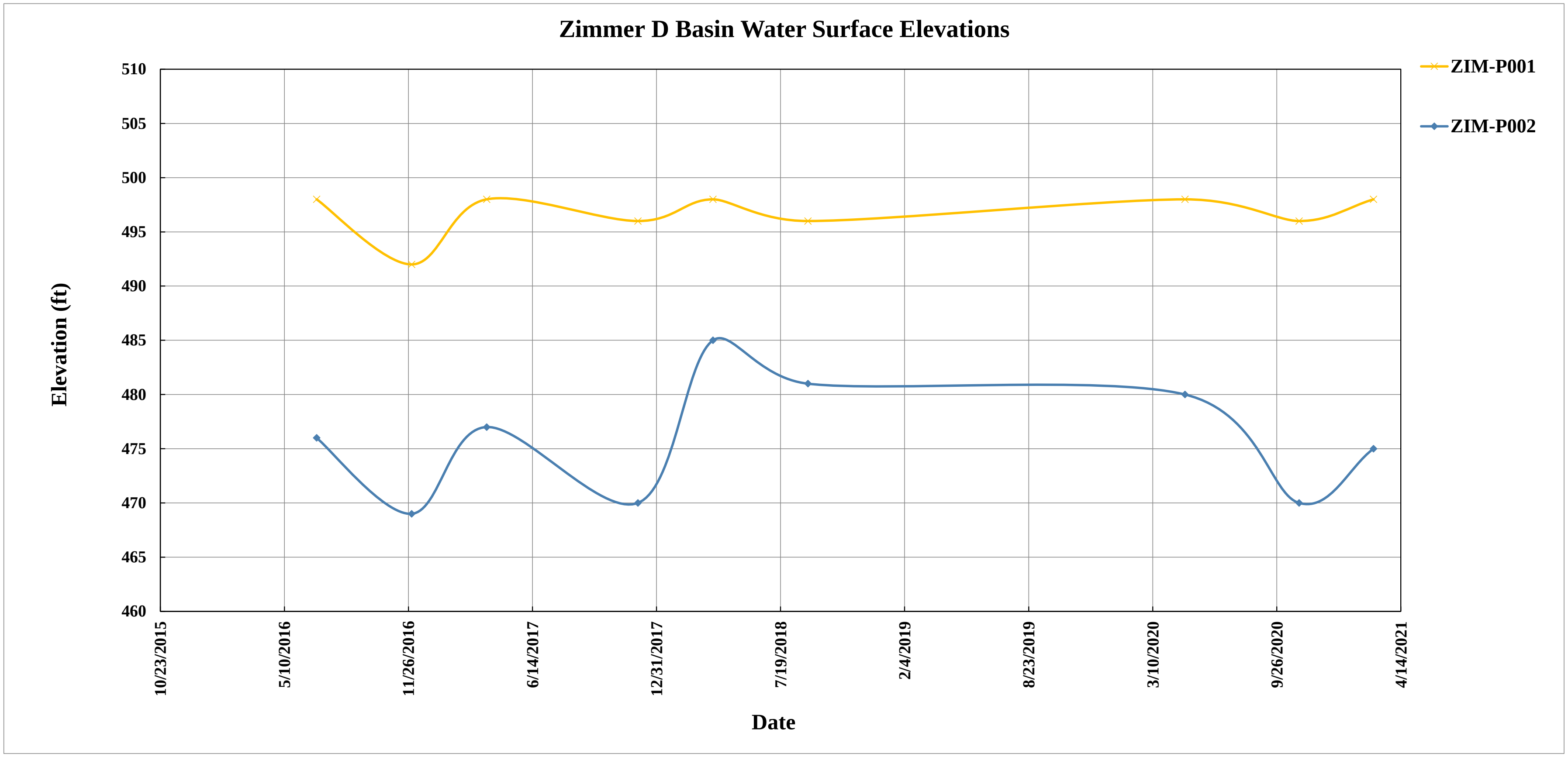
GLP8027.10 | JULY 2021

DRAWING 3

ATTACHMENTS

Attachment A

DBSN Piezometer Data Plots



NOTES:

1. Piezometer data was extracted from the monitoring PDF files, provided by the Zimmer Power Plant.

PIEZOMETER DATA
PERIODIC CERTIFICATION, D BASIN
ZIMMER POWER PLANT
MOSCOW, OHIO

Geosyntec consultants

GLP8027 | 7/12/2021

Figure 1

Attachment B

DBSN Site Visit Photolog

GEOSYNTEC CONSULTANTS
Photographic Record

Site Owner: Zimmer Power Company, LLC	**Project Number:** GLP8027
CCR Unit: D Basin	**Site:** Zimmer Power Plant

Photo: 01

Date: 06/02/2021

Direction Facing: NE

Comments: Photo of the D Basin from the west embankment. Example of vegetative coverage along the upstream sides of the basin's embankments.

Photo: 02

Date: 06/02/2021

Direction Facing: N

Comments: Example of vegetative coverage for the downstream slope along the west embankment.

Site Owner: Zimmer Power Company, LLC	**Project Number:** GLP8027
CCR Unit: D Basin	**Site:** Zimmer Power Plant

Photo: 03

Date: 06/02/2021

Direction Facing: E

Comments: North upstream embankment. Some sparse vegetated cover between the current and what appears to be historic high-water level.

Photo: 04

Date: 06/02/2021

Direction Facing: S

Comments: Photo of the upstream side of the east embankment. Example of vegetative cover along the slope of the embankment.

GEOSYNTEC CONSULTANTS

Geosyntec consultants

Site Owner: Zimmer Power Company, LLC	**Project Number:** GLP8027
CCR Unit: D Basin	**Site:** Zimmer Power Plant

Photo: 05

Date: 06/02/2021

Direction Facing: S

Comments: Photo of D Basin taken from the east embankment. Photo is of the portion of the basin that is filled with ash.

Photo: 06

Date: 06/02/2021

Direction Facing: S

Comments: Observed some spots of poor vegetation along the upstream side of the east embankment. Geosyntec recommend these areas be seeded during regular maintenance.

Attachment C

Periodic Emergency Action Plan for Zimmer Power Plant

Zimmer Power Company LLC

ZIMMER POWER PLANT
MOSCOW, CLERMONT COUNTY, OHIO

Emergency Action Plan (EAP)

40 CFR § 257.73(a)(3)
Coal Combustion Residual (CCR) Impoundments & Related Facilities

- Coal Pile Runoff Pond (NID # OH01393)
- D Basin (NID # OH01393)

Revision Date: September 28, 2021

ZIMMER POWER PLANT
EMERGENCY ACTION PLAN
CCR IMPOUNDMENTS & RELATED FACILITIES

TABLE OF CONTENTS

Section Page

1 STATEMENT OF PURPOSE 1

2 COMMUNICATION 4

3 EAP ROLES AND RESPONSIBILITIES 8

4 EAP RESPONSE 9

5 PREPAREDNESS 15

6 FACILITY/IMPOUNDMENT DESCRIPTION 18

7 BREACH INUNDATION MAPS AND POTENTIAL IMPACTS 20

List of Tables

Table Page

Table 2-1. EAP Emergency Responders 7
Table 3-1. Summary of EAP Roles 8
Table 4-1. Guidance for Determining the Response Level 9
Table 4-2. Impoundment Trigger Elevations 11
Table 4-3. Step 3: Emergency Actions 11
Table 5-1. Emergency Supplies and Equipment 16
Table 5-2. Supplier Addresses 17
Table 6-1. Plant Impoundment Characteristics 19

List of Figures

Figure Page

Figure 1-1. Zimmer Power Plant Location Map 2
Figure 1-2. Zimmer Power Plant CCR Impoundments & Related Facilities 3
Figure 2-1. Summary/Sequence of Tasks 4-Step Incident Response Process 4
Figure 2-2. Notification Flowchart 5
Figure 2-3. EAP Response Process Decision Tree 6
Figure 7-1. Coal Pile Runoff Pond Inundation Map 21
Figure 7-2. D Basin Inundation Map 22

ZIMMER POWER PLANT
EMERGENCY ACTION PLAN
CCR IMPOUNDMENTS & RELATED FACILITIES

1 STATEMENT OF PURPOSE

The Zimmer Power Plant (Plant) is located near Moscow in Clermont County, Ohio. The location is shown in Figure 1-1. The Plant is a coal-fired electricity producing power plant operated Zimmer Power Company LLC, a subsidiary of Luminant. This Emergency Action Plan (EAP) was prepared in accordance with 40 CFR **§** 257.73(a)(3) and covers the following Coal Combustion Residual (CCR) surface impoundments located at the site:

- Coal Pile Runoff Pond
- D Basin

The locations of these impoundments are shown in Figure 1-2. Section 6 of this EAP includes a description of each impoundment.

The purpose of this Emergency Action Plan (EAP) is to:

1. Safeguard the lives, as well as to reduce property damage, of citizens living within potential downstream flood inundation areas of CCR impoundments and related facilities at the Zimmer Power Plant.
2. Define the events or circumstances involving the CCR impoundments and related facilities at the Zimmer Power Plant that represent atypical operating conditions that pose a safety hazard or emergency and how to identify those conditions.
3. Define responsible persons, their responsibilities, and notification procedures in the event of a safety emergency.
4. Provide contact information of emergency responders.
5. Identify emergency actions in the event of a potential or imminent failure of the impoundments.
6. Identify the downstream area that would be affected by failure of the impoundments.
7. Provide for effective facility surveillance, prompt notification to local Emergency Management Agencies, citizen warning and notification responses, and preparation should an emergency occur.

