NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY

Environmental Quality

COAL COMBUSTION RESIDUAL IMPOUNDMENT RISK CLASSIFICATIONS

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Collaboration between

Division of Water Resources

Division of Waste Management

Division of Energy, Mineral and Land Resources

EXECUTIVE SUMMARY

Background

Under the historic Coal Ash Management Act (CAMA) of 2014, all coal ash impoundments in North Carolina are required to be closed. The deadlines for closure depend on the classification of each impoundment as low, intermediate, or high. CAMA requires the Department of Environmental Quality (DEQ) to make available to the public a summary of the initial draft proposed classifications no later than Dec. 31, 2015. These draft proposed classifications are based on the information available to the department as of December 2015. They are of critical importance because of the environmental impact and closure costs associated with each classification. Impoundments classified as intermediate or high must be excavated at a potential cost of up to $10 billion for all impoundments, while environmentally protective, less costly options are available for low priority impoundments. Closure costs could be passed on to the ratepayer. It is also important to note that these are not the final proposed classifications. After the release of the summary of the initial draft proposed classifications, CAMA requires the following process:

- DEQ must make available a written declaration that provides the documentation to support the summary of the initial draft proposed classifications within 30 days, which will be made available on the DEQ website. The written declaration will provide the technical and scientific background data and analyses and describe in detail how each impoundment was evaluated.
- DEQ will publish a summary of the declaration weekly for three consecutive weeks in a newspaper in each county where a coal ash facility is located.
- The declaration will be provided to each local health director and made available in a library in each county where a coal ash facility is located.
- The summary of the declaration will be provided to each person who makes a request.
- A public meeting will held in each county where a coal ash facility is located.
- Following completion of the public meetings and the submission of comments, the department will consider the comments and develop final proposed classifications.

Public input and involvement are critically important parts of the classification process. All draft proposed classifications are subject to change based on public comment, including consideration of scientific and technical data gained through the public input process outlined above.

Factors

Four of Duke's 14 facilities are designated as high-risk by the coal ash law. Under CAMA, the department is required to consider the following factors, at a minimum, in proposing classifications for the remaining ten facilities:

1. Any hazards to public health, safety, or welfare resulting from the impoundment.
2. The structural condition and hazard potential of the impoundment.

3. The proximity of surface waters to the impoundment and whether any surface waters are contaminated or threatened by contamination as a result of the impoundment.
4. Information concerning the horizontal and vertical extent of soil and groundwater contamination for all contaminants confirmed to be present in groundwater in exceedance of groundwater quality standards and all significant factors affecting contaminant transport.
5. The location and nature of all receptors and significant exposure pathways.
6. The geological and hydrogeological features influencing the movement and chemical and physical character of the contaminants.
7. The amount and characteristics of coal combustion residuals in the impoundment.
8. Whether the impoundment is located in an area subject to a 100-year flood.
9. Any other factor the department deems relevant to the establishment of risk.

The department incorporated all of the preceding criteria into three primary categories that were used to evaluate each impoundment:

- Structural Integrity
- Impact to Surface Water
- Impact to Groundwater

A brief summary of these three categories and how they factored into the department's draft proposed classifications is presented below. Comprehensive details and information regarding how the factors were applied to each impoundment are included in the following sections of this report. It is important to note that the draft classification process was iterative and occurred over a series of months. Recommendations regarding the impoundments were amended and updated as additional scientific and technical information was received, reviewed and verified.

Structural Integrity

This category included factors regarding the current and future threat to public safety, welfare, or the environment resulting from a structural failure of an impoundment or from the failure of a component of an impoundment (e.g. riser and decant structures). Following the February 2014 coal ash spill at the Dan River Combined Cycle Station, DEQ conducted comprehensive inspections of all impoundments and required Duke Energy to conduct similar inspections, including video inspections of all structures. While no imminent threats to the structural integrity were found, DEQ did issue a number of Notice of Deficiencies (NODs) that required the utility to take action to correct the cited deficiencies.

Subsequent to passage of CAMA, the federal Environmental Protection Agency (EPA) issued its long-awaited Coal Combustion Residuals (CCR) rule that established new federal requirements for the safe storage of coal ash. The CCR rule includes provisions that are applicable to some, but not all, of the impoundments covered under CAMA. Like North Carolina law, many of the CCR provisions are designed to ensure continued structural integrity of the impoundments. The additional review and requirements imposed under the federal CCR were also considered in the

classification analyses. Comprehensive review of all 33 impoundments, the corrective action taken under the NODs, and the implementation of state law requirements, CAMA, and federal CCR supports a finding that none of the 33 impoundments would be considered intermediate or high risk based on structural integrity concerns alone.

Impacts to Surface Waters

This category incorporated factors regarding the location of the impoundments relative to surface waters, the best use of the nearby surface waters, and the impoundments' current impact or potential future impact on these surface waters. Factors taken into consideration regarding surface waters include landscape position and 100-year floodplain; siting of the pond; classification of the receiving waters; and proximity to water supply intake, among others.

The federal CCR rule relies on the existing National Pollutant Discharge Elimination System (NPDES) permitting program for protection of surface waters.

Impacts to Groundwater

This category included factors related to the horizontal and vertical extent of any groundwater contamination associated with the impoundment that exceeds North Carolina's groundwater quality standards and the potential threat to any public or private drinking water supplies. This category was a critical factor in the department's proposed classifications because exceedances of the groundwater standards were measured in the groundwater beneath all 14 Duke facilities. In particular, the department was highly concerned about the potential threat to the environment and public health that could be caused by contaminated groundwater to nearby private or public drinking water wells. Some of the contaminants detected in nearby wells are naturally occurring in North Carolina and also appear in municipal drinking water supplies. As with public drinking water supplies throughout the state, these levels comply with federal drinking water standards.

The federal CCR rule emphasizes the importance of groundwater protection from coal ash contamination.

The coal ash law contains aggressive deadlines for Duke to submit to DEQ data on the extent of groundwater contamination and its impact on private and public wells. CAMA's requirement that Duke provide to DEQ Corrective Action Plan (CAP) Reports that include a "description of all exceedances of the groundwater quality standards, including any exceedances that the owner asserts are the result of natural background conditions" was of particular importance for the department to accurately assess the risk associated with groundwater. CAP Reports for each facility were due to the department in early December. After reviewing the CAP Report submissions, department staff concluded that Duke had failed to provide sufficient information for some impoundments to support a definitive conclusion as to whether the exceedances of groundwater standards near the coal ash impoundments are the result of natural background. The department notified Duke of the deficiencies in their CAP Reports and DEQ continues to review information submitted by Duke after the CAMA deadline.

Draft Proposed Classifications

The department has sufficient information at this time to issue draft proposed classifications for some of the impoundments at the remaining 10 facilities. The draft proposed classification for the H.F. Lee Energy Complex (five impoundments), Cape Fear Steam Electric Plant (five impoundments), W. H. Weatherspoon Power Plant (one impoundment) and Roxboro Steam Electric Plant (Unnamed Eastern Extension Impoundment) facilities is intermediate. The draft proposed classification for the James E. Rogers Energy Complex (Formerly the Cliffside Plant) (two non-active basins), Roxboro Steam Electric Plant (West basin) and the Mayo Steam Electric Plant (one impoundment) is low. For the remaining impoundments, the department only has enough information to narrow the classification to between low and intermediate. The draft proposed classification for the Allen Steam Station (two impoundments); Belews Creek Steam Station (one impoundment); Buck Combined Cycle Station (three impoundments); James E. Rogers Energy Complex (active impoundment); Marshall Steam Station (one impoundment); and Roxboro Steam Electric Plant (East Basin) is low-to-intermediate. A summary table of the classifications is provided below.

Risk Classification Summary Table

Facility	**Basin**	**County**	**Proposed Risk Classification***	**Key Factors for Risk Classification**
Asheville Steam Station	1964 Ash Basin	Buncombe	High	Deemed High Priority for Closure by Part II, Section 3(b) of Coal Ash Management Act
	1982 Ash Basin			
Dan River Combined Cycle Station	Primary Ash Basin	Rockingham		
	Secondary Ash Basin			
Riverbend Steam Station	Primary Ash Basin	Gaston		
	Secondary Ash Basin			
L. V. Sutton Energy Complex	1971 Ash Pond	New Hanover		
	1984 Ash Pond			

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Facility	Basin	County	Proposed Risk Classification*	Key Factors for Risk Classification
Cape Fear Steam Electric Plant	1956 Ash Pond	Chatham	Intermediate	Position of ash impoundments in 100-year flood level and landscape position; The Unnamed Eastern Extension Impoundment at the Roxboro Steam Electric reportedly contains CCR near receptors and requires further assessment
	1963 Ash Pond			
	1970 Ash Pond			
	1978 Ash Pond			
	1985 Ash Pond			
H. F. Lee Energy Complex	Active Ash Pond	Wayne		
	Polishing Pond			
	Ash Pond #1			
	Ash Pond #2			
	Ash Pond #3			
Roxboro Steam Electric Plant	Unnamed Eastern Extension Impoundment	Person		
W. H. Weatherspoon Power Plant	Ash Pond	Robeson		
Allen Steam Station	Active Ash Basin	Gaston	Low to Intermediate	Uncertainty related to site conditions that may relate to potential impacts to up-gradient and side-gradient well users at this time
	Retired Ash Basin			
Belews Creek Steam Station	Active Ash Basin	Stokes		
Buck Combined Cycle Station	Ash Basin 1	Rowan		
	Ash Basin 2			
	Ash Basin 3			
James E. Rogers Energy Complex (formerly Cliffside Steam Station)	Active Ash Basin	Cleveland/ Rutherford		
Marshall Steam Station	Ash Basin	Catawba		
Roxboro Steam Electric Plant	East Ash Pond	Person		

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Facility	Basin	County	Proposed Risk Classification*	Key Factors for Risk Classification
James E. Rogers Energy Complex (formerly Cliffside Steam Station)	Retired Unit 1-4 Basin	Cleveland/ Rutherford	Low	Lack of well-user receptors within CCR groundwater impact footprint; low risk with respect to dam safety if modifications and/or dewatering are completed
	Retired Unit 5 Basin			
Mayo Steam Electric Plant	Ash Pond	Person		
Roxboro Steam Electric Plant	West Ash Pond	Person		

*Proposed risk classifications are contingent on all necessary structural repairs being completed to address dam safety requirements.

Next Steps

In accordance with CAMA, the following report is a written declaration that includes findings of fact that document and support the department's initial draft proposed classifications. This written declaration is being widely distributed and the department will hold multiple meetings to solicit comments. Every draft proposed classification is subject to change based on public comment, including scientific and technical data gained through the public input process. Public meetings and comment periods will be announced in local newspapers where the ash pond facilities are located. Information regarding the date, time, and location of the public meeting has been posted on the DEQ website.

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INTRODUCTION

Coal Ash Management Act

According to the Coal Ash Management Act (CAMA) of 2014, the North Carolina Department of Environmental Quality (DEQ) must classify the coal combustion residuals surface impoundments (CCR impoundments or impoundments) at each of Duke Energy's fourteen (14) coal ash facilities. The CCR impoundments include both active and inactive basins. CAMA G.S.130A-309.213(a) states:

> *"As soon as practicable, but no later than December 31, 2015, the Department shall develop proposed classifications for all coal combustion residuals surface impoundments, including active and retired sites, for the purpose of closure and remediation based on these sites' risks to public health, safety, and welfare; the environment; and natural resources and shall determine a schedule for closure and required remediation that is based on the degree of risk to public health, safety, and welfare; the environment; and natural resources posed by the impoundments and that gives priority to the closure and required remediation of impoundments that pose the greatest risk…"*

In evaluating and assessing the risks for each CCR impoundment, CAMA G.S.130A-309.213(a) lists the following criteria for consideration:

(1) Any hazards to public health, safety, or welfare resulting from the impoundment.
(2) The structural condition and hazard potential of the impoundment.
(3) The proximity of surface waters to the impoundment and whether any surface waters are contaminated or threatened by contamination as a result of the impoundment.
(4) Information concerning the horizontal and vertical extent of soil and groundwater contamination for all contaminants confirmed to be present in groundwater in exceedance of groundwater quality standards and all significant factors affecting contaminant transport.
(5) The location and nature of all receptors and significant exposure pathways.
(6) The geological and hydrogeological features influencing the movement and chemical and physical character of the contaminants.
(7) The amount and characteristics of coal combustion residuals in the impoundment.
(8) Whether the impoundment is located within an area subject to a 100-year flood.
(9) Any other factor the Department deems relevant to establishment of risk.

According to G.S.130A-309.213(b), there are three possible classifications for CCR impoundments: high risk, intermediate risk, and low risk. A CCR impoundment that is classified as high risk must be closed as soon as practicable, but not later than December 31, 2019. Two options are given in how the impoundment must be closed, with details given in G.S.130A-309.214(a)(1). Intermediate-risk CCR impoundments must be closed as soon as practicable, but

no later than December 31, 2024 and must be in accordance with G.S.130A-309.214(a)(2). Low-risk CCR impoundments must be closed as soon as practicable, but no later than December 31, 2029 and must be in accordance with General Statue 130A-309.214(a)(3).

Federal CCR Rule

On December 19, 2014, the EPA Administrator signed a final rule that establishes a comprehensive set of requirements for the disposal of coal combustion residuals (CCRs) in landfills and surface impoundments. The rule was published in the Federal Register on April 17, 2015:

http://www2.epa.gov/coalash/coal-ash-rule

This rule establishes requirements for both existing and new CCR landfills and surface impoundments, including lateral expansions of any existing unit. Specifically, no later than October 17, 2018, owners or operators must demonstrate that their existing landfills or surface impoundments currently meet these restrictions, through engineering enhancements, or established alternatives as set forth in the rule. Owners or operators of existing units that cannot make the required demonstrations must close the unit. New units must be built in compliance with the requirements. 40 CFR Section 257.64 states the following:

> **§ 257.64 Unstable areas.**
> *(a) An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.*
> *(b) The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:*
> *(1) On-site or local soil conditions that may result in significant differential settling;*
> *(2) On-site or local geologic or geomorphologic features; and*
> *(3) On-site or local human-made features or events (both surface and subsurface).*
> *(c) The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer stating that the demonstration meets the requirements of paragraph (a) of this section.*

The failure to provide this demonstration will result in the closure or retrofit of CCR units in keeping with 40 CFR Sections 257.101 and 257.102.

The requirements set forth in CAMA, including the groundwater assessments, corrective actions for groundwater quality, drinking water supply well investigations, identification of discharges, and dam safety will complement or exceed the Federal CCR rule compliance efforts for the coal power plants in the North Carolina.

Groundwater monitoring and increased NPDES monitoring during dewatering and ash removal will help assess the efficacy of the closure efforts and provide new information on ash removal and dewatering treatment methods. The monitoring will also help assess how ash pore water and downgradient CCR concentrations are affected by changes in redox conditions that may occur during closure. In addition, the closure efforts will increase the base of information and expertise related to the safe removal and transport of coal ash and to landfill leachate management. This information will be valuable for use for managing the remaining CCR impoundments in North Carolina and may prove helpful to facilities beyond North Carolina.

METHODOLOGIES

Overview

In order to evaluate each CCR impoundment based on the nine criteria set forth in G.S.130A-309.213, DEQ formed a risk classification group. This group was divided into three subgroups based on areas of expertise: groundwater, surface water, and dam safety. Each subgroup then developed a set of factors to address the nine criteria. These factors were applied to each CCR impoundment to determine an overall individual risk classification ranking for that impoundment.

The following reports, as required pursuant to CAMA, were used in the evaluation by the work group:

- Groundwater Assessments of Coal Combustion Residuals Surface Impoundments, also referred to as the Comprehensive Site Assessment Reports (G.S. 130A-309.211(a));
- Plans of Corrective Action for the Restoration of Groundwater Quality, also referred to as the CAP Report (G.S. 130A-309.211(b));
- Surveys of the Drinking Water Supply Wells and Provision of Alternate Water Supply (G.S. 130A-309.211(c));
- Maps showing the Identification of Discharges from Coal Combustion Residuals Surface Impoundments (G.S. 130A-309.212(a));
- Assessment of Discharges from Coal Combustion Residuals Surface Impoundments to the Surface Waters of the State (G.S. 130A-309.212(b)); and
- Plans of Corrective Action to Prevent Unpermitted Discharges from Coal Combustion Residuals Surface Impoundments to the Surface Waters of the State (G.S. 130A-309.212(c)).

CAMA Deemed High-Priority Sites

According to CAMA Section 3(b), the CCR impoundments at the following facilities are deemed high priority:

- CCR impoundments located at the Dan River Steam Station, owned and operated by Duke Energy Progress, and located in Rockingham County.
- CCR impoundments located at the Riverbend Steam Station, owned and operated by Duke Energy Carolinas, and located in Gaston County.
- CCR impoundments located at the Asheville Steam Electric Generating Plant, owned and operated by Duke Energy Progress, and located in Buncombe County.
- CCR impoundments located at the Sutton Plant, owned and operated by Duke Energy Progress, and located in New Hanover County.

An overall classification of high or intermediate risk requires remediation in the form of excavation of the CCR from the impoundment. An overall classification of low-risk allows for the option of

capping the CCR impoundment in place. It should be noted that capping-in-place is not the only option for remediation under the low risk classification. G.S.130A-309.214(a)(3)(a) allows for closure options as with high or intermediate risk classifications. If an overall classification of low risk is assigned DEQ will review any and all additional information requested of and/or presented by Duke Energy, as well as, public input to determine the most appropriate closure method that is protective of public health, safety, and welfare; the environment; and the natural resource which could include complete or partial excavation of the CCR impoundment.

Classification Methodology

For all three subgroups (groundwater, surface water and dam safety), classification of risk began with developing a series of factors that satisfy one or more of the nine criteria presented under G.S.130A-309.213(a). The end goal for classification of risk is to establish a schedule for closure and required remediation that is based on the degree of risk that is posed by the CCR impoundments. The three subgroups have placed a primary emphasis on risk as it relates to the public from a groundwater, surface water, and dam safety perspective. Therefore, a key factor was established to directly address the immediate risk to public health, safety, and welfare. The remaining supporting factors and other considerations were used to refine the risk classification and address the actual or potential risk to the environment and natural resources. The key factor for each subgroup plays a significant role in assigning an overall classification to each CCR impoundment with the supporting factors playing lesser roles.

It should be noted that assigning high and intermediate risk rankings to the supporting factors and other considerations, acknowledges a negative impact to the environment and/or natural resources but does not necessarily represent an immediate risk to public health, safety and welfare.

Groundwater Methodology

The processes and site conditions that determine risk to human health and the environment posed by a contaminated site are described and integrated in a conceptual site model. Risk classification for groundwater addresses conceptual site model elements that relate to contaminant source(s), contaminant migration, exposure pathways, and receptors specific to the CCR impoundments. Evaluation of groundwater exposure risk incorporates comprehensive site assessment data as well as the results of groundwater models developed in support of the corrective action plans. Uncertainties associated with the conceptual site model are acknowledged and addressed as part of the risk classification process.

The decision-making process allows for scoring of high, intermediate, or low risk for all factors that relate to those criteria identified in CAMA, but is focused on assigning the overall groundwater risk classification based on identifying human receptors that are potentially or currently exposed to the source(s) or migration pathways. Following this overarching principle, the ultimate deciding factor of the groundwater risk classification evaluation is weighted to the determination of potential direct exposure contact that poses an imminent risk to human health. Potential exposure

to groundwater contamination in the conceptual model for the coal ash residuals impoundments could occur via two absorption routes – ingestion and dermal contact.

Surface Water Methodology

Classification for risk of surface water began with developing a series of factors that satisfy one or more of the nine criteria presented under G.S. 130A-309.213(a).

Dam Safety Methodology

Classification of risk for dam safety began with developing a series of factors that satisfy one or more of the nine criteria presented under CAMA G.S.130A-309.213(a). CAMA directly stated that the hazard classification, structural condition and hazard potential, proximity of surface waters to the impoundment, and any other factors that the Department deemed relevant to establishment of risk should be considered when assessing the risks of the impoundments. When designing and maintaining a dam, there are several components of a dam that are important and should be considered. All of these components can be found in the Dam Safety Law and Administrative Code. The two most important components of a dam are 1) structural stability and 2) hydrology & hydraulics (H&H). Structural stability pertains to the design of the embankment whereas hydrology & hydraulics deals with the amount of inflowing water to the impoundment versus the amount of outflowing water from the impoundment. It should be noted that in order to evaluate risk, the most common types of failure of dams should be considered. The two most common types of failure of dams are piping and overtopping, while failures from maintenance related items are less frequent. Piping failures are related to structural stability, overtopping failures are related to the hydrology & hydraulics, and maintenance failures are related to the lack of routine maintenance of a dam that lead to future piping and overtopping issues. As the two most common failures of a dam are related to the structural stability and hydrology & hydraulics, each of these parameters were assigned thirty (30) percent of the total weighting of risk assessment. As maintenance related failures are less common, this parameter was assigned twenty (20) percent of the total weighting of risk assessment. The other two categories for considering risk are hazard classification and proximity of surface waters to the impoundment. Each of these parameters were assigned ten (10) percent of the total weighting of risk assessment. It is worth noting that the hydrology & hydraulics parameter noted above was separated into three distinct categories, each at ten (10) percent, as follows: volume of impoundment, free water content, and offsite drainage area.

Key Factors

In accordance with the criteria specified in CAMA, DEQ developed key factors that played a critical role in defining the overall classification of the impoundment based on potential threat to public health and the environment.

The groundwater key factor is as follows:

- Based on the data provided in CSA Report and results of the initial groundwater modeling presented in the CAP Reports, the number of down-gradient receptors (well users) 1,500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:

    - Low Risk – 0 people
    - Low/Intermediate Risk – 1-10 people
    - Intermediate Risk – 11-20 people
    - Intermediate/High Risk – 21-30 people
    - High Risk - >30 people

  This risk factor addresses the CAMA criteria to account for the location and nature of all receptors and significant exposure pathways as well as the nature and extent of CCR impacted groundwater. For this factor, DEQ assumed that, for single-family residences, there were 2.5 users per well. For public water supply wells, DEQ assumed 25 users per well.

The surface water key factor is as follows:

- Landscape Position and Floodplain. In North Carolina, CCR impoundments are sited in landscape positions along both lotic (flowing) rivers and adjacent to reservoirs. Reservoirs are lentic aquatic communities that are not free flowing, rather they have protracted detention times and can become thermally stratified. Flowing rivers have the potential to have higher flow rates and provide greater dilution as compared to reservoirs.

  The floodplain is a strip of relatively smooth land bordering a stream and overflowed at time of high water. These landscapes are depositional features of the river valley associated with a particular or hydrologic regime of the drainage basin (Leopold 1992). CCR impoundments located within a floodplain can pose a significant risk to surface waters. Accordingly, consideration of 100-year flood level, CCR impoundment location and river valley floodplain is a reasonable measure for when a CCR impoundment presents an elevated risk to adjacent surface waters.

  For this landscape position and floodplain criteria, CCR impoundments located outside of the 100 year floodplain and impoundments contained by a stream valley embankments with a designed/engineered discharge (spillway) were determined to be Low Risk.

