Big Rivers
ELECTRIC CORPORATION

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Green Station CCR Surface Impoundment

Disposal of Coal Combustion Residuals (CCR) from Electric Utilities Final Rule
Structural Integrity Criteria for Existing CCR Surface Impoundments
History of Construction

October 11, 2016

Prepared By:

ASSOCIATED ENGINEERS, INC.
2740 North Main St. • Madisonville, KY 42431
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Project ID: 160028A

Big Rivers Electric Corporation
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CCR Surface Impoundment Information

Name:	Green Station CCR Surface Impoundment
Operator:	Sebree Generating Station
Address:	9000 Highway 2096 Robards, Kentucky 42452

Qualified Professional Engineer

Name:	David A. Lamb
Company:	Associated Engineers, Inc.
Kentucky P.E. Number:	17822

Regulatory Applicability

As part of the 40 CFR § 257.73 Structural Integrity Criteria for Existing CCR Surface Impoundments requirements, an owner or operator of an existing CCR surface impoundment that either has a height of five feet or more and a storage volume of 20 acre-feet or more; or has a height of 20 feet or more must, no later than October 17, 2016, compile a history of construction, which shall contain, to the extent feasible, the information specified below:

1. The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

Name of owner:	Big Rivers Electric Corporation
Address of owner:	201 Third Street, P.O. Box 24 Henderson, Kentucky 42419
Name of CCR unit:	Green Station CCR Surface Impoundment
Identification number of CCR unit:	Kentucky State Dam Inventory System ID No. 0980

An aerial photo of the CCR unit is provided as Attachment A.

2. The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7.5 minute or 15 minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available.

   An excerpt from U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps showing the location of the CCR unit is provided as Attachment B.

3. A statement of the purpose for which the CCR unit is being used.

   The CCR unit is used for the placement of coal combustion residual material; currently slurried bottom ash.

4. The name and size in acres of the watershed within which the CCR unit is located.

   The immediate watershed that drains to the CCR unit, and in which the CCR unit is considered to be located, is unnamed and 54.13 acres in size.

5. A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

   The CCR unit is a combined incised/earthen embankment structure. Embankments form the west, south and east sides of the impoundment and the north side is incised. The Green River is located approximately 400 feet east of the structure. Due to surface relief, only the toe area of the south dike is potentially subject to flooding. The predominant features were small stream valleys draining eastward to the Green River. Most of the central portion of the south dike was constructed on a subdued ridge. The toe of the outboard slope intersected a lower drainage area. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands.

6. A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.

   The west dike is generally less than five feet in height and the south dike reaches a maximum height of 19.5 feet. The east dike reaches a maximum height of approximately eight feet and is buttressed with a secondary parallel embankment that serves as a 40-foot wide roadway. The Burns and Roe, Inc. Engineering and Consultants June 30, 1978 site grading plans show the original construction layout and ground contours for the impoundment site. Bottom ash has been placed above the normal pool along the inboard side, essentially creating reclaimed land.

7. At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

   Green CCR Surface Impoundment historical engineering drawings and notes that were reviewed for this report were provided by Big Rivers Electric Corporation and are maintained at the Big Rivers Electric Corporation corporate office in Henderson, Kentucky.

   Additional information determined during the 2015 Initial Annual Inspection follows:

   Depth of impounded water and CCR is 16 feet and 46 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 394 feet and 408 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (December 2015) flight derived topographic contours and bathymetric survey data.

   The remaining storage capacity is approximately 172,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey.

   The approximate volume of impounded water and CCR is 981,000 cubic yards (approximate water volume is 172,000 cubic yards and approximate CCR volume is 809,000 cubic yards). This volume was calculated based on the maximum storage capacity, the current amount of CCR stored in the facility based on the most recent bathymetric survey, and the best available as-built data for the structure construction prior to placement of CCR.

8. A description of the type, purpose, and location of existing instrumentation.

   There are five piezometers associated with this surface impoundment that are used to record the phreatic surface elevation in the embankment.

