2019 COAL COMBUSTION RESIDUALS (CCR)
SURFACE IMPOUNDMENT INSPECTION REPORT

CAPE FEAR STEAM STATION
1956 Retired Ash Basin Dam (State ID No. CHATH-075)
1963/1970 Retired Ash Basin Dam (State ID No. CHATH-076/077)
1978 Retired Ash Basin Dam (State ID No. CHATH-078)
1885 Retired Ash Basin Dam (State ID No. CHATH-079)

Duke Energy Carolinas LLC
500 CP&L Road
Moncure, Chatham, North Carolina

Inspection Date: 02/27/2019

Summary

Wood Environment & Infrastructure Solutions (Wood E&IS) has been retained to conduct the 2019 Annual Inspection for the coal combustion residuals (CCR) surface impoundments at Cape Fear Steam Station. This annual dam/CCR Surface Impoundment Inspection Report meets the requirements of the North Carolina Coal Ash Management Act (Session Law 2014-122) Part V, Section 10 (amending G.S. 143-216.32) inspection of dams. This annual inspection focused primarily on an assessment of (i) the structural stability of the CCR surface impoundment; (ii) the integrity of any hydraulic structures passing underneath the CCR surface impoundments or through the dikes of the units; and (iii) verifying that the construction, design, operation, and maintenance of the CCR surface impoundments appear to be in accordance with recognized and generally accepted good engineering standards.

In summary, no conditions were observed during the field inspection nor identified by existing engineering analyses that represent an unsafe structural stability concern requiring immediate attention. Wood E&IS concludes that the construction, design, operation, and maintenance of the CCR surface impoundments have been sufficiently consistent with recognized and generally accepted engineering standards for protection of public safety and the environment.

Sincerely,

Wood Environment & Infrastructure Solutions

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Senior Engineer
Registered, North Carolina PE 22943

J Allan Tice, PE (Technical Reviewer)
Principal Engineer

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919-381-9900
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1. **Design / Geometry of the Impounding Structure**

Based on the data reviewed and the visual inspection, no modifications to the geometry of impounding structures have been made since the 2018 annual inspection. The following geometry data was obtained from Duke Energy. Values given in the tabulations below should be considered approximate.

a. **Retired 1956 Ash Basin Dam (State ID No. CHATH-075):**

<table>
<thead>
<tr>
<th>Ash Basin Dam</th>
<th>Dam Length, ft</th>
<th>3,200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum Dam Height, ft</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Crest Elevation, ft</td>
<td>182 - 190</td>
</tr>
<tr>
<td></td>
<td>Crest Width, ft</td>
<td>7-10</td>
</tr>
<tr>
<td></td>
<td>Pond Area, acres</td>
<td>Approx. 12</td>
</tr>
</tbody>
</table>

b. **Retired 1963 Ash Basin Dam (State ID No. CHATH-076):**¹

<table>
<thead>
<tr>
<th>Ash Basin Dam</th>
<th>Dam Length, ft</th>
<th>4,000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum Dam Height, ft</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Crest Elevation, ft</td>
<td>197</td>
</tr>
<tr>
<td></td>
<td>Crest Width, ft</td>
<td>12-14</td>
</tr>
<tr>
<td></td>
<td>Pond Area, acres</td>
<td>Approx. 21</td>
</tr>
</tbody>
</table>

c. **Retired 1970 Ash Basin Dam (State ID No. CHATH-077):**¹

<table>
<thead>
<tr>
<th>Ash Basin Dam</th>
<th>Dam Length, ft</th>
<th>4,600</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Maximum Dam Height, ft</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Crest Elevation, ft</td>
<td>197</td>
</tr>
<tr>
<td></td>
<td>Crest Width, ft</td>
<td>12-14</td>
</tr>
<tr>
<td></td>
<td>Pond Area, acres</td>
<td>Approx. 30</td>
</tr>
</tbody>
</table>

d. **Retired 1978 Ash Basin Dam (State ID No. CHATH-078):**

<table>
<thead>
<tr>
<th>Ash Basin Dam</th>
<th>Dam Length, ft</th>
<th>5,600</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Maximum Dam Height, ft</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Crest Elevation, ft</td>
<td>197</td>
</tr>
<tr>
<td></td>
<td>Crest Width, ft</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Pond Area, acres</td>
<td>Approx. 35</td>
</tr>
</tbody>
</table>

e. **Retired 1985 Ash Basin Dam (State ID No. CHATH-079):**

<table>
<thead>
<tr>
<th>Ash Basin Dam</th>
<th>Dam Length, ft</th>
<th>7,400</th>
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<tbody>
<tr>
<td></td>
<td>Maximum Dam Height, ft</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Crest Elevation, ft</td>
<td>194</td>
</tr>
<tr>
<td></td>
<td>Crest Width, ft</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Pond Area, acres</td>
<td>Approx. 60</td>
</tr>
</tbody>
</table>

¹ The perimeter enclosure dikes for the 1963 Ash Basin were extended and incorporated into the 1970 Ash Basin to form the current combined area. The common separating dike originating from the 1963 Ash Basin was cut down to allow flow to pass into the 1970 Ash Basin.