CCR impoundments sited along the run of river, within the floodplain, and within the 100-year flood level were determined to be High Risk.

To understand the position of CCR impoundments with regard to the 100-year flood level, DEQ utilized the Flood Risk Information System website at www.ncfloodmaps.com.

The dam safety key factor is as follows:

- State of Structural Stability and Maintenance. The nature and extent of the structural condition of the coal ash impoundments is specifically identified as risk classification criterion in CAMA. In order to assess this factor, it is imperative to consider the past and current condition assessments that have been made during routine inspections of the impoundments. By looking at recent and past inspections of the impoundments, visual condition assessments of the maintenance as well as the structural condition of the impoundments can be obtained. In order to gain a deeper depth of knowledge of the current and future structural condition of the impoundments, it is essential to look at the short term and long term stability analyses obtained from geotechnical engineering reports. Also, it is imperative to take into consideration that various projects to improve the structural condition and maintenance of the impoundments have been recently approved or are currently under review, and that construction to repair the dam has been recently completed, is underway, or is scheduled to commence in the near future. Since there may soon be a change in the structural condition of the impoundment due to design approvals and commencement of construction that improves the structural condition of a dam, it is essential to provide a risk assessment of the condition of a dam before and after construction to repair the dam is completed. This factor was divided into three categories:

    - Low Risk – Notice of Inspection issued at last inspection
    - Intermediate Risk – Notice of Deficiency with non-structural deficiencies issued at last inspection
    - High Risk – Notice of Deficiency with structural deficiencies issued at last inspection

Supporting Factors and Other Considerations

In addition to these key factors DEQ analyzed a wide range of additional information that was gathered as part of this classification process. This supporting information provides a more detailed picture of the conditions at the impoundments, but has less significance in the determination of the overall classification.

The supporting factors and other considerations for groundwater are as follows:

- Amount of Stored CCR Reported in an Impoundment. The volume of impounded CCR is specifically identified as a risk classification criterion in CAMA. The risk, as it relates to groundwater, is associated with the leaching of coal ash constituents to groundwater. Risk for this factor is divided into three categories:

    - Low Risk – 0 to 3,240,103 tons
    - Intermediate Risk – 3,240,104 to 12,512,755 tons
    - High Risk – >12,512,755 tons

  In this capacity, tonnage is used as a surrogate for volume because that information is readily available. Estimates of stored CCR were obtained from Duke Energy's website (https://www.duke-energy.com/pdfs/duke-energy-ash-metrics.pdf). This data was current as of September 25, 2015.

  The categories were defined using the average (7,900,000 tons) and standard deviation (4,600,000 tons) of the reported total amounts of all CCR impoundments. The groundwater subgroup looked at the total tonnage of all CCR impoundments at the facility. The groundwater subgroup viewed the groundwater impacts resulting from the source material as cumulative over the entire site because it is problematic to segregate the impacts from the adjacent coal ash impoundments.

- Depth of CCR with Respect to the Water Table. This risk factor is important because CCR that is saturated (below the water table) has a greater tendency to leach constituents to groundwater and thereby result in a greater risk to downgradient receptors. The risk for this factor was divided into three categories based on location of the seasonal water table:

    - Low Risk – Bottom of CCR in the impoundment above the water table
    - Intermediate Risk – Bottom of CCR in the impoundment approximately equal to water table
    - High Risk – Bottom of CCR in the impoundment below water table

- Exceedance of Title 15A of the North Carolina Administrative Code (NCAC) 02L Standard (2L Standard) or Interim Maximum Allowable Concentrations (IMAC) at or Beyond the Established CCR Impoundment Compliance Boundary. This risk factor addresses the CAMA criteria to account for the nature and extent of CCR impacted groundwater as well as the relative toxicity, carcinogenicity, and contaminant transport properties of a constituent. Risk for this factor was divided into three categories based on toxicity/ carcinogenicity of the exceedances reported in the groundwater samples obtained from compliance monitoring and CSA Report

investigations obtained from compliance monitoring and CSA Report investigations:

- Low Risk – Aluminum, iron, manganese, molybdenum, and strontium
- Intermediate Risk – Barium
- High Risk – Antimony, arsenic, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, thallium, vanadium, and zinc

The toxicity ratings are based on data evaluation presented in the United States Geological Survey Circular 1133 (*Contaminants in the Mississippi River*, 1987-92). The relative toxicity ranges presented for groundwater constituents also reflects EPA maximum contaminant levels as well as 2L Standards and IMACs, which are based on toxicity and adverse health effects.

Most of these constituents can occur naturally in the environment at various levels depending on local geological and geochemical conditions, which are referred to as background concentrations. It should be noted that determinations of background concentrations for the constituents of interest are still on-going at all of the facilities.

- Population Served by Water Supply Wells within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary. This risk factor addresses the CAMA criteria to account for the location and nature of all receptors and significant exposure pathways. This risk factor also relates to the nature and extent of contaminated groundwater with respect to the CCR impoundments. Because past and/or present pumping may have altered flow paths, there is an element of uncertainty related to water quality in wells near the CCR impoundments. This presents an element of uncertainty and therefore potential risk to the population served by water wells within 1,500 feet of a CCR impoundment is considered even if the wells are not determined to be downgradient of the CCR impoundments in the CSA Reports. Risk for this factor was divided into five categories:

  - Low Risk – 0 people
  - Low/Intermediate Risk – 1-10 people
  - Intermediate Risk – 11-20 people
  - Intermediate/High Risk – 21-30 people
  - High Risk - >30 people

In several factors (including this one and several others), a distance of 1,500 feet from the established CCR impoundment compliance boundary was used. Per G.S.130A-309.211(c), Duke Energy conducted a water supply well survey around

each of their 14 facilities. This survey was performed out to a distance of one-half mile from the established CCR impoundment compliance boundaries. Also per this general statue, beginning in January 2015, testing of private/public water supply wells began. Residents within 1,500 feet of the established CCR impoundment compliance boundaries were contacted regarding having their wells tested. Therefore, most of the offsite private/public location and groundwater quality data comes from wells sampled as part of this effort within this radius.

For this factor, DEQ assumed that, for single-family residences, there were 2.5 users per well. For public water supply wells, DEQ assumed 25 users per well.

- Population Served by Water Supply Wells Within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary. The location and nature of all receptors and significant exposure pathways is specifically identified as a risk classification criterion in CAMA. This risk classification question also relates to the nature and extent of impacted groundwater related to the CCR impoundments. A radius of 1,500 feet from the compliance boundary is used to be consistent with the receptor well sampling program that was implemented as part of the CSA Reports. This factor is similar to another groundwater factor with the exception that this factor considers only populations hydraulically downgradient of the CCR impoundment. This factor was divided into five categories:

    - Low Risk – 0 people
    - Low/Intermediate Risk – 1-10 people
    - Intermediate Risk – 11-20 people
    - Intermediate/High Risk – 21-30 people
    - High Risk - >30 people

  For this factor, DEQ assumed that, for single-family residences, there were 2.5 users per well. For public water supply wells, DEQ assumed 25 users per well.

- Proximity of 15A NCAC 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells. The location and nature of all receptors and significant exposure pathways is specifically identified as a risk classification criterion in CAMA. This risk classification question also relates to the nature and extent of impacted groundwater related to the CCR impoundments. The exceedances were reported in groundwater samples taken from wells drilled as part of the CSA Reports at each facility. This factor considers all wells regardless of their positioning from the CCR impoundment and the detected exceedance. This factor was divided into three categories of location:

    - Low Risk – >1,500 feet

- Intermediate Risk – Between 500 and 1,500 feet
- High Risk – <500 feet

In several factors (including this one and several others), a distance of 1,500 feet from the established CCR impoundment compliance boundary was used. Per G.S.130A-309.211(c), Duke Energy conducted a water supply well survey around each of their 14 facilities. This survey was performed out to a distance of one-half mile from the established CCR impoundment compliance boundaries. Also per this general statue, beginning in January 2015, testing of private/public water supply wells began. Residents within 1,500 feet of the established CCR impoundment compliance boundaries were contacted regarding having their wells tested. Therefore, most of the offsite private/public location and groundwater quality data comes from wells sampled as part of this effort within this radius.

Most of these constituents can occur naturally in the environment at various levels depending on local geological and geochemical conditions, which are referred to as background concentrations. It should be noted that determinations of background concentrations for the constituents of interest are still on-going at all of the facilities.

- Groundwater Emanating from the Impoundment that Exceeds 15A NCAC 2L Standard or IMAC and that Discharges into a Surface Water Body. This risk classification question addresses the location and nature of all receptors and significant exposure pathways as well as nature and extent of impacted groundwater associated with the CCR impoundments and surface water impacts. This factor was divided into three categories based on toxicity of the exceedances reported in the groundwater samples:

  - Low Risk – Aluminum, iron, manganese, molybdenum, and strontium
  - Intermediate Risk – Barium
  - High Risk – Antimony, arsenic, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, thallium, vanadium, and zinc

The toxicity data was taken from the United States Geological Survey Circular 1133. The relative toxicity ranges for groundwater constituents reflects EPA maximum contaminant levels as well as 2L Standards and IMACs.

Most of these constituents can occur naturally in the environment at various levels depending on local geological and geochemical conditions, which are referred to as background concentrations. It should be noted that determinations of background concentrations for the constituents of interest are still on-going at all of the facilities.

- Exposure to CCR and Contaminated Soil by Ingestion or Fugitive Emissions. Potential exposure to coal ash and contaminated soil addresses aspects of hazards related to the CCR impoundments, location of receptors and exposure pathways, amount/characteristics of coal ash, and the extent of contaminated soil identified in CAMA risk classification criteria. The risk for this factor was divided into three exposure categories:

    - Low Risk – 0 people
    - Intermediate Risk – 1 to 100 people
    - High Risk – >100 people

    Because the sites are restricted to the public and institutional controls are in place to restrict access and safety programs are implemented for authorized personnel , this risk factor did not take into account Duke Energy employees or their contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors. Components of the conceptual site model components related to a CCR impoundment that are incomplete or inadequately characterized contribute a degree of uncertainty that translates to an increased potential risk to the classification evaluation process. For example, pumping effects and subsurface heterogeneities may influence contaminant transport, but may not be adequately addressed in a CSA Report or CAP Report because of data gaps and limited modeling scenarios conducted to date. Other examples of data gaps or uncertainty may include insufficiently low laboratory detection limits, vertical extent of contamination not delineated, potential underflow under a stream, etc. Any missing data needed to adequately understand source(s), flowpaths, contaminant migration, exposure pathways, and receptors represent uncertainties related to site assessment and in turn, the risk classification process. For scoring purposes, this factor considered the relative level of uncertainty and was not divided into categories; the higher the degree of uncertainty, the greater the potential risk.

The supporting factors and other considerations for surface water are as follows:

- NPDES Wastewater and Ash Disposal Methods. There are several different types of wastewater treatment technologies that are typically used at coal-fired power plants. There are also differences in ash handling and disposal methods. This variation corresponds to disposal systems that produce higher concentrations of coal combustion residuals at one facility as compared to another. For example, once through cooling water effluents that are not mixed with other CCR waste have lower contaminant concentrations and are not enriched beyond that of upstream reference. When CCR effluents and cooling water discharges are blended, the

contaminant level is diluted. Wet ash disposal systems have higher concentrations of CCR constituents when compared to the upstream waters. Flue Gas Desulfurization (FGD) effluent has larger enrichments compared to the ash discharge only outfalls (Ruhl 2012). Accordingly, as the different combinations of NPDES and coal combustion residual disposal methods elevate constituent concentrations, the risk increases. This factor was divided into four categories:

- Low/Intermediate Risk – Impoundment is retired and no longer receiving CCR. CCR are handled in the following manner(s):
  - Cooling water, dry fly ash, and bottom ash handling;
  - FGD wastewater is evaporated through the Zero Liquid Discharge (ZLD) process; and
  - CCR go to a landfill.
- Intermediate Risk – CCR are handled through cooling water, wet fly ash and/or wet bottom ash with no FGD
- Intermediate/High Risk – CCR are handled through cooling water, dry fly ash, wet bottom ash, FGD, and a landfill that is located on top of and partially capping an active impoundment
- High Risk – CCR are handled through cooling water, dry fly ash, wet bottom ash, wet fly ash, wet bottom ash, and FGD.

In response to the clean smokestacks legislation, select coal-burning power plants have installed FGD scrubbers on operating units. The waste water that is generated from this process contains high concentrations of CCR. The active basins housed at these facilities receive the highest rank. However, if the facility generates FGD wastes and the CCR impoundment has a landfill partially capping the basin, the ranking is reduced to intermediate/high.

- <u>CCR Impoundments Footprint Siting in Natural Drainage Way or Stream</u>. A review of topographic map contours and aerial photographs (current and historic) confirm that CCR impoundments are commonly located in natural drainage ways and tributaries. This factor was divided into three categories:

  - Low Risk – CCR impoundments not sited on top of waters (stream)
  - Low/Intermediate Risk – CCR impoundments sited in or located on top of a stream or natural drainage way
  - High Risk - CCR impoundments located within the arm of a reservoir

  CCR impoundments not sited in waters or drainage ways were considered not to be a risk because there is no water feature to impact. For locations where the CCR impoundment is sited in or located on top of a stream or natural drainage feature, the stream footprint is no longer present. In this setting, there is low risk related to

surface water; however, the downstream proximity to surface waters and threat of potential impacts remains. For CCR impoundments located within the arm of a reservoir, the risk for contamination is further elevated due to proximity of surface waters and protracted detention times which is considered high-risk.

- Potential to Impact Surface Water Based on Total Ash Amount at Facility. Increased volumes of coal combustion residuals contained in unlined CCR impoundments correspond to larger amounts of contaminants available to be mobilized and transported to surface water. In this capacity, tonnage is used as a surrogate for volume because that information is readily available while measured volumes are not. This factor is divided into five categories:

    - Low Risk – <100,000 tons
    - Low/Intermediate Risk – 100,001 to 675,000 tons
    - Intermediate Risk – 675,001 to 1,825,000 tons
    - Intermediate/High Risk – 1,825,001 to 4,255,000 tons
    - High Risk – >4,255,000 tons

  Whereas the groundwater group looked at the total amount of CCR in all the impoundments on each site, the surface water group looked at the amounts in the individual impoundments. On September 10, 2014, Duke Energy provided DEQ with amounts of CCR stored in each of the impoundments for each facility. The lowest amount reported was 9,000 tons and the highest amount reported was 22,270,000 tons. The median value was 1,825,000 tons. The categories were based on the percentiles of the amounts. For example, the low/intermediate, intermediate, and intermediate/high risk categories represent the 25th, 50th, and 75th percentiles respectively.

- Potential to Impact Surface Water Based on Dilution. The impacts of the effluent discharge from NPDES outfalls in the downstream waterways is dependent on the flow rate to river/lake/reservoir (dilution effect), residence time in the water body, and the mobilization (i.e. adsorption/desorption to sediment) (Ruhl 2012). The term 7Q10 means the seven-day consecutive low flow (cubic feet/second) with a ten year return frequency or the lowest stream flow for seven consecutive days that would be expected to occur once in ten years. The consideration of stream flow and residence time is a way to evaluate surface water risk. This factor was divided into four categories:

    - Low Risk – Lotic systems with 7Q10 ≥500 cubic feet per second (cfs)
    - Low/Intermediate Risk – Lotic systems with 7Q10 ≥200 cfs and <500 cfs

- Intermediate Risk – Lotic systems with 7Q10 >0 and <200 cfs and lentic systems with positive 7Q10
- High Risk – Lentic systems with 7Q10 = 0

Flowing (lotic systems) run-of-river receiving waters typically have greater dilution and lower detention times, thus they are given the lowest risk. Conversely, reservoirs (lotic systems) with no 7Q10 have the lowest dilution effect and exhibit protracted residence times, thus they are given the highest risk.

- Development Density of Single-Family Residences along Lake/Reservoir Shoreline. The risk of CCR impoundment impacts that inhibit best use of waters are elevated in close proximity to unlined CCR impoundments. The increase density of single-family residences along the lakeshore edges in close proximity to CCR impoundments represent an increased risk. This factor was divided into three categories:

  - Low Risk – No lake/reservoir (CCR impoundment located along river)
  - Low Risk – 0-400 houses on lakeshore within a 2-mile radius of CCR impoundment
  - Intermediate Risk – >401 houses on lakeshore within a 2-mile radius of CCR impoundment

  Due to floodplain and flowing river systems, this factor was not applied to facilities located along the run-of-river. The CCR impoundments along the run-of-river received no rank for this factor. A radius of 2-miles was chosen and investigated to understand the frequency of single-family residences located on the lakeshore and in close proximity to CCR impoundments. This data was determined from 2012 (release date) NAIP orthoimagery, lake shoreline data from www.ncfloodmaps.com, county parcel data, and homes (defined as parcel with building value greater than $10,000).

- Classification of the Receiving Waters. Title 15A of the North Carolina Administrative Code (NCAC) Section 02B .0200 describes the classification of surface waters. Rule 15A NCAC 02B .0201(c) states, *"The Commission shall consider the present and anticipated usage of waters with quality higher than the standards, including any uses not specified by the assigned classification (such as outstanding national resource waters or waters of exceptional water quality) and shall not allow degradation of the quality of waters with quality higher than the standards below the water quality necessary to maintain existing and anticipated uses of those waters."* Essentially, the more sensitive the waters or the more users/consumers of that water increases the risk. This factor was divided into five categories:

- Low Risk – Class C
- Low/Intermediate Risk – Water Supply V (WS-V)
- Intermediate Risk – Class B: Protected for Primary Recreation
- Intermediate/High Risk – Water Supply IV (WS-IV)
- High Risk – Water Supply IV Ca (WS-IV Ca)

Class C: Freshwater protected for secondary recreation, fishing, aquatic life including propagation and survival, and wildlife. All freshwater shall be classified to protect these uses at a minimum. (15A NCAC 02B .0101)

Class WS-V: Class WS-V waters protected as water supplies which are generally upstream of and draining to Class WS-IV waters. No categorical restrictions on watershed development or treated wastewater discharges shall be required. However, the Environmental Management Commission or its designee may apply appropriate management requirements as deemed necessary for the protection of downstream receiving waters (15A NCAC 2B .0203); suitable for all Class C uses. (15A NCAC 02B .0101) [Note: Waters classified as a WS-V are generally upstream and draining to Class WS-IV waters; or waters previously used for drinking water supply purpose; or waters used by industry to supply the employees, but not municipalities or counties with a raw drinking water supply sources. (15A NCAC 02B .0218)]

Class B: Freshwater protected for primary recreation which includes swimming on a frequent or organized basis and all Class C uses. (15A NCAC 02B .0101)

WS-IV: Waters protected as water supplies which are generally in moderately to highly developed watersheds. Point source discharges of treated wastewater are permitted pursuant to Rule .0104 and .0211 of this subchapter. Local programs to control nonpoint sources and storm water discharges of pollution shall be required; suitable for all Class C uses. (15A NCAC 02B .0101)

Critical Area (Ca): Critical area means the area adjacent to a water supply intake or reservoir where risk associated with pollution is greater than from the remaining portions of the watershed. The critical area is defined as extending ½ mile from the normal pool elevation of the reservoir in which the intake is located or to the ridge line of the watershed (whichever comes first); or ½ mile upstream from and draining to the intake (or other appropriate downstream location associated with the water supply) located directly in the stream or river (run-of-the-river) or to the ridge line of the watershed (whichever comes first). (15A NCAC 02B .0202)

- Proximity to Water Supply Intake. Rule 15A NCAC 02B .0104(c) states, *"All waters used for water supply purposes or intended for future water supply use shall be classified to the most appropriate water supply classification as determined by the Commission…"* For these classified waters, the closer the water supply intake is to the CCR impoundment, the greater the risk. This factor was divided into three categories:

    - Low Risk – No water supply intake downstream of CCR impoundment
    - Intermediate Risk – Water Supply V or water supply intake is greater than 10 miles downstream from CCR impoundment
    - High Risk – Water supply intake is less than 10 miles from CCR impoundment

    Waters classified as a WS-V are generally upstream and draining to Class WS-IV waters; or waters previously used for drinking water supply purpose; or waters used by industry to supply the employees, but not municipalities or counties with a raw drinking water supply sources. (15A NCAC 02B .0218)

    Water supply IV are generally in moderately to highly developed watersheds or protected areas and meet average water supply watershed development density as specified in the 15A NCAC 02B .0216.

    Ranking classification increases as proximity of the water supply intake (use) becomes closer. Water supply protected area for run-of-river intakes is defined 10 miles upstream and draining to the intake located directly in the stream or river (run-of-the-river) or to the ridge line of the watershed (whichever comes first). [15A NCAC 02B .0202 (53)]

The supporting factors and other considerations for dam safety are as follows:

- Hazard Classification. The nature and extent of the hazard classification of the coal ash impoundments is specifically identified as risk classification criterion in CAMA. North Carolina Administrative Code – Title 15A, Department of Environment and Natural Resources, Subchapter 2K – Dam Safety .0105 Classification of Dams states under (a) For the purposes of this Subchapter, dams shall be divided into three classes, which shall be known as class A (low hazard), class B (intermediate hazard), and class C (high hazard). Class A includes dams located where failure may damage uninhabited low value non-residential buildings, agricultural land, or low volume roads. Class B includes dams located where failure may damage highways or secondary railroads, cause interruption of use or service of public utilities, cause minor damage to isolated homes, or cause minor damage to commercial and industrial buildings. Damage to these structures will be

considered minor only when they are located in back water areas not subjected to the direct path of the breach flood wave; and they will experience no more than 1.5 feet of flood rise due to breaching above the lowest ground elevation adjacent to the outside foundation walls or no more than 1.5 feet of flood rise due to breaching above the lowest floor elevation of the structure, the lower of the two elevations governing. All other damage potential will be considered serious. Class C includes dams located where failure will likely cause loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, primary highways, or major railroads.

North Carolina Administrative Code – Title 15A, Department of Environment and Natural Resources, Subchapter 2K – Dam Safety .0205(e) provides the following:

Size	Total Storage (Acre-Feet)*	Height (Feet)*
Small	less than 750	less than 35
Medium	equal to or greater than 750 and less than 7,500	equal to or greater than 35 and less than 50
Large	equal to or greater than 7,500 and less than 50,000	equal to or greater than 50 and less than 100
Very Large	equal to or greater than 50,000	equal to or greater than 100

*The factor determining the largest size shall govern.