Information provided by Luminant was utilized and relied upon in preparation of this report.

Figure 1-1. Zimmer Power Plant Location Map

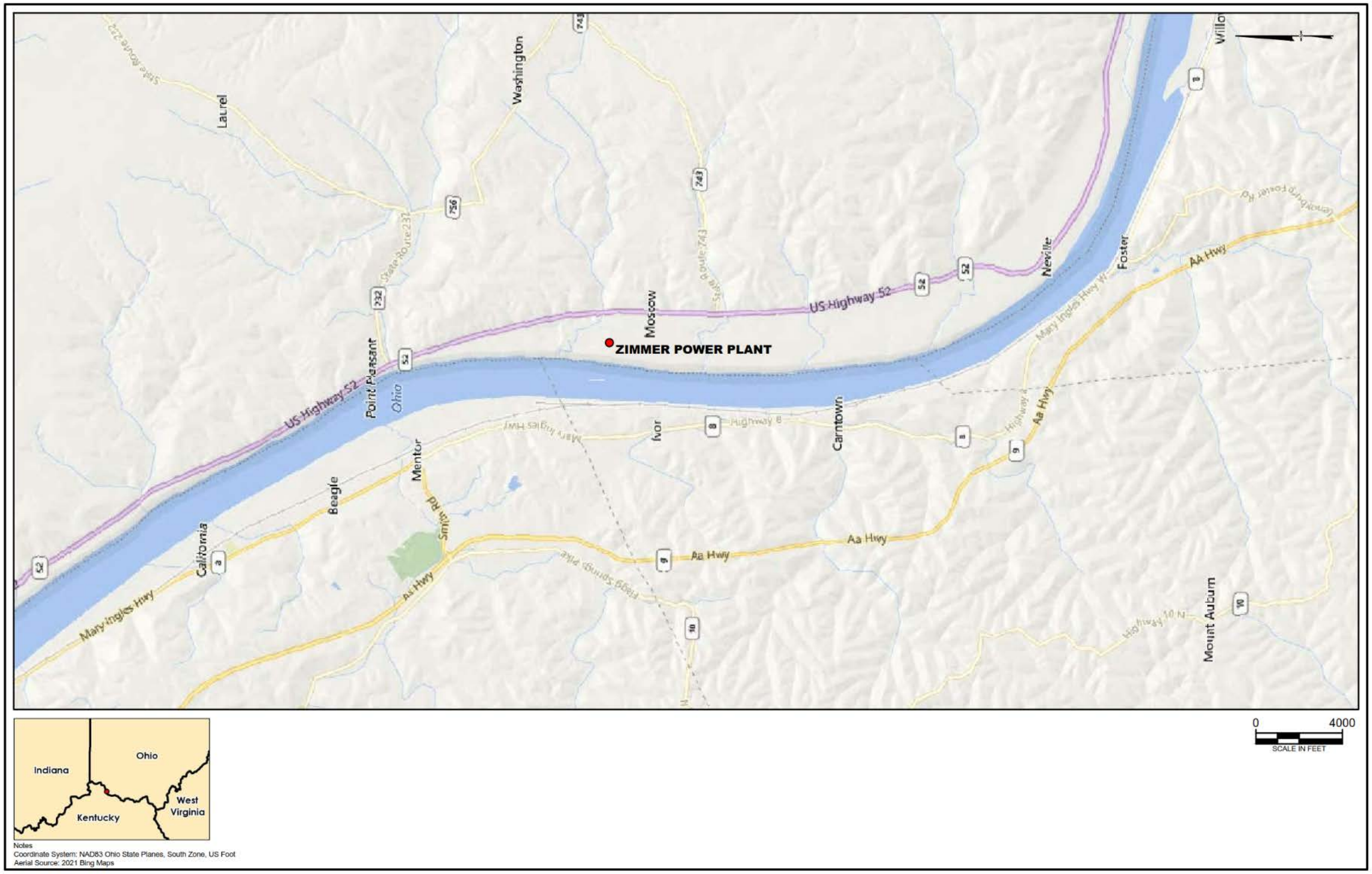
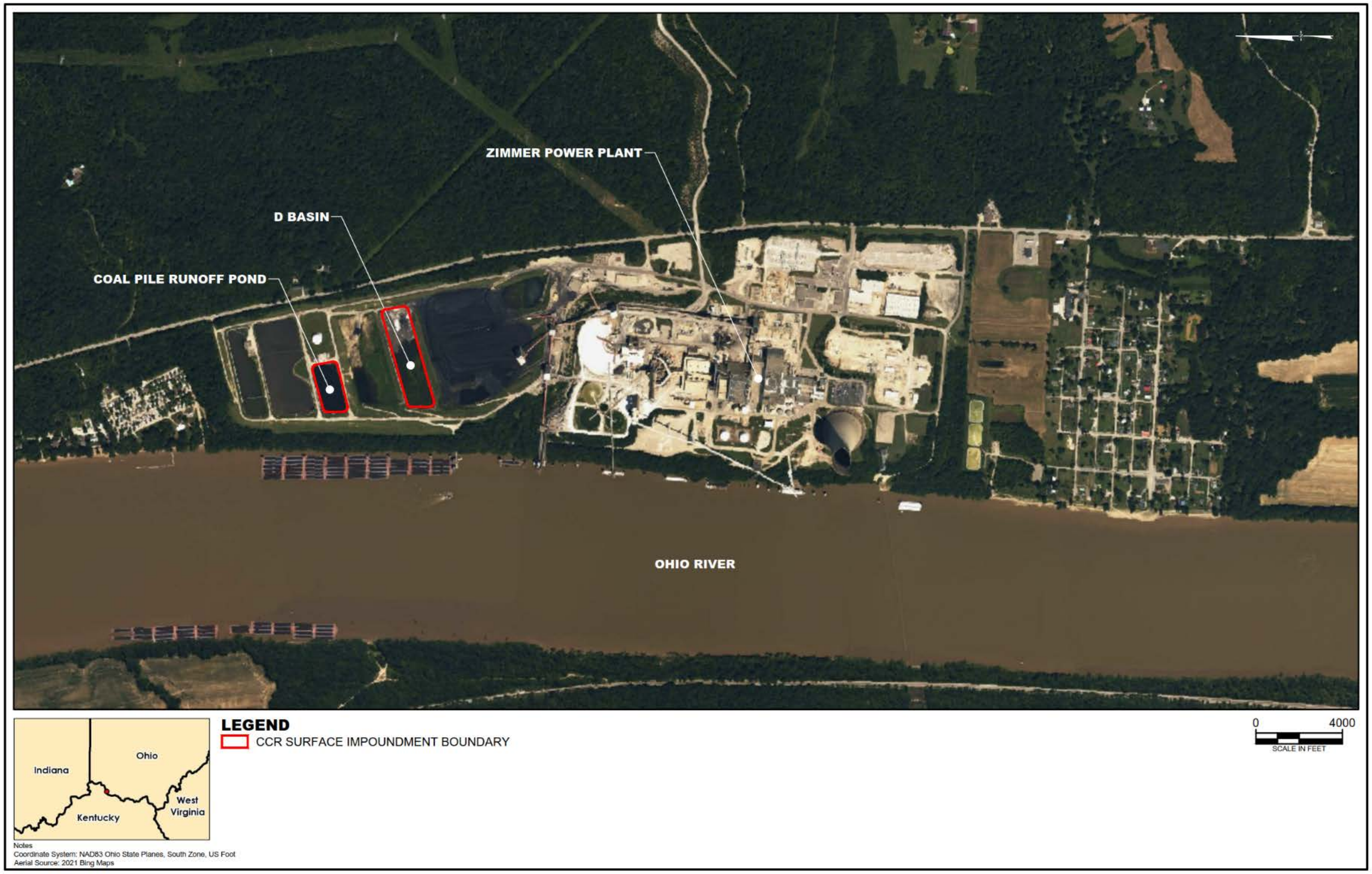


Figure 1-2. Zimmer Power Plant CCR Impoundments & Related Facilities



2 COMMUNICATION

To facilitate understanding among everyone involved in implementing this EAP, four response levels are used to identify the condition of an impoundment. These are:

Response Levels:

- **Level 0:** Normal conditions and routine operations, including surveillance and initial investigation of unusual conditions and effects of storm events.
- **Level 1:** Potentially hazardous condition exists, requiring investigation and possible corrective action.
- **Level 2:** Potential failure situation is developing; possible mode of failure is being assessed; corrective measures are underway.
- **Level 3:** Failure is occurring or is imminent, public protective actions are required.

The 4-Step Incident Response Process is outlined in Figure 2-1. This should be used in conjunction with the Notification Flowchart (Figure 2-2) and EAP Decision Tree (Figure 2-3). Section 4 provides guidance tables for determining Response Levels and a table providing emergency actions to be taken given various situations. Table 2-1 lists contact information for the emergency responders.