ID	Northing	Easting	Top of Casing Elevation (FAMSL)	Depth to Static Water Level* (Feet)	Static Water Elevation* (FAMSL)
P-1A	480202.55	1492104.21	396.17	14.21	381.96
P-2A	480186.48	1492464.48	395.98	13.54	382.44
P-3A	480175.11	1492692.75	395.91	15.29	380.62

P-6	480122.51	1492462.58	379.33	1.34	377.99
P-7	480137.28	1492099.00	380.26	1.33	378.93

*Value listed was measured on June 7, 2016.

There is a water level indicator located on the pump intake structure at the north end of the unit that is used to record the impoundment pool elevation. The water level elevation measured on June 7, 2016 was 394.27 feet above mean sea level (FAMSL).

9. Area-capacity curves for the CCR unit.

   No accurate historic area capacity curves were located for the CCR unit during the review of construction records. The following information was determined during in the 2015 Initial Annual Inspection:

   Depth of impounded water and CCR is 16 feet and 46 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 394 feet and 408 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (December 2015) flight derived topographic contours and bathymetric survey data.

   The remaining storage capacity is approximately 172,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey.

10. A description of each spillway and diversion design features and capacities and calculations used in their determination.

    No accurate historic diversion ditch designs, capacities and calculations were located for the CCR unit during the review of construction records. The following information was determined during the 2015 Initial Annual Inspection:

    The impoundment discharge consists of two corrugated steel pipes, each 30 inches in diameter. The pipe intakes are through a concrete common headwall collection structure with a variable height steel debris deflector on each pipe intake.

11. The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

    The CCR unit has been in place for 40 plus years. There is no current construction thus no applicable construction specification. Per Final Rule CCR requirements, the CCR unit is inspected as follows:

    <u>Weekly CCR Unit Inspection</u>
    The CCR unit must be examined by a qualified person at least once every seven days for

any appearance of actual or potential structural weakness or other conditions that are disrupting or that have the potential to disrupt the operation or safety of the CCR unit.

Monthly Instrumentation Inspection
Monitoring of all instrumentation supporting the operation of the CCR unit must be conducted by a qualified person no less than once per month.

Annual CCR Unit Inspection
The CCR unit inspection must be conducted annually throughout its operating life. These annual inspections are focused primarily on the structural stability of the CCR surface impoundment and must ensure that the operation and maintenance of the CCR surface impoundment is in accordance with recognized and generally accepted good engineering standards.

The CCR unit operator has general maintenance and repair procedures in place as they determine necessary.

12. Any record or knowledge of structural instability of the CCR unit.

There are no known occurrences of structural instability of the CCR unit.

Sources of Information

Geotechnical and other information provided by Associated Engineers, Inc.

Engineering drawings, notes and other information provided by Big Rivers Electric Corporation

United States Geological Survey U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps

Professional Engineer Certification [Per 40 CFR § 257.73]
Green CCR Impoundment History of Construction

I hereby certify that myself or an agent under my review has prepared this History of Construction Report (Report), and being familiar with the provisions of the final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Report has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.73. To the best of my knowledge and belief, the information contained in this Report is true, complete, and accurate.

David A. Lamb P.E.
State of Kentucky License No. 17822

Date: 10/11/16

Attachment A. Aerial Photo of the Green CCR Surface Impoundment

Attachment B. Topographic Map showing the Green CCR Surface Impoundment

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History of Construction

CCR Surface Impoundment Information

Name:	Reid/HMPL Station CCR Surface Impoundment
Operator:	Sebree Generating Station
Address:	9000 Highway 2096 Robards, Kentucky 42452

Qualified Professional Engineer

Name:	David A. Lamb
Company:	Associated Engineers, Inc.
Kentucky P.E. Number:	17822

Regulatory Applicability

As part of the 40 CFR § 257.73 Structural Integrity Criteria for Existing CCR Surface Impoundments requirements, an owner or operator of an existing CCR surface impoundment that either has a height of five feet or more and a storage volume of 20 acre-feet or more; or has a height of 20 feet or more must, no later than October 17, 2016, compile a history of construction, which shall contain, to the extent feasible, the information specified below:

1. The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

Name of owner:	Big Rivers Electric Corporation
Address of owner:	201 Third Street, P.O. Box 24 Henderson, Kentucky 42419
Name of CCR unit:	Reid/HMPL Station CCR Surface Impoundment
Identification number of CCR unit:	Kentucky State Dam Inventory System ID No. 0855

An aerial photo of the CCR unit is provided as Attachment A.