Therefore, based on the information provided above, this factor was divided into five categories:

- Low Risk – Low and Intermediate Hazard
- Low/Intermediate Risk – High Hazard – Environmental Concerns – Small Size
- Intermediate Risk – High Hazard – Environmental Concerns – Medium Size
- Intermediate/High Risk – High Hazard – Environmental Concerns – Large or Very Large Size
- High Risk – High Hazard – Potential Loss of Life

- Proximity to Waters of the State. The nature and extent of the CCR impoundments proximity to waters of the state is specifically identified as a risk classification criterion in CAMA. In order to assess this factor, it is imperative to consider that, if a CCR impoundment were to breach, (1) could coal combustion residuals from the CCR impoundment reach waters of the state, (2) would it only slump or migrate across the ground, or (3) would it be contained inside a larger basin downstream. This factor was divided into three categories:

- Low Risk – Located within or above a larger CCR impoundment with a large amount of available storage
- Intermediate Risk – Potential coal combustion residual migration constrained by physical barrier
- High Risk – Directly adjacent to waters of the state

- Volume of Facility. The nature and extent of the volume of the impoundment was considered in order to provide an assessment of the risk because if the dam were to fail, it is likely that larger impoundments could cause more damage downstream than smaller impoundments. This factor was divided into three categories:

  - Low Risk – Volume less than 1,500 acre-feet
  - Intermediate Risk – Volume greater than or equal to 1,500 acre-feet and less than or equal to 3,000 acre-feet
  - High Risk – Volume greater than 3,000 acre-feet

- Free Water Content. The nature and extent of the free water content of the impoundment was considered in order to provide an assessment of the risk because if the dam were to fail, it is likely that impoundments that have a larger water content could flow farther downstream and therefore cause more damage downstream than impoundments that were made up of mostly solids. This factor was divided into three categories:

  - Low Risk – Less than 25 % of the reservoir area covered by water
  - Intermediate Risk – Greater than or equal to 25 % and less than or equal to 75 % of the reservoir area covered by water
  - High Risk – Greater than 75 % of the reservoir area covered by water

- Offsite Drainage Area. The nature and extent of the offsite drainage area of the impoundment was considered in order to provide an assessment of the risk because it is likely that impoundments that have a larger drainage area are more likely to overtop than impoundments with a smaller drainage area. This factor was divided into five categories:

  - Low Risk – Drainage area less than 20 acres
  - Low/Intermediate Risk – Drainage area greater than or equal to 20 acres and less than or equal to 100 acres
  - Intermediate Risk – Drainage area greater than or equal to 100 acres and less than or equal to 500 acres
  - Intermediate/High Risk – Drainage area greater than or equal to 500 acres and less than or equal to 1000 acres
  - High Risk – Drainage area greater than 1000 acres

CCR IMPOUNDMENT RISK CLASSIFICATION RESULTS

In the following sections for each facility, an overall risk classification for a CCR impoundment is assessed and refined by considering salient points related to site conditions. General information is then given about each facility which includes a site description, the number of basins (active and in-active) at that location, and the source characterization. The key factors from each of the subgroups (e.g., groundwater, surface water, and dam safety) for risk classification are presented for each facility. Supporting information and other considerations that were used to refine the risk classification for each facility are presented in the Appendix.

ALLEN STEAM STATION RISK CLASSIFICATION

Overall Risk Classification

DEQ has proposed the risk classification of both the Active Ash Basin and the Retired Ash Basin as **LOW TO INTERMEDIATE**.

- Groundwater Key Factor. If either it is determined that no receptor is impacted by the coal ash impoundments or alternate water is made available to all residents whose wells are being impacted by coal ash impoundments, the overall groundwater risk would be low. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary. The following data gaps related to groundwater uncertainty include:
    - Incomplete capture zone modeling in fractured bedrock for up-gradient and side-gradient supply wells in the immediate vicinity of the impoundments
    - Incomplete geochemical modeling
    - Incomplete background concentration determination

(*It should be noted that the data gaps are currently being addressed by Duke Energy and their findings will be presented to the DEQ in supplemental reports.*)

- Surface Water Key Factor. The impoundments are not located within the 100-year floodplain.
- Dam Safety Factor. The impoundments that received a high risk rating based on structural deficiencies will receive a low risk rating once repairs are completed.

Coal Ash Plant, Operations, and CCR Impoundment Description Summary (from CSA Report)

- NPDES Permit No.: NC0004979
- County: Gaston
- Plant Status: Operating
- Number of CCR Impoundments: 2 (Active Ash Basin, Retired Ash Basin)
- Duke Energy owns and operates Allen, which is located near the town of Belmont, in Gaston County, North Carolina. Allen began operation in 1957 as a coal-fired generating station and currently operates five coal-fired units. The coal ash residue from Allen's coal combustion process has historically been disposed in the ash basin system located to the south of the station and adjacent to the Catawba River. Discharge from the ash basin system is permitted by the NCDENR Division of Water Resources (DWR) under the NPDES Permit NC0004979.
- The ash basin system at Allen consists of an active ash basin and an inactive ash basin. In general, the ash basin is located south of the power complex in historical drainage features formed from tributaries that flowed toward the Catawba River. There is one earthen embankment dam and one earthen dike impounding the active ash basin: the East Dam, located along the west bank of the Catawba River, and the North Dike, separating the active and inactive ash basins. The original ash basin at the Allen site (the inactive ash basin) began operation in 1957 and was formed by constructing an underlying portion of the earthen North Dike and the northern portion of the main East Dam where tributaries flowed toward the Catawba River. As the original ash basin capacity diminished over time, the active ash basin was formed in 1973 by constructing the southern portion of the East Dam and raising the North Dike. Ash has been sluiced to the active ash basin since 1973. Two unlined dry ash storage areas, two unlined structural fill units, and a double-lined dry ash landfill are located within the footprint of the inactive ash basin. The ash landfill was constructed in 2009. Construction of the structural fill units began in 2003 and was completed in 2009. The dry ash storage areas were constructed in 1996. The ash basin is operated as an integral part of the station's wastewater treatment system, which receives permitted and variable discharges from the ash removal system, coal pile runoff, landfill leachate, FGD wastewater, the station yard drain sump, and site storm water.

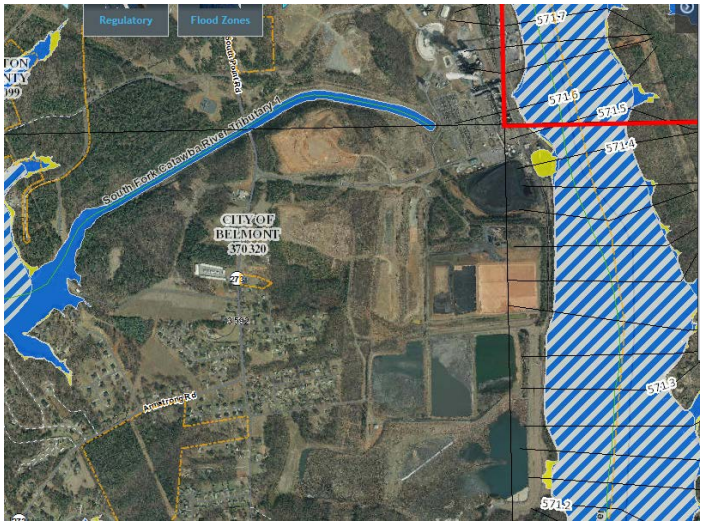
Source Characterization Summary (from CSA Report)

- Coal Ash. Laboratory analytical results of ash samples collected from the active and inactive ash basin identified eight constituents of interest (COIs), which include arsenic, barium, boron, cobalt, iron, manganese, selenium and vanadium.
- Ash Pore Water. COIs identified in ash pore water samples include antimony, arsenic, boron, cobalt, iron, manganese, pH, sulfate, thallium, total dissolved solids, and vanadium.
- Ash Basin Surface Water. COIs identified in ash basin surface water samples include aluminum, copper, and lead.

Groundwater Risk Classification – Key Factor

- Based on the data provided in CSA Report and results of the groundwater modeling results presented in the CAP Report, the number of downgradient receptors (well users) 1,500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:
    - Active Ash Basin. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - Retired Ash Basin. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment boundary.

Surface Water Risk Classification – Key Factor



This figure depicts landscape positions in regards to the 100-year flood level for the CCR impoundment (Active Ash Basin (GASTO-061) and Retired Ash Basin (GASTO-016)) for the Allen Steam Electric Plant.

- Landscape Position and Floodplain:
    - Active Ash Basin. **LOW RISK**. The CCR Impoundment is sited along the Catawba River/Lake Wylie, outside of the 100-year floodplain.
    - Retired Ash Basin. **LOW RISK**. The CCR Impoundment is sited along the Catawba River/Lake Wylie, outside of the 100-year floodplain.

Dam Safety Risk Classification – Key Factor

- State of Structural Stability and Maintenance:
    - Active Ash Basin (GASTO-061). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: tree removal, slope remediation, grout pipe, and installation of a new spillway.
    - Retired Ash Basin (GASTO-016). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: slope improvement, grading, replace sluice lines, grout pipe, and installation of a new spillway.

BELEWS CREEK STEAM STATION RISK CLASSIFICATION

Overall Risk Classification

DEQ has proposed the risk classification for the Active Ash Basin as **LOW TO INTERMEDIATE**.

- Groundwater Key Factor. If either it is determined that no receptor is impacted by the coal ash impoundments or alternate water is made available to all residents whose wells are being impacted by coal ash impoundments, the overall groundwater risk would be low. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary. The following data gaps related to groundwater uncertainty include:
    - Incomplete capture zone modeling in fractured bedrock for up-gradient and side-gradient supply wells in the immediate vicinity of the impoundments
    - Incomplete geochemical modeling
    - Incomplete background concentration determination
    - Horizontal and vertical extent of contamination downgradient not well defined

- Potential contamination resulting from the on-site landfill and structural fill not addressed
- Groundwater flow in bedrock not well defined

(*It should be noted that the data gaps are currently being addressed by Duke Energy and their findings will be presented to the DEQ in supplemental reports.*)

- Surface Water Key Factor. The impoundment is not located within the 100-year floodplain.
- Dam Safety Key Factor. The impoundment received a high risk ranking before any repairs are made and a low risk rating once repairs are made and the impoundment has been dewatered.

Coal Ash Plant, Operations, and CCR Impoundment Description Summary (from CSA Report)

- NPDES Permit No.: NC0024406
- County: Stokes
- Plant Status: Operating
- Number of CCR Impoundments: 1 (Active Ash Basin)
- Duke Energy owns and operates the Belews Creek Steam Station (BCSS) located in Stokes County, North Carolina. BCSS began operation in 1974 as a coal-fired generating station and currently operates two coal-fired units. Coal ash residue and other liquid discharges from the BCSS coal combustion process have historically been disposed of in the ash basin system located across Pine Hall Road, northwest of the station. The BCSS ash basin consists of a single cell impounded by an earthen dike located on the north end of the ash basin. The ash basin system was constructed from 1970 to 1972 and is located approximately 3,200 feet northwest of the station. The area contained within the ash basin waste boundary is approximately 283 acres. The ash basin is operated as an integral part of the station's wastewater treatment system, which receives permitted flows from the ash removal system, BCSS powerhouse and yard holding sumps, chemical holding pond, coal yard sumps, stormwater, landfill leachate, and treated FGD wastewater. Inflows to the ash basin are generally stable due to the base load nature of station operations. Inflows from the station are discharged into the southeast portion of the ash basin.

Source Characterization Summary (from CSA Report)

- Coal Ash. Laboratory analytical results of ash samples collected from the ash basin identified eight COIs, which include arsenic, boron, cobalt, iron, manganese, selenium and vanadium.
- Ash Pore Water. COIs identified in ash pore water samples include antimony, arsenic, boron, chloride, cobalt, iron, manganese, selenium, sulfate, thallium, total dissolved solids, and vanadium.

- Ash Basin Surface Water. COIs identified in ash basin surface water samples include antimony, arsenic, boron, chloride, iron, lead, manganese, thallium, total dissolved solids, and vanadium.

Groundwater Risk Classification – Key Factor

- Based on the data provided in CSA Report and results of the groundwater modeling results presented in the CAP Report, the number of down-gradient receptors (well users) 1,500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:

    - Active Ash Basin. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.

Surface Water Classification – Key Factor

This figure depicts landscape positions in regards to the 100-year flood level and river valley floodplain for the ash basin at the Belews Creek Steam Electric Plant.

- Landscape Position and Floodplain:

    - Active Ash Basin. **LOW RISK.** This CCR impoundment is sited along a reservoir, has a 135 foot tall embankment, has an outfall and is designed to discharge. CCR impoundment is sited along a reservoir and is not located within a 100-year floodplain.

Dam Safety Classification – Key Factor

- State of Structural Stability and Maintenance:
    - Active Ash Basin (STOKE-116). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: tree removal, slope improvements, grout pipe, and weighted filter overlay.

BUCK COMBINED CYCLE STATION RISK CLASSIFICATION

Buck Combined Cycle Station Overall Risk Classification

DEQ has proposed the risk classification for Ash Basin Cell 1, Ash Basin Cell 2, and Ash Basin Cell 3 as **LOW TO INTERMEDIATE**.

- Groundwater Key Factor. If either it is determined that no receptor is impacted by the coal ash impoundments or alternate water is made available to all residents whose wells are being impacted by coal ash impoundments, the overall groundwater risk would be low. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary. The following data gaps related to groundwater uncertainty include:
    - Incomplete capture zone modeling in fractured bedrock for up-gradient and side-gradient supply wells in the immediate vicinity of the impoundments

- Incomplete geochemical modeling
- Incomplete background concentration determination

(*It should be noted that the data gaps are currently being addressed by Duke Energy and their findings will be presented to the DEQ in supplemental reports.*)

- Surface Water Key Factor. The impoundments are not located within the 100-year floodplain.
- Dam Safety Key Factor. The impoundments received a high risk ranking before any repairs are made and a low risk rating once repairs are made and the impoundments have been dewatered.

Coal Ash Plant, Operations, and CCR Impoundment Description Summary (from CSA Report)

- NPDES Permit No.: NC0004774
- County: Rowan
- Plant Status: Retired
- Number of CCR Impoundments: 3 (Ash Basin Cell 1, Ash Basin Cell 2, Ash Basin Cell 3)
- Duke Energy owns and formerly operated the Buck station, located on the Yadkin River in Rowan County near the town of Salisbury, North Carolina. Buck began operation in 1926 as a coal-fired generating station. The Buck Combined Cycle Station (BCCS) natural gas facility was constructed at the site and began operating in late 2011. Subsequently, Buck was decommissioned and taken offline in April 2013. The coal ash residue from Buck's coal combustion process was historically disposed of in the station's ash basin system located adjacent to the station and the Yadkin River. The discharge from the ash basin system is permitted by the DEQ Division of Water Resources (DWR) under the NPDES Permit NC0004774.
- The Buck ash basin system is located near the Yadkin River and comprises three cells designated as Cell 1, Cell 2, and Cell 3, and associated embankments and outlet works. The ash basin is located to the south (Cell 1) and southeast (Cells 2 and 3) of the retired Buck Units 1 through 6 and the BCCS. An area between Cell 1 and Cell 2 has also been utilized for storage of dredged ash from Cell 1 and is referred to as the ash storage area. This unlined storage area is located topographically up-gradient and adjacent to the east side of Cell 1. The dry ash storage area was constructed in 2009 by excavating ash within the eastern half of Cell 1 in order to provide additional capacity for sluiced ash and covers approximately 14 acres. All coal ash from Buck was disposed of in the ash basin from approximately 1957 until 2013. Fly ash precipitated from flue gas and bottom ash collected in the bottom of the boilers were sluiced to the ash basin using conveyance water withdrawn from the Yadkin River. The ash basin system is operated as an integral part of the station's wastewater treatment system, which receives permitted and variable discharges from the ash removal system, coal pile runoff, landfill leachate, the station yard drain sump, and site stormwater.

Source Characterization Summary (from CSA Report)

- Coal Ash. Laboratory analytical results of ash samples collected from the ash basin and ash storage area identified eight COIs including arsenic, cobalt, barium, boron, cobalt, iron, manganese, selenium, and vanadium.
- Ash Pore Water. COIs identified in ash basin pore water include antimony, arsenic, barium, boron, cobalt, iron, manganese, thallium, and vanadium.
- Ash Basin Surface Water. COIs identified in ash basin surface water include aluminum, antimony, arsenic, cadmium, cobalt, copper, lead, thallium, and zinc.

Groundwater Risk Classification – Key Factor

- Based on the data provided in CSA Report and results of the groundwater modeling results presented in the CAP Report, the number of down-gradient receptors (well users) 1,500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:
    - Ash Basin Cell 1. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - Ash Basin Cell 2. **LOW RISK.** There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - Ash Basin Cell 3. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.

Surface Water Risk Classification – Key Factor

This figure depicts landscape positions in regards to the 100-year flood level and river valley floodplain for the Ash Basin Cells 1, 2, and 3 at Buck Steam Electric Plant.

- Landscape Position and Floodplain:
    - Ash Basin Cell 1. **LOW RISK.** The Ash Basin Cell 1 is sited along the Yadkin River and is not located within the 100 year floodplain.
    - Ash Basin Cell 2. **LOW RISK.** The Ash Basin Cell 2 is sited along the Yadkin River and is not located within the 100 year floodplain.
    - Ash Basin Cell 3. **LOW RISK.** The Ash Basin Cell 3 is sited along the Yadkin River and is not located within the 100 year floodplain.

Dam Safety Risk Classification – Key Factor

- State of Structural Stability and Maintenance:
    - Ash Basin Cell 1 to Ash Basin Cell 2 & Additional Primary Dams (ROWAN-068 & ROWAN-069). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: pipe repair and excavation for investigation of terra cotta piping near toe of dam.
    - Ash Basin Cell 2 to Ash Basin Cell 3 & Divider Dams (ROWAN-070 & ROWAN-071). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: pipe repair.
    - Main Dam (ROWAN-047). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: tree removal, slip-line pipe, and installation of a new spillway.

CAPE FEAR STEAM ELECTRIC PLANT RISK CLASSIFICATION

Cape Fear Steam Electric Plant Overall Risk Classification

DEQ has proposed the risk classification for the 1956 Ash Pond, 1963 Ash Pond, 1970 Ash Pond, 1978 Ash Pond, and 1985 Ash Pond as **INTERMEDIATE**.

- Groundwater Key Factor. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary.
- Surface Water Key Factor. The impoundments are located within the 100-year floodplain.
- Dam Safety Key Factor. The impoundments received a low to high risk ranking before any repairs are made and a low risk rating once repairs are made.

Coal Ash Plant, Operations, and CCR Impoundment Description Summary (from CSA Report)

- NPDES Permit No.: NC0003433
- County: Chatham
- Plant Status: Retired
- Number of CCR Impoundments: 5 (1956 Ash Pond, 1963 Ash Pond, 1970 Ash Pond, 1978 Ash Pond, 1985 Ash Pond)
- The Cape Fear Plant is a former coal-fired electrical power generation facility located on approximately 900 acres in central North Carolina near the town of Moncure in Chatham County at 500 CP&L Road. Duke Energy owns the Plant which began operating in 1923. Duke Energy continued operating the Cape Fear Plant until 2012, when the Plant was retired. The Site includes five ash basins that collectively encompass approximately 173 acres. The Site is bound to the west by the Haw and, after its confluence with the Deep River, the Cape Fear River. The Deep River and the Cape River form the Chatham / Lee County Boundary, west of the Plant. Corinth Road forms a portion of the eastern property boundary.
- The Cape Fear Plant began producing power in 1923 and added additional coal-fire power producing units from 1924 to 1969. Two of the site's six coal-fired units were retired in 1977 and two in 2011. The remaining two coal-fired units, along with one of four oil-fueled combustion turbine units on site, were retired in October 2012. Ash generated from coal combustion was sluiced to and stored on-site in ash basins. Five ash basins have historically been used to retain and settle ash sluice water generated from coal combustion at the Cape Fear Plant and are referenced using the date of construction: 1956, 1963, 1970, 1978, and 1985. Due to their age, several basins have not received ash in decades. Sluicing to the most recently active ash basin, the 1985 ash basin, ceased in 2012. The 1956 ash basin is located north of the former power production area (PPA), and the remaining ash basins are located south of the former PPA. The 1963 and 1970 ash basins were constructed on the west side of the Site adjacent to the Cape Fear River. The 1978 ash basin was constructed east of and abutting the 1963 and 1970 ash basins. The 1985 ash basin was constructed east of the existing ash basins between the cooling water channel and Corinth Road. Un-usable coal was placed in a mill reject pile area on the northern portion of the 1963 ash basin.

Source Characterization Summary (from CSA Report)

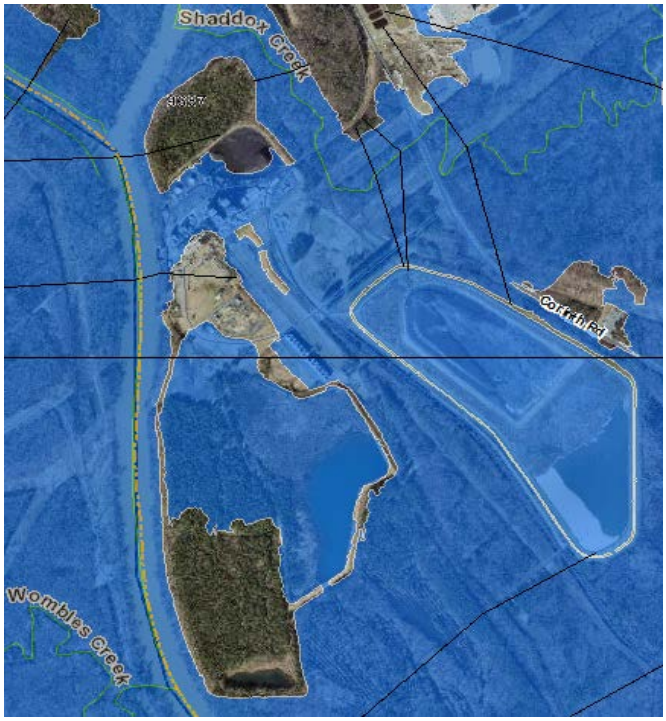
- Coal Ash. Aluminum, arsenic, cobalt, iron, manganese, molybdenum, selenium, and vanadium were detected in ash samples at concentrations above the respective USEPA Soil Regional Screening Level (RSL) - Industrial or Residential. Additionally, antimony, barium, beryllium, copper, lead, mercury, and selenium were detected in one or more ash samples at concentrations above the RSL – Protection of Groundwater.

- Ash Leachate. Ash sample leachate generally exceeds the 2L Standards reference for antimony, arsenic, chromium, cobalt, iron, manganese, nitrate, selenium, thallium, and vanadium.
- Ash Pore Water. Antimony, arsenic, beryllium, boron, chromium, cobalt, iron, manganese, nickel, sulfate, thallium, total dissolved solids, vanadium, and zinc were detected in ash pore water above the 2L Standards or IMAC, and pH was below the 2L Standard.

Groundwater Risk Classification – Key Factor

- Based on the data provided in CSA Report and results of the groundwater modeling results presented in the CAP Report, the number of down-gradient receptors (well users) 1,500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:
    - 1956 Ash Pond. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - 1963 Ash Pond. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - 1970 Ash Pond. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - 1978 Ash Pond. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - 1985 Ash Pond. **LOW RISK.** There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.