2. **Existing Instrumentation and Maximum Readings**

Monitoring equipment/devices observed at Cape Fear Steam Station include piezometers at all basins, electronic basin water level gauges in the 1978 and 1985 Ash Basins (CHATH-078 and CHATH-079), and a staff gauge in the 1970 Ash Basin (CHATH-077). Duke Energy personnel take monthly piezometer readings and daily electronic basin water level readings and report the readings to
CCP Engineering. Duke Energy personnel have begun bi-weekly reading of the staff gauge in the 1970 Ash Basin (since January 2019). Dewatering pumping data is recorded daily (when operating) and is reported to CCP Engineering. The data collected is analyzed by CCP Engineering for any changes or anomalies.

a. **Retired 1956 Ash Basin Dam (State ID No. CHATH-075):**

<table>
<thead>
<tr>
<th>Location (Latitude, Longitude)</th>
<th>Piezometers</th>
<th>Maximum Recorded Elevation Reading ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.597354°, -79.050530°</td>
<td>PZ-10 ¹</td>
<td>167.27 ft</td>
</tr>
<tr>
<td>35.59841°, -79.049351°</td>
<td>CHATH-075- P100 ¹</td>
<td>165.35 ft</td>
</tr>
<tr>
<td>35.597238°, -79.048607°</td>
<td>CHATH-075-P101</td>
<td>166.38 ft</td>
</tr>
<tr>
<td>35.598306°, -79.049149°</td>
<td>CHATH-075-P102</td>
<td>165.92 ft</td>
</tr>
<tr>
<td>35.597275°, -79.048393°</td>
<td>CHATH-075-P103 ¹</td>
<td>162.26 ft</td>
</tr>
</tbody>
</table>

¹ Instituted quarterly reading starting in July 2018 (monthly readings from January to May 2018).
² Piezometer readings typically showed 3-4 foot increase following the Hurricane Florence storm event.


<table>
<thead>
<tr>
<th>Location (Latitude, Longitude)</th>
<th>Piezometers</th>
<th>Maximum Recorded Elevation Reading ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.589401°, -79.049627°</td>
<td>PZ-8 ¹</td>
<td>181.15 ft</td>
</tr>
<tr>
<td>35.588757°, -79.051349°</td>
<td>CHATH-076- P100</td>
<td>167.64 ft</td>
</tr>
<tr>
<td>35.588810°, -79.051129°</td>
<td>CHATH-076-P101</td>
<td>171.51 ft</td>
</tr>
<tr>
<td>35.587333°, -79.051096°</td>
<td>CHATH-076-P102</td>
<td>169.00 ft</td>
</tr>
<tr>
<td>35.587333°, -79.051256°</td>
<td>CHATH-076-P103</td>
<td>166.47 ft</td>
</tr>
<tr>
<td>35.586398°, -79.048342°</td>
<td>PZ-7 ¹</td>
<td>179.93 ft</td>
</tr>
<tr>
<td>35.585300°, -79.050811°</td>
<td>CHATH-077- P100</td>
<td>168.21 ft</td>
</tr>
<tr>
<td>35.582678°, -79.047750°</td>
<td>CHATH-077-P102</td>
<td>167.57 ft</td>
</tr>
<tr>
<td>35.582578°, -79.047802°</td>
<td>CHATH-077-P103</td>
<td>170.49 ft</td>
</tr>
<tr>
<td>In Pond</td>
<td>Water Level Staff Gauge ³</td>
<td>4.64 ft</td>
</tr>
</tbody>
</table>

¹ Instituted quarterly reading starting in July 2018 (monthly readings from January to May 2018).
² Piezometer readings typically showed 3-4 foot increase following the Hurricane Florence storm event.
³ Pond water level was minimal prior to Hurricane Florence. Ponded water has seen an increase in level since the Hurricane Florence and subsequent rainfall events. Bi-weekly readings of the staff gauge were implemented in January 2019.
c. Retired 1978 Ash Basin Dam (State ID No. CHATH-078)

