CAPE FEAR STEAM STATION
1956 Ash Pond Dam (State ID No. CHATH-075)
1963 Ash Pond Dam (State ID No. CHATH-076)
1970 Ash Pond Dam (State ID No. CHATH-077)
1978 Ash Pond Dam (State ID No. CHATH-078)
1985 Ash Pond Dam (State ID No. CHATH-079)
500 CP&L ROAD
MONCURE, NORTH CAROLINA

Inspection Date: October 28, 2014
Report Date: December 30, 2014
AMEC Project No.: 7810-14-0139

Inspection Team: Roy Moore, P.E. (GA)  Associate Civil Engineer
Christopher K. Nobles, P.E.  Senior Civil Engineer
Chris Keenan  Duke Representative

Summary

Attached is the Report for the 2014 Annual Inspection of the Cape Fear Steam Station ash basin dams. The inspection included observations of the ash basin dams, discharge towers and drainage pipes. In addition to the field observations of the physical features of the impoundments, this annual inspection included a review of available design documents and inspection records. In preparing this report, AMEC has relied on information contained in these design documents and inspection records developed by others, which does not constitute an engineering validation as to the accuracy or completeness of all information reviewed.

This inspection did not identify any features or conditions in the inspected ash basin dams, their outlet structures or their spillways that indicate an imminent threat of impending failure hazard. Review of critical analyses suggests the design conforms to current engineering state of practice to a degree that no immediate actions are required other than the recent and ongoing surveillance and monitoring activities already being practiced. Minor deficiencies exist that require remedial action and/or secondary studies or investigations that are part of an on-going comprehensive engineering review discussed herein. Recommendations are contained in Section 6.0 of this report.

Christopher K. Nobles, P.E.
Senior Civil Engineer
Registered, North Carolina 29917

Roy Moore
Associate Civil Engineer

Allan Tice, P.E. (Responsible Engineer)
Senior Principal
Registered, North Carolina 006428
1.0 STATUS OF PREVIOUS RECOMMENDATIONS

In early 2014, Duke’s Ash Basin Strategic Action Team (ABSAT) initiated a comprehensive engineering review of all of Duke’s ash basins to identify and address potential risks. This review consists of a risk-informed approach to confirm the structural integrity of the ash basins and associated structures, as well as the characterization and evaluation of all stormwater discharges near ash basins. This work was initiated as Phase 1 work consisting of inspections at all of their ash basins performed and reported by “third party inspectors”. Based on the third party inspections, ABSAT identified certain items for follow-up, either by particular reference to a feature or condition in subsequent field inspections or by addressing in a written response specific to the identified condition or deficiency.

Following the Phase 1 inspections, the ABSAT initiated a program of rehabilitation of pipes and conduits where indications of possible need for such repair were observed during the third party inspections. At the time this 2014 annual inspection report was prepared, design for rehabilitation of pipes where needed had been submitted to North Carolina Department of Environment and Natural Resources (NCDENR) for permitting review.

The ABSAT ordered Phase 2 work at this site to be performed. The Phase 2 work will culminate in the reconstitution of the engineering designs for the ash basins (or ash ponds as sometimes referenced). The initial Phase 2 work was a thorough review of the available existing information including previous inspection reports, design drawings, engineering calculations and reports, performing another field inspection of the ash basins and their dams and dikes, and assessing what new data are required to reconstitute the design of the ash pond dams, outlet structures and spillways in accordance with generally accepted current engineering standards.

A Work Plan for Phase 2 activities was prepared to acquire the necessary new field and office data and to update engineering calculations to reconstitute the design. At the time this 2014 annual inspection report was prepared, field and office work necessary to reconstitute the design was in progress. This 2014 annual inspection report notes items or features observed during the field inspection requiring maintenance or monitoring plus the status of items or features identified in the previous inspections by Duke, their consultants, the NCDENR, EPA and the third party inspectors (both Phase 1 and Phase 2). This 2014 annual inspection report does not include any of the results of the Phase 2 office and field work being performed.

This 2014 annual inspection report is intended to identify any features or conditions in the inspected ash pond dams, their outlet structures or their spillways that indicate an imminent threat of impending failure hazard. The Phase 2 work, when completed, will evaluate the structural soundness of the impoundment and the compatibility of design of the impoundment with respect to generally accepted current engineering standards, or identify corrective actions, including possible new construction features, needed to achieve this goal.

See Appendix 1 for a tabular listing of previous recommendations and their status for the 1956 Ash Pond Dam.

See Appendix 2 for a tabular listing of previous recommendations and their status for the 1963...
and 1970 Ash Pond Dam. The 1963 and 1970 Ash Pond Dams have been combined because most of the inspection documentation combines these two ash pond dams.

See Appendix 3 for a tabular listing of previous recommendations and their status for the 1978 Ash Pond Dam

See Appendix 4 for a tabular listing of previous recommendations and their status for the 1985 Ash Pond Dam.

2.0 MONITORING DATA

Monitoring of the Ash Pond Dams at the Cape Fear Steam Station consists of the following items:

A) Environmental

Discharge from the impoundment is regulated by NCDENR through the site’s National Pollutant Discharge Elimination System Permit (NPDES). Heavy metals, total suspended solids, oil, grease, and pH are also monitored on a regular basis. All environmental monitoring will continue in order to satisfy NPDES permit requirements.

B) Piezometers and Flow Monitoring

No piezometers have been installed in the 1956 Ash Pond or 1963/1970 Ash Pond. In 2010, piezometers were installed for water level observation at three cross-sectional locations in the 1978 Ash Pond and at two locations for the 1985 Ash Pond. These piezometers are no longer in service.

No flow monitoring weirs or other measurement devices are present.

C) Plant Personnel Inspections

The 1956, 1963/1970, 1978, and 1985 Ash Pond Dams are inspected by plant personnel on a monthly basis (references 7.8). The inspection reports prepared by plant personnel since January 2013 were reviewed as part of this annual inspection. Subsequent to passage of the Coal Ash Management Act, weekly dam inspections have been conducted by AMEC.

3.0 DESIGN HISTORY

The Cape Fear Steam Station began commercial operation in 1923. The site consists of six coal-fired power units. All units have been retired; two in 1977, two in 2011 and two in 2012. The Cape Fear Steam Station has five ash pond basins. Ash material or Coal Combustion Residuals (CCR) have historically been deposited within the Ash Ponds located on the plant site by hydraulic sluicing operations for both fly ash and bottom ash material. There are no longer any ash disposal operations within the Ash Pond areas because of the permanent retirement of the fossil generating units. From discussions with Duke personnel, AMEC understands that plant stormwater flow may continue to be discharged into the 1978 Ash Pond area until completion of plant demolition. A brief description of the design of the ash pond basins is provided below:
1956 Ash Pond

The 1956 Ash Pond is the first ash pond constructed at the plant, and it was in service until 1963. The 1956 Ash Pond is located at the northwest corner of the plant site adjacent to the Haw River and near the confluence with the Deep River that then forms the Cape Fear River. From review of available descriptive information (reference 7.8), this Ash Pond has a surface area of about 12 acres, a maximum dike height of about 20 feet, a crest width in the range of 7-10 feet, a crest level in the range of Elevation 186-188 feet, and a dike length of approximately 3,200 feet. From review of available information (reference 7.8), the Ash Pond size classification is Medium, and the Hazard classification is High. The upstream (interior) slope is reported to be about 2(horizontal):1(vertical), and the downstream (exterior) slope is reported to be in the range of 1:1 to 1.5:1. The dike along the southeast side of the Ash Pond was formed by the plant flood protection levee. There are no records available for design and construction of the 1956 Ash Pond.

The original discharge structures consisted of three 30-inch diameter RCP risers with discharge outlet piping of unknown construction. Flow from the discharge outlets, when the pond was active, was released into a topographic swale leading to Shaddox Creek on the north side of the pond. Shaddox Creek drains toward the Haw River.

1963/1970 Ash Pond

The combined 1963 and 1970 Ash Ponds are located on the southwest corner of the site adjacent to the east bank of the Cape Fear River.

From review of available descriptive information (reference 7.8), the 1963 Ash Pond has a surface area of about 21 acres, maximum dike height of about 22 feet, crest width in the range of 12-14 feet, crest level at Elevation 197 feet, and dike length of approximately 4,000 feet. The upstream (interior) slope is reported to be in the range of 1.5:1 to 2:1, and the downstream (exterior) slope is reported to be 1.5:1. At the northeast corner of the 1963 Ash Pond, natural ground forms the pond edge for a short segment.

From review of available descriptive information (reference 7.8), the 1970 Ash Pond has a surface area of about 30 acres, maximum dike height of about 27 feet, crest width in the range of 12-14 feet, crest level at Elevation 197 feet, and dike length of approximately 4,600 feet. From review of available information (reference 7.8), the Ash Pond size classification is Medium and the Hazard classification is High. The upstream (interior) slope is reported to be about 2:1, and the downstream (exterior) slope is reported to be 2:1.

The original 1963 Ash Pond was constructed with a crest level at Elevation 188 feet. The perimeter enclosure dikes for the 1963 Ash Pond were raised and extended. The pond was incorporated into the 1970 Ash Pond to form the current combined pond. The crest level for the combined 1963/1970 Ash Pond area is at Elevation 197 feet. The common separating dike originating from the 1963 Ash Pond area was cut through to allow flow to pass into the 1970 Ash Pond.
Pond area. There are limited records available for design of the 1970 Ash Pond and no records for construction of the combined 1963/1970 Ash Pond area.

The original discharge outlet structure for the 1963 Ash Pond consisted of an 18-inch diameter reinforced concrete riser and discharge pipe, located at the south end of the pond, on what is now the separation dike between the 1963 Ash Pond and 1970 Ash Pond areas (Reference 7.11). The original discharge outlet structure for the 1963 Ash Pond area was abandoned after combining the two ash pond areas; however, there are no records available to document the abandonment of the original discharge outlet structure.

The original outlet for the 1970 Ash Pond was at the southwest corner of the pond. The available drawing (Reference 7.12) shows the structure consisted of an 18-inch diameter reinforced concrete pipe riser and outlet extending under the dike. The top of the riser is indicated to have been at Elevation 185 feet and the outlet end at Elevation 168 feet. This original discharge outlet structure was removed (details unknown) during construction of the 1978 Ash Pond, and a new structure (the current structure) constructed. At the same time, the southern dike of the 1970 Ash pond was cut down to its current elevation. The current 1970 Ash Pond discharge outlet structure is at the south end of the pond, on the west dike and consists of a concrete riser box with nominal dimensions of 3.5 feet by 3.5 feet and a 20-inch diameter fiberglass reinforced plastic (FRP) discharge pipe. Flow from the discharge outlet structure is released to the Cape Fear River.

1978 Ash Pond

The 1978 Ash Pond area is located south of the Cape Fear Plant facility, on the east side of the 1963/1970 Ash Pond area, and adjacent to the Cape Fear Plant discharge canal.

From review of available descriptive information (reference 7.8), the 1978 Ash Pond has a surface area of about 35 acres, maximum dike height of about 27 feet, crest width of 15 feet, crest level at Elevation 197 feet, and dike length of approximately 5,600 feet. From review of available information (reference 7.8), the Ash Pond size classification is Medium and the Hazard classification is High. The upstream (interior) slope is reported to be 2:1, and the downstream (exterior) slope is reported to be 2:1.