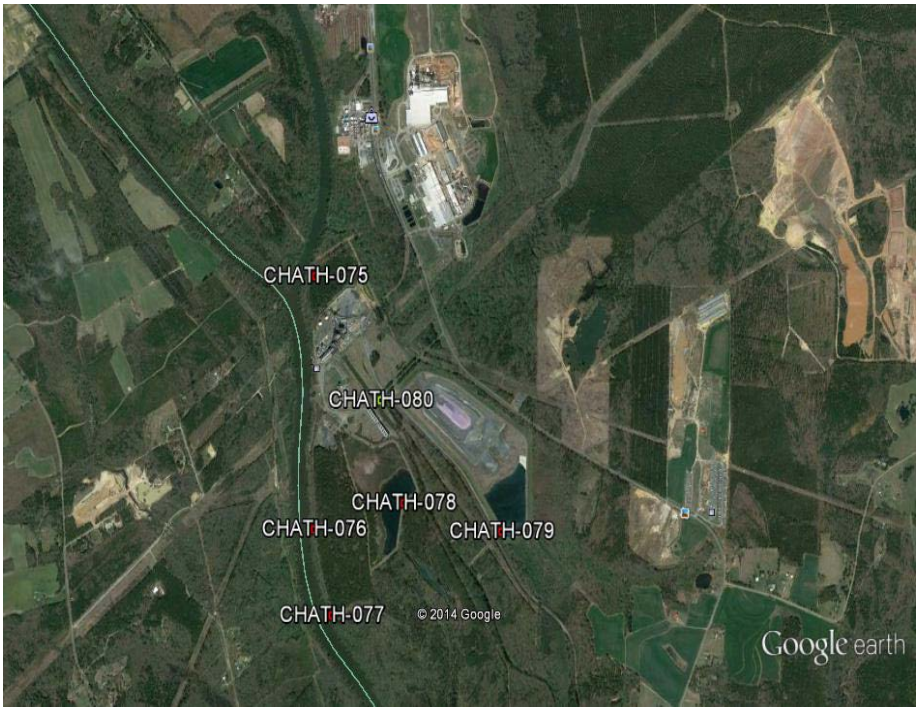
Surface Water Risk Classification – Key Factor



This figure depicts landscape positions in regards to the 100-year flood level, CCR impoundment location and river valley floodplain for the 1956, 1963, 1970, 1978, and 1985 ash ponds at the Cape Fear Steam Electric Plant.

- Landscape Position and Floodplain:
    - 1956 Ash Pond. **HIGH RISK**. The footprint of the CCR impoundment is sited along Cape Fear River and is located within the 100 year floodplain.
    - 1963 Ash Pond. **HIGH RISK**. The footprint of the CCR impoundment is sited along Cape Fear River and is located within the 100 year floodplain.
    - 1970 Ash Pond. **HIGH RISK.** The footprint of the CCR impoundment is sited along Cape Fear River and is located within the 100 year floodplain.
    - 1978 Ash Pond. **HIGH RISK.** The footprint of the CCR impoundment is sited along Cape Fear River and is located within the 100 year floodplain.
    - 1985 Ash Pond. **HIGH RISK.** The footprint of the CCR impoundment is sited along Cape Fear River and is located within the 100 year floodplain.

Dam Safety Risk Classification – Key Factor



- State of Structural Stability and Maintenance:
    - 1956 Ash Pond (CHATH-075). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made**.** This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: vegetation removal, remove pipes, and grout riser.
    - 1963 Ash Pond (CHATH-076). **LOW RISK.** This impoundment received a notice of inspection. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: vegetation removal and pipe removal.
    - 1970 Ash Pond (CHATH-077). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made**.** This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: vegetation removal and pipe replacement.
    - 1978 Ash Pond (CHATH-078). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made**.** This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and

should be completed as a minimum: cured in place resin liner, grading and stabilization, rip rap buttressing, and pipe removal.

- 1985 Ash Pond (CHATH-079). **LOW RISK.** This impoundment received a notice of inspection. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: slope repair, grout pipe, pipe joint filler, grading, and pipe removal.

JAMES E. ROGERS ENERGY COMPLEX (FORMERLY CLIFFSIDE STEAM STATION) RISK CLASSIFICATION

James E. Rogers Energy Complex Overall Risk Classification

DEQ has proposed the risk classification for the Active Ash Basin as **LOW TO INTERMEDIATE**.

- Groundwater Key Factor. If either it is determined that no receptor is impacted by the coal ash impoundments or alternate water is made available to all residents whose wells are being impacted by coal ash impoundments, the overall groundwater risk would be low. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary. The following data gaps related to groundwater uncertainty include:
    - Incomplete capture zone modeling in fractured bedrock for up-gradient and side-gradient supply wells in the immediate vicinity of the impoundments
    - Incomplete background concentration determination
    - Amount and extent of CCR in storage areas
    - Need a better understanding of heterogeneities in subsurface

  (*It should be noted that the data gaps are currently being addressed by Duke Energy and their findings will be presented to the DEQ in supplemental reports.*)

- Surface Water Key Factor. The impoundment is not located within the 100-year floodplain.
- Dam Safety Key Factor. The impoundment received a high risk ranking before any repairs are made and a low risk rating once repairs are made.

DEQ has proposed the risk classification for the Retired Unit 1-4 and Retired Unit 5 Basin as **LOW**.

- Groundwater Key Factor. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary.
- Surface Water Key Factor. The impoundment is not located within the 100-year floodplains.
- Dam Safety Key Factor. The impoundments received a low to intermediate ranking before any repairs are made and a low risk rating once repairs are made and the impoundments have been dewatered.

Coal Ash Plant, Operations, and CCR Impoundment Description Summary (from CSA Report)

- NPDES Permit No.: NC0005088
- County: Rutherford/Cleveland
- Plant Status: Operating
- Number of CCR Impoundments: 3 (Active Ash Basin, Retired Unit 1-4 Basin, Retired Unit 5 Basin)
- Duke Energy owns and operates the Cliffside Steam Station (CSS) located in Mooresboro, in Rutherford and Cleveland counties, North Carolina. CSS began operation in 1940 as a coal-fired generating station. Units 1 through 4 were subsequently retired in October 2011, and Units 5 and 6 continue to operate at CSS. Coal ash residue and other liquid discharges from CSS's coal combustion process have been disposed of in the ash basin system located both west and east-southeast from the station and adjacent to the Broad River. Discharge from the active ash basin is currently permitted by the DWR under the NPDES Permit NC0005088. Coal ash residue is conveyed to the active ash basin system at the plant and is used to settle and retain ash generated from coal combustion at CSS. The ash basin system is located adjacent to the Broad River and consists of the active ash basin, the Units 1-4 inactive ash basin, and the Unit 5 inactive ash basin, all of which are unlined. A series of stormwater and plant process water storage ponds are located atop the unit 1-4 inactive ash basin.
- The ash basin system is an integral part of the CSS station's wastewater treatment system. Currently, the active ash basin is permitted to receive variable wastewater and stormwater inflows from the Unit 5 fly ash handling system, Unit 5 bottom ash handling system, cooling tower blowdown, stormwater runoff from yard drainage,

coal pile runoff, gypsum pile runoff, limestone pile runoff, landfill leachate, and wastewater streams generated from emission monitoring equipment, precipitators, and Selective Catalytic Reduction (SCR) Unit. Additional inflow consists of treated sanitary wastewater, miscellaneous cleaning wastes, domestic package plant wastewater (through the yard sumps) and water treatment system wastes (filter backwash, demineralizer regeneration waste, reverse osmosis rinse water, and clarifier solids). The coal ash was historically sluiced to the ash basin system via sluice lines.

Source Characterization Summary (from CSA Report)

- Coal Ash. Laboratory analytical results of ash samples collected from the ash basins and ash storage areas identified eight COIs: arsenic, barium, boron, cobalt, iron, manganese, selenium and vanadium.
- Ash Pore Water. COIs identified in pore water in the ash basins and ash storage area included antimony, arsenic, boron, cobalt, iron, manganese, pH, sulfate, thallium, vanadium, and total dissolved solids.
- Ash Basin Surface Water. COIs identified in water within the basin included aluminum, arsenic, cadmium, cobalt, copper, dissolved oxygen, and thallium

Groundwater Risk Classification – Key Factor

- Based on the data provided in CSA Report and results of the groundwater modeling results presented in the CAP Report, the number of downgradient receptors (well users) 1,500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:
    - Active Ash Basin, including adjacent ash storage areas. **LOW RISK.** There are two reported water supply wells within 1,500 feet that are side-gradient or possibly downgradient of the active basin compliance boundary; however, neither well appears to be impacted by CCR contamination.
    - Retired Unit 1-4 Basin. **LOW RISK.** There are no reported supply wells within 1,500 feet downgradient of the Retired Unit 1-4 Basin compliance boundary.
    - Retired Unit 5 Basin. **LOW RISK.** There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.

Surface Water Risk Classification – Key Factor

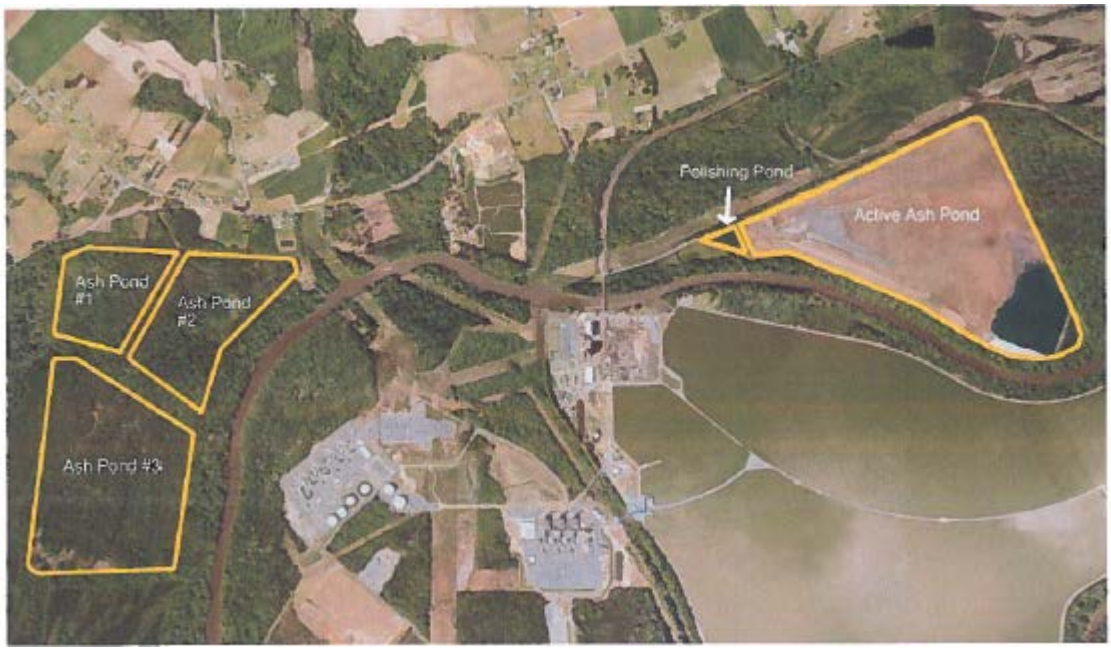
This figure depicts landscape positions in regards to the 100-year flood level and river valley floodplain for the Active Ash Basin, including adjacent ash storage areas, Retired Unit 1-4 Basin and Retired Unit 5 Basin at James E. Rogers Steam Electric Plant (Cliffside).

- Landscape Position and Floodplain:
    - Active Ash Basin, including adjacent ash storage areas. **LOW RISK**. The footprint of the CCR impoundment is sited along the Broad River, and is not located within the 100 year floodplain.
    - Retired Unit 1-4 Basin. **LOW RISK**. The footprint of the CCR impoundment is sited along the Broad River, and is not located within the 100 year floodplain.
    - Retired Unit 5 Basin. **LOW RISK**. The footprint of the CCR impoundment is sited along the Broad River, and is not located within the 100 year floodplain.

Dam Safety Risk Classification – Key Factor

- State of Structural Stability and Maintenance:
    - Active Ash Basin (CLEVE-049 & CLEVE-050). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: slope improvements, grout pipe, and installation of a new spillway.
    - Retired Unit 1-4 Basin (CLEVE-047). **LOW RISK.** This impoundment received a notice of inspection. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: vegetation removal, grout pipe, and remove toe drains.
    - Retired Unit 5 Basin (RUTHE-070 & RUTHE-072). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: slope improvements, grout pipe, and installation of graded filter.

H. F. LEE ENERGY COMPLEX RISK CLASSIFICATION



H. F. Lee Energy Complex Overall Risk Classification

DEQ has proposed the risk classification for the Active Ash Pond, Polishing Pond, Inactive Ash Pond #1, Inactive Ash Pond #2, and Inactive Ash Pond #3 as **INTERMEDIATE**.

- Groundwater Key Factor. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary.
- Surface Water Key Factor. The impoundments are located within the 100-year floodplain.
- Dam Safety Key Factor. The impoundments received a low or high risk ranking before any repairs are made and a low risk rating once repairs are made.

Coal Ash Plant, Operations, and CCR Impoundment Description Summary (from CSA Report)

- NPDES Permit No.: NC0003417
- County: Wayne
- Plant Status: Retired
- Number of Impoundments: 5 (Active Ash Pond, Polishing Pond, Ash Pond #1, Ash Pond #2, Ash Pond #3)
- Duke Energy owns and operates the H.F. Lee Energy Complex (Lee Plant) located at 1199 Black Jack Church Road, Goldsboro, North Carolina. The property encompasses approximately 2,100 acres, including the approximately 314-acre ash

basins (171-acre inactive ash basins and 143-acre active ash basin). The Lee Plant began commercial operation in 1951. Three coal-fired units were retired in September 2012 followed by installation of four oil-fueled combustion turbine units in October 2012. In December 2012, the H.F. Lee Combined Cycle Plant was brought on-line. The Combined Cycle Plant uses combustion and steam turbines to convert natural gas to electricity.

- Coal ash has been managed in the Plant's on-site ash basins, which include three inactive ash basins located to the west of the plant operations area, an active ash basin and Lay of Land Area (LOLA) northeast of the operations area. The ash basins and the LOLA comprise the ash management areas.

Source Characterization Summary (from CSA Report)

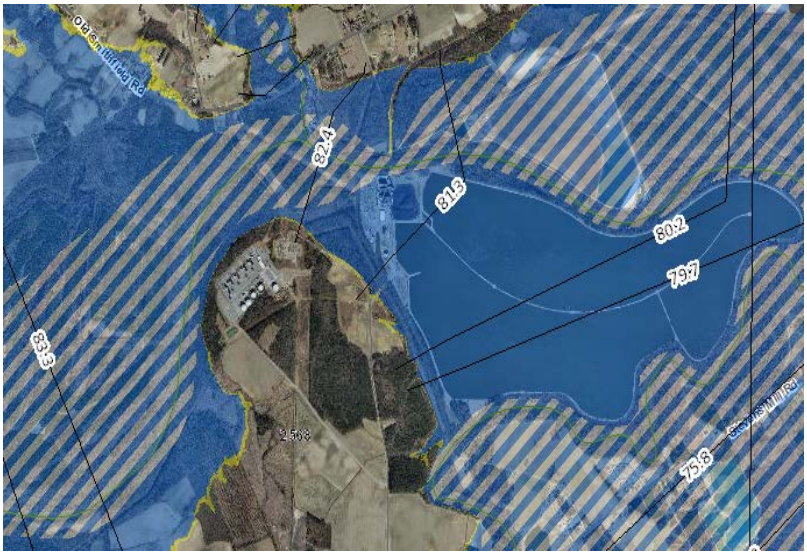
- Coal Ash. Fourteen constituents were detected above RSLs in the ash samples collected from within the ash basins. Six constituents (barium, beryllium, copper, lead, mercury, and selenium) exceeded the RSL – Protection of Groundwater in the active ash basin, five constituents (barium, beryllium, copper, lead, and selenium) exceeded the RSL – Protection of Groundwater in the LOLA, five of the constituents (barium, beryllium, lead, mercury, and selenium) exceeded the RSL – Protection of Groundwater in the inactive basins. Five constituents (aluminum, antimony, cobalt, iron, and vanadium) exceeded the RSL – Residential Health in the active ash basin, six constituents (aluminum, antimony, cobalt, iron, manganese and vanadium) exceeded the RSL –Residential Health in the LOLA, five of the constituents (aluminum, antimony, cobalt, iron, and vanadium) exceeded the RSL – Residential Health in the inactive basins. Arsenic and thallium exceeded the RSL – Industrial Health in each of the three areas. Arsenic, barium, boron, cobalt, iron, manganese, thallium, and vanadium were detected above corresponding 2L Standard or IMAC in the active ash basin. Antimony, arsenic, boron, cobalt, iron, manganese, selenium, thallium, and vanadium were detected above corresponding 2L Standard or IMAC in the inactive ash basin. Antimony, arsenic, barium, cobalt, iron, manganese, thallium, and vanadium were detected above corresponding 2L Standard or IMAC in the LOLA area.
- Ash Leachate. Aluminum, barium, boron, iron, and vanadium were the only COIs detected at concentrations exceeding 1 milligram per liter (mg/L) in leachate from the samples.
- Ash Pore Water. Elevated concentrations of calcium, potassium, magnesium, sodium, bicarbonate, chloride, and sulfate were detected in the samples of ash pore water.

Groundwater Risk Classification – Key Factor

- Based on the data provided in CSA Report and results of the groundwater modeling results presented in the CAP Report, the number of down-gradient receptors (well users) 1,500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:

    - Active Ash Pond. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - Polishing Pond. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - Ash Pond #1. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - Ash Pond #2. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
    - Ash Pond #3. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.

Surface Water Risk Classification – Key Factor



This figure depicts landscape positions in regard to the 100-year flood level, CCR impoundment location and river valley floodplain for the Active Ash Pond and Polishing Pond, Ash Pond #1, Ash Pond #2, and Ash Pond #3 at H.F. Lee Energy Steam Electric Plant.

- Landscape Position and Floodplain:

    - Active Ash Pond. **HIGH RISK.** The footprint of the CCR impoundment is sited along the Neuse River and is located in the 100-year floodplain.
    - Polishing Pond. **HIGH RISK.** The footprint of the CCR impoundment is sited along the Neuse River and is located in the 100-year floodplain.
    - Ash Pond #1. **HIGH RISK.** The footprint of the CCR impoundment is sited along the Neuse River and is located in the 100-year floodplain.
    - Ash Pond #2. **HIGH RISK.** The footprint of the CCR impoundment is sited along the Neuse River and is located in the 100-year floodplain.
    - Ash Pond #3. **HIGH RISK.** The footprint of the CCR impoundment is sited along the Neuse River and is located in the 100-year floodplain.

Dam Safety Risk Classification – Key Factor

- State of Structural Stability and Maintenance:

    - Active Ash Pond (WAYNE-022). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and

should be completed, as a minimum: vegetation removal, slope repair, grout pipe, and installation of a new spillway.

- Polishing Pond (WAYNE-034). **LOW RISK.** This impoundment received a notice of inspection. The following modifications/repairs to the dam have been submitted and should be completed as a minimum: removal of mature trees.
- Ash Pond #1 (WAYNE-031). **LOW RISK.** This impoundment received a notice of inspection. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: removal of mature trees.
- Ash Pond #2 (WAYNE-032). **LOW RISK.** This impoundment received a notice of inspection. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: removal of mature trees, slope repair, and pipe removal near crest and crest repair.
- Ash Pond #3 (WAYNE-033). **LOW RISK.** This impoundment received a notice of inspection. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: removal of mature trees and pipe removal near crest and crest repair.

MARSHALL STEAM STATION RISK CLASSIFICATION

Marshall Steam Station Overall Risk Classification

DEQ has proposed the risk classification for the Ash Basin as **LOW TO INTERMEDIATE**.

- Groundwater Key Factor. If either it is determined that no receptor is impacted by the coal ash impoundments or alternate water is made available to all residents whose wells are being impacted by coal ash impoundments, the overall groundwater risk would be low. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary. The following data gaps related to groundwater uncertainty include:
    - Incomplete capture zone modeling in fractured bedrock for up-gradient and side-gradient supply wells in the immediate vicinity of the impoundments
    - Incomplete geochemical modeling

- Incomplete background concentration determination

(*It should be noted that the data gaps are currently being addressed by Duke Energy and their findings will be presented to the DEQ in supplemental reports.*)

- Surface Water Key Factor. The impoundments are not located within the 100-year floodplain.
- Dam Safety Key Factor. The impoundments received a high risk ranking before any repairs are made and a low risk rating once repairs are made and the impoundments have been dewatered.

Coal Ash Plant, Operations, and CCR Impoundment Description Summary (from CSA Report)

- NPDES Permit No.: NC0004987
- County: Catawba
- Plant Status: Operating
- Number of Impoundments: 1 (Ash Basin)
- Duke Energy owns and operates Marshall Steam Station (MSS), which is located on Lake Norman in Catawba County near the town of Terrell, North Carolina. MSS began operation in 1965 as a coal-fired generating station and currently operates four coal-fired units. The CCR from MSS's coal combustion process has historically been stored in the station's ash basin located to the north of the station and adjacent to Lake Norman. The ash basin system at MSS consists of a single cell impounded by an earthen dike located on the southeast end of the ash basin. The ash basin system was constructed in 1965 and is located north of the power plant. Inflows from the station to the ash basin are discharged into the southwest portion of the ash basin. All coal ash from MSS was disposed of in the ash basin from approximately 1965 until 1984. Fly ash precipitated from flue gas and bottom ash collected in the bottom of the boilers were sluiced to the ash basin using conveyance water withdrawn from Lake Norman. Since 1984, fly ash has mainly been disposed of in the on-site dry ash landfills and bottom ash has continued to be sluiced to the ash basin.
- The ash basin is operated as an integral part of the station's wastewater treatment system, which receives permitted and variable discharges from the ash removal system, coal pile runoff, landfill leachate, FGD wastewater, the station yard drain sump, and site stormwater. During operations of the coal-fired units, the sluice lines discharge the water/slurry and other permitted flows to the southwest portion of the ash basin. Inflows to the ash basin are highly variable due to station operations and weather.

Source Characterization Summary (from CSA Report)

- Coal Ash. Laboratory analytical results of ash samples collected identified nine COIs: antimony, arsenic, barium, boron, cobalt, iron, manganese, selenium, and vanadium.
- Ash Pore Water. COIs identified in ash pore water samples include antimony, arsenic, barium, beryllium, boron, cadmium, chloride, chromium, cobalt, iron, lead, manganese, nickel, selenium, sulfate, thallium, total dissolved solids, and vanadium.
- Ash Basin Surface Water. COIs identified in ash basin surface water samples include arsenic, beryllium, boron, cadmium, chloride, cobalt, copper, lead, manganese, nickel, selenium, sulfate, thallium, total dissolved solids, vanadium, and zinc.

Groundwater Risk Classification – Key Factor

- Based on the data provided in CSA Report and results of the groundwater modeling results presented in the CAP Report, the number of down-gradient receptors (well users) 1,500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:
    - Ash Basin. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.