2. The location of the CCR unit identified on the most recent U.S. Geological Survey (USGS) 7.5 minute or 15 minute topographic quadrangle map, or a topographic map of equivalent scale if a USGS map is not available.

   An excerpt from U.S. Geological Survey (USGS) 7.5 minute Robards and Delaware topographic quadrangle maps showing the location of the CCR unit is provided as Attachment B.

3. A statement of the purpose for which the CCR unit is being used.

   The CCR unit is used for the placement of coal combustion residual material; currently slurried bottom ash.

4. The name and size in acres of the watershed within which the CCR unit is located.

   The immediate watershed that drains to the CCR unit, and in which the CCR unit is considered to be located, is unnamed and 25.45 acres in size.

5. A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

   The CCR unit is a combined incised/earthen embankment structure. Embankments form the west, south and east sides of the impoundment and the north side is incised. The original terrain on which the pond was constructed generally sloped toward the west. Although the Green River is located less than 0.5 miles from the site, the structure does not extend significantly into the floodplain. Underlying preconstruction soils consisted of Loring-Grenada, Loring-Zanesville-Wellston (Henderson County) and Loring-Wellston-Zanesville (Webster County) soil associations which are generally characterized as well drained to moderately well drained soils on nearly level to sloping uplands.

6. A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.

   The embankment reaches its greatest relief of approximately 42 feet on the west side. The Burns & McDonnell Engineering Co. October 8, 1971 design drawings show the inboard slope and central core portion of the dike to be constructed of compacted soil fill and the outboard slope to be consisted of sand fill. A sand blanket drain was designed for the outboard third of the base of the dike for the majority of the length and the plans show a crushed limestone drainage layer with a minimum thickness of 18 inches topped with a minimum six inches thick sand layer which extends across the entire width of the dike cross section in the southwest corner. The plans also show a cut-off trench in the original ground below dike crest and extending for the entire length of the dike.

7. At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

   Reid/HMPL CCR Surface Impoundment historical engineering drawings and notes that were reviewed for this report were provided by Big Rivers Electric Corporation and are maintained at the Big Rivers Electric Corporation corporate office in Henderson, Kentucky.

   Additional information determined during the 2015 Initial Annual Inspection follows:

   Depth of impounded water and CCR is 16 feet and 39 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 426 feet and 440 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (December 2015) flight derived topographic contours and bathymetric survey data.

   The remaining storage capacity is approximately 85,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey. Note that bottom ash that accumulates in the upper end of the impoundment is allowed to dewater and then hauled to the Green CCR landfill. Therefore, the timeframe to reach the remaining capacity of the impoundment is extended in this manner.

   The approximate volume of impounded water and CCR is 767,000 cubic yards (approximate water volume is 85,000 cubic yards and approximate CCR volume is 682,000 cubic yards). This volume was calculated based on the maximum storage capacity, the current amount of CCR stored in the facility based on the most recent bathymetric survey, and the best available as-built data for the structure construction prior to placement of CCR.

8. A description of the type, purpose, and location of existing instrumentation.

   There are five piezometers associated with this surface impoundment that are used to record the phreatic surface elevation in the embankment.