The 1978 Ash Pond was formed by incorporating a portion of the 1963/1973 Ash Pond dike on the west side, and constructing new dikes on the north, south and east sides. Design was reported to have been provided by CP&L with technical support from William L. Wells. Limited records for design and construction are available for review. There are no provisions for seepage control (internal drain or blanket) provided for the dike based on review of available design information.

The discharge outlet structure consists of an 18-inch diameter reinforced concrete drop inlet riser and an 18-inch diameter reinforced concrete outlet pipe. Flow from the discharge outlet
structure, when the pond was active, was released into the plant discharge canal which ultimately discharged into the Cape Fear River.

Since at least 1986, an area adjacent to the north dike and west of the plant cooling towers has been observed as wet. In 1990, plant personnel installed a french drain in this area which has been visually monitored as part of routine inspections.

1985 Ash Pond

The 1985 Ash Pond area is located on the southeast corner of the plant, east of the 1978 Ash Pond area, and adjacent to the Cape Fear Plant discharge canal.

From review of available descriptive information (reference 7.8), the 1985 Ash Pond has a surface area of about 60 acres, maximum dike height of about 28 feet, crest width of 15 feet, crest level at Elevation 194 feet, and dike length of approximately 7,400 feet. From review of available information, the Ash Pond size classification is Medium and the Hazard classification is High. The upstream (interior) slope is reported to be 2:1, and the downstream (exterior) slope is reported to be in the range of 2:1 to 4:1.

The original design was reported to have been provided by CP&L with technical support from William L. Wells. Records for design are available for review including geotechnical investigation documentation. A cutoff/key trench is shown under the approximate middle of the dike on the design drawings, and called to be filled with compacted clay fill. There are no other provisions for seepage control, such as an internal drain or blanket, provided for the dike based on review of available design information.

The discharge outlet structure consists of a 48-inch diameter reinforced concrete drop inlet riser with a 30-inch diameter reinforced concrete outlet pipe. Flow from the discharge outlet structure when the pond was active was routed along a concrete flume to a release point into the plant discharge canal which ultimately discharged into the Cape Fear River.

In 1986, repair work was performed by the original contractor to fill holes observed along the crest of the 1985 pond dike approximately 1 to 2 feet from outer edge in areas where waste materials had been placed on exterior slopes. In addition, repair of two apparent slumps was performed.

Since 1991, additional small vertical holes have been noted on the exterior slope of the west dike and occasionally on the east dike. These holes appear to be created by rainfall infiltration near the dike crest and flow underneath the slope surface at shallow depth through possibly dispersive soils. The holes have been filled with gravel as they have occurred. During 2004, low areas along the dike crest were filled to raise the crest to the design elevation.
During 2006-2007, an interior ash storage area was constructed within the Ash Pond area. The design for the interior ash storage area was provided by MACTEC. The interior ash storage area has a discharge outlet structure that releases flow into the remaining area of the 1985 Ash Pond.

During 2010, ash restacking operations began within the interior ash storage area based on a plan developed by MATEC.

4.0 DESIGN FLOOD AND DAM ADEQUACY

A) Hydrology and Hydraulics

1956 Ash Pond

The 1956 Ash Pond area is located adjacent to the Haw River near the confluence with the Deep River that forms the Cape Fear River. There is no analysis available concerning the potential impact of site flooding from the adjacent rivers.

There are no records available for hydraulic and hydrologic analysis for this Ash Pond area. Based on this inspection, the containment dike appears to completely enclose the Ash Pond, and there is no drainage inflow from areas outside the pond. Under the ABSAT Task Issues program, AMEC performed hydrologic and hydraulic analyses related to planning for possible repair or replacement of the existing discharge structures. Plans resulting from that work have been submitted to the NCDENR for permitting review. Under the Phase 2 Reconstitution of Design work, AMEC is performing an updated hydrologic and hydraulic analysis.

The existing discharge outlet structure described in Section 3.0 is not operational; discharge piping from the risers is blocked by unknown materials and covered by vegetation.

1963/1970 Ash Pond

The 1963/1970 Ash Pond area is located adjacent to the Haw River near the confluence adjacent to the Cape Fear River. There is no analysis available concerning the potential impact of site flooding from the adjacent river. In 2012-2013, Geosyntec performed a hydraulic and hydrologic analysis of the pond as part of the conceptual closure.

There are no records available for hydraulic and hydrologic analysis for this Ash Pond area. Based on the inspection, the containment dike appears to completely enclose the Ash Pond, with the exception of a small area at the north end of the pond. Under the Phase 2 Reconstitution of Design work, AMEC is reviewing the design storm in consideration for adequacy of freeboard/discharge and for possible repair or replacement of the discharge outlet structure.

Under the ABSAT Task Issues program, AMEC reviewed video inspection records for the discharge outlet structure and identified some problem conditions. Plans to address those conditions are being reviewed by NCDENR as of the date of this report.

1978 Ash Pond

The 1978 Ash Pond area is located adjacent to the former plant discharge canal which flows into the Cape Fear River. A hydraulic and hydraulic analysis was provided in the 1996 MACTEC 5-year
independent inspection report (reference 7.3). The inspection report indicated that the pond receives runoff captured in sumps from about 18 acres of the main plant area, which is pumped to the pond, and the rain that falls on the pond itself. The inspection report indicates that a storm delivering the ½ PMP will result in a rise in water level of 22 inches, and a full PMP will result in a rise in water level of 42 inches. The analysis did not include the outflow capacity of the discharge pipe. The pond was reported to have 4.5 feet of available freeboard, therefore it would safely store both the ½ and full PMP storms. In 2012-2013, Geosyntec performed a hydraulic and hydrologic analysis of the pond as part of the conceptual closure.

The regulatory design storm event is reported to be ½ PMP with a 6-hour rainfall amount of 14.75 inches. Based on the inspection, the containment dike appears to completely enclose the Ash Pond. Although no ash flow has been pumped into the pond for many years, stormwater is pumped from the power block areas into this pond. Under the Phase 2 Reconstitution of Design work, AMEC is reviewing the design storm in consideration for adequacy of freeboard/discharge and for possible repair or replacement of the discharge outlet structure.

The discharge outlet structure consists of an 18-inch diameter reinforced concrete drop inlet riser and an 18-inch diameter reinforced concrete outlet pipe. Flow from the discharge outlet structure is released to the plant discharge canal.

Under the ABSAT Task Issues program, AMEC reviewed video inspection records for the discharge outlet structure and identified some problem conditions. Plans to address those conditions are being reviewed by NCDENR as of the date of this report.

1985 Ash Pond

The 1985 Ash Pond area is located adjacent to the plant discharge canal which flows into the Cape Fear River. A hydraulic and hydrologic analysis was provided in the 1996 MACTEC 5-year independent inspection report and a 1991 5-year independent inspection report (reference 7.3). The 1996 inspection report indicated that the pond could store the ½ PMP while accommodating inflow from the plant’s drainage system, which is currently discharged into the 1978 Ash Pond. The 1991 inspection report that the pond could store the full PMP but could not accept flows from the plant during this design storm without taking into account outflow from the discharge structure. In 2010, AMEC performed a hydraulic and hydrologic analysis of the pond as part of the dry stack design (the pond within the pond). In 2012-2013, Geosyntec performed a hydraulic and hydrologic analysis of the pond as part of the conceptual closure.

The regulatory design storm event is reported to be ½ PMP with a 6-hour rainfall amount of 14.75 inches. A hydraulic and hydrologic analysis report was issued by Geosyntec in 2014 (reference 7.9) as part of their review of slope repairs on the dike section at the discharge outlet structure. The hydraulic and hydrologic analysis looked at two options. Option 1 was to install a sluice gate based emergency shutoff system for the discharge pipe. Option 2 was to install a 12-inch gate valve based emergency shutoff system for the discharge pipe. The results of the analyses showed the following:

- Pond does not overtop and maintains at least 2 feet of freeboard during the 72 hour ½ PMP event for Option 1 and 2.
• Option 1 and 2 satisfy the regulatory requirement to achieve an 80% drawdown time within 15 days following peak inflow for the 72-hour ½ PMP event.

Based on this inspection, the containment dike completely encloses the Ash Pond and there is no drainage inflow from areas outside the pond. Under the Phase 2 Reconstitution of Design work, AMEC is reviewing the design storm in consideration for adequacy of freeboard/discharge and for possible repair or replacement of the discharge outlet structure.

The discharge outlet structure consists of a 48-inch diameter reinforced concrete drop inlet riser with a 30-inch diameter reinforced concrete outlet pipe. Flow from the discharge outlet structure is released to the plant discharge canal which ultimately flows into the Cape Fear River.

Under the ABSAT Task Issues program, AMEC reviewed video inspection records for the discharge outlet structure and identified some minor repair items. The minor repair items were discussed with NCDENR and the minor repair items did not require a permit because they were considered standard maintenance items. Plans for the minor repairs are in progress.

B) **Structural Adequacy**

1956 Ash Pond

There is no record of slope stability analysis associated with this dike. Records related to the construction of the dam are unavailable.

1963/1970 Ash Pond

No records related to the original design or stability analysis of the dikes are available.

In 1982, Law Engineering performed a slope stability analysis using the Modified Bishop procedure on the 1963 Ash Pond dike, at a location where a local failure in the exterior slope had occurred. The analysis report concluded that the slope of the dike along the Cape Fear River was marginally stable. Repairs to local failure area at that time consisted of placing a rock berm out into the river to confine the failure area and regarding the slope face. Those actions were accompanied by lowering the pond level to between Elevation 182 and 186 feet (MSL).

1978 Ash Pond

No records related to the original design or stability analysis of the dikes are available.

In 2010, MACTEC performed slope stability analyses on the 1978 Ash Pond dike [ref. 7.10]. Included with these analyses were soil test borings with laboratory data. Piezometers were installed for water level observation at three cross-sectional locations. Slope stability analyses were conducted for the normal operating level and design flood for the ponds. The computer program PCSTABL5M using the Modified Bishop Method was utilized for the analyses. Rapid drawdown conditions were not evaluated because in order to have a rapid drawdown condition, a breach of the dam would be needed. The stability analysis results indicate the dikes are in satisfactory structural condition with respect to potential for structural failure. With the exception of one analysis section (section along the discharge canal), the factors of safety meet or exceed the NCDENR and the USACE criteria for both seismic and static loading conditions. The section along the discharge canal’s factor of safety was slightly below the NCDENR and
USACOE criteria, but MACTEC interprets it as an acceptable value considering the long successful performance of the dike.

1985 Ash Pond

In 2010, MACTEC performed slope stability analyses for two cross-sectional locations on the west 1985 Ash Pond dike [ref. 7.10]. Included with these analyses were soil test borings with laboratory data. Piezometers were installed for water level observation at both cross-sectional locations. Slope stability analyses were conducted for the normal operating level and design flood for the ponds. The computer program PCSTABLSM using the Modified Bishop Method was utilized for the analyses. Rapid drawdown conditions were not evaluated because in order to have a rapid drawdown condition, a breach of the dam would be needed. The stability analysis results indicate the dikes are in satisfactory structural condition with respect to potential for structural failure. The analysis shows the minimum factors of safety meet or exceed the NCDENR and the USACOE criteria for both seismic and static loading conditions.