Surface Water Risk Classification – Key Factor

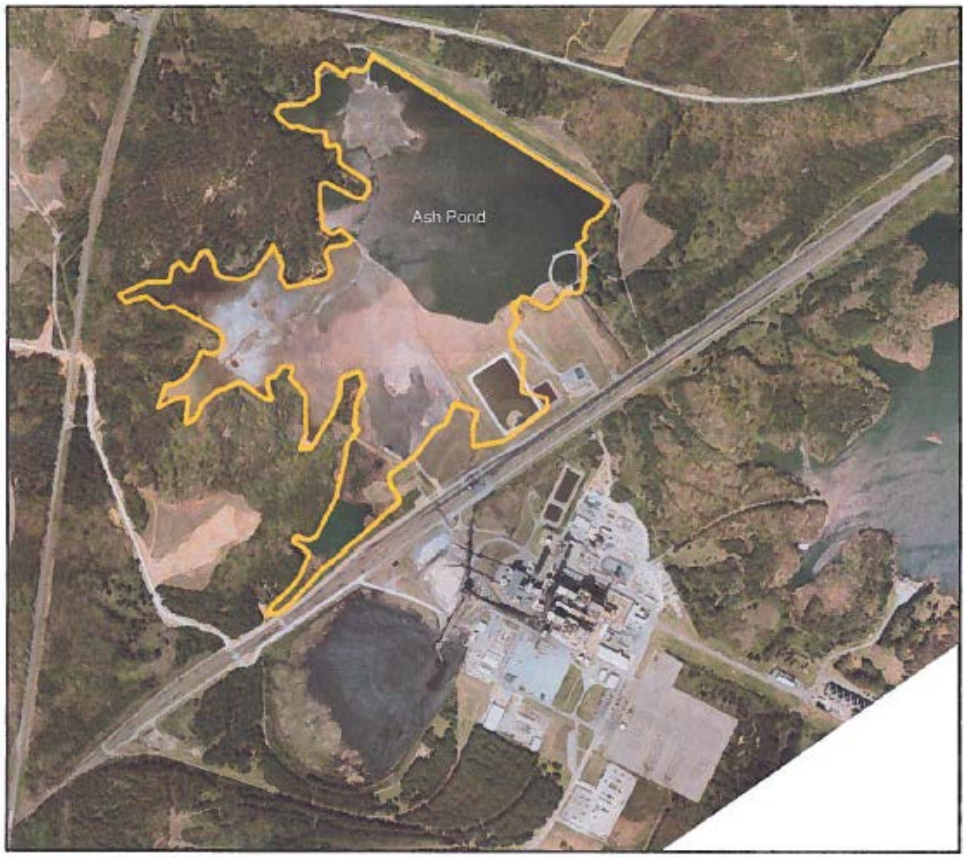
The NC floodplain map depicts a 100-year flood elevation within the ash basin and within Lake Norman. This CCR impoundment and Lake Norman elevations are predicted to be 797.7 and 760 feet above sea level, respectively. This ash basin, contained by a stream valley embankment (dam), is designed/engineered to discharge to Lake Norman. Because the CCR impoundment footprint is not sited along a run of a river floodplain the risk classification is Low for the Landscape Position and Floodplain criteria. [Note: Dam Safety Risk Classification section addresses hydrology, hydraulics parameter and other factors as they relate to dam safety.]

- Landscape Position and Floodplain:
    - Ash Basin. **LOW RISK**. The CCR impoundment is sited in a natural drainage way of Holdsclaw Creek. The NC floodplain map depicts a 100-year flood elevation within the footprint of the ash impoundment. (The impoundment and Lake Norman flood elevations are predicted to be 797.7 and 760 feet above sea level, respectively.) The CCR impoundment is sited along a reservoir, has a 37 foot tall embankment, and this ash basin is designed to discharge into Lake Norman.

Dam Safety Risk Classification – Key Factor

- State of Structural Stability and Maintenance:
    - Ash Basin (CATAW-054). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: pipe repair, riser repair, slope repair, erosion repair, and installation of a new spillway.

MAYO STEAM ELECTRIC PLANT RISK CLASSIFICATION



Mayo Steam Electric Plant Overall Risk Classification

DEQ has proposed the risk classification for the Ash Pond as **LOW**.

- Groundwater Key Factor. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary.
- Surface Water Key Factor. The impoundment is not located within the 100-year floodplain.
- Dam Safety Key Factor. The impoundment received a high risk ranking before any repairs are made and a low risk rating once repairs are made and the impoundments have been dewatered.

Coal Ash Plant, Operations, and CCR Impoundment Description Summary (from CSA Report)

- NPDES Permit No.: NC0038377
- County: Person
- Plant Status: Operating
- Number of Impoundments: 1 (Ash Pond)
- The Mayo Plant is a coal-fired electricity-generating facility located in north-central North Carolina in the northeastern corner of Person County, North Carolina, north of the City of Roxboro. The Mayo Plant address is 10660 Boston Road (US Highway 501), Roxboro, North Carolina. The Carolina Power & Light (CP&L) Mayo Plant became fully operational in June 1983. CP&L merged with Florida Progress Corporation in 2000 to become Progress Energy Inc. Progress Energy merged with Duke Energy in July 2012. The northern Plant property line extends to the North Carolina/Virginia state line. The overall topography of the Plant generally slopes toward the east (Mayo Lake or Mayo Reservoir) and northeast (Crutchfield Branch). The Site is roughly bisected by Highway 501. The majority of the Site, including the power plant, the ash basin, and the majority of operational features, is located east of Highway 501 and extends to the eastern shore of Mayo Lake. The property is bounded to the north by the North Carolina/Virginia state line. Mayo Lake Road runs west to east from the intersection with Highway 501 to NC county road 1504. The portion of the Site located west of Highway 501 contains the recently operational ash monofill and a haul road that connects the monofill with the operational portion of the Mayo Plant. A railroad spur bisects the western portion of the property. RT Hester Road also cuts across the northeastern portion of the western property. The eastern portion of the Site, excluding Mayo Lake, encompasses 460 acres. Mayo Lake encompasses 2,880 acres with a normal water elevation of 436 feet above mean sea level (msl).
- CCR has historically been managed at the Plant's on-site ash basin and transported via wet sluicing. In 2013, the Mayo Plant converted from a wet to dry ash system. Consequently, 90 percent of currently generated CCR is dry. Wet sluicing is conducted when there is a shutdown of the dry fly ash transport system, which occurs infrequently. This system is currently being upgraded so that all future CCR generation will be dry. Until recently, dry ash had been hauled and disposed in the lined landfill located at the nearby Roxboro Steam Electric Plant (near Semora, North Carolina). Beginning in November 2014, CCR from the Mayo Plant has been placed in a newly constructed on-site monofill (a landfill managing one single material type; Permit #73-05).
- A FGD system is active at the Plant. The FGD system directs flue gas into an absorber where limestone (calcium carbonate) slurry is sprayed. Sulfur dioxide in the flue gas reacts with the limestone slurry to produce calcium sulfate, or gypsum. The system reclaims the un-reacted limestone slurry to be reused in the absorber. A small blowdown stream is used to maintain the chloride concentration in the reaction tank. The blowdown stream is discharged to the FGD settling pond. From

the FGD settling pond the water is pumped to the partial ZLD system. The ZLD is a thermal evaporation process that creates a clean distillate and brine. The brine solution is mixed with fly ash that is placed in the on-site monofill. The clean distillate is used in absorber make-up water.

Source Characterization Summary (from CSA Report)

- Coal Ash. Arsenic was detected at quantifiable concentrations above the RSL for industrial health in 9 of the 14 ash samples tested. Arsenic was detected above the residential RSL in two ash samples. Cobalt was detected above the residential RSL in 10 samples. Vanadium was detected above the residential RSL in five samples. The RSL for protection of groundwater was exceeded at quantifiable concentrations in ash for barium (three samples) and lead (three samples).
- Ash Leachate. Ash sample leachate generally exceeds the 2L Standard in one or more samples for antimony, arsenic, chromium, iron, manganese, nitrate, thallium, and vanadium.
- Ash Pore Water. Antimony, arsenic, barium, boron, cobalt, iron, manganese, thallium, and vanadium were detected above the corresponding 2L Standard or IMAC in one or more samples of ash pore water.

Groundwater Risk Classification – Key Factor

- Based on the data provided in CSA Report and results of the groundwater modeling results presented in the CAP Report, the number of down-gradient receptors (well users) 1,500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:
    - Ash Pond. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.

Surface Water Risk Classification – Key Factor

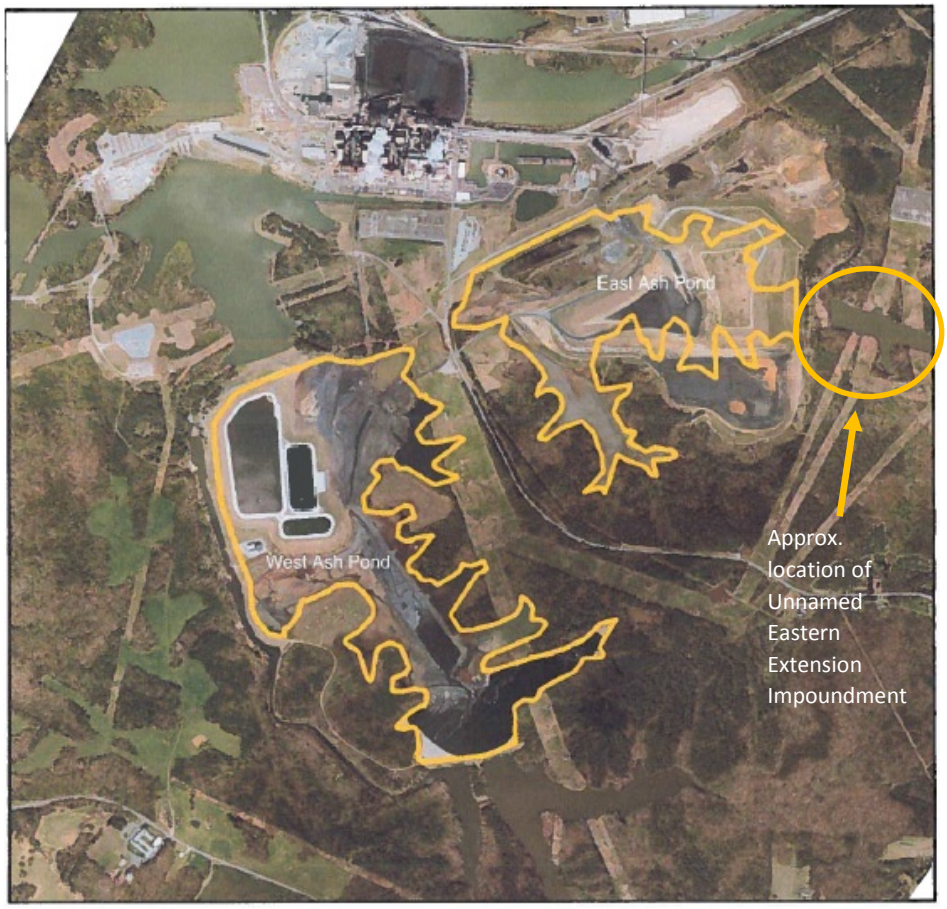
This figure depicts landscape positions in regards to the 100-year flood level and river valley floodplain for the Ash Pond at Mayo Steam Electric Plant.

- Landscape Position and Floodplain:
    - Ash Pond. **LOW RISK**. The footprint of the CCR impoundment is sited in Crutchfield Branch, a natural drainage way, and it is not located within a 100-year floodplain. This ash basin has an outfall and it is designed to discharge into Mayo Reservoir.

Dam Safety Risk Classification – Key Factor

- State of Structural Stability and Maintenance:
    - Ash Pond (PERSO-035). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made**.** This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed as a minimum: tree removal, erosion repair, grout pipe, rip rap repair, and installation of a new spillway.

ROXBORO STEAM ELECTRIC PLANT RISK CLASSIFICATION



Roxboro Steam Electric Plant Overall Risk Classification

DEQ has proposed the risk classification for the East Ash Pond as **LOW TO INTERMEDIATE**.

- Groundwater Key Factor. If either it is determined that no receptor is impacted by the coal ash impoundments or alternate water is made available to all residents whose wells are being impacted by coal ash impoundments, the overall groundwater risk would be low. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary. The following data gaps related to groundwater uncertainty include:
    - Additional areas adjacent to the current impoundment may contain CCR and would therefore require additional assessment.
    - Incomplete capture zone modeling in fractured bedrock for up-gradient and side-gradient supply wells in the immediate vicinity of the impoundment
    - Incomplete geochemical modeling

    - Incomplete background concentration determination

  (*It should be noted that the data gaps are currently being addressed by Duke Energy and their findings will be presented to the DEQ in supplemental reports.*)
- Surface Water Key Factor. The impoundment is not located within the 100-year floodplain.
- Dam Safety Key Factor. The impoundment received a low risk ranking before any repairs are made.

DEQ has proposed the risk classification for the West Ash Pond as **LOW**.

- Groundwater Key Factor. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary.
- Surface Water Key Factor. The impoundment is not located within the 100-year floodplain.
- Dam Safety Key Factor. The impoundment received a high risk ranking before any repairs are made and a low risk rating once repairs are made and the impoundments have been dewatered.

DEQ has proposed the risk classification for the Unnamed Eastern Extension Impoundment as **INTERMEDIATE**.

- Groundwater Key Factor. If either it is determined that no receptor is impacted by the coal ash impoundments or alternate water is made available to all residents whose wells are being impacted by coal ash impoundments, the overall groundwater risk would be low. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary. The following data gaps related to groundwater uncertainty include:
    - This impoundment was just recently identified by Duke Energy and assessment is currently underway.
    - The location of the impoundment is in close proximity to potential receptors.

  (*It should be noted that the data gaps are currently being addressed by Duke Energy and their findings will be presented to the DEQ in supplemental reports.*)
- Surface Water Key Factor. The impoundment is not located within the 100-year floodplain.
- Dam Safety Key Factor. This impoundment does not have a dam and was therefore not given a rank with respect to dam safety.

Coal Ash Plant, Operations, and CCR Impoundment Description Summary (from CSA Report)

- NPDES Permit No.: NC0003425
- County: Person
- Plant Status: Operating
- Number of Impoundments: 3 (East Ash Pond, West Ash Pond, Unnamed Eastern Extension Impoundment)
- The Site is a coal-fired electrical power generation facility located on a 6,095 acre parcel in north-central North Carolina near Semora, in Person County, North Carolina. The Site is located between McGhees Mill Road to the east and Hyco Reservoir. A large part of the Plant area encompasses the east bank of Hyco Reservoir. Plant operations began at the Site in 1966, and additional units were added in 1968, 1973, and 1980. Throughout its operational history, the Site has employed coal-fired units to produce steam. Ash generated from coal combustion has been stored on-site in ash basins and lined and unlined landfills.
- CCRs have been sluiced to the ash basins or conveyed in its dry form to the landfills. Two ash basins areas have been used at the Roxboro Plant and are referenced using the dates of construction and relative location: the 1966 semi-active East Ash Basin and the 1973 active West Ash Basin. The East Ash Basin is located southeast of the power generation facilities, and the West Ash Basin is located south of the power generation facilities. An unlined landfill was constructed on the East Ash Basin in the late 1980s. A lined landfill was subsequently constructed over the unlined landfill in 2004. The ash basins are impounded by earthen dams. Surface water runoff from the East Ash Basin and the lined landfill are routed into the West Ash Basin to allow settling. Currently, the East Ash Basin and lined landfill are covered with vegetation where the landfill is not active (grasses and shrubs). The West Ash Basin has some grass cover and ponded water, mostly along the southern and eastern edges of the basin.
- A FGD System is present within the 1973 Active Ash Basin footprint. The FGD system directs flue gas into an absorber where limestone (calcium carbonate) slurry is sprayed. Sulfur dioxide in the flue gas reacts with the limestone slurry to produce calcium sulfate, or gypsum. The system reclaims the un-reacted limestone slurry to be reused in the absorber. A small blowdown stream is used to maintain the chloride concentration in the reaction tank. The blowdown stream is discharged to a lined gypsum settling pond where suspended solids are settled out prior to entering a bioreactor. The bioreactor utilizes microbes to reduce targeted soluble contaminants to insoluble forms that then precipitate from solution. The treated wastewater enters the ash basin effluent channel prior to Internal Outfall 002. Wastewater discharges from the facility are permitted by the DWR under NPDES Permit NC0003425.
- In late 2015, Duke Energy identified a new basin just east of the East Ash Basin. DEQ has temporarily named this basin the "Unnamed Eastern Extension Impoundment." This basin appears to be a former extension of the East Ash Basin

that was cut off when the landfill was created over the East Ash Basin. Duke Energy is currently in the process of addressing this new basin.

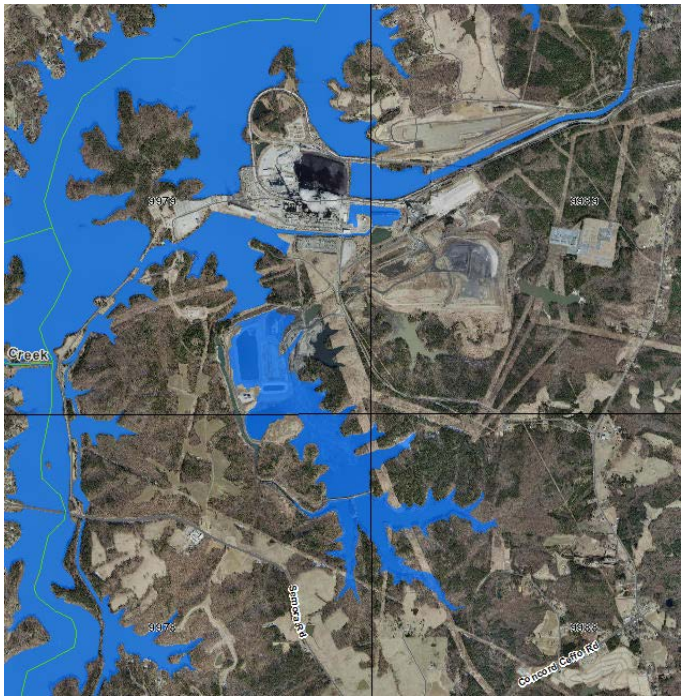
Source Characterization Summary (from CSA Report)

- Coal Ash. The ash samples from both basins were found to contain barium, beryllium, copper, lead, mercury and selenium above the RSL – Protective of Groundwater. Concentrations of aluminum, cobalt, iron, manganese and vanadium were detected in ash basin samples above the residential health RSL; however iron and manganese were not detected above RSLs in the West Ash Basin.
- Ash Leachate. Leachate concentrations exceeding 2L Standard or IMAC for antimony, arsenic, chromium, cobalt, iron, manganese, nitrate, and vanadium in samples from both ash basins.
- Ash Pore Water. Antimony, arsenic, boron, cobalt, iron, manganese, sulfate, thallium, total dissolved solids, and vanadium were detected in ash pore water samples from both the ash basins above the corresponding 2L Standard or IMAC.

Groundwater Risk Classification – Key Factor

- Based on the data provided in CSA Report and results of the groundwater modeling results presented in the CAP Report, the number of down-gradient receptors (well users) 1500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:
    - East Ash Pond. **LOW RISK**. There are no reported supply wells within 1500 feet downgradient of the impoundment compliance boundary.
    - West Ash Pond. **LOW RISK.** There are no reported supply wells within 1500 feet downgradient of the impoundment compliance boundary.
    - Unnamed Eastern Extension Impoundment. **LOW RISK**. There are no reported supply wells within 1500 feet downgradient of the impoundment compliance boundary.

Surface Water Risk Classification – Key Factor



The NC floodplain map depicts a 100-year flood elevations within the west CCR impoundment. The west CCR impoundment and Hyco Lake flood elevations are predicted to be 462 and 413 feet above sea level, respectively. However, this ash basin is contained by a stream valley embankment (dam) with a discharge canal that conveys wastewater from the ash basin to Hyco Lake. This canal also conveys offsite (upstream) water around the west ash basin and into Hyco Lake. Because the basin footprint is not located along a run of a river floodplain the risk classification is Low for the Landscape Position and Floodplain criteria [Note: Dam Safety Risk Classification section addresses hydrology, hydraulics parameters and other factors as they relate to dam safety.]

- Landscape Position and Floodplain:
    - East Ash Pond. **LOW RISK.** The CCR impoundment is sited in a natural drainage way, it is sited along a reservoir and it is not located within a 100 year floodplain.
    - West Ash Pond. **LOW RISK.** The footprint of the CCR impoundment is in Sargents Creek a natural drainage way. The NC floodplain map depicts a100-year flood elevation to occur within the ash impoundment. (The CCR impoundment and Hyco Lake flood elevations are predicted to be 462 and 413 feet above sea level, respectively.) This West Ash Pond CCR impoundment is sited along a reservoir, is in drainage way, has a 70 foot tall embankment, has an outfall and is designed to discharge into Hyco Lake, a reservoir.

- Unnamed Eastern Extension Impoundment. **LOW RISK**. The CCR impoundment is sited in a natural drainage way, it is sited along a reservoir and it is not located within a 100 year floodplain.

Dam Safety Risk Classification – Key Factor

- State of Structural Stability and Maintenance:
  - East Ash Pond (PERSO-033). **LOW RISK.** This impoundment received a notice of inspection. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: tree removal and pipe removal.
  - West Ash Pond (PERSO-038 & PERSO-039). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made. This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: tree removal, slope repair, slope modification, grout pipe, and installation of a new spillway.
  - Unnamed Eastern Extension Impoundment. **N/A**. This impoundment does not have a dam and was therefore not given a rank with respect to dam safety.

W. H. WEATHERSPOON POWER PLANT RISK CLASSIFICATION

W. H. Weatherspoon Power Plant Overall Risk Classification

DEQ has proposed the risk classification for the Ash Pond as **INTERMEDIATE**.

- Groundwater Key Factor. Based on the information received to date, there appears to be no downgradient receptors located 1,500 feet downgradient of the impoundment compliance boundary. The following data gaps related to groundwater uncertainty include:
    - Incomplete background concentration determination due to turbidity issues in the background wells
    - Potential for CCR to be present in the cooling pond which would require additional assessment

  (*It should be noted that the data gaps are currently being addressed by Duke Energy and their findings will be presented to the DEQ in supplemental reports.*)
- Surface Water Key Factor. The landscape position of southeastern ash basin berm increases the risk.
- Dam Safety Key Factor. The impoundment received a high risk ranking before any repairs are made and a low risk rating once repairs are made.

Coal Ash Plant, Operations, and CCR Impoundment Description Summary (from CSA Report)

- NPDES Permit No.: NC0005363
- County: Robeson
- Plant Status: Retired
- Number of Impoundments: 1 (Ash Pond)
- The Weatherspoon Plant is a former coal-fired electrical power generation facility located on 1,015 acres near the city of Lumberton in Robeson County. Duke Energy Progress, Inc. owns the site and has owned the site for decades. The Weatherspoon Plant became operational in 1949 with a Babcock & Wilcox boiler. Two additional coal-fired units were added in the 1950s. Four oil and natural gas fueled combustion turbines were added in the 1970s. All of the coal-fired units were retired by October 2011. The four oil and natural gas fueled units continue to operate on an intermittent basis.
- The Weatherspoon Plant utilizes an approximate 225-acre cooling pond located adjacent to the Lumber River. The cooling pond remains in service. Coal ash, the potential source of contamination at the site, is no longer generated at the site. Reportedly, from 1949 to 1955 coal ash was sluiced to a low area that was eventually encompassed by the existing ash basin. Examination of historic United States Geological Survey (USGS) aerial photography shows that a small diked impoundment had been constructed by 1958. The basin was enlarged in stages to its current size by early 1981.

