

# INITIAL STRUCTURAL STABILITY ASSESSMENT

EXISTING CCR IMPOUNDMENTS  
*CCR Rule Section 257.73(d)*

## ASBURY POWER PLANT

21133 Uphill Lane  
Asbury, Missouri 64832

October 17, 2016



**SERVICES YOU COUNT ON**

## EMPIRE DISTRICT ELECTRIC COMPANY

Prepared by:



Donald C. Nowack, P.E., R.G.  
MO P.E. 2008019579  
MO R.G. 2001011344

October 17, 2016

Empire District Electric Company  
Asbury Power Plant  
21133 Uphill Lane  
Asbury, Missouri 64832

RE: **Initial Structural Stability Assessment** . CCR Rule Section 257.73(d)  
Empire District Electric Company . Asbury Power Plant  
Asbury, Missouri  
PPI Project Number 231518

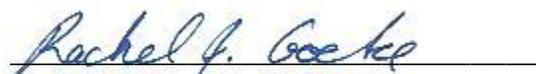
To Whom it May Concern:

This Report presents the results of the **Initial Structural Stability Assessment** of the Empire District Electric Company's CCR Impoundment at the Asbury Power Plant (Asbury CCR Impoundment). This document has been prepared to meet the requirements of Section 257.73(d) of the CCR Rule.

In accordance with Section 257.105(f)(10) of the CCR Rule, a copy of this document should be maintained in Empire's operating records. In accordance with Section 257.107(f)(9), a copy of this document should also be posted to Empire's CCR Compliance website. Notification of the availability of this document should be provided to the State Director, as required in Section 257.106(f)(9).

PALMERTON & PARRISH, INC.

By:



Rachel J. Goetze, P.E.  
MO P.E. 2007020268

PALMERTON & PARRISH, INC.

By:



Donald C. Nowack, P.E., R.G.  
MO P.E. 2008019579  
MO R.G. 2001011344

## TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
2.0	INITIAL STRUCTURAL STABILITY ASSESSMENT .....	1
2.1	Stable Foundation Abutments .....	2
2.2	Slope Protection.....	2
2.3	Compaction .....	2
2.4	Vegetation Height.....	3
2.5	Spillway .....	3
2.5.1	Spillway Erodibility.....	3
2.5.2	Spillway Capacity .....	3
2.6	Hydraulic Structures.....	3
2.7	Downstream Slopes .....	3
3.0	SUMMARY OF DEFICIENCIES .....	4
4.0	CERTIFICATION 257.73(d)(3) .....	4

## INITIAL STRUCTURAL STABILITY ASSESSMENT

### CCR RULE SECTION 257.73(d)

#### EMPIRE DISTRICT ELECTRIC COMPANY – ASBURY POWER PLANT

#### ASBURY, MISSOURI

### 1.0 INTRODUCTION

In accordance with Section 257.73(b), the Asbury CCR Impoundment has a height of five feet or more and a storage volume of 20 acre-feet or more, and is therefore subject to the requirements of Section 257.73(c) through (e). In accordance with Section 257.73(a)(2) of the CCR Rule, the initial hazard potential classification for the existing Asbury CCR Impoundments is *significant hazard potential CCR surface impoundment*. The design storm event for a significant hazard potential CCR surface impoundment is a 1,000-year flood, as stated in Section 257.73(d)(v)(B)(2).

*“CCR Rule Section 257.73(d) Periodic Structural Stability Assessments: (1) The owner or operator of the CCR unit must conduct initial and periodic structural stability assessments and document whether the design, construction, operation, and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering practices for the maximum volume of CCR and CCR wastewater which can be impounded therein.”*

Section 257.73(d) of the CCR Rule requires completion of an Initial and Periodic Structural Stability Assessments to document that the CCR Impoundment meets the criteria listed in Section 257.73(d)(1)(i) through (viii) of the CCR Rule. If structural stability deficiencies are identified, corrective measures must be implemented and documented in accordance with Section 257.73(d)(2).

### 2.0 INITIAL STRUCTURAL STABILITY ASSESSMENT

*“CCR Rule Section 257.73(d)... The assessment must, at a minimum, document whether the CCR unit has been design, constructed, operated, and maintained with:*

- (i) Stable foundations and abutments;*
- (ii) Adequate slope protection to protect against surface erosion, wave action, and adverse effects of sudden drawdown;*
- (iii) Dikes mechanically compacted to a density sufficient to withstand the range of loading conditions in the CCR unit;*
- (iv) Vegetated slopes of dikes and surrounding areas not to exceed a height of six inches above the slope of the dike except for slopes which have an alternate form or forms of slope protection;*
- (v) A single spillway or a combination of spillways configured as specified in paragraphs (d)(1)(v)(A) of this section. The combined capacity of all spillways must be designed,*

*constructed, operated, and maintained to adequately manage flow during and following the peak discharge from the event specified in paragraph (d)(1)(v)(B) of this section.*

*(A) All spillways must be either:*

*(1) Of non-erodible construction and designed to carry sustained flows; or*

*(2) Earth-or grass-lined and designed to carry short-term infrequent flows at non-erosive velocities where sustained flows are not expected.*