5.0 FIELD INSPECTION

The field inspection was performed on Tuesday, October 28, 2014. The weather was clear with the air temperature in the range of 65 to 75 °F. A little over an inch of rain fell at the site between October 14 and 15, 2014. The site was relatively dry.

Observations noted during the inspection are as described and depicted in the following sections of this report. Appendix 5 contains photographs taken at the 1956 Ash Pond Dam, Appendix 6 contains photographs taken at the 1963/1970 Ash Pond Dam, Appendix 7 contains photographs taken at the 1978 Ash Pond Dam, and Appendix 8 contains photographs taken at the 1985 Ash Pond Dam. Photograph location maps are included in the respective appendices.

5.1 1956 Ash Pond Dam

A) Ash Basin Dam

The entire 1956 ash pond area is heavily overgrown with vegetation consisting of trees and underbrush along the crest, both the interior and exterior slopes, the toe of the dam and the interior of the pond. No water is impounded within the pond. The existing dikes have somewhat irregular crest and slope surfaces. The exterior slopes are also steep and evidence of old surficial slumping of the slope has been noted in past inspection reports.

No cracks, scarps, slides, unusual depressions/bulges, erosion gullies/rills, or wet/soft areas were observed on the interior face (Photograph 1 – Appendix 5). Only a small portion of the interior face was visible. The interior of the pond was mostly covered with ash.

No cracks, scarps, slides, unusual depressions/bulges, or wet/soft areas were observed on the crest. Minor erosion rills and slumping along the crest were observed. The crest was observed to be uneven particularly in the northwest portion of the pond and the top width varied (Photograph 6 – Appendix 5).

The exterior slopes were observed to be variable slope except for the original flood protection levee section (Photograph 5 – Appendix 5). Erosion rills and slumping along the
crest were observed in the exterior face. Animal burrows and/or cavities caused by falling trees or tree slumps were observed in the exterior face of the dam. Evidence of previous slides in the northwest quadrant of the dam were observed but appear to be inactive based on abundant tree growth.

No indications of wet areas or seepage were observed along the toe of the dam.

**B) Principal Spillway**

The outlet structure is inoperable. All three risers were observed to have soil and debris in the lower portion of the risers (Photograph 2 – Appendix 5). Only two discharge outlet pipes could be found and the discharge end of both appeared to be partially blocked with the surrounding soils (Photograph 4 – Appendix 5).

**C) Ash Pond Perimeter Drainage Features**

A perimeter drainage system was not observed at the dam. Drainage appears to sheetflow away from the toe of the dam to the surrounding area.

**D) Other Inspection Findings**

Recommendations developed from these other inspection findings are presented in Section 6.1 -D, and the status of implementation of the recommendations is present in Appendix 1

Stantec – 2014 Field Reconnaissance (reference 7.1).

1. Seeps were observed along the downstream toe of the 1956 pond. (CF-3)
2. Debris, possibly ash, is at the bottom of all three decant structures and this debris extends an unknown distance into the outlet pipes. (CF-4)
3. Current configuration of the five ash ponds vary from the design in certain locations. In some cases, no design or analysis of the ponds were available. (CF-8)

EPA – 2009 Inspection (reference 7.3)

1. Ash pond dikes lack appropriate vegetation cover, and thick brush and weeds in non-wooded areas.
2. Surficial erosion and sloughing resulting from exposed soil because of poor vegetation coverage.
3. Best management practices be applied to facility for consideration of stabilization of the dike slopes so as to reduce risk of a release.
4. No hydraulic or hydrology evaluation to show ponds ability to safely store or pass the 1/3 PMP with actual available storage capacity.
5. No stability analysis for the pond.
According to the visual inspection, the dam appears to be in a stable condition at this time.

NCDENR request that Duke Energy perform an internal inspection of the spillway system of the dam.

According to the visual inspection, the dam appears to be in a stable condition at this time.

5.2 1963/1970 Ash Pond Dam

A) Ash Basin Dam

The 1963/1970 ash pond area has thick vegetation consisting of trees and underbrush along the western and southern sides. Much of the interior area of both ponds has old tree growth. An area of standing water was observed at the southern end of the 1970 ash pond. The surface of this water is lower than the existing discharge structure.

No cracks, scarps, slides, unusual depressions/bulges, erosion gullies/rills, or wet/soft areas were observed on the interior face (Photograph 1 – Appendix 6).

No cracks, scarps, slides, unusual depressions/bulges, erosion gullies/rills, or wet/soft areas were observed on the crest. A roadway on the crest appeared fairly level and well maintained. (Photograph 8 – Appendix 6)

The south exterior dike slope has numerous trees and tall, thick brush on the upper section. The lower section is clear of trees and tall, thick brush. The east face consists of maintained turfgrass. The west face is has vegetation greater than 2 inches (trees) and tall brush. The slope was observed to be irregular. Two small areas of apparent seepage from ground near the toe of the 1963 pond west dike. These were reported by Duke as having been seen previously. One seep was located near the northwest corner of the exterior face next to the Cape Fear River (Photograph 5 – Appendix 6). The other seep was located on the west exterior face half way down the 1963 ash pond (Photograph 6 – Appendix 6). The locations of the seeps are marked on the Photograph Location Plan in Appendix 6. Both seeps appear to be stable with little to no change in flow when compared to the weekly inspections.

The toe of the exterior slope and the area adjacent to the toe has thick vegetation consisting of trees and high brush.
B) Principal Spillway

The outlet structure at the southwest corner of the 1970 Ash Pond appeared to be in generally sound visual condition with no evidence of significant deterioration of the limited visible parts of the structure that could be seen at the riser and at the outfall (Photograph 2 and 3 – Appendix 6). It was noted that the discharge outlet pipe is in need of repair or replacement. AMEC has prepared plans for needed work at the discharge outlet pipe, and those plans have been sent to NCDENR for permitting review at the time of this report.

C) Ash Pond Perimeter Drainage Features

A perimeter drainage system was not observed at the dam. Drainage appears to sheetflow away from the toe of the dam to the surrounding area.

D) Other Inspection Findings

Recommendations developed from these other inspection findings are presented in Section 6.2-D, and the status of implementation of the recommendations is present in Appendix 2.

Stantec – 2014 Field Reconnaissance (reference 7.1).

i. Seeps were observed along the downstream toe of the 1963 pond. (CF-3)
ii. The current configuration of the ash pond varies from the design in certain locations. In some cases, no design or analysis of the pond was available. (CF-8)

EPA – 2009 Inspection (reference 7.3)

i. Ash pond dikes lack appropriate vegetation cover, and thick brush and weeds in non-wooded areas.
ii. Surficial erosion and sloughing resulting from exposed soil because of poor vegetation coverage.
iii. Best management practices be applied to facility for consideration of stabilization of the dike slopes so as to reduce risk of a release.
iv. No hydraulic or hydrology evaluation to show ponds ability to safely store or pass the 1/3 PMP with actual available storage capacity.
v. No stability analysis for the pond.

NCDENR – 2014 NOI (reference 7.5)

ii. According to the visual inspection, the dam appears to be in a stable condition at this time.

NCDENR – 2014 NOD (reference 7.6)

ii. NCDENR request that Duke Energy perform an internal inspection of the spillway system of the dam.
5.3 1978 Ash Pond Dam

A) Ash Basin Dam

No vegetation greater than 2 inches, cracks, scarps, slides, unusual depressions/bulges, erosion gullies/rills, or wet/soft areas were observed on the interior face (Photograph 1 – Appendix 7). Due to the low water level in the pond, the water level was below the line of established vegetation and “beaching” erosion was observed in areas where water is impounded (Photograph 2 – Appendix 7). Animal burrows were observed along southwest side of the interior face.

The interior portion of the ash pond is partially vegetated with trees and underbrush. Impounded water was observed in the southeast quadrant of the pond. The water level is approximately 5 to 7 feet below the riser.

No cracks, scarps, slides, unusual depressions/bulges, erosion gullies/rills, or wet/soft areas were observed on the crest. A gravel driving surface is provided the length of the crest (Photograph 6 – Appendix 7).

No vegetation greater than 2 inches, cracks, scarps, slides, unusual depressions/bulges, erosion gullies/rills, or wet/soft areas were observed on the exterior face (Photograph 3 – Appendix 7). Local holes in the dike exterior face were observed on all sides of the pond; these are interpreted as evidence of animal burrowing.

The toe of the dam is vegetated with trees greater than 2 inches in diameter and thick brush. No cracks, scarps, slides, unusual depressions/bulges, erosion gullies/rills, or wet/soft areas were observed at the toe of the dam. No indication of seepage was observed along the toe of the dam.

The toe areas of the dikes are typically dry. Some old clay pits which contain standing water are close to the toe of the dike along the south side and near the outlet. These have been noted in past inspection reports and concluded in those reports to pose no safety concern.

B) Principal Spillway

The outlet structure appeared to be damaged and is in need of repair (Photograph 4 – Appendix 7). The skimmer was observed to be tilted. Weekly inspection reports by AMEC personnel have often noted a small trickle of flow at the end of the outlet pipe, indicating slight leakage through the pipes/joints either in the riser structure or the outlet piping. (Photograph 5 – Appendix 7). At the time of this inspection, no flow was observed. AMEC has prepared plans for slip-lining the pipe that have been submitted to NCDENR for permitting review.
C) Ash Pond Perimeter Drainage Features

A perimeter drainage system was not observed at the dam. Drainage appears to sheetflow away from the toe of the dam to the surrounding area.

A small drain pipe outlet was observed west of the plant cooling tower with water flowing out in a clear stream. This pipe was installed in the 1990’s to provide drainage of wet areas adjacent to the dike toe. (Photograph 7 – Appendix 7)

D) Other Inspection Findings

Recommendations developed from these other inspection findings are presented in Section 6.3-D, and the status of implementation of the recommendations is present in Appendix 3

Stantec – 2014 Field Reconnaissance (reference 7.1).

i. Ponded water was observed at the downstream toe along the eastern dike approximately 75 feet west of the outlet structure. (CF-1)

ii. Decant structure is constructed of stacked manhole or concrete pipe sections which may lack lateral support. The metal skimmer is rusted, deteriorated and skewed from horizontal (CF-5)

iii. Current configuration of the ash pond varies from the design in certain locations. (CF-8)

EPA – 2009 Inspection (reference 7.3)

i. Ash pond dikes lack appropriate vegetation cover, and thick brush and weeds in non-wooded areas.

ii. Dike parallel to the Discharge Canal exhibits erosion form the flows in the Discharge Canal, and surficial sloughing has occurred.

iii. There is a large area of ponded water at the southeast corner of dike to the south of the outlet pipe.

iv. Surficial erosion and sloughing resulting from exposed soil because of poor vegetation coverage.

v. Evidence of animal burrows and slides were observed.

vi. 1978 hydraulic and hydrologic analyses concluded that the available freeboard was available throughout the pond to safely store the ½ PMP. While only a 1/3 PMP storm is currently required to be used as the design storm based on North Carolina Dam Safety Regulations and therefore, should be safely stored, CHA observed that the freeboard ranges from about 0 at the north end of the pond, to 3 to 8 feet at the south end of the pond.

vii. Results of the stability analyses reportedly performed for the pond were not provided.
NCDENR – 2014 NOD (reference 7.6)

i. NCDENR has reviewed the camera inspection video, and have noted that it documents signification infiltration weepers with staining, a signification longitudinal fracture and multiple fracture in the barrel as well as significant root intrusion. A joint was documented with a poorly fitted, loose sealing ring, and a sag in the alignment was also documented. Surface spalling was documented with the conduit.