Source Characterization Summary (from CSA Report)

- Coal Ash. Ten samples of ash were analyzed for total metals, total organic carbon (TOC) and metals susceptible to leaching by the USEPA Synthetic Precipitation Leaching Procedure (SPLP). Arsenic was detected at quantifiable concentrations above the RSL for industrial health in all the samples tested. Cobalt was detected above the industrial health RSL in one sample, and above the residential RSL in the remaining samples. Vanadium was detected above the residential RSL in all ash samples. The residential RSL concentration in ash was exceeded for aluminum (six samples), barium (one sample), iron (four samples), manganese (one sample), and strontium (one sample). The RSL for protection of groundwater was exceeded at quantifiable concentrations in ash for antimony (three samples), barium (nine sample), beryllium (seven samples), copper (one sample), lead (nine samples), and selenium (10 samples). Boron was detected in the samples from an estimated concentration of 16.5 mg/kg to 248 mg/kg. Residual carbon (measured as TOC) in the samples ranged from 0.143 to 12.3 percent (1,430 to 123,000 mg/kg).
- Ash Leachate. Of the 25 metals analyzed, all were detected in the SPLP leachate from one or more samples except mercury and silver. Aluminum, iron, sodium, calcium, and potassium were the only COIs detected at concentrations exceeding 1

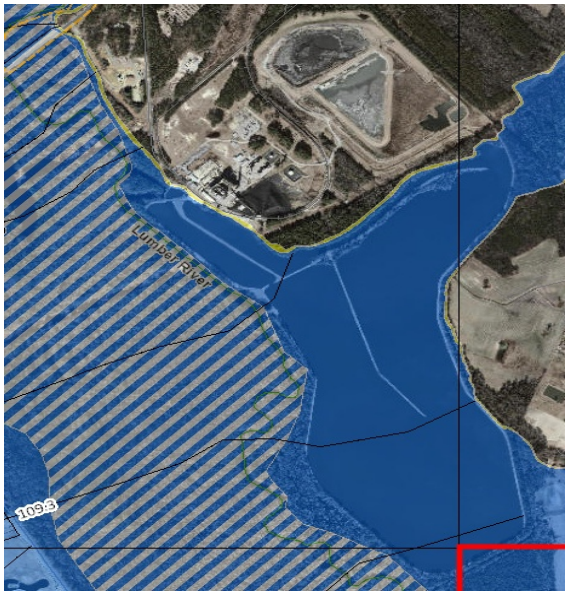
milligram per liter (mg/L) in leachate from the samples. The remainder of the metals leached at concentrations less than one milligram per liter of leachate.

- Ash Pore Water. Arsenic, barium, boron, chromium, cobalt, iron, lead, manganese, thallium, total dissolved solids, and vanadium were detected above the corresponding 2L Standard or IMAC in ash pore water in one or more samples. Elevated concentrations of calcium, potassium, magnesium, sodium, bicarbonate, chloride, and sulfate were also detected in the sample of ash pore water.

Groundwater Risk Classification – Key Factor

- Based on the data provided in CSA Report and results of the groundwater modeling results presented in the CAP Report, the number of down-gradient receptors (well users) 1,500 feet from the compliance boundary that are potentially or currently known to be exposed to impacted groundwater from source(s) or migration pathways related to the CCR impoundments:
    - Ash Pond. **LOW RISK**. There are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.

Surface Water Risk Classification – Key Factor



This figure depicts landscape positions in regard to the 100-year flood level, CCR impoundment location and river valley floodplain for the Ash Pond at W. H. Weatherspoon Steam Electric Plant. This landscape position was determined to be high risk.

- Landscape Position and Floodplain:

    - Ash Pond. **HIGH RISK.** The southeastern ash basin berm is sited along the confluence of Jacobs Swamp, the main-stem of the Lumber River and is adjacent to the cooling pond that is located within the 100-year flood plain. This landscape position was determined to be high risk.

Dam Safety Risk Classification – Key Factor

- State of Structural Stability and Maintenance:

    - Ash Pond (ROBES-009). **HIGH RISK** before repairs are made. **LOW RISK** after repairs are made**.** This impoundment received a notice of deficiency with structural deficiencies. The following modifications/repairs to the dam have been submitted and should be completed, as a minimum: vegetation removal, erosion repair, improve slopes, grout pipe, clean and clear toe drains, installation of drainage blanket, and installation of a new spillway.

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Leopold, Luna B., Wolman, M. Gordon; Miller, John P. (1992*). Fluvial Processes in Geomorphology*. Luna B. Leopold, M. Gordon Wolman and John P. Miller. Dover Publications, Inc. New York. Page 317 and 328.

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APPENDIX

In addition to the key factors DEQ analyzed a wide range of additional information that was gathered as part of this classification process. This supporting information provides a more detailed picture of the conditions at the impoundments, but has less significance in the determination of the overall classification.

Allen Steam Station

Groundwater Supporting Factors and Other Considerations:

- Amount of Stored CCR Reported in an Impoundment:
  - Active Ash Basin and Retired Ash Basin. **HIGH RISK**. There are an estimated 16,510,000 total tons of CCR stored in the impoundments.

- Position of CCR Relative to the Water Table:
  - Active Ash Basin. **HIGH RISK**. Based on the data from the CSA Report, it appears that the bottom of the Active Ash Basin is situated below the seasonal high water table.
  - Retired Ash Basin. **HIGH RISK**. Based on the data from the CSA Report, it appears that the bottom of the Retired Ash Basin is situated below the seasonal high water table.

- Exceedance of 15A NCAC 2L Standard or IMAC at or Beyond the Established CCR Impoundment Compliance Boundary:
  - Active Ash Basin. **HIGH RISK**. Several constituents were detected at or beyond the compliance boundary above the 2L Standard or IMAC including chromium, cobalt, and vanadium.
  - Retired Ash Basin. **HIGH RISK**. Several constituents were detected at or beyond the compliance boundary above the 2L Standard or IMAC including antimony, chromium, cobalt, and vanadium.

- Population Served by Water Supply Wells Within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary:
  - Active Ash Basin. **HIGH RISK.** Duke identified approximately 126 water supply wells within 1,500 feet of the ash basins. These wells are located roughly evenly between the Active and Retired Ash Basins. With the assumption of 2.5 users per well, even dividing the number of wells in half, there would be 158 users.
  - Retired Ash Basin. **HIGH RISK.** Duke identified approximately 126 water supply wells within 1,500 feet of the ash basins. These

wells are located roughly evenly between the Active and Retired Ash Basins. With the assumption of 2.5 users per well, even dividing the number of wells in half, there would be 158 users.

- Population Served by Water Supply Wells within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary:

    - Active Ash Basin. **LOW RISK**. Based on information in the CSA Report and groundwater modeling in the CAP Report related to hydraulic flow, constituent concentrations and water supply well locations, there are no supply wells located within 1,500 feet of the Active Ash Basin compliance boundary.
    - Retired Ash Basin. **LOW RISK**. Based on information in the CSA Report related to hydraulic flow, constituent concentrations and water supply well locations, there are no water supply wells that are located in the overall downgradient groundwater flow direction within 1,500 feet of the Inactive Ash Basin compliance boundary.

- Proximity of 15A NCAC 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells:

    - Active Ash Basin. **HIGH RISK**. There are several exceedances of the 2L Standard or IMAC within 500 feet of a water supply well.
    - Retired Ash Basin. **HIGH RISK**. There are several exceedances of the 2L Standard or IMAC within 500 feet of a water supply well.

- Groundwater Emanating from the Impoundment that Exceeds 2L Standard or IMAC and that Discharges into a Surface Water Body:

    - Active Ash Basin. **HIGH RISK.** Several constituents were detected above the 2L Standard or IMAC in seeps potentially associated with the active ash basin, including boron, cobalt, and vanadium that are potentially discharging to a surface water body. Several constituents were detected above the 2L Standard or IMAC in groundwater samples collected downgradient of the active basin and adjacent to surface waters. These constituents included boron, chromium, cobalt, and vanadium.
    - Retired Ash Basin. **HIGH RISK.** In addition to lower toxicity constituent manganese being detected in seeps potentially associated with the retired ash basin, vanadium was also detected which is potentially discharging to a surface water body. Several constituents were detected above the 2L Standard or IMAC in

groundwater samples collected downgradient of the inactive basin and adjacent to surface waters. These constituents included boron, chromium, cobalt, and vanadium.

- Exposure to Coal Combustion Residuals and Contaminated Soil by Ingestion or Fugitive Emissions:

    - Active Ash Basin. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
    - Retired Ash Basin. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors:

    - Active Ash Basin. **HIGH RISK**. There is a high degree of uncertainty with the data presented in the CSA Report, CAP Report, and subsequent characterization by Duke Energy related to the impoundment. The horizontal extent of contamination remains unclear until adequate background information can be determined and whether there is any potential current or historical on- or off-site hydraulic influence on observed contaminant distribution. There appears to be four water supply wells that may be located side-gradient or downgradient within 1,500 feet of the Active Ash Basin compliance boundary. Currently, there are not enough bedrock well locations to refine the understanding of groundwater flow in this area.
    - Retired Ash Basin. **INTERMEDIATE RISK**. There is a moderate degree of uncertainty with the data presented in the CSA Report, CAP Report, and subsequent characterization by Duke Energy related to the impoundment. The horizontal extent of contamination remains unclear until adequate background information can be determined and whether there is any potential current or historical on- or off-site hydraulic influence on observed contaminant distribution.

Surface Water Supporting Factors and Other Considerations:

- NPDES Wastewater and Ash Disposal Methods:
    - Active Ash Basin. **HIGH RISK**. This unlined CCR impoundment is located at a facility that currently generates cooling water, dry fly ash, and wet bottom ash wastes. The facility also has flue gas desulfurization waste.
    - Retired Ash Basin. **INTERMEDIATE/HIGH RISK**. This unlined CCR impoundment is located at a facility that currently generates wastes that include cooling water, dry fly ash, and wet bottom ash. This CCR impoundment is partially capped by a lined landfill that is located on part of the basin. The facility also has flue gas desulfurization waste.

- CCR Impoundments Footprint Siting in Natural Drainage Way or Stream:
    - Active Ash Basin. **LOW/INTERMEDIATE RISK**. A review of the aerial photographs and USGS topographic maps revealed that the existing CCR impoundments are located in landscape positions that depict contours indicating that the basins are sited in a natural drainage ways and/or streams.
    - Retired Ash Basin. **LOW/INTERMEDIATE RISK**. A review of the aerial photographs and USGS topographic maps revealed that the existing CCR impoundments are located in landscape positions that depict contours indicating that the basins are sited in a natural drainage ways and/or streams.

- Potential to Impact Surface Water Based on Total Ash Amount at Facility:
    - Active Ash Basin. **HIGH RISK**. The Active Ash Basin reportedly contains 7,660,000 tons of CCR.
    - Retired Ash Basin. **INTERMEDIATE/HIGH RISK**. The Retired Ash Basin reportedly contains 3,920,000 tons of CCR.

- Potential to Impact Surface Water Based on Dilution:
    - Active Ash Basin. **INTERMEDIATE RISK**. The NPDES discharge is in South fork of Catawba River that has a 7Q10 = 95 cfs with an average flow =2470 cfs.
    - Retired Ash Basin. **INTERMEDIATE RISK**. The NPDES discharge is in South fork of Catawba River that has a 7Q10 = 95 cfs with an average flow =2470 cfs.

- Development Density of Single-Family Residences Along Lake/Reservoir Shoreline:

    - Active Ash Basin. **INTERMEDIATE RISK**. Within two miles of the facility, there are greater than 400 single family residences located along the shoreline.
    - Retired Ash Basin. **INTERMEDIATE RISK**. Within two miles of the facility, there are greater than 400 single family residences located along the shoreline.

- Classification of the Receiving Waters:

    - Active Ash Basin. **INTERMEDIATE RISK**. The South Fork of the Catawba River is Class WS – V and B.
    - Retired Ash Basin. **INTERMEDIATE RISK**. The South Fork of the Catawba River is Class WS – V and B.

- Proximity to Water Supply Intake:

    - Active Ash Basin. **INTERMEDIATE RISK**. The Active Ash Basin and Retired Ash Basin are located adjacent to each other and are both located along the edge of Catawba River/Lake Wylie. A review of drinking water supply intakes revealed that the downstream water supply intake is greater than 10 miles away.
    - Retired Ash Basin. **INTERMEDIATE RISK**. The Active Ash Basin and Retired Ash Basin are located adjacent to each other and are both located along the edge of Catawba River/Lake Wylie. A review of drinking water supply intakes revealed that the downstream water supply intake is greater than 10 miles away.

Dam Safety Supporting Factors and Other Considerations:

- Hazard Classification:

    - Active Ash Basin (GASTO-061). **INTERMEDIATE/HIGH. RISK**. Embankment is 75 feet tall and has a volume of 1,259.3 acre-feet therefore is large in size with downstream hazards being environmental concerns.
    - Retired Ash Basin (GASTO-016). **INTERMEDIATE RISK**. Embankment is 45 feet tall and has a volume of 69 acre-feet therefore is medium in size with downstream hazards being environmental concerns.

- Proximity to Waters of the State:
    - Active Ash Basin (GASTO-061). **HIGH RISK**. Impoundment is directly adjacent to waters of the state**.**
    - Retired Ash Basin (GASTO-016). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.

- Volume of Facility:
    - Active Ash Basin (GASTO-061). **LOW RISK.** Impoundment has a volume of 1259.3 acre-feet.
    - Retired Ash Basin (GASTO-016). **LOW RISK.** Impoundment has a volume of 69 acre-feet.

- Free Water Content:
    - Active Ash Basin (GASTO-061). **LOW RISK.** Multiple cells with some being covered by water.
    - Retired Ash Basin (GASTO-016). **LOW RISK.** Impoundment is completely dry.

- Offsite Drainage Area:
    - Active Ash Basin (GASTO-061). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 293.3 acres.
    - Retired Ash Basin (GASTO-016). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 232.6 acres.

- Overall Dam Safety Risk Classification
    - Active Ash Basin (GASTO-061). **HIGH RISK** before any repairs are made and **LOW RISK** once repairs are made**.**
    - Retired Ash Basin (GASTO-016). Impoundment received a rating of **HIGH RISK** before any repairs are made and **LOW RISK** once repairs are made**.**

Belews Creek Steam Station

Groundwater Supporting Factors and Other Considerations:

- Amount of Stored CCR Reported in an CCR Impoundment:
    - Active Ash Basin. **HIGH RISK.** There are an estimated 12,010,000 total tons of CCR stored in the impoundment.
- Position of CCR Relative to the Water Table:
    - Active Ash Basin. **HIGH RISK.** Based on the information from the comprehensive site assessment, it appears that the bottom of the CCR is situated below the seasonal high water table.
- Exceedance of 2L Standard or IMAC at or Beyond the Established CCR Impoundment Compliance Boundary:
    - Active Ash Basin. **HIGH RISK**. There are several water supply wells within 500 feet of the compliance boundary, including three water supply wells containing vanadium or other constituents exceeding the 2L Standard or IMAC.
- Population Served by Water Supply Wells Within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary:
    - Active Ash Basin. **INTERMEDIATE/HIGH RISK**. Duke identified 24 drinking water supply wells within 1,500 of the compliance boundary. Comparing to the shallow and intermediate groundwater flow directions, no water supply well is exactly in downgradient. However, most of water supply wells are in bedrock, but the groundwater flow in bedrock has not been properly determined at the site. Based on the topographic map and the location of the water supply wells identified in the CSA Report, a total of five wells are (or potentially) side-downgradient of the Pine Hall Road Landfill or the CCR impoundment. With the assumption of 2.5 users per well, there would potentially be 13 users.
- Population Served by Water Supply Wells within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary:
    - Active Ash Basin. **LOW RISK.** Based on information in the CSA Report and groundwater modeling presented in the CAP Report,

there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.

- Proximity of 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells:

    - Active Ash Basin. **HIGH**. There are several water supply wells within 500 feet of the compliance boundary, including three water supply wells containing vanadium or other constituents exceeding the 2L Standard or IMAC.

- Groundwater Emanating from the Impoundment that Exceeds 2L Standard or IMAC and that Discharges into a Surface Water Body:

    - Active Ash Basin. **HIGH RISK.** Elevated chloride and thallium exceeding 2B standards were detected in the Dan River. In addition, several constituents were detected at or beyond the compliance boundary above the 2L Standard or IMAC, including beryllium, cobalt, chromium, vanadium, Total Dissolved Solids, and thallium, which may potentially discharge to the Dan River.

- Exposure to Coal Combustion Residuals and Contaminated Soil by Ingestion or Fugitive Emissions:

    - Active Ash Basin. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors:

    - Active Ash Basin. **HIGH RISK**. There is a high degree of uncertainty with the data presented in the CSA Report. Determinations of background concentrations for the constituents of interest are still on-going. Bedrock flowpaths have not been adequately characterized. The horizontal and vertical extent beneath the impoundment and downgradient have not been adequately delineated. In addition, both the closed Pine Hall Road Landfill and the onsite structural fill may contribute to groundwater contamination, which have not been adequately assessed. Groundwater flow direction in bedrock has not been well determined.

Surface Water Supporting Factors and Other Considerations:

- NPDES Wastewater and Ash Disposal Methods:
    - Active Ash Basin. **HIGH RISK.** This unlined CCR impoundment is located at a facility that currently generates cooling water, dry fly ash, wet bottom ash and FGD waste.
- CCR Impoundments Footprint Siting in Natural Drainage Way or Stream:
    - Active Ash Basin. **LOW/INTERMEDIATE RISK.** A review of the aerial photographs and USGS topographic maps revealed that the existing unlined CCR impoundment is located in a landscape position that depict topographic contours indicating that the basin is sited in a natural drainage ways and/or stream.
- Potential to Impact Surface Water Based on Total Ash Amount at Facility:
    - Active Ash Basin. **HIGH RISK.** The reported total amount of CCR in the impoundment is 12,610,000 tons.
- Potential to Impact Surface Water Based on Dilution:
    - Active Ash Basin. **INTERMEDIATE RISK.** The Dan River is Class WS- IV waters and has a 7Q10 = 80 cfs with an average flow =576 cfs.
- Development Density of Single-Family Residences Along Lake/Reservoir Shoreline:
    - Active Ash Basin. **LOW RISK.** Within two miles of the facility, there are less than 400 single family residences located along the shoreline.
- Classification of the Receiving Waters:
    - Active Ash Basin. **INTERMEDIATE/HIGH RISK.** The Dan River is classified as water supply (WS) - IV and Belews Lake is WS- IV waters.

- Proximity to Water Supply Intake:

    - Active Ash Basin. **HIGH RISK.** A review of drinking water supply intakes revealed that the downstream water supply intake is located approximately 10 miles downstream.

Dam Safety Supporting Factors and Other Considerations:

- Hazard Classification:

    - Active Ash Basin (STOKE-116). **HIGH RISK.** Embankment is 135 feet tall and has a volume of 18,200 acre-feet therefore is very large in size with downstream hazards being potential loss of life due to several structures being in the inundation area of potential breach.

- Proximity to Waters of the State:

    - Active Ash Basin (STOKE-116). **INTERMEDIATE RISK.** Potential coal combustion residual migration is constrained by physical barrier. Road NC 1908 (Pine Hall Road) is the physical barrier and the pipe through the roadway embankment has been recently grouted.

- Volume of Facility:

    - Active Ash Basin (STOKE-116). **HIGH RISK.** Impoundment has a volume of 18,200 acre-ft.

- Free Water Content:

    - Active Ash Basin (STOKE-116). **INTERMEDIATE RISK** before being dewatered. **LOW RISK** after being dewatered. 25 to 75% of reservoir area is covered by water.

- Offsite Drainage Area:

    - Active Ash Basin (STOKE-116). **INTERMEDIATE/HIGH RISK.** Impoundment has an offsite drainage area of 683 acres.

- Overall Dam Safety Risk Classification

    - Active Ash Basin (STOKE-116). **HIGH RISK** before any repairs are made, **INTERMEDIATE RISK** once repairs are made, and **LOW RISK** once repairs are made and impoundment has been dewatered**.**

Buck Combined Cycle Station

Groundwater Supporting Factors and Other Considerations:

- Amount of Stored Coal Combustion Residuals Reported in a CCR Impoundment:
    - Ash Basin Cell 1, Ash Basin Cell 2, and Ash Basin Cell 3. **INTERMEDIATE RISK.** There are an estimated 5,060,000 total tons of CCR stored in the impoundments.

- Position of Coal Combustion Residuals Relative to the Water Table:
    - Ash Basin Cell 1. **HIGH RISK**. Based on the data from the CSA Report, it appears that the bottom of the Ash Basin Cell 1 is situated below the water table.
    - Ash Basin Cell 2. **HIGH RISK**. Based on the data from the CSA Report, it appears that the bottom of the Ash Basin Cell 2 is situated below the water table.
    - Ash Basin Cell 3. **HIGH RISK**. Based on the data from the CSA Report, it appears that the bottom of the Ash Basin Cell 3 is situated below the water table.

- Exceedance of 2L Standard or IMAC at or Beyond the Established CCR Impoundment Compliance Boundary:
    - Ash Basin Cell 1. **HIGH RISK**. Several constituents were detected at or beyond the compliance boundary above the 2L Standard or IMAC including chromium, cobalt, and vanadium.
    - Ash Basin Cell 2. **HIGH RISK**. Several constituents were detected at or beyond the compliance boundary above the 2L Standard or IMAC including antimony, chromium, cobalt, and vanadium.
    - Ash Basin Cell 3. **HIGH RISK**. Several constituents were detected at or beyond the compliance boundary above the 2L Standard or IMAC including antimony, chromium, cobalt, and vanadium.

- Population Served by Water Supply Wells Within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary:
    - Ash Basin Cell 1. **HIGH RISK.** Duke identified approximately 103 water supply wells within 1,500 feet of the CCR impoundments. These wells are in locations spread around all three CCR impoundments. Each CCR impoundment has at least 12 water supply wells within 1,500 feet of it which places it in the high risk

category (>30 people, assuming 2.5 persons per well). Even dividing the number of wells evenly between the three basins, assuming 2.5 users per well, there are at least 86 persons per basin within 1,500 feet. This totals approximately 258 persons and does not include the Buck Station's own water supply well which is also within 1,500 feet of Ash Basin 1.

- Ash Basin Cell 2. **HIGH RISK.** Duke identified approximately 103 water supply wells within 1,500 feet of the CCR impoundments. These wells are in locations spread around all three CCR impoundments. Each CCR impoundment has at least 12 water supply wells within 1,500 feet of it which places it in the high risk category (>30 people, assuming 2.5 persons per well). Even dividing the number of wells evenly between the three basins, assuming 2.5 users per well, there are at least 86 persons per basin within 1,500 feet. This totals approximately 258 persons and does not include the Buck Station's own water supply well which is also within 1,500 feet of Ash Basin 1.
- Ash Basin Cell 3. **HIGH RISK.** Duke identified approximately 103 water supply wells within 1,500 feet of the CCR impoundments. These wells are in locations spread around all three CCR impoundments. Each CCR impoundment has at least 12 water supply wells within 1,500 feet of it which places it in the high risk category (>30 people, assuming 2.5 persons per well). Even dividing the number of wells evenly between the three basins, assuming 2.5 users per well, there are at least 86 persons per basin within 1,500 feet. This totals approximately 258 persons and does not include the Buck Station's own water supply well which is also within 1,500 feet of Ash Basin 1.