Figure 2-1. Summary/Sequence of Tasks 4-Step Incident Response Process

Step 1: Detection, Evaluation, and Response Level Determination

Sequence of Tasks:

- Notify EAP Coordinator, Plant Manager, and Dam Safety Manager of unusual condition detected and confer on next steps needed.
- Conduct technical evaluation of conditions as needed.
- Determine Response Level based on evaluation. **(Table 4-1)**
- Reset Response Level as revised evaluations warrant.

Step 2: Notification

Sequence of Tasks:

- Notify authorities, designated personnel, and external response partners of change in Response Level, using the Notification Flowchart. **(Figure 2-2)**
- *Re-notify authorities, designated personnel, and external response partners as Response Level is changed.*

Step 3: Emergency Actions

Sequence of Tasks:

- Perform emergency actions with goal of saving the impoundment and minimizing impacts to life, property, and environment. **(Table 4-3)**
- Take continuous actions to include situation assessment, information sharing, remediation, and public safety advisories or warnings, as warranted.
- *Revise action plan as changes in conditions warrant.*

Step 4: Follow-up

Sequence of Tasks:

- Document conditions and decisions in the Emergency Incident Log.
- Notify authorities, designated personnel, and external response partners that condition is stabilized; limit incident termination declarations to conditions at the site.
- Conduct and document after-action review of incident and response.

Figure 2-2. Notification Flowchart

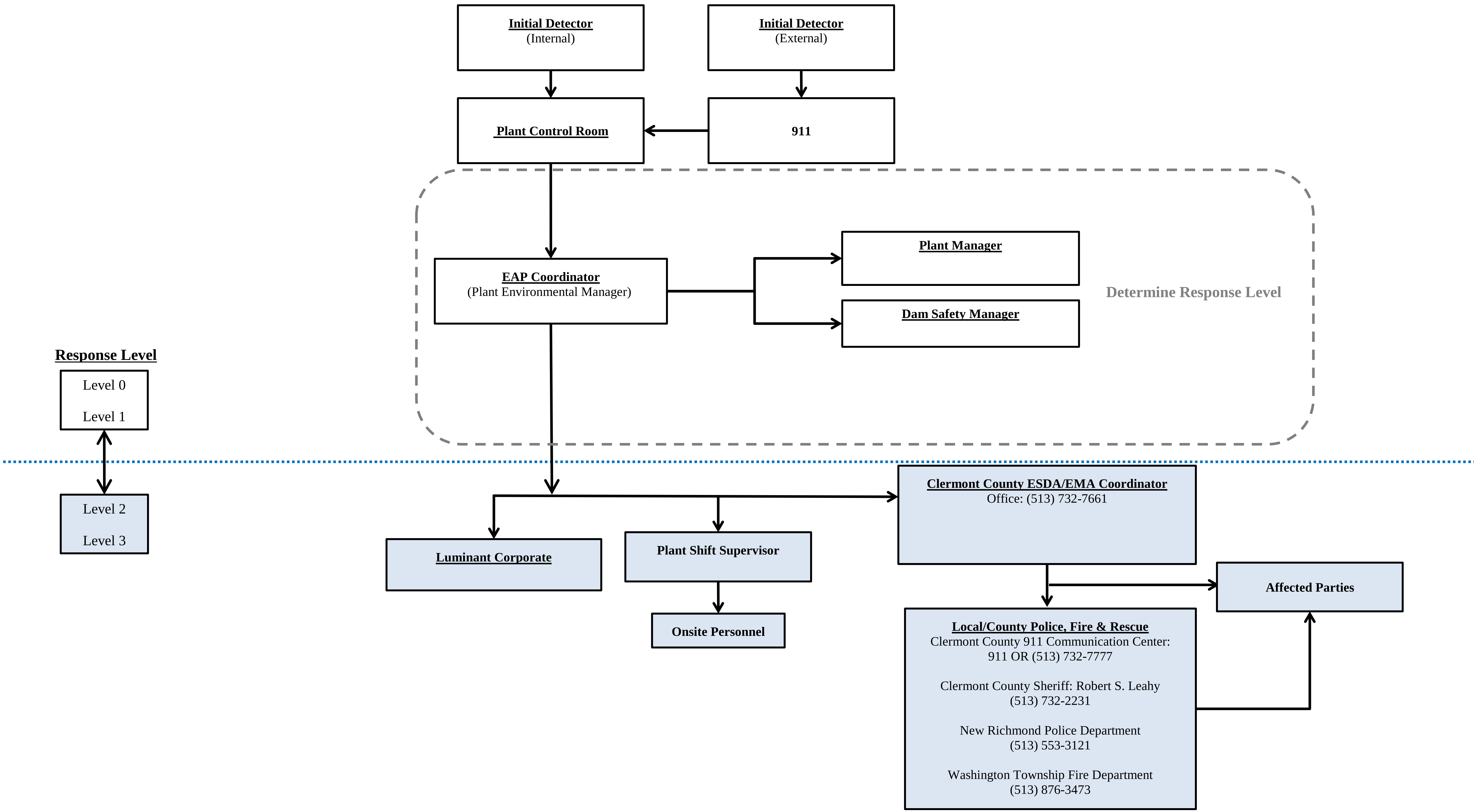


Figure 2-3. EAP Response Process Decision Tree

__Note:__ At any given below, if failure is imminent or actively occurring **CALL 911 IMMEDIATELY** to notify emergency responders and then continue with process afterwards.

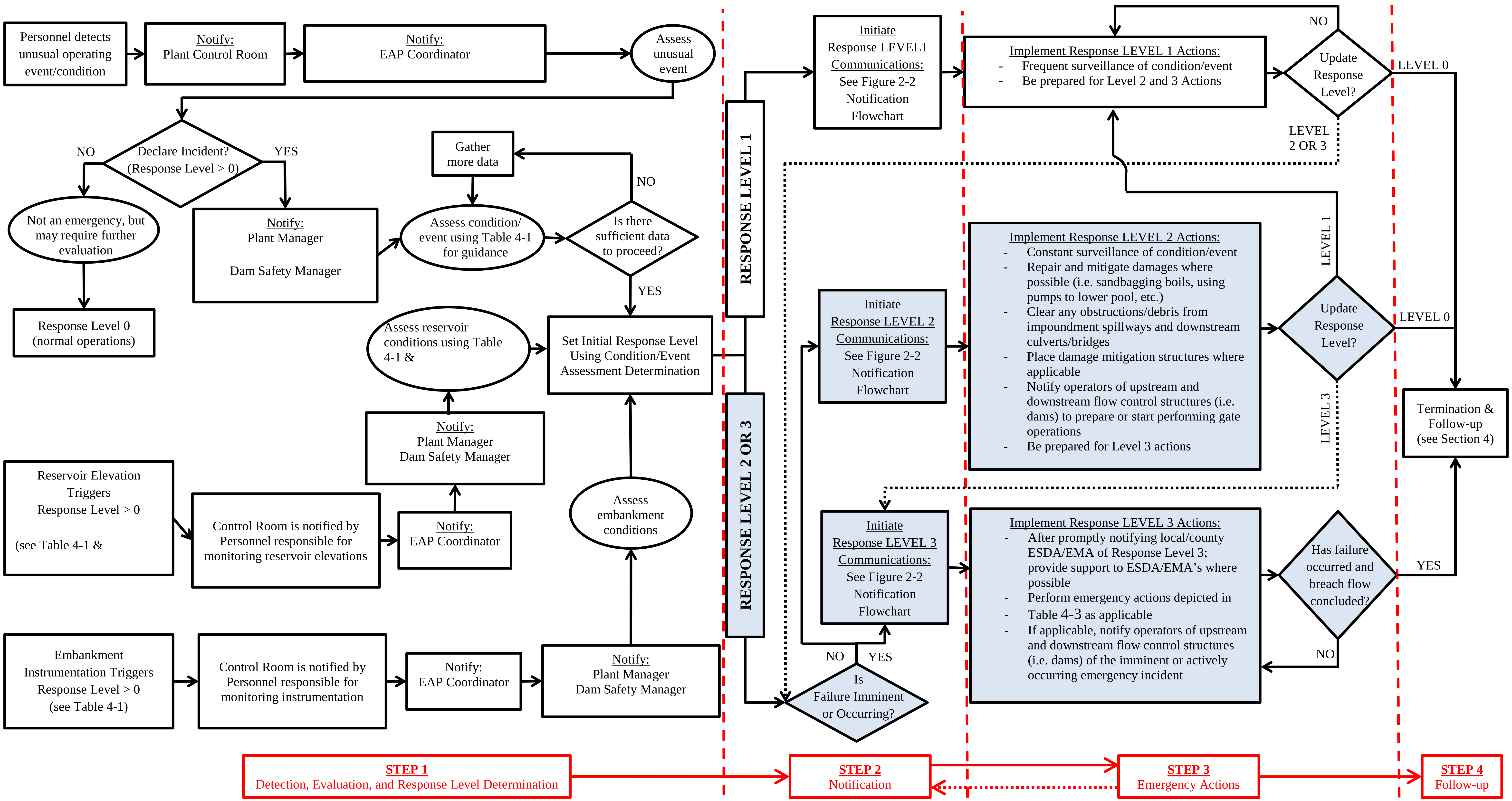


Table 2-1. EAP Emergency Responders

Position / Entity	Contact Information		
Internal Contacts			
Zimmer Power Plant	**Contact**		
Plant Manager	Chris Osterbrink	(513) 312-4500	
Environmental Manager (EAP Coordinator)	Sean Behm	(937) 750-3182	
Control Room		(513) 467-5205	
Luminant Corporate Operations	**Contact**		
Dam Safety Manager	Jason Campbell	(618) 792-8488	
External Contacts			
Local/County ESDA/EMA, Police, & Fire	**Contact**	**Phone #**	**Alternate Phone #**
Clermont County 911 Emergency Communication Center		911	(513) 732-7777
Clermont County – ESDA/EMA	Clermont County EMA	(513) 732-7661	
New Richmond – Police Department	Chief Mike Couch	(513) 553-3121	
Clermont County – Sheriff Department	Sheriff Robert S. Leahy	(513) 732-2231	(513) 732-7500
Washington Township – Fire Department	Chief Danny Jones	(513) 876-3473	(513) 876-3740
State Emergency Management Agencies & Organizations	**Contact**	**Phone #**	**Alternate Phone #**
Ohio Department of Natural Resources - Wildlife		(800) 945-3543	(614) 265-6314

3 EAP ROLES AND RESPONSIBILITIES

Table 3-1 provides a summary of the EAP roles during an emergency event.