ID	Northing	Easting	Top of Casing Elevation (FAMSL)	Depth to Static Water Level* (Feet)	Static Water Elevation* (FAMSL)
P-1A	483464.43	1491086.43	428.95	16.33	412.62
P-2A	483141.96	1491515.32	428.63	12.56	416.07
P-3A	483772.54	1491306.43	428.75	22.24	406.51
P-4	483033.84	1491399.12	396.92	5.11	391.81
P-5	483415.93	1490969.80	395.34	9.45	385.89

*Value listed was measured on June 7, 2016.

There is a water level indicator located on the pump intake structure at the north end of the unit that is used to record the impoundment pool elevation. The water level elevation measured on June 7, 2016 was 426.19 feet above mean sea level (FAMSL).

9. Area-capacity curves for the CCR unit.

   No accurate historic area capacity curves were located for the CCR unit during the review of construction records. The following information was determined during the 2015 Initial Annual Inspection:

   Depth of impounded water and CCR is 16 feet and 39 feet (at respective locations of maximum impounded water and CCR depths). Elevation of impounded water and CCR is 426 feet and 440 feet, respectively, above mean sea level. These approximate depths and respective elevations are based on the most recent (December 2015) flight derived topographic contours and bathymetric survey data.

   The remaining storage capacity is approximately 85,000 cubic yards (if CCR can be placed to the elevation of the current water surface). This volume was calculated based on the maximum allowable storage volume and the current volume of CCR stored in the facility based on the most recent bathymetric survey.

10. A description of each spillway and diversion design features and capacities and calculations used in their determination.

    No accurate historic diversion ditch designs, capacities and calculations were located for the CCR unit during the review of construction records. The following information was determined during the 2015 Initial Annual Inspection:

    The impoundment discharge consists of a rectangular concrete drop structure with a variable height steel debris skimmer. The pool elevation can be controlled by adding or removing stop logs. The discharge structure connects to a 24-inch diameter smooth walled metal pipe underground conveyance. Diversion design features and capacities, with applicable calculations, will be included in the CCR unit's Hydrologic and Hydraulic Capacity Assessment.

11. The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

    The CCR unit has been in place for 40 plus years. There is no current construction thus no applicable construction specification. Per Final Rule CCR requirements, the CCR unit is inspected as follows:

    Weekly CCR Unit Inspection
    The CCR unit must be examined by a qualified person at least once every seven days for any appearance of actual or potential structural weakness or other conditions that are disrupting or that have the potential to disrupt the operation or safety of the CCR unit.

    Monthly Instrumentation Inspection
    Monitoring of all instrumentation supporting the operation of the CCR unit must be conducted by a qualified person no less than once per month.

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    The CCR unit inspection must be conducted annually throughout its operating life. These annual inspections are focused primarily on the structural stability of the CCR surface impoundment and must ensure that the operation and maintenance of the CCR surface impoundment is in accordance with recognized and generally accepted good engineering standards.

    The CCR unit operator has general maintenance and repair procedures in place as they determine necessary.

12. Any record or knowledge of structural instability of the CCR unit.

    There are no known occurrences of structural instability of the CCR unit.

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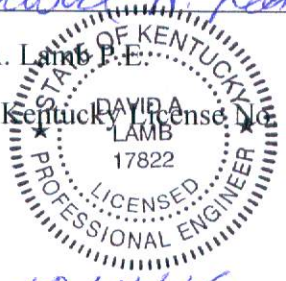
Professional Engineer Certification [Per 40 CFR § 257.73]
Reid/HMPL CCR Impoundment History of Construction

I hereby certify that myself or an agent under my review has prepared this History of Construction Report (Report), and being familiar with the provisions of the final rule to regulate the disposal of coal combustion residuals (CCR) as solid waste under subtitle D of the Resource Conservation and Recovery Act (RCRA), attest that this Report has been prepared in accordance with good engineering practices and meets the intent of 40 CFR Part 257.73. To the best of my knowledge and belief, the information contained in this Report is true, complete, and accurate.