- Population Served by Water Supply Wells within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary:

  - Ash Basin Cell 1. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.
  - Ash Basin Cell 2. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.

- Ash Basin Cell 3. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.

- Proximity of 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells:

  - Ash Basin Cell 1. **HIGH RISK**. There are several exceedances of the 2L Standard or IMAC within 500 feet of a water supply well.
  - Ash Basin Cell 2. **HIGH RISK**. There are several exceedances of the 2L Standard or IMAC within 500 feet of a water supply well.
  - Ash Basin Cell 3. **HIGH RISK**. There are several exceedances of the 2L Standard or IMAC within 500 feet of a water supply well.

- Groundwater Emanating from the Impoundment that Exceeds 2L Standard or IMAC and that Discharges into a Surface Water Body:

  - Ash Basin Cell 1. **HIGH RISK.** Several constituents were detected above the 2L Standard or IMAC in seeps potentially associated with the Ash Basin Cell 1, including boron, cobalt, and vanadium that are potentially discharging to a surface water body. Several constituents were detected above the 2L Standard or IMAC in groundwater samples collected downgradient of the Ash Basin Cell 1 and adjacent to surface waters. These constituents included chromium, cobalt, and vanadium.
  - Ash Basin Cell 2. **HIGH RISK.** Several constituents were detected above the 2L Standard or IMAC in seeps potentially associated with the Ash Basin Cell 2, including chromium, cobalt, and vanadium that are potentially discharging to a surface water body. Several constituents were detected above the 2L Standard or IMAC in groundwater samples collected downgradient of Ash Basin Cell 2 and adjacent to surface waters. These constituents included chromium, cobalt, and vanadium.
  - Ash Basin Cell 3. **HIGH RISK.** Several constituents were detected above the 2L Standard or IMAC in seeps potentially associated with the Ash Basin Cell 3, including chromium, cobalt, and vanadium that are potentially discharging to a surface water body. Several constituents were detected above the 2L Standard or IMAC in groundwater samples collected downgradient of the Ash Basin Cell 3 and adjacent to surface waters. These constituents included boron, chromium, cobalt, and vanadium.

- Exposure to Coal Combustion Residuals and Contaminated Soil by Ingestion or Fugitive Emissions:

    - Ash Basin Cell 1. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
    - Ash Basin Cell 2. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
    - Ash Basin Cell 3. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors:

    - Ash Basin Cell 1. **INTERMEDIATE RISK**. There is a moderate degree of uncertainty with the data presented in the CSA Report, CAP Report, and subsequent characterization by Duke Energy related to the impoundment. The horizontal extent of contamination remains unclear until adequate background information can be determined and whether there is any potential current or historical on- or off-site hydraulic influence on observed contaminant distribution.
    - Ash Basin Cell 2. **INTERMEDIATE RISK**. There is a moderate degree of uncertainty with the data presented in the CSA Report, CAP Report, and subsequent characterization by Duke Energy related to the impoundment. The horizontal extent of contamination remains unclear until adequate background information can be determined and whether there is any potential current or historical on- or off-site hydraulic influence on observed contaminant distribution.
    - Ash Basin Cell 3. **INTERMEDIATE RISK**. There is a moderate degree of uncertainty with the data presented in the CSA Report, CAP Report, and subsequent characterization by Duke Energy related to the impoundment. The horizontal extent of contamination remains unclear until adequate background information can be determined and whether there is any potential current or historical on- or off-site hydraulic influence on observed contaminant distribution.

Surface Water Supporting Factors and Other Considerations:

- NPDES Wastewater and Ash Disposal Methods:
    - Ash Basin Cell 1. **LOW/INTEMEDIATE RISK.** Retired plant. Permitted wastewater outfalls include cooling water, ash pond and coal pile runoff, and emergency yard sump overflow. Also, no FGD treatment units were built or put into operation for this facility.
    - Ash Basin Cell 2. **LOW/INTEMEDIATE RISK**. Retire plant. Permitted wastewater outfalls include cooling water, ash pond and coal pile runoff, and emergency yard sump overflow. Also, no FGD treatment units were built or put into operation for this facility.
    - Ash Basin Cell 3. **LOW/INTEMEDIATE RISK**. Retired plant. Permitted wastewater outfalls include cooling water, ash pond and coal pile runoff, and emergency yard sump overflow. Also, no FGD treatment units were built or put into operation for this facility.

- CCR Impoundments Footprint Siting in Natural Drainage Way or Stream:
    - Ash Basin Cell 1. **LOW/INTERMEDIATE RISK.** A review of the aerial photographs and USGS topographic maps revealed that the existing unlined CCR impoundment is located in a landscape position that depict topographic contours indicating that it is sited in a natural drainage way and/or stream.
    - Ash Basin Cell 2. **LOW/INTERMEDIATE RISK**. A review of the aerial photographs and USGS topographic maps revealed that the existing unlined CCR impoundment is located in a landscape position that depict topographic contours indicating that it is sited in a natural drainage way and/or stream.
    - Ash Basin Cell 3. **LOW/INTERMEDIATE RISK**. A review of the aerial photographs and USGS topographic maps revealed that the existing unlined CCR impoundment is located in a landscape position that depict topographic contours indicating that it is sited in a natural drainage way and/or stream.

- Potential to Impact Surface Water Based on Total Ash Amount at Facility:
    - Ash Basin Cell 1. **INTERMEDIATE/HIGH RISK.** The reported total amount of CCR in the impoundment is 2,840,000 tons.
    - Ash Basin Cell 2. **INTERMEDIATE/HIGH RISK**. The reported total amount of CCR in the impoundment is 1,950,000 tons.
    - Ash Basin Cell 3. **LOW/INTERMEDIATE**. The reported total amount of CCR in the impoundment is 270,000 tons.

- Potential to Impact Surface Water Based on Dilution:

    - Ash Basin Cell 1. **LOW RISK.** The Yakin River is Class WS- V waters and has a 7Q10 = 1030 cfs with an average flow = 4960 cfs.
    - Ash Basin Cell 2. **LOW RISK**. The Yakin River is Class WS- V waters and has a 7Q10 = 1030 cfs with an average flow = 4960 cfs.
    - Ash Basin Cell 3. **LOW RISK**. The Yakin River is Class WS- V waters and has a 7Q10 = 1030 cfs with an average flow = 4960 cfs.

- Development Density of Single-Family Residences Along Lake/Reservoir Shoreline:

    - Ash Basin Cell 1. **LOW RISK.** This metric was not applied because the facility is not located along a reservoir.
    - Ash Basin Cell 2. **LOW RISK.** This metric was not applied because the facility is not located along a reservoir.
    - Ash Basin Cell 3. **LOW RISK.** This metric was not applied because the facility is not located along a reservoir.

- Classification of the Receiving Waters:

    - Ash Basin Cell 1. **INTERMEDIATE RISK.** The Yadkin River is Class WS-V B waters.
    - Ash Basin Cell 2. **INTERMEDIATE RISK**. The Yadkin River is Class WS-V waters.
    - Ash Basin Cell 3. **INTERMEDIATE RISK**. The Yadkin River is Class WS-V waters.

- Proximity to Water Supply Intake:

    - Ash Basin Cell 1. **INTEMEDIATE RISK.** The water supply protected area begins approximately 11 air miles (approximately 13 river miles) downstream from the facility.
    - Ash Basin Cell 2. **INTEMEDIATE RISK**. The water supply protected area begins approximately 11 air miles (approximately 13 river miles) downstream from the facility.
    - Ash Basin Cell 3. **INTEMEDIATE RISK**. The water supply protected area begins approximately 11 air miles (approximately 13 river miles) downstream from the facility.

Dam Safety Supporting Factors and Other Considerations:

- Hazard Classification:
  - Ash Basin Cell 1 to Ash Basin Cell 2 & Additional Primary Dams (ROWAN-068 & ROWAN-069). **INTERMEDIATE/HIGH RISK.** Embankment is 71 feet tall and has a volume of 851 acre-feet therefore is large in size with downstream hazards being environmental concerns.
  - Ash Basin Cell 2 to Ash Basin Cell 3 & Divider Dams (ROWAN-070 & ROWAN-071). **LOW/INTERMEDIATE RISK.** Embankment is 14 feet tall and has a volume of 225 acre-feet therefore is small in size with downstream hazards being environmental concerns.
  - Main Dam (ROWAN-047). **LOW/INTERMEDIATE RISK.** Embankment is 59 feet tall and has a volume of 195 acre-feet therefore is large in size with downstream hazards being environmental concerns.

- Proximity to Waters of the State:
  - Ash Basin Cell 1 to Ash Basin Cell 2 & Additional Primary Dams (ROWAN-068 & ROWAN-069). **INTERMEDIATE RISK.** Potential coal combustion residual migration is constrained by physical barrier. There is approximately 1,500 feet of land between the embankment and the waters of the state.
  - Ash Basin Cell 2 to Ash Basin Cell 3 & Divider Dams (ROWAN-070 & ROWAN-071). **LOW RISK.** The impoundment is located within or above a larger CCR impoundment with a large amount of available storage. The main dam (ROWAN-047) contains a larger impoundment that could store this impoundment.
  - Main Dam (ROWAN-047). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.

- Volume of Facility:
  - Ash Basin Cell 1 to Ash Basin Cell 2 & Additional Primary Dams (ROWAN-068 & ROWAN-069). **LOW RISK.** Impoundment has a volume of 851 acre-feet.
  - Ash Basin Cell 2 to Ash Basin Cell 3 & Divider Dams (ROWAN-070 & ROWAN-071). **LOW RISK.** Impoundment has a volume of 225 acre-feet.

- Main Dam (ROWAN-047). **LOW RISK.** Impoundment has a volume of 195 acre-feet.

- Free Water Content:

  - Ash Basin Cell 1 to Ash Basin Cell 2 & Additional Primary Dams (ROWAN-068 & ROWAN-069). **LOW RISK**. Impoundment has been dry since 2013. Less than 25% of reservoir area is covered by water.
  - Ash Basin Cell 2 to Ash Basin Cell 3 & Divider Dams (ROWAN-070 & ROWAN-071). **INTERMEDIATE RISK** before being dewatered. **LOW RISK** after being dewatered. 25 to 75% of reservoir area is covered by water.
  - Main Dam (ROWAN-047). **LOW RISK**. Less than 25% of reservoir area is covered by water.

- Offsite Drainage Area:

  - Ash Basin Cell 1 to Ash Basin Cell 2 & Additional Primary Dams (ROWAN-068 & ROWAN-069). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 179 acres.
  - Ash Basin Cell 2 to Ash Basin Cell 3 & Divider Dams (ROWAN-070 & ROWAN-071). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 154 acres.
  - Main Dam (ROWAN-047). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 45 acres.

- Overall Dam Safety Risk Classification

  - Ash Basin Cell 1 to Ash Basin Cell 2 & Additional Primary Dams (ROWAN-068 & ROWAN-069). **INTERMEDIATE RISK** before any repairs are made and **LOW RISK** once repairs are made**.**
  - Ash Basin Cell 2 to Ash Basin Cell 3 & Divider Dams (ROWAN-070 & ROWAN-071). **INTERMEDIATE RISK** before any repairs are made, **INTERMEDIATE RISK** once repairs are made, and **LOW RISK** once repairs are made and impoundment has been dewatered**.**
  - Main Dam (ROWAN-047). **HIGH RISK** before any repairs are made and **LOW RISK** once repairs are made**.**

Cape Fear Steam Electric Plant

Groundwater Supporting Factors and Other Considerations:

- Amount of Stored CCR Reported in an Impoundment:
    - 1956 Ash Pond, 1963 Ash Pond, 1970 Ash Pond, 1978 Ash Pond, and 1985 Ash Pond. **INTERMEDIATE RISK.** There are an estimated 5,670,000 total tons of CCR stored in the impoundments.

- Position of CCR Relative to the Water Table:
    - 1956 Ash Pond. **INTERMEDIATE RISK**. It should be noted that cross section 6-2 depicts that the CCR impoundment may be above the seasonal high water table.
    - 1963 Ash Pond. **INTERMEDIATE RISK.** According to the data presented in the CSA Report, the coal combustion residuals appear to be approximately equal to the water table.
    - 1970 Ash Pond. **INTERMEDIATE RISK.** According to the data presented in the CSA Report, the CCR appear to be approximately equal to the water table.
    - 1978 Ash Pond. **INTERMEDIATE RISK.** According to the data presented in the CSA Report, the CCR appear to be approximately equal to the water table.
    - 1985 Ash Pond. **INTERMEDIATE RISK.** According to the data presented in the CSA Report, the CCR appear to be approximately equal to the water table.

- Exceedance of 2L Standard or IMAC at or Beyond the Established CCR Impoundment Compliance Boundary:
    - 1956 Ash Pond. **HIGH RISK**. Cobalt detected in CMW-02 at a concentration greater than the 2L Standard or IMAC.
    - 1963 Ash Pond. **HIGH RISK**. Boron detected in CMW-08 at a concentration greater than the 2L Standard or IMAC.
    - 1970 Ash Pond. **HIGH RISK**. Boron detected in CMW-01 at a concentration greater than the 2L Standard or IMAC.
    - 1978 Ash Pond. **HIGH RISK**. Cobalt detected in the ash basin well ABMW-02SU at 19 ug/L. The presence of Cobalt in in well CMW-08 may be a contribution from the 1978 basin. Also, Cobalt present in downgradient well CMW-07 at 16.5 ug/L. Further downgradient well MW-12 has the presence of Cobalt greater than the IMAC.

- 1985 Ash Pond. **HIGH RISK.** Boron present in CMW-06 at greater than the 2L standard. Cobalt present in MW-17SU at greater than the IMAC.

- Population Served by Water Supply Wells Within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary:

  - 1956 Ash Pond. **LOW RISK**. No water supply wells noted within 1,500 feet up-gradient or side-gradient of the impoundment compliance boundary.
  - 1963 Ash Pond. **LOW RISK**. No water supply wells noted within 1,500 feet up-gradient or side-gradient of the impoundment compliance boundary.
  - 1970 Ash Pond. **LOW RISK**. No water supply wells noted within 1,500 feet up-gradient or side-gradient of the impoundment compliance boundary.
  - 1978 Ash Pond. **LOW RISK**. No water supply wells noted within 1,500 feet up-gradient or side-gradient of the impoundment compliance boundary.
  - 1985 Ash Pond. **LOW RISK**. No water supply wells noted within 1,500 feet up-gradient or side-gradient of the impoundment compliance boundary.

- Population Served by Water Supply Wells within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary:

  - 1956 Ash Pond. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.
  - 1963 Ash Pond. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.
  - 1970 Ash Pond. **LOW RISK** Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.
  - 1978 Ash Pond. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report,

there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.

- 1985 Ash Pond. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.

- Proximity of 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells:

  - 1956 Ash Pond. **LOW RISK**. No exceedances detected within 1,500 feet of impoundment compliance boundary. Reported well DW-10 in Duke WSW survey Figure 1 discovered to be incorrect per landowner.
  - 1963 Ash Pond. **LOW RISK**. No exceedances detected within 1,500 feet of impoundment compliance boundary.
  - 1970 Ash Pond. **LOW RISK.** No exceedances detected within 1,500 feet of impoundment compliance boundary.
  - 1978 Ash Pond. **LOW RISK.** No exceedances detected within 1,500 feet of impoundment compliance boundary.
  - 1985 Ash Pond. **INTERMEDIATE RISK**. Exceedances detected within 500 feet to 1,500 feet of impoundment compliance boundary. Monitoring well MW-09 has a detection of Cobalt greater than the IMAC. MW-09 is within the range (horizontal distance) for the intermediate ranking in relation to identified water supply wells DW-5 and DW-9 (Duke Water Supply Well Survey). It should be noted that the identified water wells are expected to be up-gradient of monitoring well MW-09 and that this monitoring well's intended purpose is as a geochemical background data point.

- Groundwater Emanating from the Impoundment that Exceeds 2L Standard or IMAC and that Discharges into a Surface Water Body:

  - 1956 Ash Pond. **HIGH RISK.** CMW-02 has detection of various constituents (including Boron) greater than the 2L Standard or IMAC. The well's proximity to this basin and its location near the Cape Fear is an indication that groundwater from the CCR impoundment is discharging into the river.
  - 1963 Ash Pond. **HIGH RISK**. Arsenic and Cobalt (but not limited to) detected in S-16 (seep) that exceed the 2L Standard or IMAC. CMW-08 has detections of various constituents (including Boron)

greater than the 2L Standard or IMAC. The well's proximity to this basin and its location near the Cape Fear is an indication that groundwater from the CCR impoundment is discharging into the river.

- 1970 Ash Pond. **HIGH RISK.** CMW-01 has detection of various constituents (including Boron) greater than the 2L Standard or IMAC. The wells proximity to this basin and its location near the Cape Fear is an indication that groundwater from the CCR impoundment is discharging into the river.
- 1978 Ash Pond. **HIGH RISK**. CMW-07 has detections of various constituents (including Cobalt) greater than the 2L Standard or IMAC. The well is located adjacent to the discharge canal which discharges into the Cape Fear and in a location expected to be downgradient from the CCR impoundment.
- 1985 Ash Pond. **HIGH RISK**. Boron exceeds 2L Standard in S-4, S-9, S-10 (seeps). One or more of the seeps appear to discharge to the Cape Fear by way of the unnamed tributaries or named surface water features.

- Exposure to Coal Combustion Residuals and Contaminated Soil by Ingestion or Fugitive Emissions:

  - 1956 Ash Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
  - 1963 Ash Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
  - 1970 Ash Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
  - 1978 Ash Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
  - 1985 Ash Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors:

  - 1956 Ash Pond. **INTERMEDIATE RISK.** A review of additional geologic literature was completed and it was found that diabase

dikes or sills were mapped in the immediate area of the CCR impoundments. Diabase may present a preferential pathway/s for coal ash constituents.

- 1963 Ash Pond. **INTERMEDIATE RISK.** A review of additional geologic literature was completed and it was found that diabase dikes or sills were mapped in the immediate area of the CCR impoundments. Diabase may present a preferential pathway/s for coal ash constituents.
- 1970 Ash Pond. **INTERMEDIATE RISK.** A review of additional geologic literature was completed and it was found that diabase dikes or sills were mapped in the immediate area of the CCR impoundments. Diabase may present a preferential pathway/s for coal ash constituents.
- 1978 Ash Pond. **INTERMEDIATE RISK.** A review of additional geologic literature was completed and it was found that diabase dikes or sills were mapped in the immediate area of the CCR impoundments. Diabase may present a preferential pathway/s for coal ash constituents.
- 1985 Ash Pond. **INTERMEDIATE RISK.** A review of additional geologic literature was completed and it was found that diabase dikes or sills were mapped in the immediate area of the CCR impoundments. Diabase may present a preferential pathway/s for coal ash constituents.

Surface Water Risk Supporting Factors and Other Considerations:

- NPDES Wastewater and Ash Disposal Methods:

  - 1956 Ash Pond. **LOW/INTERMEDEIATE RISK**. Retired plant. Permitted wastewater outfall included combined flow from ash pond, once through cooling water, domestic wastewater and coal pile discharge. No FGD treatment units were built or put into operation for this facility.
  - 1963 Ash Pond. **LOW/INTERMEDEIATE RISK**. Retired plant. Permitted wastewater outfall included combined flow from ash pond, once through cooling water, domestic wastewater and coal pile discharge. No FGD treatment units were built or put into operation for this facility.
  - 1970 Ash Pond. **LOW/INTERMEDEIATE RISK.** Retired plant. Permitted wastewater outfall included combined flow from ash pond, once through cooling water, domestic wastewater and coal pile discharge. No FGD treatment units were built or put into operation for this facility.

- 1978 Ash Pond. **LOW/INTERMEDEIATE RISK.** Retired plant. Permitted wastewater outfall included combined flow from ash pond, once through cooling water, domestic wastewater and coal pile discharge. No FGD treatment units were built or put into operation for this facility.
- 1985 Ash Pond. **LOW/INTERMEDEIATE RISK.** Retired plant. Permitted wastewater outfall included combined flow from ash pond, once through cooling water, domestic wastewater and coal pile discharge. No FGD treatment units were built or put into operation for this facility.

- CCR Impoundments Footprint Siting in Natural Drainage Way or Stream:

  - 1956 Ash Pond. **LOW RISK**. Retired plant. From the review of the USGS map, it is unclear if Shaddox Creek was historically relocated to outlet to the Haw River rather than the Cape Fear River. It is unclear if an ash basin is sited within a stream channel.
  - 1963 Ash Pond. **LOW RISK**. Retired plant. From the review of the USGS map, it is unclear if Shaddox Creek was historically relocated to outlet to the Haw River rather than the Cape Fear River. It is unclear if an ash basin is sited within a stream channel.
  - 1970 Ash Pond. **LOW RISK.** Retired plant. From the review of the USGS map, it is unclear if Shaddox Creek was historically relocated to outlet to the Haw River rather than the Cape Fear River. It is unclear if an ash basin is sited within a stream channel.
  - 1978 Ash Pond. **LOW RISK.** Retired plant. From the review of the USGS map, it is unclear if Shaddox Creek was historically relocated to outlet to the Haw River rather than the Cape Fear River. It is unclear if an ash basin is sited within a stream channel.
  - 1985 Ash Pond. **LOW RISK.** Retired plant. From the review of the USGS map, it is unclear if Shaddox Creek was historically relocated to outlet to the Haw River rather than the Cape Fear River. It is unclear if an ash basin is sited within a stream channel.

- Potential to Impact Surface Water Based on Total Ash Amount at Facility:

  - 1956 Ash Pond. **LOW/INTERMEDIATE RISK**. The reported total amount of CCR in the impoundment is 420,000 tons.
  - 1963 Ash Pond. **INTERMEDIATE RISK**. The reported total amount of CCR in the impoundment is 760,000 tons.
  - 1970 Ash Pond. **INTERMEDIATE RISK.** The reported total amount of CCR in the impoundment is 840,000 tons.

- 1978 Ash Pond. **INTERMEDIATE RISK.** The reported total amount of CCR in the impoundment is 830,000 tons.
- 1985 Ash Pond. **INTERMEDIATE/HIGH RISK.** The reported total amount of CCR in the impoundment is 2,820,000 tons.