Table 3-1. Summary of EAP Roles

Entity	Role Description
Luminant Emergency Response Team (ERT)	**ERT:** Luminant personnel responsible for EAP implementation, distribution, updates/maintenance, and training activities. The *ERT* is comprised of the following roles; 1. **Luminant Corporate:** Luminant corporate entity, committee, team, or position with relevant responsibility for a given generating plant. 2. **Plant Management:** Personnel responsible for day-to-day operation and management of the Plant. 3. **Dam Safety Manager:** Personnel that is most knowledgeable about the design and technical operation of facilities at a given Plant. 4. **EAP Coordinator:** Personnel responsible for implementing the EAP and associated activities. **Emergency Event – EAP Responsibilities** 1. Respond to emergencies at the Plant. 2. Verify and assess emergency conditions. 3. Notify and coordinate as appropriate with participating emergency services disaster agencies or emergency management agencies (ESDA/EMA's), emergency responders, regulatory agencies, and all other entities involved or affected by this EAP. 4. Take corrective action at the Plant. 5. Declare termination of emergencies at the Plant.
Clermont County ESDA/EMA	1. Receive Response Level reports from *Luminant Corporate* through *EAP Coordinator*. 2. Coordinate emergency response activities with local authorities: police, fire and rescue, etc. 3. Coordinate notification of public as necessary through established channels, which may include door-to-door contact. 4. Coordinate notification activities to affected parties within inundation areas. 5. Evaluate risk to areas beyond the inundation areas, communicate needs to *Luminant Corporate* and/or *EAP Coordinator*, and coordinate aid as appropriate. 6. Responsible for declaring termination of an emergency condition off-site upon receiving notification of an emergency status termination from *Luminant Corporate*. 7. If necessary, coordinate with *State ESDA/EMA*.
New Richmond Police, Washington Township Fire, and Rescue	1. Receive alert status reports from the *ERT* or the *County ESDA/EMA*. 2. If necessary, notify affected parties and general public within inundation areas (see Section 7). 3. Render assistance to Clermont ESDA/EMA, as necessary. 4. Render assistance to *Luminant Corporate* and *Plant Management*, as necessary.
Clermont County Police, Fire and Rescue, and Emergency Services	1. Receive alert status reports from the *ERT* or the *County ESDA/EMA*. 2. If necessary, notify affected parties within the inundation area. 3. Provide mutual aid to other affected areas, if requested and able.

4 EAP RESPONSE

The 4-Step Incident Response Process is shown in Figure 2-1. The Decision Tree shown in Figure 2-3 provides a flowchart for the various elements of the response process. Upon reaching Step 4 of the response process (termination and follow-up), the EAP Coordinator is responsible for notifying the ESDA/EMA's that the condition of the dam/impoundment has been stabilized. The purpose of this section is to provide specific information that can be used during a response. This information is provided in the following tables:

- Table 4-1 provides guidance for determining the response level.
- Table 4-2 provides impoundment pool level trigger elevations.
-
- Table 4-3 lists emergency actions to be taken depending on the situation.

Table 4-1. Guidance for Determining the Response Level

Event	Situation	Response Level
Spillway flow (see Table 4-2 for relevant elevations)	Primary spillway flow is not causing active erosion and impoundment water surface elevation is below auxiliary spillway crest elevation (if equipped).	Level 0
	Impoundment water surface elevation is at or above auxiliary spillway crest elevation (if equipped). No active erosion caused by spillway flow.	Level 1
	Spillway flow actively causing minor erosion that is not threatening the control section or dam/impoundment stability.	Level 2
	Spillway flow that could result in flooding of people downstream if the reservoir level continues to rise.	Level 2
	Abnormal operation of the spillway system due to blockage or damage that could lead to flooding.	Level 2
	Spillway flow actively eroding the soil around the spillway that is threatening the control section (e.g. undermining) or dam/impoundment stability.	Level 3
	Spillway flow that is flooding people downstream.	Level 3
Embankment overtopping (see Table 4-2 for relevant elevations)	Impoundment water surface elevation at or below typical normal pool fluctuation elevation.	Level 0
	Impoundment water surface elevation above typical normal pool fluctuation elevation.	Level 1
	Impoundment water surface elevation above high normal pool fluctuation elevation.	Level 2
	Impoundment water surface elevation at or above embankment crest elevation.	Level 3
Seepage	New seepage areas in or near the dam/impoundment with clear flow.	Level 1
	New seepage areas with cloudy discharge or increasing flow rate.	Level 2
	Heavy seepage with active erosion, muddy flow, and/or sand boils.	Level 3
Sinkholes	Observation of new sinkhole in impoundment area or on embankment.	Level 2
	Rapidly enlarging sinkhole and/or whirlpool in the impoundment.	Level 3
Embankment cracking	New cracks in the embankment greater than ¼ inch wide without seepage.	Level 1
	Any crack in the embankment with seepage.	Level 2

Table 4-1. Guidance for Determining the Response Level

Event	Situation	Response Level
	Enlarging cracks with muddy seepage.	Level 3
Embankment movement	Visual signs of movement/slippage of the embankment slope.	Level 1
	Detectable active movement/slippage of the embankment slope or other related effects (tension cracking, bulges/heaves, etc.) that could threaten the integrity of the embankment.	Level 2
	Sudden or rapidly proceeding slides of the embankment slopes.	Level 3
Embankment Monitoring Equipment (piezometers, inclinometers, surface displacement mounts, etc.)	Instrumentation readings beyond historic normal.	Level 1
	Instrumentation readings indicate the embankment is susceptible to failure.	Level 2
	Instrumentation readings indicate embankment is at threshold of failure or is currently failing.	Level 3
Earthquake or other event	Measurable earthquake felt or reported on or within 100 miles of the impoundment.	Level 1
	Earthquake or other event resulting in visible damage to the impoundment or appurtenances.	Level 2
	Earthquake or other event resulting in uncontrolled release of water or materials from the impoundment.	Level 3
Security threat	Verified bomb threat or other physical threat that, if carried out, could result in damage to the impoundment.	Level 2
	Detonated bomb or other physical damage that has resulted in damage to the impoundment or appurtenances.	Level 3
Sabotage/ vandalism	Damage to impoundment or appurtenance with no impact to the functioning of the impoundment.	Level 1
	Modification to the impoundment or appurtenances that could adversely impact the functioning of the impoundment. This would include unauthorized operation of spillway facilities.	Level 2
	Damage to impoundment or appurtenances that has resulted in seepage flow.	Level 2
	Damage to impoundment or appurtenances that has resulted in uncontrolled water release.	Level 3

Table 4-2. Impoundment Trigger Elevations

Impoundment	Embankment Crest Elevation	Auxiliary Spillway Crest Elevation	Normal Pool Fluctuation	
			Typical	High
Coal Pile Runoff Pond	509 ft.	Not Applicable	506.9 ft.	507.5 ft.
D Basin	510 ft.	Not Applicable	None	None

Notes:
- Survey Data obtained from (Bathymetric and Aerial Topographic Map prepared for William H. Zimmer Power Station, prepared by S&ME and IBI Group – February, 2021)

Table 4-3. Step 3: Emergency Actions

Condition	Description of Condition	Action to be Taken
High Water Level/ Large Spillway Release	See Table 4-1 and Table 4-2 for elevations and triggering water levels associated with the impoundments and spillways covered by this EAP.	1. Assess cause of increased reservoir stage, especially during fair weather conditions. 2. Determine Response Level. 3. Make proper notifications as outlined in the Figure 2-2 Notification Flowchart. 4. Perform additional tasks as determined through consultation with the ERT. 5. Make notifications if condition worsens such that downstream flooding is imminent. **Response Level 0**: require enhanced surveillance 3 times per day **Response Level 1**: contact internal chain of command and external response partners as necessary; inspect impoundment minimum 1 time per hour **Response Level 2**: contact internal chain of command; notify ESDA/EMA's and notify external response partners. ESDA/EMA's notify affected parties. **Response Level 3**: contact internal chain of command; notify ESDA/EMA's and notify external response partners. ESDA/EMA's notify affected parties of emergency incident.