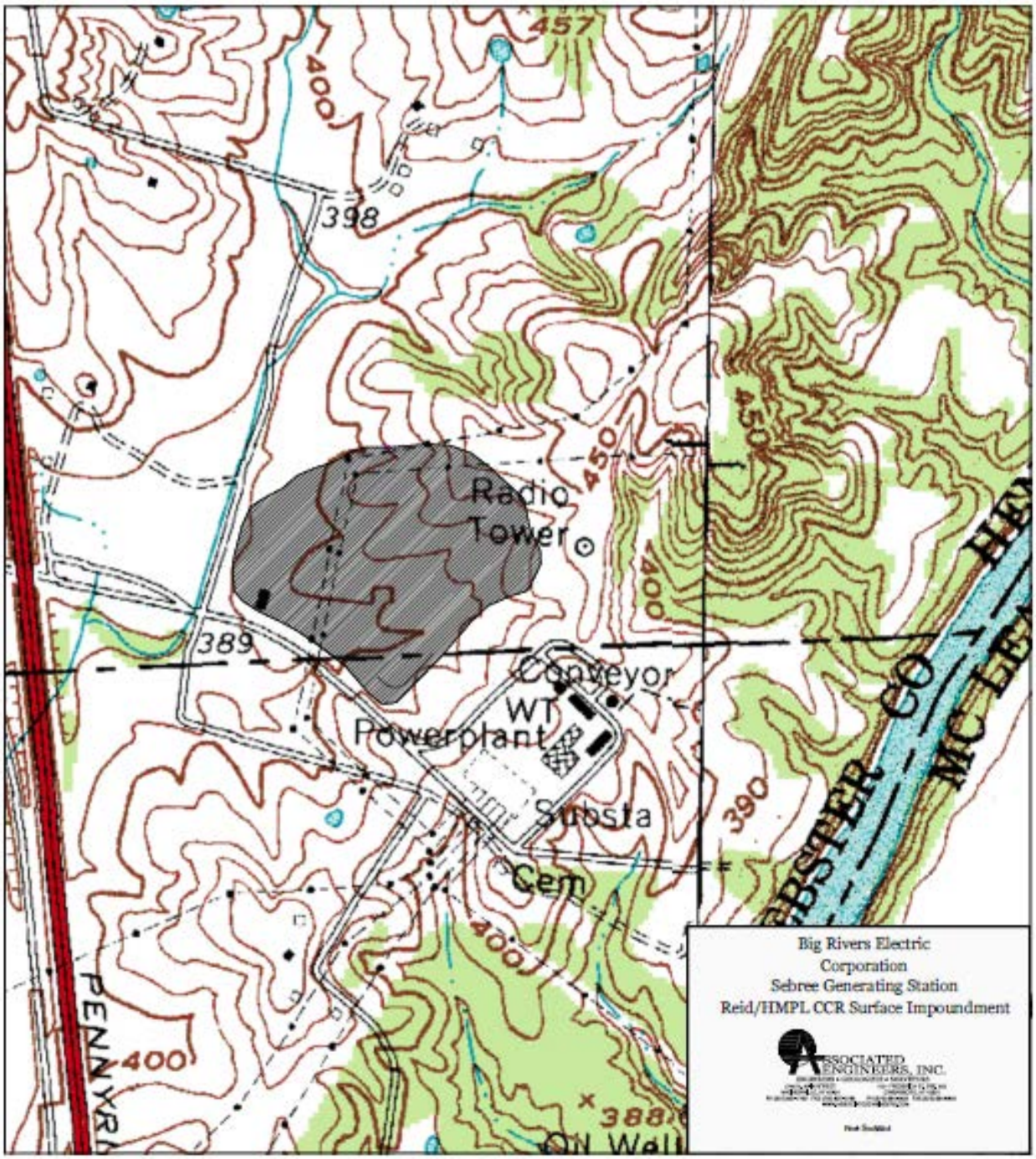
David A. Lamb P.E.

State of Kentucky License No. 17822



Date: 10/11/16

Attachment A. Aerial Photo of the Reid/HMPL CCR Surface Impoundment



Attachment B. Topographic Map showing the Reid/HMPL CCR Surface Impoundment