NCDENR – 2010 NOI (reference 7.4)

i. According to the visual inspection, the dam appears to be in a stable condition at this time.

5.4 1985 Ash Pond Dam

A) Ash Basin Dam

No vegetation greater than 2 inches, cracks, scarps, slides, unusual depressions/bulges, erosion gullies/rills, or wet/soft areas were observed on the upstream face. Impounded water was observed in the southern third of the ash pond. Due to the low water level in the pond, the water level was below the line of established vegetation and “beaching” erosion was observed. The interior face has rip rap extending down the slope approximately 10 feet in the area of the impounded water. The rip rap stops approximately 3 to 4 feet above the current water level in the pond.

No cracks, scarps, slides, unusual depressions/bulges, erosion gullies/rills, or wet/soft areas were observed on the crest. A gravel driving surface is provided the length of the crest.

No vegetation greater than 2 inches, cracks, scarps, slides, unusual depressions/bulges, erosion gullies/rills, or wet/soft areas were observed on the downstream face. Animal burrows were observed.

No vegetation greater than 2 inches, cracks, scarps, slides, unusual depressions/bulges, or erosion gullies/rills were observed at the toe of the dam. Wet areas were observed on the west side of the dam near the culverts that cross under the railroad tracks, but no flow was seen. Rip rap has been placed at the toe to prevent erosion during rain events. Additional rip rap will be placed at a later date. No indication of seepage was observed along the toe of the dam.

B) Principal Spillway

The outlet structure appeared to be in generally sound visual condition with no evidence of significant deterioration of the limited visible parts of the structure that could be seen at the riser and at the outfall.

The NCDNR inspection on March 20, 2014 (reference 7.7) indicated that the seals around the riser joints were leaking. AMEC weekly inspection reports note that the leaks have been
repaired since the NCDENR inspection; however, because the pipe was plugged, AMEC was not able to confirm the repairs during the current inspection.

C) Ash Pond Perimeter Drainage Features

A perimeter drainage system was observed on the west side of the pond only. The drainage appears to be functioning as designed. Standing water was observed in the stormwater ditch near the culverts that convey stormwater under the railroad tracks. To reduce erosion along the east side of the ash pond dam, a portion of the stormwater conveyance system has been lined with rip rap.

A vegetated drainage system was also seen on the south and east sides of the pond. Drainage in these areas appears to sheetflow away from the toe of the dam to the vegetated drainage system.

D) Other Inspection Findings

Recommendations developed from these other inspection findings are presented in Section 6.4-D, and the status of implementation of the recommendations is present in Appendix 4.

Stantec – 2014 Field Reconnaissance (reference 7.1).

i. Ponded water was observed along the external toe dikes at the 1985 Ash Pond. (CF-1)

ii. The configuration of the 2007 Ash Stack may vary from the design drawings. This is evident southeast of the ash stack where additional ash was placed. The existing stability analyses did not take this additional material into account. (CF-2)

iii. Seeps were observed at the 1985 pond. (CF-3)

iv. Decant structure is constructed of stacked manhole or concrete pipe sections which may lack lateral support. (CF-6)

EPA – 2009 Inspection (reference 7.3)

i. Ash pond dikes lack appropriate vegetation cover, and thick brush and weeds in non-wooded areas.

ii. An area of ponded water occurs between the toe of the dike and the access road along the west side of the pond.

iii. During EPA site visit, Progress Energy personnel indicated that filled holes, and voids in the downstream slope of the west dike on the pond were rodent burrows. In EPA’s review of historic documents, we found descriptions of similar voids dating back to 1985 immediately following construction. While different consultants had differing opinions on the cause of these voids, a general theme was that the voids were likely related to differential settlement from underlying soft soil resulting in cracks that then eroded form storm water runoff, or were related to shallow slope strain surfaces.
iv. Surficial erosion and sloughing resulting from exposed soil because of poor vegetation coverage.

v. Evidence of animal burrows and slides were observed.

vi. Hydrology evaluation of the 1985 impoundment was performed, the 2007 “pond within a pond” has been constructed.

vii. Perform an updated stability analyses.

NCDENR – 2014 NOR (reference 7.6)

i. NCDENR request that Duke Energy perform an internal inspection of the spillway system of the dam. Camera inspection noted at least weeper with infiltration staining and cracking that may need further attention.

NCDENR – 2014 NOD (reference 7.7)

i. The structure appeared to be stable overall; however, we did discuss your ongoing investigate of apparent joint leakage observed by Duke Energy personnel at the riser serving this dam, and potential repairs that might be subject to the permitting requirement of the Law. During the inspection the following conditions were noted: A significant longitudinal crack (approximately 40 feet in length with a maximum width of about 4 inches) had formed along the upstream crest edge of the embankment in the vicinity of the riser were fill had been added over time to widen the embankment crest and improve access to the spillway. A maximum subsidence of about 18 inches was observed near the center of the crack as well as an apparent bulge in the embankment material below the visible crack, near the existing rip rap ground cover, very close to the riser structure. It was reported that the crack was first observed by Duke Energy personnel about 2 weeks before that, when it was very small and appeared to be associated with a small, shallow slough that would not be a serious threat to the stability of the dam. Investigative work continued around the spillway, and seals were installed in the riser joints in an attempt to prevent further leakage into the riser or spillway pipe. Duke Energy’s engineering support and geotechnical consultant were mobilized to evaluate the enlarged crack on March 20, 2014, resulting in notification of our department and development of an emergency response to address the program.

ii. Three small depressions we observed on February 21, 2014 near the top of the eastern downstream face of the embankment.

NCDENR – 2010 NOI (reference 7.4)

i. According to the visual inspection, the dam appears to be in a stable condition at this time.
6.0 RECOMMENDATIONS

No significant problems affecting safety or operation were noted during the inspection. Additional details related to the structural stability of the dam are summarized as follows:

The following items should be addressed to preclude more substantial future repairs or safety concerns.

6.1 1956 Ash Pond Dam

A) General Site Recommendations

Based on the conditions observed during our October 28, 2014 field inspection, we recommend the following:

i. Vegetation should be maintained to prevent erosion.

ii. Stability analyses should be performed to improve the adequacy of supporting technical documentation. This analysis is being performed with implementation of the Phase 2 Reconstitution of Ash Pond Designs Work Plan (reference 7.8).

B) Ash Pond Dam

Based on the conditions observed during our October 28, 2014 field inspection, we recommend the following:

i. Vegetation over 2-inches but less than 6-inches in diameter should be cut and/or removed from the exterior face, crest, and toe of the dam. Vegetation larger than 6-inches should be removed only if it threatens dam integrity. The plant should contact NCDENR prior to removing vegetation greater than 6-inches in diameter for approval. Treatment of root systems should be addressed in engineering plans for removal.

ii. Evaluate if the ash pond needs an outfall structure to pass the regulatory storm event. If needed prepare plans to repair or replace the outfall structure otherwise prepare plans to abandon.

C) Ash Pond Perimeter Drainage Features

Based on the conditions observed during our October 28, 2014 field inspection, the plant should monitor the toe of the dam for ponding water. If ponding water is observed, then the plant should provide means of positive drainage away from the toe of the dam.

D) Third Party Recommendations from Previous Inspection

The status of implementation of these third party recommendations is presented in Appendix 1.
Stantec – 2014 Field Reconnaissance (reference 7.1).

i. CF-3: The seeps and 1963 Ash Pond scarp area should be monitored for any change in conditions including seepage quantity flow rates, sediment buildup, seepage extents or scarp extents.

ii. CF-4: Evaluate whether the 1956 Ash Pond and its outlet pipes are needed for stormwater management. If the pipes are needed, remove debris from bottom of the decant structures and from each outlet pipe and properly dispose. Otherwise, properly abandon the pipes.

iii. CF-8: Perform a field survey to determine the configuration of the ponds. Compare sections modeled in previous stability analyses to current conditions, and update the analyses where necessary, or perform new analyses. Subsurface explorations and/or laboratory testing may be needed to address data gaps.

EPA – 2009 Inspection (reference 7.3)

i. Tree and brush removal on all of the ash pond dikes.

ii. Areas of erosion and sloughing be re-graded and properly vegetated.

iii. Best management practices be applied to facility for consideration of stabilization of the dike slopes so as to reduce risk of a release.

iv. Evaluation be prepared for the ability of the pond to safely store or pass the 1/3 PMP with actual available storage capacity.

v. Perform detailed stability analysis including in-situ soil properties of the embankment fills, foundation soils, and existing phreatic surfaces. Subsurface investigations will be required to determine these properties.

NCDENR – 2014 NOI (reference 7.5)

Recommend the following items pertinent to maintenance and operation of the dam:

i. Continue your efforts to maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure. Monitor the stump holes and minor erosion observed around such locations, and provide suitable backfill and ground cover if erosion begins to threaten a more serious slope failure.

ii. Continue to periodically monitor the dam and appurtenant works with respect to elements affecting their safety. This is in light of the legal duties, obligations, and liabilities arising from the ownership and/or operation of a dam. In particular, the old spillway outlet pipe should be uncovered to facilitate more close observation if it were to begin conveying flow for any reason.

iii. Continue to monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or Implementation of other suitable controls.
NC DENR – 2014 NOD (reference 7.6)

i. Provide an appropriate engineering review of the video, evaluating overall structural integrity, and including recommendations for any necessary repairs or accelerated decommissioning of the structure. Plans and specifications addressing any necessary repairs or decommissioning must be filed with the Division of Energy, Mineral and Land Resources for approval.

NC DENR – 2010 NOI (reference 7.4)

Recommend the following items pertinent to maintenance and operation of the dam:

i. Maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure. Monitor the stump holes and minor erosion observed around such locations, and provide suitable backfill and ground cover if erosion begins to threaten a more serious slope failure.

ii. Periodically monitor the dam and appurtenant works with respect to elements affecting their safety. This is in light of the legal duties, obligations, and liabilities arising from the ownership and/or operation of a dam.

iii. Monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or implementation of other suitable controls.

Prepare an Emergency Action Plan (EAP) for this dam.

6.2 1963/1970 Ash Pond Dam

A) General Site Recommendations

Based on the conditions observed during our October 28, 2014 field inspection, we recommend the following:

i. Vegetation should be maintained to prevent erosion.

ii. Stability analyses should be performed to improve the adequacy of supporting technical documentation. This analysis is being performed with implementation of the Phase 2 Reconstitution of Ash Pond Designs Work Plan (reference 7.8).

B) Ash Pond Dam

Based on the conditions observed during our October 28, 2014 field inspection, we recommend vegetation over 2-inches but less than 6-inches in diameter should be cut and/or removed from the exterior face, crest, and toe of the dam. Vegetation larger than 6-inches should be removed only if it threatens dam integrity. The plant should contact NC DENR prior to removing vegetation greater than 6-inches in diameter for approval.
C) Ash Pond Perimeter Drainage Features

Based on the conditions observed during our October 28, 2014 field inspection, no specific recommendations are provided at this time. Plant to perform periodic inspections to monitor for ponding water near the toe of the dam. If ponding water is observed, then plant is to provide means of positive drainage away from the toe of the dam.