Table 3: Maximum Water Levels for the piezometers associated with the 1978 Ash Basin Recorded Between January 2018 and February 2019

<table>
<thead>
<tr>
<th>Location (Latitude, Longitude)</th>
<th>Piezometers</th>
<th>Maximum Recorded Elevation Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.587904°, -79.047993°</td>
<td>PZ-9 ²</td>
<td>189.12 ft</td>
</tr>
<tr>
<td>35.587705°, -79.045477°</td>
<td>78-1</td>
<td>178.45 ft</td>
</tr>
<tr>
<td>35.588163°, -79.044671°</td>
<td>78-3 ¹</td>
<td>185.10 ft</td>
</tr>
<tr>
<td>In Pond</td>
<td>Water Level Instrumentation ⁴</td>
<td>180.98 ft</td>
</tr>
</tbody>
</table>

¹ Based upon data review, it appears that piezometer has been damaged and will be abandoned per PO #6182371. Water levels recorded may not be valid.
² Instituted quarterly reading starting in July 2018 (monthly readings from January to May 2018).
³ Piezometer readings typically showed 3-4 foot increase following the Hurricane Florence storm event.
⁴ Water Level Instrumentation is located within the ponded water area.

d. Retired 1985 Ash Basin Dam (State ID No. CHATH-079)

Table 4: Maximum Water Levels for the piezometers associated with the 1985 Ash Basin Recorded Between January 2018 and February 2019

<table>
<thead>
<tr>
<th>Location (Latitude, Longitude)</th>
<th>Piezometers</th>
<th>Maximum Recorded Elevation Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>35.593019°, -79.045191°</td>
<td>PZ-1 ¹</td>
<td>166.43 ft</td>
</tr>
<tr>
<td>35.592838°, -79.042392°</td>
<td>PZ-2</td>
<td>169.90 ft</td>
</tr>
<tr>
<td>35.588979°, -79.037737°</td>
<td>PZ-3S ¹</td>
<td>169.40 ft</td>
</tr>
<tr>
<td>35.588956°, -79.037742°</td>
<td>PZ-3D</td>
<td>169.28 ft</td>
</tr>
<tr>
<td>35.585846°, -79.038852°</td>
<td>PZ-4</td>
<td>164.60 ft</td>
</tr>
<tr>
<td>35.588862°, -79.041906°</td>
<td>PZ-5 ¹</td>
<td>167.77 ft</td>
</tr>
<tr>
<td>35.589894°, -79.039690°</td>
<td>PZ-6 ²</td>
<td>180.91 ft</td>
</tr>
<tr>
<td>35.589028°, -79.041609°</td>
<td>CHATH-079-P100</td>
<td>179.18 ft</td>
</tr>
<tr>
<td>35.586507°, -79.039622°</td>
<td>CHATH-079-P101</td>
<td>170.34 ft</td>
</tr>
<tr>
<td>35.586371°, -79.039723°</td>
<td>CHATH-079-P102</td>
<td>165.56 ft</td>
</tr>
<tr>
<td>35.588938°, -79.037961°</td>
<td>CHATH-079-P103</td>
<td>172.51 ft</td>
</tr>
<tr>
<td>35.592140°, -79.041466°</td>
<td>CHATH-079-P104</td>
<td>175.97 ft</td>
</tr>
<tr>
<td>35.592344°, -79.041386°</td>
<td>CHATH-079-P105</td>
<td>171.43 ft</td>
</tr>
<tr>
<td>In Pond</td>
<td>Water Level Instrumentation ⁴</td>
<td>169.91 ft</td>
</tr>
</tbody>
</table>

¹ Piezometer removed from monthly recording in May 2018.
² Due to the location of these piezometers away from the toe of the dam or availability of another piezometer in the vicinity, Duke Energy instituted quarterly readings starting in July 2018 (monthly readings from January to May 2018).
³ Piezometer readings typically showed 3-4 foot increase following the Hurricane Florence storm event.
⁴ Water Level Instrumentation is located within the ponded water area.
3. **Approximate Depth & Elevation of the Impounded Water and CCR**

The data presented is based on water level readings obtained from Duke Energy on February 27, 2019.

a. **Retired 1956 Ash Basin Dam (State ID No. CHATH-075):**

   - Minimum Depth of Water: 0 ft
   - Maximum Depth of Water: 0 ft
   - Present Depth of Water: 0 ft
   - Depth of CCR: Approximately 20 feet
   