Table 4-3. Step 3: Emergency Actions

Condition	Description of Condition	Action to be Taken
Seepage	Localized new seepage or boil(s) observed along downstream face / toe of earthen embankment with muddy discharge and increasing but controllable discharge of water.	1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos. Document location on a site plan and in inspection notes. 2. Determine Response Level. 3. Make proper notifications as outlined in the Figure 2-2 Notification Flowchart. 4. ERT (with Dam Safety Manager as lead) to determine mitigation actions. The following actions may apply: a) Place a ring of sand bags with a weir at the top towards the natural drainage path to monitor flow rate. If boil becomes too large to sand bag, place a blanket filter over the area using non-woven filter fabric and pea gravel. Attempt to contain flow in such a manner (without performing any excavations) that flow rates can be measured. Stockpile gravel and sand fill for later use, if necessary. b) Inspect the embankment and collect piezometer, water level and seepage flow data daily unless otherwise instructed by the Dam Safety Manager. Record any changes of conditions. Carefully observe embankment for signs of depressions, seepage, sinkholes, cracking or movement. c) Maintain continuous monitoring of feature. Record measured flow rate and any changes of condition, including presence or absence of muddy discharge. 5. Make notifications as outlined in the lower portion of the Notification Flowchart (Figure 2-2) if condition worsens such that failure is imminent.
Sabotage and Miscellaneous Other Issues	Criminal action with significant damage to embankment or structures where significant repairs are required and the integrity of the facility is compromised—condition appears stable with time.	1. Contact law enforcement authorities and restrict all access (except emergency responders) to impoundment. Restrict traffic on embankment crest to essential emergency operations only. 2. Determine Response Level. 3. Make internal notifications as outlined in the upper portion of the Notification Flowchart (Figure 2-2). 4. In conjunction with the Dam Safety Manager, assess extent of damage and visually inspect entire embankment and ancillary structures for additional less obvious damage. Based on inspection results, confirm if extent of damage to various components of the impoundment warrants a revised Response Level and additional notifications. 5. Perform additional tasks as directed by the ERT. 6. Make notifications if conditions worsen.

Table 4-3. Step 3: Emergency Actions

Condition	Description of Condition	Action to be Taken
Embankment Deformation	**Cracks:** New longitudinal (along the embankment) or transverse (across the embankment) cracks more than 6 inches deep or more than 3 inches wide or increasing with time. New concave cracks on or near the embankment crest associated with slope movement.	1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos. Document location on a site plan and in inspection notes. 2. Restrict traffic on embankment crest to essential emergency operations only. 3. Determine Response Level. 4. Make notifications as outlined in the Figure 2-2 Notification Flowchart 5. ERT (with Dam Safety Manager as lead) to determine mitigation actions. The following actions may apply: a) Place buttress fill against base of slope immediately below surface feature. Stock pile additional fill. b) Place sand bags as necessary around crack area to divert any storm water runoff from flowing into crack(s). 6. As directed by the Dam Safety Manager, additional inspection and monitoring of the dam may be required. Items may include; inspect the dam on a schedule determined by the engineers; collect piezometer and water level data; and record any changes of condition. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement. 7. Make notifications as outlined in the Figure 2-2 Notification Flowchart if conditions worsen such that failure is imminent.
Embankment Deformation (cont.)	**Slides / Erosion:** Deep slide / erosion (greater than 2 feet deep) on the embankment that may also extend beyond the embankment toe but does not encroach onto the embankment crest and appears stable with time.	1. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos. Document location on a site plan and in inspection report. 2. Restrict traffic on embankment crest to essential emergency operations only. 3. Determine the Response Level. 4. Make notifications as outlined in the Figure 2-2 Notification Flowchart. 5. ERT (with Dam Safety Manager as lead) to determine mitigation actions. Additional actions may include the following items. a) Place sand bags as necessary around slide area to divert any storm water runoff from flowing into slide(s). b) Increase inspections of the dam; collect piezometer and water level data; and record any changes of condition. During inspections,

Table 4-3. Step 3: Emergency Actions

Condition	Description of Condition	Action to be Taken
		carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement. 6. Make notifications as outlined in the Figure 2-2 Notification Flowchart if conditions worsen such that failure is imminent.
	Sinkholes: Small depression observed on the embankment or within 50 feet of the embankment toe that is less than 5 feet deep and 30 feet wide or which is increasing with time.	1. Slowly open drain gates to lower pool elevation. 2. Measure and record feature dimensions, approximate flow rate, and relative location to existing surface features. Take photos. Document location on a site plan and in inspection notes. 3. Restrict traffic on embankment crest to essential emergency operations only. 4. Determine Response Level. 5. Make notifications as outlined in the Figure 2-2 Notification Flowchart. 6. ERT (with Dam Safety Manager as lead) to determine mitigation actions. Additional actions may include the following items: a) Backfill the depression with relatively clean earth fill (free of organic materials) generally even with surrounding grade and slightly mounded (6 to 12 inches higher) in the center in order to shed storm water away from the depression. Stock pile additional fill. b) Increase inspections of the dam; collect piezometer and water level data daily unless otherwise instructed by Dam Safety Manager; and record any changes of condition. Carefully observe dam for signs of depressions, seepage, sinkholes, cracking or movement. 7. Make notifications as outlined in the Figure 2-2 Notification Flowchart if conditions worsen such that failure is imminent.

5 PREPAREDNESS

The intent of this section is to provide information that will be utilized during a response. Established emergency supplies and locations, suppliers, and equipment are provided in Table 5-1. Supplier contact information is listed in Table 5-2.

A coordination meeting shall be conducted annually between representatives of Zimmer Power Company LLC and local emergency responders. This meeting may be in the form of a face-to-face meeting, tabletop exercise, or additional training regarding the EAP.

Table 5-1. Emergency Supplies and Equipment

Item	On-site (Yes/No/Occasionally)	Remarks
Flashlights Generator Extension Cords Fire extinguishers Floodlights	Yes	At Zimmer Power Plant Maintenance Facility, contact Operations Shift Supervisor for location(s).
Backhoe	No	Contact the Nelson Stark Company, Utter Construction (see Table 5-2) and/or other nearby large equipment rental providers for additional large equipment as necessary.
Dozer	Yes	One CAT D8T and one CAT D6N. Contact Operations Shift Supervisor for location(s).
Large Equipment (Rental – including excavating equipment, pumps, lighting)	Yes	One Hyundai 290 Long Reach Excavator, one CAT 980H Rubber Tire Loader and one CAT IT28G Rubber Tire Loader, two 4000 gallon capacity water trucks, two 637G Motor Scrapers, one Chevy crew cab pickup truck, one New Holland LS125 Skid Steer, one Bobcat 463 Skid Steer, one POSI TRAK RC60 Skid Steer, one 84-inch hamm smooth drum roller, one 500 gallon fuel/lube wagon, three light plants, two industrial vacuum trucks, one John Boat, and an MV Pleasant. Contact Art's Rental, Utter Construction (see Table 5-2) and/or other nearby large equipment rental providers for additional large equipment as necessary.
Dump Truck	Yes	Six 35-ton Mountain Mack dump trucks. Contact Environmental Manager for location(s).
Pump and Hoses	Yes	Three Portable Water Pumps. Contact Shift Supervisor for availability and location(s). Contact Shift Supervisor for location(s). Contact Allied Technical Services or Art's Rental for high capacity portable pumps (see Table 5-2).
Sandbags and Sand	Yes	Soil stockpiled on-site. Contact Shift Supervisor for location(s). Contact Dayton Bag & Burlap or Max Katz Bag Company, Inc for additional sandbags (see Table 5-2).
Fill (Stone, aggregate, sand)	Yes	Medium sized aggregate available on-site. Contact Shift Supervisor for location(s). Contact listed suppliers in Table 5-2 for gravel, sand, and riprap fill as necessary.
Concrete/grout	No	Contact Ernst Concrete and/or City Wide Ready Mix for concrete/grout (see Table 5-2).
Geotextile Filter Fabric	No	
Plastic Sheeting	No	
Rope	No	
Personal Flotation Devices	Yes	Contact Operations Shift Supervisor for location(s) and availability.

Table 5-2. Supplier Addresses

Supply/Rental Item(s)	Supplier Contact Information	Distance from Site (miles)	Address
Backhoe, Large Equipment (Rental – including excavating equipment, pumps, lighting)	**Art's Rental** (513) 753-3957	18.2	3781 Bach-Buxton Road Amelia, OH 45102
	Utter Construction (513) 876-8616	11.1	1302 OH-133 Bethel, OH 45106
Pump and Hoses	**Allied Technical Services** (513) 793-0499	37.5	3460 Mustafa Drive Cincinnati, OH 45241
	Art's Rental (513)-753-3957	18.2	3781 Bach-Buxton Road Amelia, OH 45102
Fill (Stone, aggregate, sand)	**Hilltop Companies Kellogg Terminal** (513) 232-1755	17.6	6777 Kellogg Avenue Cincinnati, OH 45230
	Arch Materials LLC (513) 724-7625	24.5	4438 OH-276 Batavia, OH 45103
Sandbags and Sand	**Dayton Bag & Burlap** (937) 253-1726	76.4	322 Davis Avenue Dayton, OH 45403
	Max Katz Bag Company, Inc. (317) 635-9561	133	235 S La Salle Street Indianapolis, IN 46201
Concrete/grout	**Ernst Concrete** (513) 402-5001	23.8	4212 Curliss Lane Batavia, OH 45103
	City Wide Ready Mix (513) 533-1111	24.2	5623 Wooster Pike Cincinnati, OH 45226

6 FACILITY/IMPOUNDMENT DESCRIPTION

The impoundments included in this EAP are described as follows and illustrated in Figure 1-2. Table 6-1 contains additional geometric details for each impoundment.