D) Third Party Recommendations from Previous Inspection

The status of implementation of these third party recommendations is presented in Appendix 1.

Stantec – 2014 Field Reconnaissance (reference 7.1).

i. CF-3: The seeps and 1963 Ash Pond scarp area should be monitored for any change in conditions including seepage quantity flow rates, sediment buildup, seepage extents or scarp extents.

ii. CF-8: Perform a field survey to determine the configuration of the ponds. Compare sections modeled in previous stability analyses to current conditions, and update the analyses where necessary, or perform new analyses. Subsurface explorations and/or laboratory testing may be needed to address data gaps.

EPA – 2009 Inspection (reference 7.3)

i. Tree and brush removal on all of the ash pond dikes.

ii. Areas of erosion and sloughing be re-graded and properly vegetated.

iii. Best management practices be applied to facility for consideration of stabilization of the dike slopes so as to reduce risk of a release.

iv. Evaluation be prepared for the ability of the pond to safely store or pass the 1/3 PMP with actual available storage capacity.

v. Perform detailed stability analysis including in-situ soil properties of the embankment fills, foundation soils, and existing phreatic surfaces. Subsurface investigations will be required to determine these properties.

NCDENR – 2014 NOI (reference 7.5)

Recommend the following items pertinent to maintenance and operation of the dam:

i. Continue your efforts to maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure. Monitor the stump holes and minor erosion observed around such locations, and provide suitable backfill and ground cover if erosion begins to threaten a more serious slope failure.

ii. Continue to periodically monitor the dam and appurtenant works with respect to elements affecting their safety. This is in light of the legal duties, obligations, and liabilities arising from the ownership and/or operation of a dam. 1) In particular, the
old spillway outlet pipe should be uncovered to facilitate more close observation if it were to begin conveying flow for any reason. In particular, this applies to the area where a signification slope failure was repaired adjacent to the river in the past, and where concentrated seepage was observed on this visit at the downstream toe below the monitoring well access road adjacent to the river. Although the flow was clear and no distress was indicated, the seepage should be monitored for any changes that may signal slope instability (1963 Ash Pond Dam). 2) Your inspection program using an independent consultant is a good way to address this item (1970 Ash Pond Dam).

iii. Continue to monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or Implementation of other suitable controls.

NCDENR – 2014 NOD (reference 7.6)

ii. Provide an appropriate engineering review of the video, evaluating overall structural integrity, and including recommendations for any necessary repairs or accelerated decommissioning of the structure. Plans and specifications addressing any necessary repairs or decommissioning must be filed with the Division of Energy, Mineral and Land Resources for approval (1970 Ash Pond Dam).

NCDENR – 2010 NOI (reference 7.4)

Recommend the following items pertinent to maintenance and operation of the dam:

iv. Maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure. Monitor the stump holes and minor erosion observed around such locations, and provide suitable backfill and ground cover if erosion begins to threaten a more serious slope failure.

v. Periodically monitor the dam and appurtenant works with respect to elements affecting their safety. This is in light of the legal duties, obligations, and liabilities arising from the ownership and/or operation of a dam.

vi. Monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or Implementation of other suitable controls.

Prepare an Emergency Action Plan (EAP) for this dam.

6.3 1978 Ash Pond Dam

A) General Site Recommendations

Based on the conditions observed during our October 28, 2014 field inspection, we recommend the following:
i. Vegetation should be maintained to prevent erosion.

**B) Ash Pond Dam**

Based on the conditions observed during our October 28, 2014 field inspection, we recommend the following:

i. Vegetation over 2 inches but less than 6-inches in diameter should be cut and/or removed from the exterior face, crest, and toe of the dam. Vegetation larger than 6-inches should be removed only if it threatens dam integrity. The plant should contact NCDENR prior to removing vegetation greater than 6-inches in diameter for approval.

ii. Animal burrows should be filled with compacted earth or gravel.

**C) Ash Pond Perimeter Drainage Features**

Based on the conditions observed during our October 28, 2014 field inspection, the plant to monitor the toe of the dam for ponding water. If ponding water is observed, then the plant is to provide means of positive drainage away from the toe of the dam.

**D) Third Party Recommendations from Previous Inspection**

The status of implementation of these third party recommendations is presented in Appendix 3.

Stantec – 2014 Field Reconnaissance (reference 7.1).

i. CF-1: Grading should be performed to drain water away from the toe of the dikes. Once the areas are free of ponding water, the conditions should be re-evaluated for the presence of seeps or other stability concerns.

ii. CF-5: Evaluate whether lateral support exists and improve lateral support if needed and replace the skimmer, or properly abandon the decant structure.

iii. CF-8: Perform a field survey to determine the configuration of the ponds. Compare sections modeled in previous stability analyses to current conditions, and update the analyses where necessary, or perform new analyses. Subsurface explorations and/or laboratory testing may be needed to address data gaps.

EPA – 2009 Inspection (reference 7.3)

i. Tree and brush removal on all of the ash pond dikes.

ii. Protect ash pond dike along Discharge Canal from toe softening and velocities in the discharge canal.
iii. Grade area to minimize ponding of water and if the area cannot be fully drained buttress the toe.
iv. Areas of erosion and sloughing be re-graded and properly vegetated.
v. Make note of areas disturbed by animal activity, trapping of the animals responsible, and repair to the areas to protect the integrity of the dikes.
vi. Update hydraulic and hydrologic evaluation to account for the actual available storage capacity of the pond.
vii. Perform a detailed stability analysis for the pond that includes flood pool and seismic loading and that appropriate modifications be made to the slopes to ensure that the calculated factors of safety meet those required and/or recommended by North Carolina Dam Safety and the USACOE, respectively. These stability analyses should be performed with actual phreatic surface evaluation through the installation of piezometers on the dikes of the pond.

NCDENR – 2010 NOI (reference 7.4)

Recommend the following items pertinent to maintenance and operation of the dam:
i. Continue removal of small trees and restrictive woody undergrowth form the embankment as well as the inflow channel. This along with removal of any accumulated material in the channel, will service to (a) prevent the formation of a root system which might significantly increase seepage through the dam which could ultimately result in failure of the structure, (b) reduce the possibility of damage to the dam due to the uprooting of trees by wind or other natural causes, (c) help to prevent obstruction of the inflow channel, and (d) facilitate inspection and increase the likelihood of early detection of more serious problems connected with the dam.

ii. Monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or Implementation of other suitable controls.

iii. Maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure. This will enchanee the stability of the structure should these portions become exposed to overflow or other forms of concentrated flow. This specifically applies to the downstream slope of the embankment where vegetation was weak in places, and wherever minor erosion is encountered and corrected on the embankment. It is recommended that you work to achieve a predominantly turfgrass cover. Weeping lovergrass and serencia lespedeza should be taken out of the see mix; appropriate clover and Korean or Kobe lespedeza should be added if a legume is desired. The recently submitted SlopeMaster proposal is an acceptable alternative.

iv. Periodically monitor the dam and appurtenant works with respect to elements affecting their safety. This is in light of the legal duties, obligations, and liabilities arising from the ownership and/or operation of a dam. In particular, monitor the condition of the metallic trash rack regarding corrosion. Your current inspection
program using an independent consultant is an appropriate way to address this recommendation.

v. Prepare an Emergency Action Plan (EAP) for this dam.

6.4 1985 Ash Pond Dam

A) General Site Recommendations

Based on the conditions observed during our October 28, 2014 field inspection, we recommend the following:

i. Vegetation should be maintained to prevent erosion.

ii. Stability analyses should be performed to improve the adequacy of supporting technical documentation. This analysis is being performed with implementation of the Phase 2 Reconstitution of Ash Pond Designs Work Plan (reference 7.8).

B) Ash Pond Dam

Based on the conditions observed during our October 28, 2014 field inspection, no recommendations are provided at this time.

C) Ash Pond Perimeter Drainage Features

Based on the conditions observed during our October 28, 2014 field inspection, the plant to monitor the toe of the dam for ponding water. If ponding water is observed, then the plant is to provide means of positive drainage away from the toe of the dam.

D) Third Party Recommendations from Previous Inspection

The status of implementation of these third party recommendations is presented in Appendix 4.

Stantec – 2014 Field Reconnaissance (reference 7.1).

i. CF-1: Grading should be performed to drain water away from the toe of the dikes. Once the areas are free of ponding water, the conditions should be re-evaluated for the presence of seeps or other stability concerns.

ii. CF-2: A topographic survey should be performed to determine the actual geometry and develop cross sections to reflect current conditions. The survey should be compared with design as part of an updated analysis. Update stability analysis with current geometric, phreatic and loading information. Subsurface explorations and/or laboratory testing may be needed to address data gaps.
iii. CF-3: The seeps and 1963 Ash Pond scarp area should be monitored for any change in conditions including seepage quantity flow rates, sediment buildup, seepage extents or scarp extents
iv. CF-6: Evaluate whether lateral support exists and improve lateral support if needed, or properly abandon decant structure.

EPA – 2009 Inspection (reference 7.3)
i. Increase mowing schedule and tree and brush removal on the ash pond dikes.
ii. An area of ponded water occurs between the toe of the dike and the access road along the west side of the pond.
iii. Improved drainage and/or buttressing of the toe in the area where water flows or is ponded against the toe of the dikes with erosion resistant materials, to reduce the risk of dike instability from a softened or eroded toe.
iv. Voids be filled and an engineered monitoring program be implemented. The monitoring program should include the use of piezometric measurements in the embankment and foundation soils and inclinometers to monitor movement within the embankment at various depths.
v. Areas of erosion and sloughing be re-graded and properly vegetated.
vi. Make note of areas disturbed by animal activity, trapping of animals responsible, and repair to the areas to protect the integrity of the dikes.
vii. Recommends that a hydraulic and hydrologic analyses to be updated to evaluate the ability of the 2007 and 1985 combined pond capacity to safely pass the 1/3 PMP.
viii. Perform an updated stability analyses to confirm that embankments are indeed stable under the various loading conditions outlined below:
   a. Perform an investigation in which the properties of the embankment and foundation soils are determined. This scope of work should include laboratory testing of samples retrieved from the embankment and foundation soils and installation of piezometers in the embankment for accurate measurement and monitoring of the phreatic surfaces in for stability analysis and for long term monitoring.
   b. Perform stability analyses for the current conditions as well as any changes should additional capacity be required such as moving forward with plan to increase the height of the existing 2007 ash pond embankments. An investigation should be performed to sample and test the sluiced ash on which the 2007 pond is sitting, as well as the in-situ strength of the compacted ash from which the 2007 dikes are constructed.
   c. Remediation work, if required, be performed on the embankment slopes to improve the factor of safety to the minimum values required by North Carolina Dam Safety Regulations and as recommended by the USACOE for all loading
conditions. The design of the remediation work should be based on the findings of the subsurface investigation described above.