   1 Based on Geologic Cross-Sections by Synterra, Comprehensive Site Assessment Report, 2015.

b. **Retired 1963/1970 Ash Basin Dam (State ID No. CHATH-076/077):**

   - Minimum Depth of Water: 0 ft.
   - Maximum Depth of Water: Approximately 4.6 feet (Staff Gauge reading on February 27, 2019)
   - Present Depth of Water: Approximately 4.6 feet on February 27, 2019 (staff gauge reading)
   - Depth of CCR: Approximately 25 feet

   1 As recorded between January 2019 and February 27, 2019. Ponded water has seen an increase in level since the Hurricane Florence storm event and subsequent rain events.
   2 Based on Geologic Cross-Sections by Synterra, Comprehensive Site Assessment Report, 2015.

C. **Retired 1978 Ash Basin Dam (State ID No. CHATH-078):**

   - Minimum Elevation of Water: 174.93 ft., February 28, 2018 (water level instrumentation)
   - Maximum Elevation of Water: 180.98 ft., February 25, 2019 (water level instrumentation)
   - Present Elevation of Water: 180.98 ft. as recorded on February 25, 2019 (water level instrumentation)
   - Depth of CCR: Approximately 25 feet

   1 As recorded between February 27, 2018 and February 25, 2019
   2 Based on Geologic Cross-Sections by Synterra, Comprehensive Site Assessment Report, 2015.
   3 A new dewatering system was under construction at the time of the Annual inspection and is expected to be commissioned in the next quarter.

d. **Retired 1985 Ash Basin Dam (State ID No. CHATH-079):**

   - Minimum Elevation of Water: 164.46 ft., July 19, 2018 (water level instrumentation)
   - Maximum Elevation of Water: 169.91 ft., February 25, 2019 (water level instrumentation)
   - Present Elevation of Water: 169.91 ft. as recorded on February 25, 2019 (water level instrumentation)
   - Depth of CCR: Approximately 40 feet

   1 As recorded between February 27, 2018 and February 25, 2019
   2 Based on Geologic Cross-Sections by Synterra, Comprehensive Site Assessment Report, 2015.
   3 A new dewatering system was under construction at the time of the Annual inspection and is expected to be commissioned in the next quarter.

4. **Storage Capacity of Impounding Structure at the Time of the Inspection**

Since the Cape Fear Steam Station has been retired and demolished, and there is no active ash management; storage capacity and remaining life is not applicable to this report. See Section 5 of this report for approximate volume of impounded water at the time of the inspection and CCR as of last inventory.

a. **Retired 1956 Ash Basin Dam (State ID No. CHATH-075):**

   Ash Basin has been retired.

b. **Retired 1963/1970 Ash Basin Dam (State ID No. CHATH-076/077):**

   Ash Basin has been retired.

c. **Retired 1978 Ash Basin Dam (State ID No. CHATH-078):**

   Ash Basin has been retired.
d. **Retired 1985 Ash Basin Dam (State ID No. CHATH-079):**
   Ash Basin has been retired.

5. **Approximate Volume of the CCR and Impounded Water at the Time of the Inspection**

   Basin volumes of ash presented are based on the data summary sheet provided by Duke Energy dated February 8, 2019. Plant operations ceased in 2012, and there has been no additional inclusion of ash into any of the basins within the last year. Volume of impounded water is based upon basin survey data (provided by McKim and Creed, 2014) and Hydrologic and Hydraulic Analyses (Amec, 2014).

   a. **Retired 1956 Ash Basin (State ID No. CHATH-075):**
      - Approximate Weight CCR: 420,000 tons
      - Approximate Volume Water: Dry
   
   b. **Retired 1963/1970 Ash Basin (State ID No. CHATH-076/077):**
      - Approximate Weight CCR: 1,700,000 tons
      - Approximate Volume Water \(^1\): 1.95 million gallons of water

   \(^1\) Based upon water level data recorded on February 27, 2019, and basin storage information from H&H Analysis.

   c. **Retired 1978 Ash Basin (State ID No. CHATH-078):**
      - Approximate Weight CCR: 830,000 tons
      - Approximate Volume Water \(^1\): 12.2 million gallons of water

   \(^1\) Based upon water level data recorded on February 25, 2019, and basin storage information from H&H Analysis.

   d. **Retired 1985 Ash Basin (State ID No. CHATH-079):**
      - Approximate Weight CCR: 2,820,000 tons
      - Approximate Volume Water \(^1\): 16.75 million gallons of water

   \(^1\) Based upon water level data recorded on February 25, 2019, and basin storage information from H&H Analysis.