*(B) The combined capacity of all spillways must adequately manage flow during and following the peak discharge from a:*

*(1) Probable maximum flood (PMF) for a high hazard potential CCR surface impoundment; or*

*(2) 1000-year flood for a significant hazard potential CCR surface impoundment;*  
*or*

*(3) 100-year flood for a low hazard potential CCR surface impoundment.*

*(vi) Hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit that maintain structural integrity and are free of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, and debris which may negatively affect the operation of the hydraulic structure; and*

*(viii) For CCR units with downstream slopes which can be inundated by the pool of an adjacent water body, such as a river, stream or lake, downstream slopes that maintain structural stability during low pool of the adjacent water body or sudden drawdown of the adjacent water body.”*

## **2.1 Stable Foundation Abutments**

The Asbury CCR Impoundment has stable foundation conditions. The perimeter levee embankments are constructed of earth fill materials, and are founded on natural medium stiff to very stiff clay soils or shale bedrock. The stability of the Asbury CCR Impoundment levees has been documented in previous studies that included analysis of the in situ density, shear strength parameters, and geologic stratigraphy.

## **2.2 Slope Protection**

The Asbury CCR Impoundment is not subject to wave action from an adjacent body of water. Exterior levee embankment slopes are vegetated, and the vegetation provides adequate protection against erosion from storm water runoff. Sudden drawdown is not an applicable design case for the Asbury CCR Impoundments.

## **2.3 Compaction**

The perimeter levee embankments of the Asbury CCR Impoundment are constructed of earth fill. As-built documentation of the compaction of the Asbury CCR Impoundment levees is not available. The results of previous studies document that the in situ density and associated strength parameters of the earthen embankments are adequate to withstand the various loading conditions that occur at the Asbury CCR Impoundment.

## 2.4 Vegetation Height

Empire mows the perimeter levee embankment slopes periodically, and schedules mowing immediately prior to the Periodic Annual Levee Inspection required by Section 257.83 of the CCR Rule.

## 2.5 Spillway

The Asbury CCR Impoundment has a single discharge point, identified as Outfall #002. The primary spillway at Outfall #002 consists of two (2) 12-inch diameter PVC pipes with butterfly valves. The intake of these two (2) pipes is set at approximately 928.8 feet. Outfall #002 also has an auxiliary spillway consisting of a trapezoidal shaped concrete lined channel that is 24 feet wide and 1.2 feet from the bottom of spillway to the top of the berm. The flowline of the auxiliary spillway is at elevation 930.35 feet.

### 2.5.1 Spillway Erodibility

Discharges from the primary and auxiliary spillways at Outfall #002 occur on the outside of the CCR Impoundment berm. A combination of concrete and rip-rap surfaces along the potential path of discharge prevents erosion on the levee embankment. The spillway discharge areas are considered non-erodible in accordance with the CCR Rule.

### 2.5.2 Spillway Capacity

In accordance with Section 257.73(a)(2) of the CCR Rule, the initial hazard potential classification for the Asbury CCR Impoundment is *significant hazard potential*. The design storm event for a significant hazard potential CCR Impoundment is a 1,000-year flood event.

Flood modeling performed as part of the Initial Inflow Design Flood Control System Plan indicates that with Outfall #002 passes the 1,000-year flood event with the two (2) 12-inch pipes open, without overtopping the auxiliary spillway. The two spillway pipes have a combined maximum capacity of 10.94 cubic feet per second (cfs). The estimated maximum flow across the auxiliary concrete spillway, using the equation for flow over an Ogee spillway, is 106 cfs.

## 2.6 Hydraulic Structures

There are several pipe penetrations through the levee embankments of the Asbury CCR Impoundment. These pipe penetrations are located near the top of the levee crest, typically within 2 to 3 feet of the top of the levee embankment. PPI visually observed the pipe penetrations during an engineer's site visit on October 7, 2016. Based on visual observation, the pipes do not exhibit signs of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris.

## 2.7 Downstream Slopes

The downstream (exterior) slopes of the Asbury CCR Impoundment levees are not subject to inundation by an adjacent body of water, such as a river, stream, or lake. Blackberry Creek is channelized in a ditch North of the Lower Pond, but does not

inundate the toe of the levee embankment. Slope stability analysis results show that the water level in Blackberry Creek is sufficiently far away from the levee toe and does not impact the global slope stability of the levee embankment.

### 3.0 SUMMARY OF DEFICIENCIES

*“CCR Rule Section 257.73(d)(2): The periodic assessment described in paragraph (d)(1) of this section must identify any structural stability deficiencies associated with the CCR unit in addition to recommending corrective measures. If a deficiency or a release is identified during the periodic assessment, the owner or operator unit must remedy the deficiency or release as soon as feasible and prepare documentation detailing the corrective measures taken.”*

No deficiencies were identified as part of this Initial Structural Stability Assessment.

### 4.0 CERTIFICATION 257.73(d)(3)

The undersigned Professional Engineer certifies that the initial structural stability assessment was completed in accordance with the requirements of 40 CFR 257.73(d).

State of Missouri Professional Engineering License Number: 2008019579

Name: Donald C. Nowack, P.E.

Seal:

Signature: 

Date: October 17, 2016