**NC DENR – 2014 NOR (reference 7.6)**

i. Provide an appropriate engineering review of the video, evaluating overall structural integrity, and include recommendations for any necessary repairs (such repairs should be incorporated with the ongoing work already proposed for this structure). Plans and specifications addressing any necessary repairs must be filed with the Division of Energy, Mineral and Land Resources for approval.

**NC DENR – 2014 NOD (reference 7.7)**

i. Complete the comprehensive engineering reports and plans outlined in the emergency repair approval issued to Mr. Scott Harris, P.E. by out State Dam Safety Engineer, Steve M. McEvoy, P.E. on March 21, 2014.

ii. Three small downstream depressions we observed on February 21, 2014 near the top of the eastern downstream face of the embankment should be backfilled with suitable granular material and stabilized as a part of your ongoing ground cover management process at the site. All woody vegetation should continue to be removed from the embankments. All seepage areas previously identified at this site should continue to be monitored regularly to check for any changed conditions.

iii. Prepare an Emergency Action Plan (EAP) for this dam.

**NC DENR – 2010 NOI (reference 7.4)**

Recommend the following items pertinent to maintenance and operation of the dam:

i. Continue removal of small trees and restrictive woody undergrowth from the embankment. This will serve to (a) prevent the formation of a root system which might significantly increase seepage through the dam which could ultimately result in failure of the structure, (b) reduce the possibility of damage to the dam due to the uprooting of trees by wind or other natural causes, and (c) facilitate inspection and increase the likelihood of early detection of more serious problems connected with the dam.

ii. Monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or Implementation of other suitable controls.

iii. Maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure. This will enhance the stability of the structure should these portions become exposed to overflow or other forms of concentrated flow. It is recommended that you work to achieve a predominantly turfgrass cover. Weeping lovegrass and serecia lespedeza should be taken out of the seed mix;
appropriate clover and Korean or Kobe lespedeza should be added if a legume is desired. The recently submitted SlopeMaster proposal is an acceptable alternative.

iv. Periodically monitor the dam and appurtenant works with respect to elements affecting their safety. This is in light of the legal duties, obligations, and liabilities arising from the ownership and/or operation of a dam. This particularly applies to the evidence of seepage observed near the downstream toe of the embankment as well as the soft soil conditions found around the spillway outlet pipe. The drainage swale/channel between the toe of the upper portion of the embankment and the crest of the lower portion should be maintained in an open condition with appropriate ground cover for safety conveying liquid to the main portion of the pond. Your current inspection program, including the seepage and embankment stability analysis is an appropriate way to address this recommendation.

Prepare an Emergency Action Plan (EAP) for this dam.

7.0 REFERENCES

7.1 STANTEC, “Cape Fear Plant – Field Reconnaissance,” (Phase 1 Study)


7.7 NCDENR, “Notice of Deficiency (Dam CHATH-079),” dated March 28, 2014


Appendix 1
Status of Previous Recommendations and 2014 Recommendations
1956 Ash Pond Dam
The table below is a summary of a current inspection results, STANTEC report [Ref. 7.1], AMEC 2013 report recommendations [Ref. 7.2], EPA report recommendations [Ref. 7.3], NCDENR inspection report (2010) [Ref. 7.4], NCDENR inspection reports (2014) [Ref. 7.5], NCDENR NOD reports (2014) [Ref. 7.6], and NCDENR NOD report (2014)[Ref. 7.7]. Recommendations based on 2014 inspections are denoted as AP-2014-##

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Recommendations</th>
<th>Recommended Time for Implementation</th>
<th>2013 Status</th>
<th>Current Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP-2014-1</td>
<td>Vegetation Control</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-2</td>
<td>Vegetation over 2 inches but less than 6-inches in diameter should be cut and/or removed from the exterior face, crest, and toe of the dam. Vegetation larger than 6-inches should be removed only if it threatens dam integrity. The plant should contact NCDENR prior to removing vegetation greater than 6-inches in diameter for approval.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-3</td>
<td>Evaluate if Outlet Structure is needed</td>
<td>No time specified</td>
<td>In Progress</td>
<td>Performed under Phase 1 activities. Plans have been sent to NCDENR for permitting review/approval</td>
</tr>
<tr>
<td>AP-2014-4</td>
<td>The plant should monitor the toe of the dam for ponding water. If ponding water is observed, then the plant should provide means of positive drainage away from the toe of the dam.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-5 (Stantec CF-3)</td>
<td>Monitor seeps for any change in conditions including seepage quantity flow rates, sediment build-up, seepage</td>
<td>No time specified</td>
<td>N/A</td>
<td>Monitoring for seeps continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-6 (Stantec CF-4)</td>
<td>Extents or scarp extents inspections.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Completed under Phase 1 Work Plan, Package has been sent to NCDENR for approval</td>
</tr>
<tr>
<td>AP-2014-7 (Stantec CF-8)</td>
<td>Per STANTEC inspection: Evaluate whether the 1956 Ash Pond and its outlet pipes are needed for stormwater management. If the pipes are needed, remove debris from bottom of the decant structures and from each outlet pipe and properly dispose. Otherwise, properly abandon the pipes.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Being evaluated under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
</tr>
<tr>
<td>AP-2014-8 (NCDENR)</td>
<td>[Ref. 7.5, NCDENR] Continue efforts to maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspection</td>
</tr>
<tr>
<td>AP-2014-9 (NCDENR)</td>
<td>[Ref. 7.5, NCDENR] Continue to periodically monitor the dam and appurtenant works with respect to elements affecting their safety.</td>
<td>No time specified</td>
<td>N/A</td>
<td>A program of weekly, monthly, and annual inspections is in place.</td>
</tr>
<tr>
<td>AP-2014-10 (NCDENR)</td>
<td>[Ref. 7.5, NCDENR] Continue to monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or implementation of other suitable controls</td>
<td>No time specified</td>
<td>N/A</td>
<td>Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-11</td>
<td>Written response</td>
<td>Response</td>
<td>Plans to close</td>
<td>33</td>
</tr>
<tr>
<td>AP-2010-1 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspection</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------------------------</td>
<td>-----------------</td>
<td>-----</td>
<td>-----------------------------------------------------------------</td>
</tr>
<tr>
<td>AP-2010-2 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Periodically monitor the dam and appurtenant works with respect to elements affecting their safety.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspection</td>
</tr>
<tr>
<td>AP-2010-3 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or implementation of other suitable controls</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspection</td>
</tr>
<tr>
<td>AP-2010-4 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Prepare an Emergency Action Plan (EAP)</td>
<td>Not time specified</td>
<td>N/A</td>
<td>EAP submitted to NCDENR in 2014</td>
</tr>
<tr>
<td>AP-2009-1 (EPA)</td>
<td>[Ref. 7.3, EPA]: Remove tree and brush</td>
<td>No time specified</td>
<td>Tree and brush still remains.</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspection</td>
</tr>
</tbody>
</table>
## Report of Annual Inspection
### 2014 Cape Fear Steam Station Annual Inspection

<table>
<thead>
<tr>
<th>AP-2009-2 (EPA)</th>
<th>[Ref. 7.3, EPA]: Areas of erosion and sloughing be re-graded and properly vegetated.</th>
<th>No time specified</th>
<th>N/A</th>
<th>Monitoring continues during weekly and monthly inspections</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP-2009-3 (EPA)</td>
<td>[Ref. 7.3, EPA]: Best Management practices be applied to facility for consideration of stabilization of the dike slopes so as to reduce the risk of a release. Tree growth on slopes of dams and landfills is not desirable.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspection</td>
</tr>
<tr>
<td>AP-2009-4 (EPA)</td>
<td>[Ref. 7.3, EPA]: Perform hydraulic and hydrology evaluation to show ponds ability to safely store or pass the 1/3 PMP with the actual available storage capacity.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Being performed under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
</tr>
<tr>
<td>AP-2009-5 (EPA)</td>
<td>[Ref. 7.3, EPA]: Recommend that a detailed stability analysis be performed. Analysis should be based on in-situ soil properties of the embankment fills, foundation soils and existing phreatic surfaces. Subsurface investigations will be required to determine these properties.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Being performed under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
</tr>
</tbody>
</table>
Appendix 2
Status of Previous Recommendations and 2014 Recommendations
1963/1970 Ash Pond Dam
The table below is a summary of a current inspection results, STANTEC report [Ref. 7.1], AMEC 2013 report recommendations [Ref. 7.2], EPA report recommendations [Ref. 7.3], NCDENR inspection report (2010) [Ref. 7.4], NCDENR inspection reports (2014) [Ref. 7.5], NCDENR NOD reports (2014) [Ref. 7.6], and NCDENR NOD report (2014)[Ref. 7.7]. Recommendations based on 2014 inspections are denoted as AP-2014-##