Zimmer Power Plant is located to the north of the Village of Moscow in Monroe Township and Washington Township, Clermont County, Ohio. The plant is bounded to the west by the Ohio River, to the east by US 52, and to the south by the village of Moscow, approximately 22 miles to the southeast of downtown Cincinnati.

The Coal Pile Runoff Pond is part of the Wastewater Pond Complex and is located about 3,000 feet north of the power house. The Coal Pile Runoff Pond is a diked impoundment constructed from native soils excavated from the site (primarily clayey soils with low permeability) and sand dredged from the Ohio River. The pond was constructed in the late 1980s when the Zimmer Power Plant was converted into a coal fired operation facility. Including the embankment, the footprint of the Coal Pile Runoff Pond is approximately 4 acres. The total storage capacity of the Coal Pile Runoff Pond is approximately 18 acre-feet with a bottom elevation of approximately 498 feet. A normal pool within the Coal Pile Runoff Pond is maintained around 507 feet per a Topographic Survey conducted in 2021 (stored water volume of approximately 12.9 acre-feet).

The main inflow to the Coal Pile Runoff Pond is precipitation which is either falls directly on the pond or runs off the embankment. Additionally, flow from D Basin (runoff from the coal pile) is pumped from a sump located at an elevation of 482 feet along the west dike through two 6-inch diameter high density polyethylene (HDPE) pipes into the Coal Pile Runoff Pond. The Wastewater Pond Complex discharge to the Ohio River is permitted as Outfall 005 under OEPA Permit #1IB00011*JD and NPDES permit #OH0048836.

D Basin is a diked impoundment. Drawing files indicate that D Basin was constructed after 2002 as a dewatering basin. Including the embankment, the footprint of D Basin is approximately 9 acres. A normal pool within the D Basin is maintained around 489 feet per a Topographic Survey conducted in 2021 The lowest crest elevation of the impoundment is approximately 508 feet per the 2021 Topographic Survey. The crest is approximately 53 feet above the normal pool elevation of the Ohio River. Flow from D Basin is pumped along the west dike through a 6-inch diameter pipe into the Coal Pile Runoff Pond to the north.

Table 6-1. Plant Impoundment Characteristics

Feature/Parameter	Coal Pile Runoff Pond	D Basin
Maximum Embankment Height	15 ft.	7 ft.
Length of Dam	1,600 ft.	2,600 ft.
Crest Width	20 ft to 60 ft.	20 ft.
Crest Elevation	509 ft.	510 ft.
Reservoir Area at Top of Dam	2.6 acres	5.2 acres
Storage Capacity at Top of Dam	18 acre-ft.	4 acre-ft.
Primary Spillway Type	2 x 12" Pipes	Sump Pump to 6-inch Pipe
Primary Spillway Crest Elevation	Approximately 506.4 and 506.6 ft. for each 12" pipe, respectively	Not Applicable
Storage Capacity at Primary Spillway Elevation	Approximately 12 acre-ft.	Not Applicable
Reservoir Area at Normal Water Surface Elevation	2.3 acres	Not Applicable
Auxiliary Spillway Type	Not Applicable	Not Applicable
Auxiliary Spillway Crest Elevation	Not Applicable	Not Applicable

Notes:

- Survey Data obtained from (Bathymetric and Aerial Topographic Map prepared for William H. Zimmer Power Station, prepared by S&ME and IBI Group – February, 2021)
- 2.5-Feet Resolution LiDAR DEM - Downloaded from http://ogrip.oit.ohio.gov/ (January, 2016)
- Elevations are in reference to Mean Sea Level (MSL), NAVD88.

7 BREACH INUNDATION MAPS AND POTENTIAL IMPACTS

Inundation maps for the Coal Pile Runoff Pond and D Basin potential breach scenarios are provided in this section. It is the Clermont County ESDA/EMA's responsibility to keep a current list of affected parties/properties to contact in the case of emergencies that result in Response Level 2 or 3. This list should encompass all properties within and adjacent to the probable inundation extents shown in the provided maps.

The methodology used to identify probable inundation extents for potential breach scenarios varied as a function of the impoundment size, location, surrounding topography, and surrounding structures/facilities/waterbodies.

A visual analysis was performed for the Coal Pile Runoff Pond and D Basin to determine possible inundation limits for each breach scenario. The inundation limits were mapped using a combination of digital elevation data from the topographic survey prepared by ESP Associates, P.A. – September, 2014 and DEM data downloaded from the Ohio OGRIP website. Stage-storage capacity was considered when the impoundment could breach into an adjacent basin.

Approximate inundation areas are illustrated in Figure 7-1 and Figure 7-2.