6. **Appearances of an Actual or Potential Structural Weakness, as well as Existing Conditions That Are Disrupting or Have Potential to Disrupt the Operation and Safety of the CCR Unit and Appurtenant Structures**

   The observations made during the February 27, 2019 annual inspection indicate that the dam structures are generally well maintained and appear to comply with regulatory standards and requirements. Based upon data from the WeatherUnderground.com, approximately 0.04 inches of rainfall occurred in the 24 hours prior to the inspection, with approximately 2.78 inches of rainfall during the two weeks prior to the inspection.

   a. **Retired 1956 Ash Basin (State ID No. CHATH-075):**
      At the time of our inspection, Wood E&IS did not observe items that indicate a potential structural weakness of the ash pond dam. The ash pond dam appears to be in the same general condition as in the 2018 inspection. The western interior portion of the ash pond dam is cleared and graded as a retention basin. No water was observed in the retention basin at the time of the inspection.

   b. **Retired 1963/1970 Ash Basin (State ID No. CHATH-076/077):**
      At the time of our inspection, Wood E&IS did not observe items that indicate a potential structural weakness of the ash pond dam. The ash pond dam appears to be in the same general condition as in the 2018 inspection except that water level within the ponded area of the basin was higher (approximately 4.6-foot depth). A CCTV inspection of the drainage pipe was completed on February 7, 2019. The pipe was found to be in excellent condition, with no repairs or modifications warranted.

   c. **Retired 1978 Ash Basin (State ID No: CHATH-078):**
      At the time of our inspection, Wood E&IS did not observe items that indicate a potential structural
weakness of the ash pond dam. The ash pond dam appears to be in the same general condition as in the 2018 inspection, except that water level within the ponded area of the basin was higher (approximately 6-foot increase in depth).

d. Retired 1985 Ash Basin (State ID No: CHATH-079):
At the time of our inspection, Wood E&IS did not observe items that indicate a potential structural weakness of the ash pond dam. The ash pond dam appears to be in the same general condition as in the 2018 inspection, except that water level within the ponded area of the basin was higher (approximately 5-foot increase in depth). A CCTV inspection of the outlet pipe and riser was completed on February 7, 2019. The pipes were found to be in fair to good condition, with no repairs or modifications recommended.

7. Changes Since the Previous Annual Inspection
a. Retired 1956 Ash Basin (State ID No. CHATH-075):
There have been no changes to the 1956 Ash Basin other than routine maintenance.

There have been no changes to the 1956 Ash Basin other than routine maintenance.

c. Retired 1978 Ash Basin (State ID No: CHATH-078):
A dewatering/pumping plan had been previously implemented, with basin water pumped to an on-site water treatment system. Following treatment, the water was previously discharged into the canal. An emergency bypass pumping line is installed to allow stormwater to discharge through the permitted discharge point during severe flooding conditions. A new on-site water treatment system was in the process of being installed, with the discharge water flowing to a new headwall on the Cape Fear River installed near the north end of the 1963 Ash Basin. Relocation of the discharge point (pending receipt of new NPDES outfall permit) was required due to stagnant water conditions in the discharge canal. The water level in the basin had risen by approximately 6-feet since ceasing the basin dewatering operations on November 26, 2018.

d. Retired 1985 Ash Basin (State ID No: CHATH-079):
A dewatering/pumping plan had been previously implemented, with basin water pumped to an on-site water treatment system. Following treatment, the water was previously discharged into the canal. An emergency bypass pumping line is installed to allow stormwater to discharge through the permitted discharge point during severe flooding conditions. A new on-site water treatment system was in the process of being installed, with the discharge water flowing to a new headwall on the Cape Fear River installed near the north end of the 1963 Ash Basin. Relocation of the discharge point (pending receipt of new NPDES outfall permit) was required due to stagnant water conditions in the discharge canal. The water level in the basin had risen by approximately 5-feet since ceasing the basin dewatering operations on November 26, 2018.

8. Maintenance
Duke Energy has developed an Operations and Maintenance (O&M) Manual to instruct operation and engineering personnel the proper procedures for operating and maintaining the Ash Basin System. The Station Owners and Station Environmental Coordinators operate and maintain the impoundment facility in a safe and regulatory-compliant manner such as meeting State and Federal laws along with company guidelines without interruption to the station’s generation of electricity. The O&M manual provides the necessary information in a concise and comprehensive manner and assists those responsible for operating and maintaining the ash impoundment facility and associated support features.

Observations during this 2019 inspection indicate that Duke Energy is properly maintaining the facility.