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Recommendations</th>
<th>Recommended Time for Implementation</th>
<th>2013 Status</th>
<th>Current Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP-2014-1</td>
<td>Vegetation Control</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-2</td>
<td>Vegetation over 2 inches but less than 6-inches in diameter should be cut and/or removed from the exterior face, crest, and toe of the dam. Vegetation larger than 6-inches should be removed only if it threatens dam integrity. The plant should contact NCDENR prior to removing vegetation greater than 6-inches in diameter for approval.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-3</td>
<td>Perimeter drainage system not present. The plant to monitor the toe of the dam for ponding water. If ponding water is observed, then the plant is to provide means of positive drainage away from the toe of the dam.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-4</td>
<td>Discharge outlet pipe is in need of repair</td>
<td>No time specified</td>
<td>In Progress</td>
<td>Completed under Phase 1 activities; Package has been sent to NCDENR for approval.</td>
</tr>
<tr>
<td>AP-2014-5</td>
<td>The seeps and 1963 Ash Pond scarp area should be monitored for any change in conditions including seepage quantity flow rates, sediment</td>
<td>No time specified</td>
<td>N/A</td>
<td>Being performed under execution of Phase 2 Reconstituted Design Work Plan</td>
</tr>
<tr>
<td>AP-2014-6  (Stantec CF-8)</td>
<td>buildup, seepage extents or scarp extents.</td>
<td>Perform a field survey to determine the configuration of the ponds. Compare sections modelled in previous stability analyses to current conditions, and update the analyses where necessary, or perform new analyses. Subsurface explorations and/or laboratory testing may be needed to address data gaps.</td>
<td>No time specified</td>
<td>N/A</td>
</tr>
<tr>
<td>AP-2014-7  (NCDENR)</td>
<td>[Ref. 7.5, NCDENR] Continue efforts to maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-8  (NCDENR)</td>
<td>[Ref. 7.5, NCDENR] Continue to periodically monitor the dam and appurtenant works with respect to elements affecting their safety.</td>
<td>No time specified</td>
<td>N/A</td>
<td>A program of weekly, monthly, and annual inspections is in-place</td>
</tr>
<tr>
<td>AP-2014-9  (NCDENR)</td>
<td>[Ref. 7.5, NCDENR] Continue to monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or implementation of other suitable controls</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-10 (NCDENR)</td>
<td>[Ref. 7.6, NCDENR] 1970 Ash Pond Outfall Structure: Provide for an appropriate engineering review of the video, evaluation overall structural integrity, and including recommendations for any necessary repairs or accelerated decommissioning of the structure</td>
<td>Written response as quickly as possible, but no later than 30 days following receipt of Notice dated June 26, 2014 to advise on intended actions</td>
<td>Response provided on July 2, 2014</td>
<td>Completed under Phase 1 Work Plan, Package has been sent to NCDENR for approval</td>
</tr>
<tr>
<td>AP-2012-1</td>
<td>1963 Ash Pond: Follow-up is recommended for installation of a weir plate to provide a more reliable method for assessment of the seepage condition at the toe of the 1963 Ash Pond</td>
<td>No time specified</td>
<td>No action taken</td>
<td>No action taken</td>
</tr>
<tr>
<td>AP-2011-1</td>
<td>1963 &amp; 1970 Ash Ponds: The dikes should remain in the regular inspection program until Progress Energy completes declassification of the impoundment</td>
<td>No time specified</td>
<td>A program of weekly, monthly, and annual inspections is in-place</td>
<td>A program of weekly, monthly, and annual inspections is in-place</td>
</tr>
<tr>
<td>AP-2010-1 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure.</td>
<td>No time specified</td>
<td>Vegetation control being performed through routine maintenance</td>
<td>Vegetation control being performed through routine maintenance</td>
</tr>
<tr>
<td>AP-2010-2 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Periodically monitor the dam and appurtenant works with respect to elements affecting their safety.</td>
<td>No time specified.</td>
<td>A program of weekly, monthly, and annual inspections is in-place</td>
<td>A program of weekly, monthly, and annual inspections is in-place</td>
</tr>
<tr>
<td>AP-2010-3 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or implementation of other suitable controls</td>
<td>No time specified</td>
<td>Conducted as routine maintenance</td>
<td>Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2009-1 (EPA)</td>
<td>[Ref. 7.3, EPA]: Remove tree and brush</td>
<td>No time specified</td>
<td>Tree growth removed</td>
<td>Vegetation control being performed through routine maintenance</td>
</tr>
<tr>
<td>AP-2009-2 (EPA)</td>
<td>[Ref. 7.3, EPA]: Areas of erosion and sloughing be re-graded and properly vegetated.</td>
<td>No time specified</td>
<td>Areas were vegetated</td>
<td>Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2009-3 (EPA)</td>
<td>[Ref. 7.3, EPA]: Best Management practices be applied to facility for consideration of stabilization of the dike slopes so as to reduce the risk of a release. Tree growth on slopes of dams and landfills is not desirable.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance</td>
</tr>
<tr>
<td>Ref.</td>
<td>Description</td>
<td>Status</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>--------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>7.3</td>
<td>Perform hydraulic and hydrology evaluation to show ponds ability to safely store or pass the 1/3 PMP with the actual available storage capacity.</td>
<td>No time specified</td>
<td>In Progress</td>
<td>Being performed under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
</tr>
<tr>
<td>7.3</td>
<td>Recommend that a detailed stability analysis be performed. Analysis should be based on in-situ soil properties of the embankment fills, foundation soils and existing phreatic surfaces. Subsurface investigations will be required to determine these properties.</td>
<td>No time specified</td>
<td>Analyses performed in 2010</td>
<td>Being performed under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
</tr>
</tbody>
</table>
Appendix 3
Status of Previous Recommendations and 2014 Recommendations
1978 Ash Pond Dam
The table below is a summary of a current inspection results, STANTEC report [Ref. 7.1], AMEC 2013 report recommendations [Ref. 7.2], EPA report recommendations [Ref. 7.3], NCDENR inspection report (2010) [Ref. 7.4], NCDENR inspection reports (2014) [Ref. 7.5], NCDENR NOD reports (2014) [Ref. 7.6], and NCDENR NOD report (2014)[Ref. 7.7]. Recommendations based on 2014 inspections are denoted as AP-2014-##

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Recommendations</th>
<th>Recommended Time for Implementation</th>
<th>2013 Status</th>
<th>Current Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP-2014-1</td>
<td>Vegetation should be maintained to prevent erosion</td>
<td>No time specified</td>
<td>N/A</td>
<td>Vegetation control being performed through routine maintenance</td>
</tr>
<tr>
<td>AP-2014-2</td>
<td>Vegetation over 2 inches but less than 6-inches in diameter should be cut and/or removed from the exterior face, crest, and toe of the dam. Vegetation larger than 6-inches should be removed only if it threatens dam integrity. The plant should contact NCDENR prior to removing vegetation greater than 6-inches in diameter for approval.</td>
<td>No time specified</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>AP-2014-3</td>
<td>The plant should monitor the toe of the dam for ponding water. If ponding water is observed, then the plant should provide means of positive drainage away from the toe of the dam.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2014-4</td>
<td>Animal burrows should be filled with compacted earth or gravel</td>
<td>No time specified</td>
<td>N/A</td>
<td>Plant checks for animal burrows and fills as part of routine maintenance</td>
</tr>
<tr>
<td>AP-2014-5</td>
<td>Grading should be performed to drain water away from the toe of the dike. Once the areas are free of ponding, the conditions should be re-evaluated for the presence of seeps or other stability concerns.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Plans have been submitted to NCDENR for review to grade area</td>
</tr>
<tr>
<td>(Stantec CF-1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP-2014-6 (Stantec CF-5)</td>
<td>Evaluate whether lateral support exists and improve lateral support if needed and replace the skimmer, or properly abandon the decant structure</td>
<td>No time specified</td>
<td>N/A</td>
<td>Being evaluated under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>AP-2014-7 (Stantec CF-8)</td>
<td>Perform a field survey to determine the configuration of the pond. Compare sections modeled in previous stability analyses to current conditions, and update the analyses where necessary, or perform new analyses. Subsurface explorations and/or laboratory testing may be needed to address data gaps.</td>
<td>No time specified</td>
<td>N/A</td>
<td>Being performed under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
</tr>
<tr>
<td>AP-2014-1 (NCDENR)</td>
<td>[Ref. 7.6, NCDENR] Provide for an appropriate engineering review of the video, focusing on the defects outlined in this Notice relative to the overall structural integrity, and including recommendations for any necessary repairs or accelerated decommissioning of the structure. Written response as quickly as possible, but no later than 30 days following receipt of Notice dated June 26, 2014 to advise on intended actions</td>
<td>Written response as quickly as possible, but no later than 30 days following receipt of Notice dated June 26, 2014 to advise on intended actions</td>
<td>Response provided on July 2, 2014</td>
<td>Being evaluated under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
</tr>
<tr>
<td>AP-2012-2</td>
<td>Damaged skimmer for the discharge outlet structure should be repaired.</td>
<td>No time specified</td>
<td>No actions taken</td>
<td>Performed under Phase 1 activities. Plans have been sent to NCDENR for permitting review/approval</td>
</tr>
<tr>
<td>AP-2012-3</td>
<td>We recommend the temporary piezometers installed in 2009 at selected cross-sections along the crest of the dam be abandoned by a well driller licensed in North Carolina</td>
<td>No time specified</td>
<td>Piezometer not abandoned as of 2013 inspection</td>
<td>Piezometer not abandoned as of current inspection date</td>
</tr>
<tr>
<td>AP-2011-3</td>
<td>The plant should periodically provide a closer inspection of the riser pipe using a boat for access. If possible, the inspection should be scheduled on an annual basis.</td>
<td>No time specified</td>
<td>Inspection not performed as of 2013 inspection</td>
<td>Inspection has not been performed as of current inspection date</td>
</tr>
<tr>
<td>AP-2011-4</td>
<td>The outlet for the PVC drain pipe at the north dike should be regularly cleared of silt and rust colored deposits. Confirm that flow is clear with routine inspection.</td>
<td>No time specified</td>
<td>Activity conducted as routine maintenance</td>
<td>Monitoring continues during weekly and monthly inspections.</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
<td>------------------</td>
<td>------------------------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>AP-2011-7</td>
<td>Localized undermined areas from beaching erosion on the interior slopes should be filled with stone</td>
<td>No time specified</td>
<td>Local areas repaired</td>
<td>Routine maintenance activity.</td>
</tr>
<tr>
<td>AP-2011-8</td>
<td>Monitor the riprap at the outlet end of the discharge pipe and provide repairs as needed</td>
<td>No time specified</td>
<td>Monitoring was done during monthly inspections</td>
<td>Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2010-1 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Continue removal of small trees and restrictive woody undergrowth from the embankment.</td>
<td>No time specified</td>
<td>Vegetation removal continued as routine maintenance</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2010-2 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or implementation of other suitable controls</td>
<td>No time specified</td>
<td>Routine monitoring and maintenance</td>
<td>Monitoring for animal burrows continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2010-3 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure.</td>
<td>No time specified</td>
<td>Vegetation control being performed through routine maintenance</td>
<td>Vegetation control being performed through routine maintenance</td>
</tr>
<tr>
<td>AP-2010-4 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Periodically monitor the dam and appurtenant works with respect to elements affecting their safety.</td>
<td>No time specified</td>
<td>Monitoring done as part of monthly inspections</td>
<td>A program of weekly, monthly, and annual inspections is in place</td>
</tr>
<tr>
<td>AP-2009-1 (EPA)</td>
<td>[Ref. 7.3, EPA]: Remove tree and brush</td>
<td>No time specified</td>
<td>Trees and brush removed</td>
<td>Vegetation control being performed through routine maintenance</td>
</tr>
<tr>
<td>AP-2009-2</td>
<td>[Ref. 7.3, EPA]:</td>
<td>No time specified</td>
<td>Riprap placed</td>
<td>N/A</td>
</tr>
<tr>
<td>(EPA)</td>
<td>(EPA)</td>
<td>prior to 2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------</td>
<td>--------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protect exterior face of dike along the discharge canal from erosion and surificial sloughing.</td>
<td>No time specified</td>
<td>No actions taken</td>
<td>No actions underway</td>
<td></td>
</tr>
<tr>
<td>AP-2009-3 (EPA)</td>
<td>[Ref. 7.3, EPA]: Grade area to the south of the outlet pipe to prevent ponded of water.</td>
<td>Areas revegetated</td>
<td>Vegetation control being performed through routine maintenance</td>
<td></td>
</tr>
<tr>
<td>AP-2009-4 (EPA)</td>
<td>[Ref. 7.3, EPA]: Areas of erosion and sloughing be re-graded and properly vegetated.</td>
<td>No time specified</td>
<td>Repair work done as routine maintenance</td>
<td></td>
</tr>
<tr>
<td>AP-2009-5 (EPA)</td>
<td>[Ref. 7.3, EPA]: Animal burrows and slides to be repaired.</td>
<td>No time specified</td>
<td>Continues as routine maintenance</td>
<td></td>
</tr>
<tr>
<td>AP-2009-6 (EPA)</td>
<td>[Ref. 7.3, EPA]: Update hydraulic and hydrology evaluation to account for actual storage capacity.</td>
<td>No time specified</td>
<td>Being performed under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
<td></td>
</tr>
<tr>
<td>AP-2009-7 (EPA)</td>
<td>[Ref. 7.3, EPA]: Recommend that a detailed analysis be performed for the pond that includes flood pool and seismic loading and that appropriate modifications be made to the slopes to ensure that the calculated factors of safety meet those required and/or recommended by NC Dam Safety and USACOE, respectively. Stability analyses should be performed with actual phreatic surface evaluations through the installation of piezometers on the dikes.</td>
<td>Analyses performed in 2010</td>
<td>Being performed under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 4
Status of Previous Recommendations and 2014 Recommendations
1985 Ash Pond Dam
The table below is a summary of a current inspection results, STANTEC report [Ref. 7.1], AMEC 2013 report recommendations [Ref. 7.2], EPA report recommendations [Ref. 7.3], NCDENR inspection report (2010) [Ref. 7.4], NCDENR inspection reports (2014) [Ref. 7.5], NCDENR NOD reports (2014) [Ref. 7.6], and NCDENR NOD report (2014)[Ref. 7.7]. Recommendations based on 2014 inspections are denoted as AP-2014-##