Figure 7-1. Coal Pile Runoff Pond Inundation Map

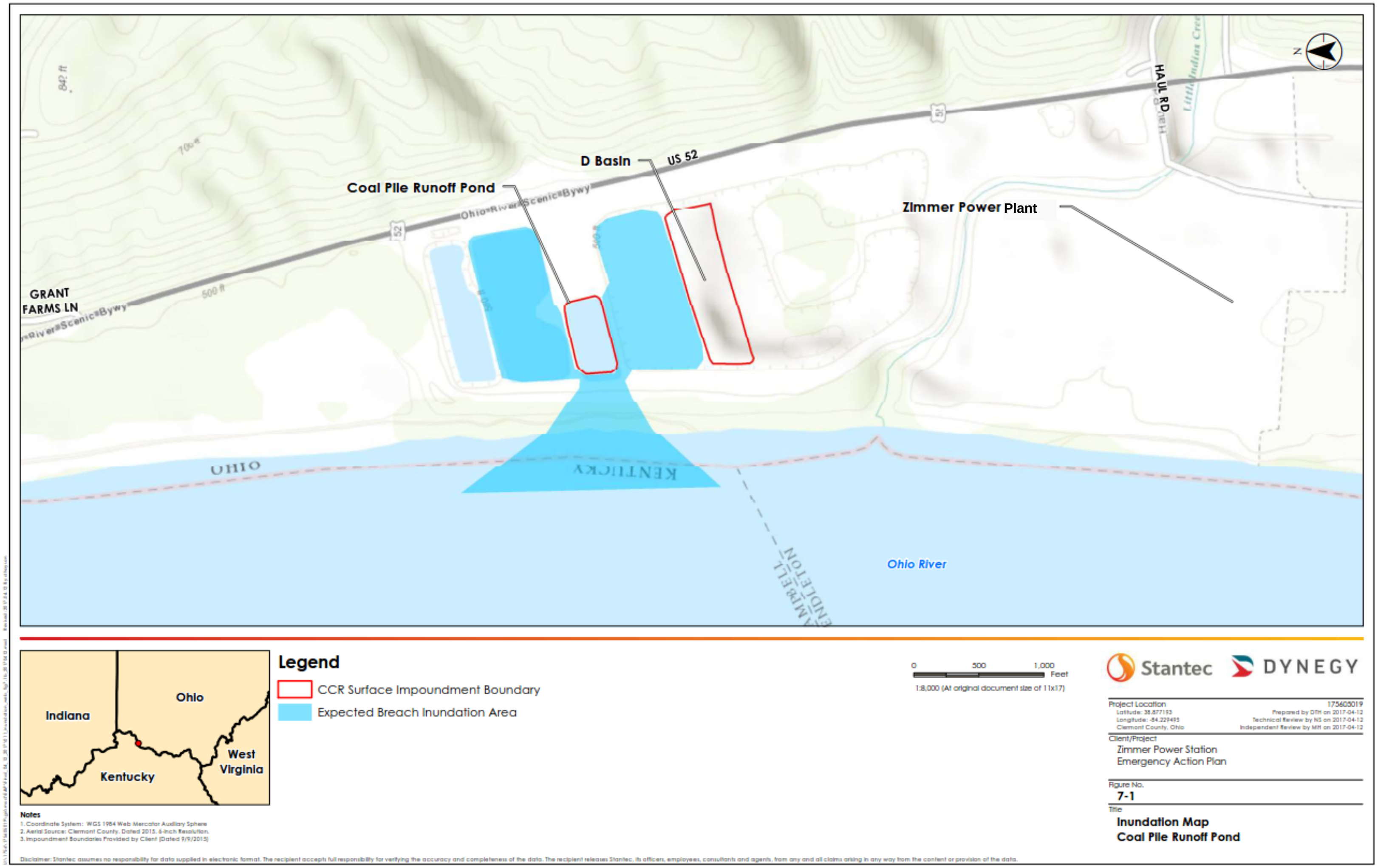
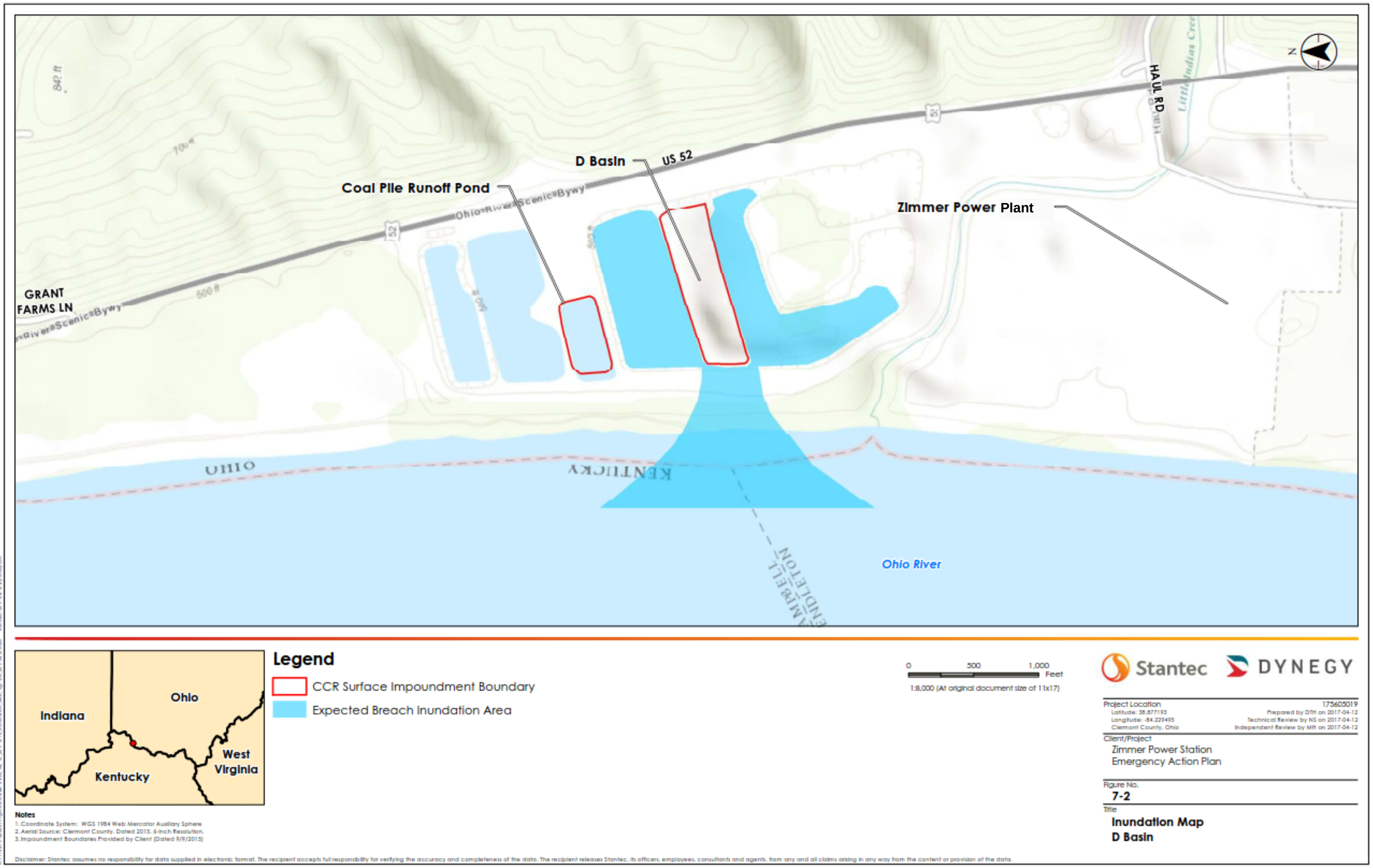


Figure 7-2. D Basin Inundation Map



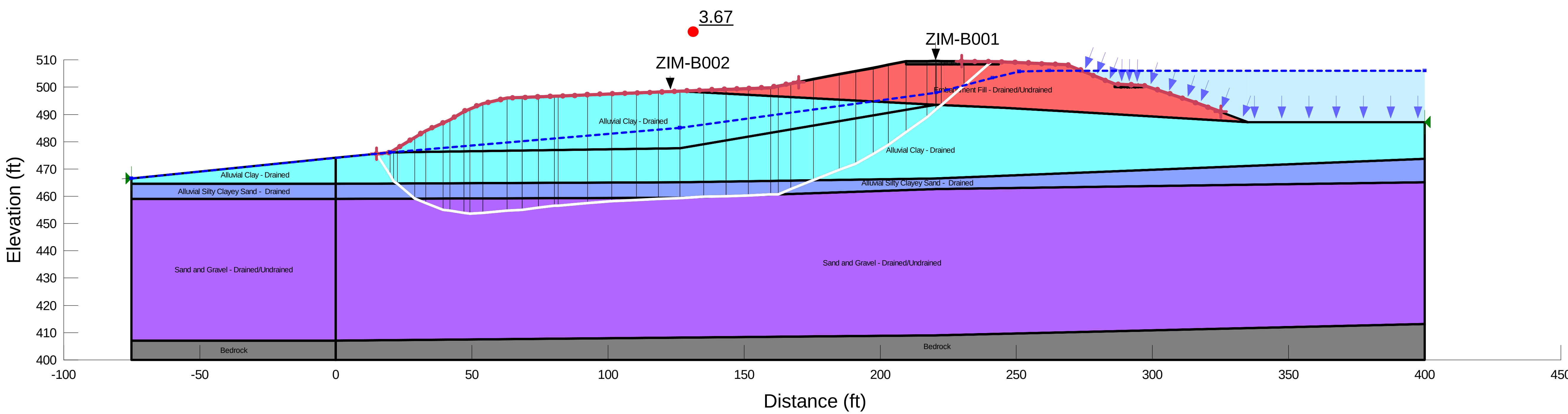
Attachment D

Periodic Structural Stability and Safety Factor Assessment Analyses

Zimmer Power Plant
Moscow, Ohio

Computed by: PK
Chekecd by: LPC, PB

Static Global (Drained Strengths) Downstream
Cross-Section 1
D Basin, West Embankment



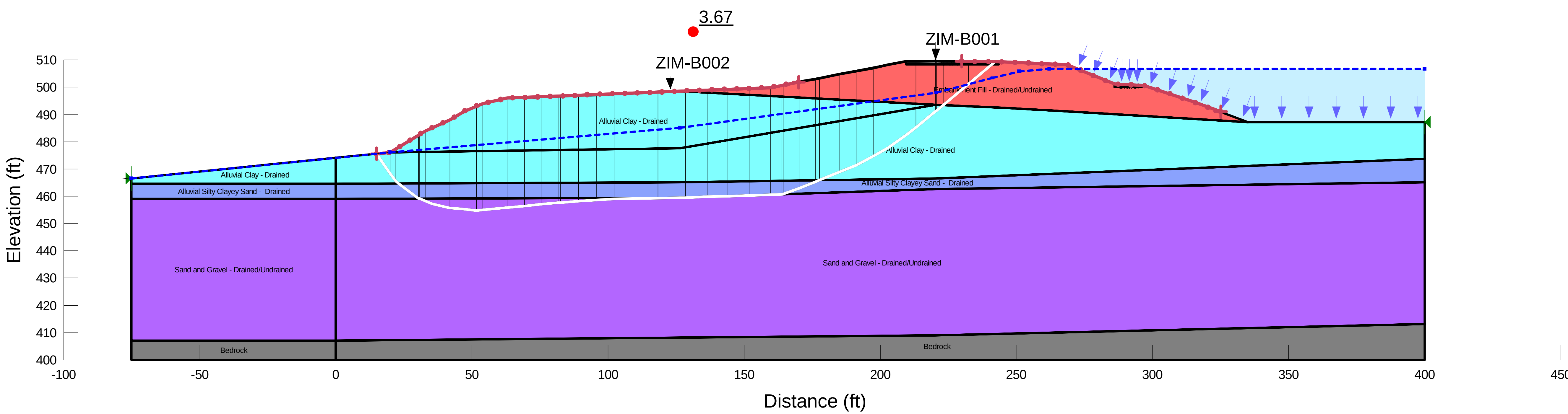
Material Properties

Name: Embankment Fill - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 127 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Alluvial Clay - Drained Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 200 psf Phi': 30 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 120 pcf Piezometric Line: 1
Name: Alluvial Silty Clayey Sand - Drained Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 150 psf Phi': 35 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Bedrock Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Gravel Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 35 ° Phi-B: 0 ° Piezometric Line: 1

Zimmer Power Plant
Moscow, Ohio

Computed by: PK
Checked by: LPC, PB

Maximum Surcharge Pool (Peak Undrained Strengths) Downstream
Cross-Section 1
D Basin, West Embankment



