Dam Safety Hazard Classification Review

Ash Disposal Area 2
Johnsonville Fossil Plant
Humphreys County, Tennessee

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Prepared for:
Tennessee Valley Authority
Chattanooga, Tennessee

October, 2011

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Stantec

October 04, 2011
File: 175630008

Mr. Scott Turnbow
Tennessee Valley Authority
1101 Market Street
LP 5E-C
Chattanooga, Tennessee 37402

Reference: **Dam Safety Hazard Classification Review**
Ash Disposal Area 2
Johnsonville Fossil Plant
Humphreys County, Tennessee

Dear Mr. Turnbow:

Stantec has a completed a review of the hazard classification assessments for facilities at the Johnsonville Fossil Plant. The attached report summarizes the likely impacts of potential failure scenarios and provides conclusions relative to hazard classification.

We appreciate the opportunity to assist you with your dam safety program. If you have any questions or comments, please call.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Dan Hoffman
Project Engineer

John Menninger, PE
Senior Project Engineer

/lfb

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1. Study Description

The Johnsonville Fossil Plant is located on the eastern shore of Kentucky Lake, an impoundment of the Tennessee River, one mile northwest of New Johnsonville, Tennessee. Kentucky Lake bounds the plant to the west and a natural hill slopes upward from the plant to the east. Figure 1.1 illustrates the plant vicinity.

Johnsonville Fossil Plant has one active ash impoundment facility: Ash Disposal Area 2. In July 2009 TVA reviewed the dam safety hazard classification for each of its active coal combustion product (CCP) impoundments and determined this impoundment to be a Significant Hazard[(1)]. Ash Disposal Area 2 is subdivided into a series of stacking areas for the management of ash, as well as an impoundment area for settling sluiced ash from the Johnsonville Fossil Plant.

Stantec has been requested to review the hazard classification assessment and either confirm or recommend a revised classification. This report summarizes the likely impacts of potential failure scenarios and provides conclusions relative to hazard classification.

2. Potential Failure Scenarios

2.1. Ash Disposal Area 2

2.1.1. Facility Description

Ash Disposal Area 2 is located on an island of Kentucky Lake on the western side of Johnsonville Fossil Plant. The disposal area is connected by an earthen causeway approximately 1,200 feet long to Johnsonville Fossil Plant. The facility has a surface area of approximately 90 acres with approximately 26 acres being the impoundment. The crest elevation of the impoundment is 390 feet which is 31 feet above the normal pool elevation of Kentucky Lake (El. 359 ft). The impoundment area is currently divided into three cells with internal dike cresting at approximate elevation 388 feet. The layout is presented as Figure 2.2.

2.1.2. Failure Scenario

Two failure scenarios for Ash Disposal Area 2 were reviewed with regards to impacts to the surrounding structures and infrastructure. The first is a breach through the perimeter dike on the western side of the facility. A breach at this location would discharge directly into Kentucky Lake. The width of the lake at the location of Ash Disposal Area 2 is approximately 9,000 feet. The opposite bank of the lake has residential structures, but they are located an estimated 25 feet or more above normal pool of the lake based on available USGS topographic mapping[(2)]. Stantec experience with modeling similar impoundment failures into large reservoirs or rivers suggest the likely flood wave will not significantly impact the water surface elevation and thus will not impact the residential structures on the opposite bank making modeling of the breach unnecessary.

The second potential failure scenario is a breach on the southern or eastern edge of Ash Disposal Area 2. A failure here would discharge directly into a harbor area to the southeast of the impoundment. This area is a part of the Kentucky Lake impoundment and is dredged to maintain navigable depth and intake flows. The connection of this harbor area to the rest of the lake is approximately 540 feet wide at the narrowest point. On the east side of the harbor area, opposite the impoundment at a distance of approximately 1,200 feet, is an industrial complex with structures located an estimated 20 feet or more above normal pool of the river based on review of available USGS topographic mapping[(2)]. On the south side of the harbor area, opposite the impoundment at a distance of approximately 800 feet, is Tennessee State Route 70 and a railroad line. These structures are built on an embankment with an estimated elevation of 20 feet or more above normal pool of the lake. Similarly, these structures are not likely to be impacted by a breach of the disposal area making modeling of the breach unnecessary. Figure 2.2 illustrates the potential breach scenarios.

3. Hazard Classification

No structures or properties, except those owned by TVA, were identified within the paths of the identified potential breach scenarios for Ash Disposal Area 2 at the Johnsonville Fossil Plant. Buildings and publicly owned roadways within the vicinity of the Johnsonville Fossil Plant facilities are either located above the elevation of the impoundment or are separated by distances which would permit the dissipation of a potential breach wave within existing waterways.

A breach of Ash Disposal Area 2 represents a minor risk to external infrastructure and does not, in Stantec's opinion, represent a probable threat to human life. However, a breach would likely result in the off-site release of CCP's into waters of the United States. Based on the Federal Guidelines for Dam Safety - Hazard Potential Classification System for Dams[(3)], it is recommended that the dam safety hazard classification of Ash Disposal Area 2 remain at Significant Hazard.

4. References

1. Tennessee Valley Authority (TVA). (2009). *Evaluation of Fossil Coal Combustion Products (CCP) Facilities for Dam Safety Hazard Classification*.

2. United States Geological Survey (USGS). (2009). *1/3-Arc Second National Elevation Dataset*. USGS, Sioux Falls, South Dakota.

3. Federal Emergency Management Association (FEMA). (2004). *Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams (FEMA 333)*. Interagency Committee on Dam Safety, FEMA.

Kentucky Lake

Nearest Downstream Structures (Approximately 1.7 Miles Upstream of Johnsonville Fossil Plant)

Johnsonville Fossil Plant

70

1

Kentucky Lake

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Johnsonville Fossil Plant Vicinity

TVA Hazard Classification
Johnsonville Fossil Plant
Tennessee Valley Authority
Humphreys County, Tennessee

PROJECT NO.	175630008
DATE	September 14, 2011
DRAWN BY	DEH
CHECKED BY	X
CHECKED BY	X
SCALE	1" = 2000'
REVISED	
1.	
2.	
3.	
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6.	
7.	
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SHEET

Figure 1.1

Legend

- Potential Breach Direction of Flow
- Direction In Which Breach Cannot Occur
- Elevation — Structure
- Dike Crest
- Impoundment Boundary
- Elevation Contours (5-Foot Intervals Outside of Plant, 2-foot Intervals Inside Plant)

Kentucky Lake
(Normal Pool El. 359 Ft)

Ash Disposal Area 2

Dike Minimum Crest
Elevation = 388 ft

391
381
391
385
393

North Street
Broadway Street
Railroad
70
1
70
1

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Ash Disposal Area 2 Breach Scenarios

TVA Hazard Classification
Johnsonville Fossil Plant
Tennessee Valley Authority
Humphreys County, Tennessee

PROJECT NO.	175630008
DATE	September 1, 2011
DRAWN BY	DEH
CHECKED BY	X
CHECKED BY	X
SCALE	1" = 1000'
REVISED	
1.	
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Figure 2.2