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Recommendations</th>
<th>Recommended Time for Implementation</th>
<th>2013 Status</th>
<th>Current Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP-2014-1 (NCDENR)</td>
<td>[Ref. 7.6, NCDENR] Provide for an appropriate engineering review of the video, evaluation overall structural integrity, and including recommendations for any necessary repairs or accelerated decommissioning of the structure</td>
<td>Written response as quickly as possible, but no later than 30 days following receipt of Notice dated June 26, 2014 to advise on intended actions</td>
<td>N/A</td>
<td>Repair plans are in progress. Per NCDENR a permit will not be required for this work</td>
</tr>
<tr>
<td>AP-2014-2 (NCDENR)</td>
<td>[Ref. 7.7, NCDENR] Prepare an Emergency Action Plan (EAP) for this dam.</td>
<td>No time specified</td>
<td>N/A</td>
<td>EAP submitted in 2014</td>
</tr>
<tr>
<td>AP-2012-4</td>
<td>We recommend the temporary piezometers installed in 2009 at the crest of the dike on the west side of the pond near the train tracks be abandoned by a well driller licensed in North Carolina</td>
<td>No time specified</td>
<td>Piezometers not abandoned as of 2013 inspection date</td>
<td>Piezometers not abandoned as of current inspection date</td>
</tr>
<tr>
<td>AP-2012-5</td>
<td>We recommend marking the locations of possible seepage along the dike toe after a period of extended dry weather. The possible seepage locations should continue to be checked periodically with routine inspection and in conjunction with the independent consultant inspection activities</td>
<td>No time specified</td>
<td>Areas observed during monthly inspections</td>
<td>Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2011-9</td>
<td>The plant should periodically provide a closer inspection of the riser pipe using a boat for access. If possible, the inspection should be scheduled on an annual basis</td>
<td>No time specified</td>
<td>No action</td>
<td>No action reported</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------</td>
<td>-----------</td>
<td>------------------</td>
</tr>
<tr>
<td>AP-2011-10</td>
<td>The plant should continue to clean out the discharge channel as a routine maintenance activity. In addition, the plant should maintain riprap material at the end of the discharge channel for stabilization and to prevent further erosion damage. This should be considered as a routine maintenance activity and should be reviewed annually.</td>
<td>No time specified</td>
<td>Routine maintenance</td>
<td>Due to cessation of ash inflow, no actions needed</td>
</tr>
<tr>
<td>AP-2011-11</td>
<td>The trees taking root in the riprap on the interior slopes should be cut as part of regular maintenance</td>
<td>No time specified</td>
<td>Routine maintenance</td>
<td>Vegetation control being performed through routine maintenance</td>
</tr>
<tr>
<td>AP-2011-12</td>
<td>The current mowing program appears to be effective and should be continued. Small trees growing on the exterior slopes should be cut as part of routine maintenance</td>
<td>No time specified</td>
<td>Routine maintenance</td>
<td>Vegetation control being performed through routine maintenance</td>
</tr>
<tr>
<td>AP-2011-13</td>
<td>Erosion features on the west dike (parallel to railroad track) should be filled with gravel to minimized potential for further damage.</td>
<td>Routine maintenance</td>
<td>Routine maintenance</td>
<td>No new areas of erosion were observed</td>
</tr>
<tr>
<td>AP-2010-1 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Continue removal of small trees and restrictive woody undergrowth from the embankment.</td>
<td>No time specified</td>
<td>Vegetation control conducted as routine maintenance</td>
<td>Vegetation control being performed through routine maintenance. Monitoring continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2010-2 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Monitor and control varmint activity on the embankment by backfilling obvious penetrations with crushed stone and/or implementation of other suitable controls</td>
<td>No time specified</td>
<td>Animal burrows filled as routine maintenance</td>
<td>Monitoring for presence of animal burrows continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>------------------</td>
<td>---------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>AP-2010-3 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Maintain a ground cover sufficient to restrain accelerated erosion on all earthen portions of the structure.</td>
<td>No time specified</td>
<td>Vegetation control being performed through routine maintenance.</td>
<td>Vegetation control being performed through routine maintenance.</td>
</tr>
<tr>
<td>AP-2010-4 (NCDENR)</td>
<td>[Ref. 7.4, NCDENR] Periodically monitor the dam and appurtenant works with respect to elements affecting their safety.</td>
<td>No time specified</td>
<td>Monitoring by monthly inspections</td>
<td>A program of weekly, monthly, and annual inspections is in-place</td>
</tr>
<tr>
<td>AP-2009-1 (EPA)</td>
<td>[Ref. 7.3, EPA]: Increase mowing schedule.</td>
<td>No time specified</td>
<td>Mowing schedule increased</td>
<td>Vegetation control by mowing is being done more frequently than in 2009</td>
</tr>
<tr>
<td>AP-2009-2 (EPA)</td>
<td>[Ref. 7.3, EPA]: Improve drainage and/or buttressing of the toe.</td>
<td>No time specified</td>
<td>No actions noted</td>
<td>Drainage improvements being evaluated as part of Phase 2 Reconstitution of Design work</td>
</tr>
<tr>
<td>AP-2009-3 (EPA)</td>
<td>[Ref. 7.3, EPA]: Voids to be filled and an engineered monitoring program be implemented.</td>
<td>No time specified</td>
<td>Routine Maintenance</td>
<td>Routine maintenance</td>
</tr>
<tr>
<td>AP-2009-4 (EPA)</td>
<td>[Ref. 7.3, EPA]: Areas of erosion and sloughing be re-graded and properly vegetated.</td>
<td>No time specified</td>
<td>Vegetation refurbished as routine maintenance</td>
<td>Vegetation control being performed through routine maintenance</td>
</tr>
<tr>
<td>AP-2009-5 (EPA)</td>
<td>[Ref. 7.3, EPA]: Animal burrows and slides to be repaired.</td>
<td>No time specified</td>
<td>Repair work done as routine maintenance</td>
<td>Monitoring for presence of burrows continues during weekly and monthly inspections</td>
</tr>
<tr>
<td>AP-2009 (EPA)</td>
<td>[Ref. 7.3, EPA]: Hydraulic and hydrology analyses be updated to evaluate the ability of the 2007 and 1985 combined pond capacity to safely pass the 1/3 PMP</td>
<td>No time specified</td>
<td>N/A</td>
<td>Item is complete per Duke Energy</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>AP-2009 (EPA)</td>
<td>[Ref. 7.3, EPA]: Perform additional stability analyses including the following: 1) Recommend that an investigation be performed in which the properties of the embankment and the foundation soils are determined. Stability models indicate failure surfaces through the embankment and have assumed that foundation soils have strength properties that are consistent with or better than the embankment soils. In the design report, it indicated that a layer of soft soil should be removed prior to construction of the dike, but documentation confirming that this was done was not provided and several of the summaries of observation on the dikes were attributed to soft foundation soils compressing. It should be verified through the recommended investigation that the soft layer is appropriately accounted for or that the layer does not exist. This scope of work should include laboratory testing of samples retrieved from the embankment and foundation soils and installation of piezometers in the embankment for accurate measurement and monitoring of the phreatic surface in for stability analysis and for long-term monitoring.</td>
<td>No time specified</td>
<td>Stability analyses performed in 2010.</td>
<td>Being performed under execution of Phase 2 Reconstituted Design Work Plan [Ref. 7.8]</td>
</tr>
</tbody>
</table>
term monitoring. 2) Recommend that stability analyses for the current conditions, including 2007 “pond within a pond” as well as any changes should additional capacity be required such as moving forward with their plan to increase the height of the existing 2007 ash pond embankments. An investigation should be performed to sample and test the sluiced ash on which the 2007 pond is sitting, as well as the in-situ strength of the compacted ash from which the 2007 dikes are constructed. 3) Recommend that remediation work, if-required, be performed on the embankment slopes to improve the factor of safety to the minimum values required by NC Dam Safety Regulations and as recommended by the USACOE for all loading conditions. The design of the remediation work should be based on the findings of the subsurface investigation described above.
Appendix 5
Site Observation Photos Nos. 1 through 7
1956 Ash Pond Dam
Photograph 1: 1956 Ash Pond Dam Interior Area (Typical)

Photograph 2: 1956 Ash Pond Dam Outfall Structures (Inactive)
Photograph 3: 1956 Ash Pond Dam Outlet Structure (Inside)

Photograph 4: 1956 Ash Pond Discharge Pipe Outlet (Typical)
Photograph 5: 1956 Ash Pond Dam Exterior Face (Typical)

Photograph 6: 1956 Ash Pond Dam Crest (Typical)
Photograph 7: 1956 Ash Pond Dam – Historical Slumps
Appendix 6
Site Observation Photos Nos. 1 through 8
1963/1970 Ash Pond Dam
Photograph 1: 1963/1970 Ash Pond Dam Interior Area

Photograph 3: 1963/1970 Ash Pond Dam Discharge Pipe

Photograph 5: 1963 Ash Pond Dam Seep

Photograph 6: 1963 Ash Pond Dam – Natural spring outside of toe of slope.
Photograph 7: 1970 Ash Pond Dam Impounded Water at the south end of pond.

Photograph 8: Crest between of 1963/1970 Ash Pond Dam. 1978 Ash Pond Dam is to right.
Appendix 7
Site Observation Photos Nos. 1 through 7
1978 Ash Pond Dam
Photograph 1: 1978 Ash Pond Dam Interior Slope Overview

Photograph 2: 1978 Ash Pond Dam – Beaching Erosion
Photograph 3: 1978 Ash Pond Dam Exterior Slope (Typical)

Photograph 4: 1978 Ash Pond Dam Outfall Structure
Photograph 5: 1978 Ash Pond Dam Discharge Pipe (Top view)

Photograph 6: 1978 Ash Pond Dam Crest (Typical)
Photograph 7: 1978 Ash Pond Dam toe drain near cooling towers.
Appendix 8
Site Observation Photos Nos. 1 through 8
1985 Ash Pond Dam
Photograph 1: 1985 Ash Pond Dam Exterior Slope, West Side (Typical)

Photograph 2: 1985 Ash Pond Dam – Wet area at culvert running under railroad tracks.
Photograph 3: 1985 Ash Pond Dam Interior with 2007 Ash Stack in background

Photograph 4: 1985 Ash Pond Dam Interior Face (Typical)
Photograph 5: 1985 Ash Pond Dam Outfall Structure

Photograph 6: 1985 Ash Pond Dam Discharge Pipe outlet
Photograph 7: 1985 Ash Pond Dam Crest and Exterior, East Side (Typical)

Photograph 8: 1985 Ash Pond Dam Inactive Ash Piping and Exterior Slope, North side (Typical)