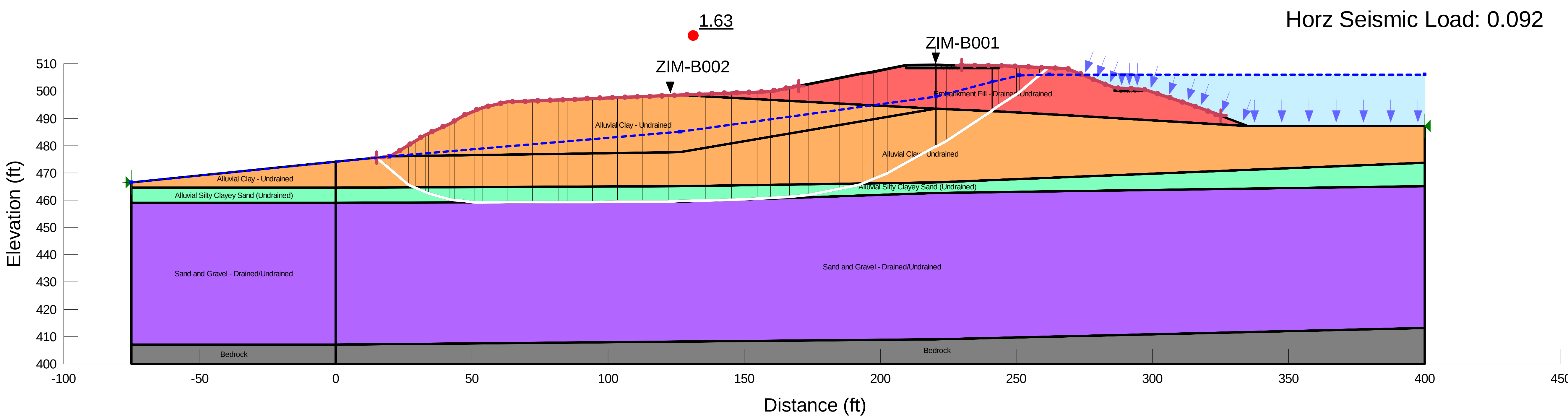
Material Properties

Name: Embankment Fill - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 127 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Alluvial Clay - Drained Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 200 psf Phi': 30 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 120 pcf Piezometric Line: 1
Name: Alluvial Silty Clayey Sand - Drained Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 150 psf Phi': 35 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Bedrock Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Gravel Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 35 ° Phi-B: 0 ° Piezometric Line: 1

Zimmer Power Plant
Moscow, Ohio

Computed by: PK
Checked by: LPC, PB

Pseudo Static (Peak Undrained Strengths) Downstream
Cross-Section 1
D Basin, West Embankment



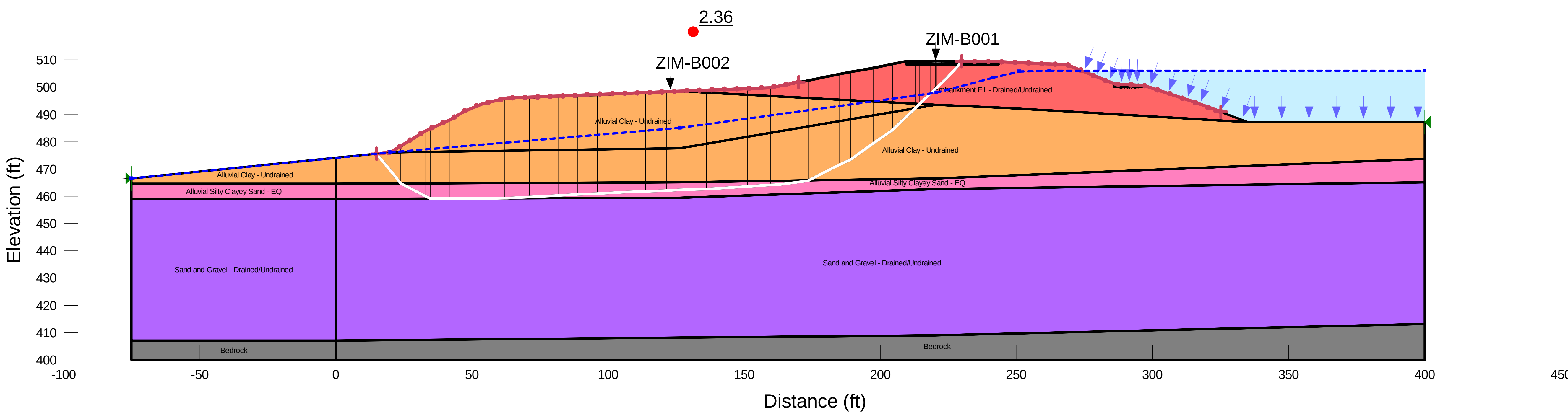
Material Properties

Name: Embankment Fill - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 127 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Bedrock Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Alluvial Clay - Undrained Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 600 psf Phi': 16 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 120 pcf Piezometric Line: 1
Name: Gravel Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 35 ° Phi-B: 0 ° Piezometric Line: 1
Name: Alluvial Silty Clayey Sand (Undrained) Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 400 psf Phi': 16 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1

Zimmer Power Plant
Moscow, Ohio

Computed by: PK
Checked by: LPC, PB

Post Earthquake (Peak Undrained Strengths with Softened Silty Clayey Sand) Downstream
Cross-Section 1
D Basin, West Embankment



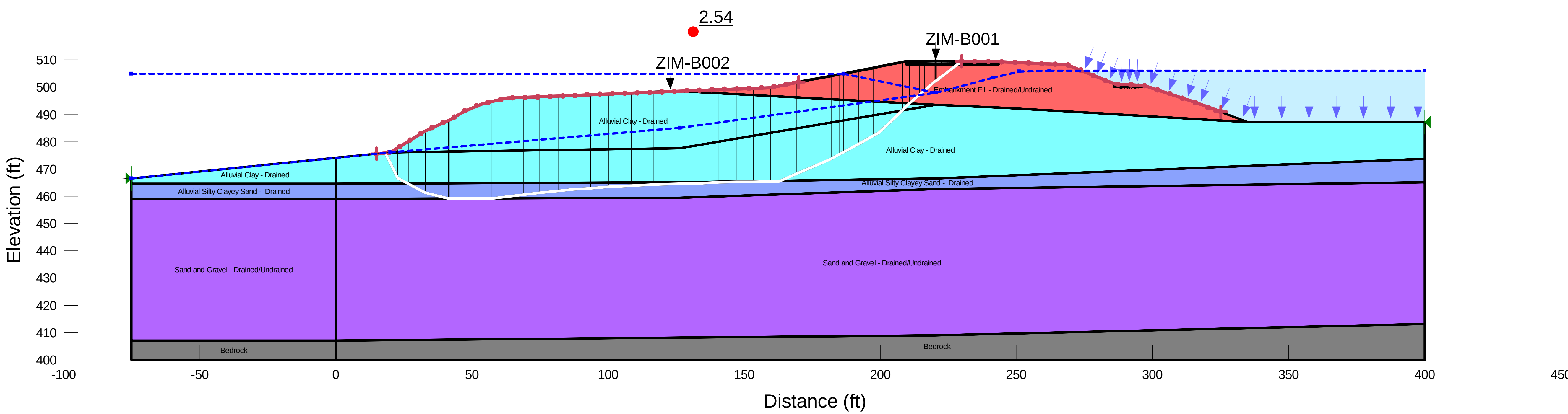
Material Properties

Name: Embankment Fill - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 127 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 1
Name: Bedrock Model: Bedrock (Impenetrable) Piezometric Line: 1
Name: Alluvial Clay - Undrained Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 600 psf Phi': 16 ° Phi-B: 0 ° Constant Unit Wt. Above Water Table: 120 pcf Piezometric Line: 1
Name: Alluvial Silty Clayey Sand - EQ Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 320 psf Phi': 12.8 ° Phi-B: 0 ° Steady State Strength (Css): 1 psf Collapse Surface Angle: 0 ° Piezometric Line: 1
Name: Gravel Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 35 ° Phi-B: 0 ° Piezometric Line: 1

Zimmer Power Plant
Moscow, Ohio

Computed by: PK
Checked by: LPC, PB

Sudden Drawdown (Drained Strengths) Downstream
Cross-Section 1
D Basin, West Embankment



Material Properties

Name: Embankment Fill - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 127 pcf Cohesion': 0 psf Phi': 30 ° Phi-B: 0 ° Cohesion R: 0 psf Phi R: 30 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: Alluvial Clay - Drained Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 200 psf Phi': 30 ° Phi-B: 0 ° Cohesion R: 600 psf Phi R: 16 ° Constant Unit Wt. Above Water Table: 120 pcf Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: Alluvial Silty Clayey Sand - Drained Model: Mohr-Coulomb Unit Weight: 128 pcf Cohesion': 150 psf Phi': 35 ° Phi-B: 0 ° Cohesion R: 400 psf Phi R: 16 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 2 Piezometric Line After Drawdown
Name: Sand and Gravel - Drained/Undrained Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 31 ° Phi-B: 0 ° Cohesion R: 0 psf Phi R: 31 ° Constant Unit Wt. Above Water Table: 125 pcf Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: Bedrock Model: Bedrock (Impenetrable) Piezometric Line: 2 Piezometric Line After Drawdown: 1
Name: Gravel Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 35 ° Phi-B: 0 ° Cohesion R: 0 psf Phi R: 35 ° Piezometric Line: 2 Piezometric Line After Drawdown: 1