- Potential to Impact Surface Water Based on Dilution:

  - 1956 Ash Pond. **INTERMEDIATE RISK**. The Cape Fear River and unnamed tributary to the Cape Fear River have a 7Q10 = 61 cfs with an average flow =61 cfs.
  - 1963 Ash Pond. **INTERMEDIATE RISK**. The Cape Fear River and unnamed tributary to the Cape Fear River have a 7Q10 = 61 cfs with an average flow =61 cfs.
  - 1970 Ash Pond. **INTERMEDIATE RISK.** The Cape Fear River and unnamed tributary to the Cape Fear River have a 7Q10 = 61 cfs with an average flow =61 cfs.
  - 1978 Ash Pond. **INTERMEDIATE RISK.** The Cape Fear River and unnamed tributary to the Cape Fear River have a 7Q10 = 61 cfs with an average flow =61 cfs.
  - 1985 Ash Pond. **INTERMEDIATE RISK.** The Cape Fear River and unnamed tributary to the Cape Fear River have a 7Q10 = 61 cfs with an average flow =61 cfs.

- Development Density of Single-Family Residences Along Lake/Reservoir Shoreline:

  - 1956 Ash Pond. **LOW RISK**. This metric was not applied because the facility is located along the run of a river.
  - 1963 Ash Pond. **LOW RISK**. This metric was not applied because the facility is located along the run of a river.
  - 1970 Ash Pond. **LOW RISK.** This metric was not applied because the facility is located along the run of a river.
  - 1978 Ash Pond. **LOW RISK.** This metric was not applied because the facility is located along the run of a river.
  - 1985 Ash Pond. **LOW RISK.** This metric was not applied because the facility is located along the run of a river.

- Classification of the Receiving Waters:

  - 1956 Ash Pond. **INTERMEDIATE/HIGH RISK**. The Cape Fear River and the unnamed tributary to Cape Fear River are Class WS-IV waters.

- 1963 Ash Pond. **INTERMEDIATE/HIGH RISK**. The Cape Fear River and the unnamed tributary to Cape Fear River are Class WS-IV waters.
- 1970 Ash Pond. **INTERMEDIATE/HIGH RISK.** The Cape Fear River and the unnamed tributary to Cape Fear River are Class WS-IV waters.
- 1978 Ash Pond. **INTERMEDIATE/HIGH RISK.** The Cape Fear River and the unnamed tributary to Cape Fear River are Class WS-IV waters.
- 1985 Ash Pond. **INTERMEDIATE/HIGH RISK.** The Cape Fear River and the unnamed tributary to Cape Fear River are Class WS-IV waters.

- Proximity to Water Supply Intake:

  - 1956 Ash Pond. **HIGH RISK**. A review of drinking water supply intakes revealed that for the facility, the downstream water supply intake is less than 10 miles away.
  - 1963 Ash Pond. **HIGH RISK**. A review of drinking water supply intakes revealed that for the facility, the downstream water supply intake is less than 10 miles away.
  - 1970 Ash Pond. **HIGH RISK.** A review of drinking water supply intakes revealed that for the facility, the downstream water supply intake is less than 10 miles away.
  - 1978 Ash Pond. **HIGH RISK.** A review of drinking water supply intakes revealed that for the facility, the downstream water supply intake is less than 10 miles away.
  - 1985 Ash Pond. **HIGH RISK.** A review of drinking water supply intakes revealed that for the facility, the downstream water supply intake is less than 10 miles away.

Dam Safety Supporting Factors and Other Considerations:

- Hazard Classification:

  - 1956 Ash Pond (CHATH-075). **LOW/INTERMEDIATE RISK.** Impoundment has a volume of 240 acre-feet therefore is small in size with downstream hazards being environmental concerns.
  - 1963 Ash Pond (CHATH-076). **LOW/INTERMEDIATE RISK.** Impoundment has a volume of 462 acre-feet therefore is small in size with downstream hazards being environmental concerns.

- 1970 Ash Pond (CHATH-077). **LOW/INTERMEDIATE RISK.** Impoundment has a volume of 810 acre-feet therefore is small in size with downstream hazards being environmental concerns.
- 1978 Ash Pond (CHATH-078). **INTERMEDIATE RISK.** Embankment is 27 feet tall and has a volume of 945 acre-feet therefore is medium in size with downstream hazards being environmental concerns.
- 1985 Ash Pond (CHATH-079). **HIGH RISK.** Embankment is 28 feet tall and has a volume of 1,680 acre-feet therefore is medium in size with downstream hazards being potential loss of life due to public road being in the inundation area of potential breach.

- Proximity to Waters of the State:

  - 1956 Ash Pond (CHATH-075). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.
  - 1963 Ash Pond (CHATH-076). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.
  - 1970 Ash Pond (CHATH-077). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.
  - 1978 Ash Pond (CHATH-078). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.
  - 1985 Ash Pond (CHATH-079). **INTERMEDIATE RISK.** Potential coal combustion residual migration is constrained by physical barrier. There is approximately 800 feet of land between the embankment and the waters of the state.

- Volume of Facility:

  - 1956 Ash Pond (CHATH-075). **LOW RISK.** Impoundment has a volume of 240 acre-feet.
  - 1963 Ash Pond (CHATH-076). **LOW RISK.** Impoundment has a volume of 462 acre-feet.
  - 1970 Ash Pond (CHATH-077). **LOW RISK.** Impoundment has a volume of 810 acre-feet.
  - 1978 Ash Pond (CHATH-078). **LOW RISK.** Impoundment has a volume of 945 acre-feet.
  - 1985 Ash Pond (CHATH-079). **INTERMEDIATE RISK.** Impoundment has a volume of 1,680 acre-feet.

- Free Water Content:

    - 1956 Ash Pond (CHATH-075). **LOW RISK.** Impoundment is dry, forested, and can't hold water. Less than 25% of reservoir area is covered by water.
    - 1963 Ash Pond (CHATH-076). **LOW RISK.** Impoundment is dry and forested. Less than 25% of reservoir area is covered by water.
    - 1970 Ash Pond (CHATH-077). **LOW RISK.** Impoundment is dry with some wetland ponding water. Less than 25% of reservoir area is covered by water.
    - 1978 Ash Pond (CHATH-078). **INTERMEDIATE RISK.** 25 to 75% of reservoir area is covered by water.
    - 1985 Ash Pond (CHATH-079). **LOW RISK.** Impoundment is dry with ash stacked in reservoir area. Less than 25% of reservoir area is covered by water.

- Offsite Drainage Area:

    - 1956 Ash Pond (CHATH-075). **LOW RISK.** Impoundment has an offsite drainage area of 0 acres.
    - 1963 Ash Pond (CHATH-076). **LOW/INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 49.7 acres.
    - 1970 Ash Pond (CHATH-077). **LOW RISK.** Impoundment has an offsite drainage area of 0 acres.
    - 1978 Ash Pond (CHATH-078). **LOW/INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 59.9 acres. Impoundment can hold 3.5 to 4 times the design storm event.
    - 1985 Ash Pond (CHATH-079). **LOW/INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 59.9 acres.

- Overall Dam Safety Risk Classification

    - 1956 Ash Pond (CHATH-075). **INTERMEDIATE RISK** before any repairs are made and **LOW RISK** once repairs are made**.**
    - 1963 Ash Pond (CHATH-076). **LOW RISK** before any repairs are made.
    - 1970 Ash Pond (CHATH-077). **INTERMEDIATE RISK** before any repairs are made and **LOW RISK** once repairs are made**.**
    - 1978 Ash Pond (CHATH-078). **HIGH RISK** before any repairs are made and **LOW RISK** once repairs are made**.**
    - 1985 Ash Pond (CHATH-079). **LOW RISK** before any repairs are made.

James E. Rogers Energy Complex (Formerly Cliffside Steam Station)

Supporting Factors and Other Considerations:

- Amount of Stored CCR Reported in an Impoundment:
  - Active Ash Basin, Retired Unit 1-4 Basin, and Retired Unit 5 Basin. **INTERMEDIATE RISK**. There are an estimated 7,730,000 total tons of CCR stored in the impoundments.

- Position of CCR Relative to the Water Table:
  - Active Ash Basin, to include adjacent ash storage areas**. HIGH RISK.** Based on data from the CSA Report, the bottom of ash is situated below the seasonal high water table.
  - Retired Unit 1-4 Basin. **HIGH RISK.** Based on data from the CSA Report, the bottom of ash is situated below the seasonal high water table.
  - Retired Unit 5 Basin. **HIGH RISK.** Based on data from the CSA Report, the bottom of ash is situated below the seasonal high water table.

- Exceedance of 2L Standard or IMAC at or Beyond the Established CCR Impoundment Compliance Boundary:
  - Active Ash Basin, including adjacent ash storage areas. **HIGH RISK.** Several constituents were detected at or beyond the compliance boundary above the 2L Standard or IMAC including iron, manganese, cobalt, vanadium, sulfate, and total dissolved solids.
  - Retired Unit 1-4 Basin. **HIGH RISK.** Data unavailable at or beyond compliance boundary in this area. However, several constituents were detected at or beyond the *waste* boundary above the 2L Standard or IMAC including iron, manganese, cobalt, vanadium, total dissolved solids, sulfate, antimony, chromium, thallium, and barium.
  - Retired Unit 5 Basin. **HIGH RISK.** Several constituents were detected at or beyond the compliance boundary above the 2L Standard or IMAC including iron, manganese, cobalt, vanadium, total dissolved solids, chromium, and antimony.

- Population Served by Water Supply Wells Within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary:

    - Active Ash Basin, to include adjacent ash storage areas. **HIGH RISK.** There are 23 reported supply wells positioned up-gradient or side-gradient of the impoundment within 1,500 feet of the compliance boundary. With the assumption of 2.5 users per well, there would potentially be 57 users.
    - Retired Unit 1-4 Basin. **LOW RISK.** There are no reported supply wells positioned up-gradient or side-gradient of the impoundment within 1500 feet of the compliance boundary.
    - Retired Unit 5 Basin. **LOW/INTERMEDIATE RISK.** Duke identified 4 supply wells positioned up-gradient or side-gradient of the impoundment within 1500 feet of the compliance boundary. With the assumption of 2.5 users per well, there would potentially be 10 users.

- Population Served by Water Supply Wells within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary:

    - Active Ash Basin, including adjacent ash storage areas. **LOW/INTERMEDIATE**. There appears to be 2 wells that are potentially downgradient but could also be side-gradient. With the assumption of 2.5 users per well, there would be 5 users.
    - Retired Unit 1-4 Basin. **LOW RISK**. There does not appear to be any down gradient wells.
    - Retired Unit 5 Basin. **LOW RISK**. There does not appear to be any down gradient wells.

- Proximity of 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells:

    - Active Ash Basin, including adjacent ash storage areas. **HIGH RISK**. There are several exceedances of the 2L Standard or IMAC less than 500 feet from a supply well including for cobalt, iron, manganese, and vanadium.
    - Retired Unit 1-4 Basin. **LOW RISK**. There are no supply wells within 1,500 feet of the Unit 1-4 Basin. The supply well nearest an exceedance of the 2L Standard or IMAC (Chromium and Vanadium) is on the opposite side of the Broad River 1,400 feet away from the monitoring well in which the exceedance was observed. That same monitoring well is located 1,000 feet from the Unit 1-4 Basin compliance boundary.

- Retired Unit 5 Basin. **HIGH RISK**. There is at least one reported supply well within 500 feet of exceedances of the 2L Standard or IMAC for iron and vanadium; however, it is believed that the supply well is up-gradient of the basin.

- Groundwater Emanating from the Impoundment that Exceeds 2L Standard or IMAC and that Discharges into a Surface Water Body:

  - Active Ash Basin, to include adjacent ash storage areas. **HIGH RISK.** Several constituents were detected above the 2L Standard or IMAC including iron, manganese, cobalt, vanadium, thallium, chromium, antimony, and total dissolved solids that are potentially discharging to a surface water body.
  - Retired Unit 1-4 Basin. **HIGH RISK.** Several constituents were detected above the 2L Standard or IMAC including iron, manganese, cobalt, vanadium, sulfate, chromium, thallium, barium, lead, and total dissolved solids that are potentially discharging to a surface water body.
  - Retired Unit 5 Basin. **HIGH RISK.** Several constituents were detected above the 2L Standard or IMAC including iron, manganese, cobalt, vanadium, sulfate, and total dissolved solids, that are potentially discharging to a surface water body.

- Exposure to Coal Combustion Residuals and Contaminated Soil by Ingestion or Fugitive Emissions:

  - Active Ash Basin, including adjacent ash storage areas. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
  - Retired Unit 1-4 Basin. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
  - Retired Unit 5 Basin. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors:

  - Active Ash Basin, to include adjacent ash storage areas**. HIGH RISK.** There is a high degree of uncertainty with the data presented

in the CSA Report. The uncertainties pertain primarily to background concentration determinations, the extent of ash in storage areas, and subsurface heterogeneities that could affect flow and transport characteristics. Background concentrations, ash extent and subsurface heterogeneities will be addressed in supplemental reports. Data collected to date suggest that supply wells in proximity to the active basin are not impacted by CCR contamination.

- Retired Unit 1-4 Basin. **HIGH RISK.** There is a high degree of uncertainty with the data presented in the CSA Report. The uncertainties pertain primarily to background concentration determinations, the extent of ash in storage areas, and subsurface heterogeneities that could affect flow and transport characteristics. Background concentrations, ash extent and subsurface heterogeneities will be addressed in supplemental reports. Data collected to date suggest that supply wells in proximity to the active basin are not impacted by CCR contamination.
- Retired Unit 5 Basin. **HIGH RISK.** There is a high degree of uncertainty with the data presented in the CSA Report. The uncertainties pertain primarily to background concentration determinations, the extent of ash in storage areas, and subsurface heterogeneities that could affect flow and transport characteristics. Background concentrations, ash extent and subsurface heterogeneities will be addressed in supplemental reports. Data collected to date suggest that supply wells in proximity to the active basin are not impacted by CCR contamination. There are four reported supply wells within 1,500 feet (includes up-gradient and side-gradient supply wells) of the compliance boundary.

Surface Water Supporting Factors and Other Considerations:

- NPDES Wastewater and Ash Disposal Methods:
  - Active Ash Basin, including adjacent ash storage areas. **HIGH RISK**. Permitted discharge once though cooling water, yard drain basin, coal pile runoff ash pond discharges and flue gas desulfurization waste.
  - Retired Unit 1-4 Basin. **LOW/INTERMEDIATE RISK**. Retired Basin. Permitted discharge once though cooling water, yard drain basin, coal pile runoff ash pond discharges and flue gas desulfurization waste.
  - Retired Unit 5 Basin. **LOW/INTERMEDIATE RISK**. Retired Basin. Permitted discharge once though cooling water, yard drain

basin, coal pile runoff ash pond discharges and flue gas desulfurization waste.

- CCR Impoundments Footprint Siting in Natural Drainage Way or Stream:

  - Active Ash Basin, including adjacent ash storage areas. **LOW/INTERMEDIATE RISK**. A review of the aerial photographs and USGS topographic maps revealed that the CCR impoundment is located in a landscape position that depicts topographic contours indicating that it is sited in natural drainage ways and/or streams.
  - Retired Unit 1-4 Basin. **LOW/INTERMEDIATE RISK**. A review of the aerial photographs and USGS topographic maps revealed that the CCR impoundment is located in a landscape position that depicts topographic contours indicating that it is sited in natural drainage ways and/or streams.
  - Retired Unit 5 Basin. **LOW/INTERMEDIATE RISK**. A review of the aerial photographs and USGS topographic maps revealed that the CCR impoundment is located in a landscape position that depicts topographic contours indicating that it is sited in natural drainage ways and/or streams.

- Potential to Impact Surface Water Based on Total Ash Amount at Facility:

  - Active Ash Basin, including adjacent ash storage areas. **HIGH RISK**. The reported total amount of CCR in the impoundment is 5,570,000 tons.
  - Retired Unit 1-4 Basin. **LOW/INTERMEDIATE RISK**. The reported total amount of CCR in the impoundment is 320,000 tons.
  - Retired Unit 5 Basin. **INTERMEDIATE RISK**. The reported total amount of CCR in the impoundment is 806,000 tons.

- Potential to Impact Surface Water Based on Dilution:

  - Active Ash Basin, including adjacent ash storage areas. **LOW/INTERMEDIATE RISK**. The Broad River has a 7Q10 = 287 cfs with an average flow =1460 cfs.
  - Retired Unit 1-4 Basin. **LOW/INTERMEDIATE RISK**. The Broad River has a 7Q10 = 287 cfs with an average flow =1460 cfs.
  - Retired Unit 5 Basin. **LOW/INTERMEDIATE RISK**. The Broad River has a 7Q10 = 287 cfs with an average flow =1460 cfs.

- Development Density of Single-Family Residences Along Lake/Reservoir Shoreline:

    - Active Ash Basin, including adjacent ash storage areas. **LOW RISK.** This metric was not applied because the facility is located along the run of a river.
    - Retired Unit 1-4 Basin. **LOW RISK.** This metric was not applied because the facility is located along the run of a river.
    - Retired Unit 5 Basin. **LOW RISK.** This metric was not applied because the facility is located along the run of a river.

- Classification of the Receiving Waters:

    - Active Ash Basin, including adjacent ash storage areas. **INTERMEDIATE/HIGH RISK**. The Broad River is Class WS-IV waters.
    - Retired Unit 1-4 Basin. **INTERMEDIATE/HIGH RISK**. The Broad River is Class WS-IV waters.
    - Retired Unit 5 Basin. **INTERMEDIATE/HIGH RISK**. The Broad River is Class WS-IV waters.

- Proximity to Water Supply Intake:

    - Active Ash Basin, including adjacent ash storage areas. **HIGH RISK**. A review of drinking water supply intake revealed that a downstream intakes is located within 10 miles of the facility.
    - Retired Unit 1-4 Basin. **HIGH RISK**. A review of drinking water supply intakes revealed that a downstream intake is located within 10 miles of the facility.
    - Retired Unit 5 Basin. **HIGH RISK**. A review of drinking water supply intakes revealed that a downstream intake is located within 10 miles of the facility.

Dam Safety Supporting Factors and Other Considerations:

- Hazard Classification:

    - Active Ash Basin (CLEVE-049 & CLEVE-050). **HIGH RISK. .**Impoundment has a volume of 1,843 acre-feet therefore is medium in size with downstream hazards being potential loss of life due to several structures being in the inundation area of potential breach.
    - Retired Unit 1-4 Basin (CLEVE-047). **LOW/INTERMEDIATE RISK.** Impoundment has a volume of 139 acre-feet therefore is

small in size with downstream hazards being environmental concerns.

- Retired Unit 5 Basin (RUTHE-070 & RUTHE-072). **LOW/INTERMEDIATE RISK.** Impoundment has a volume of 33.52 acre-feet therefore is small in size with downstream hazards being environmental concerns.

- Proximity to Waters of the State:

  - Active Ash Basin (CLEVE-049 & CLEVE-050). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.
  - Retired Unit 1-4 Basin (CLEVE-047). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.
  - Retired Unit 5 Basin (RUTHE-070 & RUTHE-072). **INTERMEDIATE RISK.** Potential coal combustion residual migration is constrained by physical barrier. There is approximately 600 feet of land between the embankment and the waters of the state.

- Volume of Facility:

  - Active Ash Basin (CLEVE-049 & CLEVE-050). **INTERMEDIATE RISK.** Impoundment has a volume of 1843 acre-feet.
  - Retired Unit 1-4 Basin (CLEVE-047). **LOW RISK.** Impoundment has a volume of 139 acre-feet.
  - Retired Unit 5 Basin (RUTHE-070 & RUTHE-072). **LOW RISK.** Impoundment has a volume of 33.52 acre-feet.

- Free Water Content:

  - Active Ash Basin (CLEVE-049 & CLEVE-050). **HIGH RISK** before being dewatered. **LOW RISK** after being dewatered.
  - Retired Unit 1-4 Basin (CLEVE-047). **LOW RISK.** Impoundment is dry.
  - Retired Unit 5 Basin (RUTHE-070 & RUTHE-072). **LOW RISK.** Impoundment is dry but does occasionally discharge water.

- Offsite Drainage Area:

  - Active Ash Basin (CLEVE-049 & CLEVE-050). **HIGH RISK.** Impoundment has an offsite drainage area of 295.32 acres. Greater than 75% of reservoir are is covered by water.

- Retired Unit 1-4 Basin (CLEVE-047). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 154.08 acres. 25 to 75% of reservoir area is covered by water.
- Retired Unit 5 Basin (RUTHE-070 & RUTHE-072). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 164.9 acres. 25 to 75% of reservoir area is covered by water.

- Overall Dam Safety Risk Classification

  - Active Ash Basin (CLEVE-049 & CLEVE-050). **HIGH RISK** before any repairs are made, **INTERMEDIATE RISK** once repairs are made, and **LOW RISK** once repairs are made and impoundment has been dewatered**.**
  - Retired Unit 1-4 Basin (CLEVE-047). **LOW RISK** before any repairs are made.
  - Retired Unit 5 Basin (RUTHE-070 & RUTHE-072). **INTERMEDIATE RISK** before any repairs are made and **LOW RISK** once repairs are made**.**

H. F. Lee Energy Complex

Groundwater Supporting Factors and Other Considerations:

- Amount of Stored CCR Reported in an Impoundment:
    - Active Ash Pond, Polishing Pond, Ash Pond #1, Ash Pond #2, and Ash Pond #3. **INTERMEDIATE RISK**. There are an estimated 5,910,000 total tons of CCR stored in the impoundments.

- Position of CCR Relative to the Water Table:
    - Active Ash Pond. **INTERMEDIATE RISK**. The Active Basin is located at or near the flood plain of the Neuse River, and CCR are considered to be at similar elevation to the seasonal high water table.
    - Polishing Pond. **INTERMEDIATE RISK**. The Polishing Pond is located at or near the flood plain of the Neuse River, and CCR are considered to be at similar elevation to the seasonal high water table.
    - Ash Pond #1. **INTERMEDIATE RISK**. Ash Pond #1 is located at or near the flood plain of the Neuse River, and CCR are considered to be at a similar elevation to the seasonal high water table.
    - Ash Pond #2. **INTERMEDIATE RISK**. Ash Pond #2 is located at or near the fold plain of the Neuse River, and CCR are considered to be at a similar elevation to the seasonal high water table.
    - Ash Pond #3. **INTERMEDIATE RISK**. Ash Pond #3 is located at or near the flood plain of the Neuse River, and CCR are considered to be at a similar elevation to the seasonal high water table.

- Exceedance of 2L Standard or IMAC at or Beyond the Established CCR Impoundment Compliance Boundary:
    - Active Ash Pond. **HIGH RISK**. Arsenic and boron are routinely detected at concentrations above the 2L Standard or IMAC at or beyond the impoundment compliance boundary.
    - Polishing Pond. **HIGH RISK**. Arsenic and boron are routinely detected at concentrations above the 2L Standard or IMAC at or beyond the impoundment compliance boundary.
    - Ash Pond #1. **HIGH RISK**. Arsenic, boron, cobalt, selenium, thallium, and vanadium were detected above respective 2L Standard or IMAC at or beyond the impoundment compliance boundary. The three inactive ash ponds are contiguous, and share a common

groundwater monitoring well network. For these reasons, and for the purposes of this exercise, the inactive basin complex was considered as one unit.

- Ash Pond #2. **HIGH RISK**. Arsenic, boron, cobalt, selenium, thallium, and vanadium were detected above respective 2L Standard or IMAC at or beyond the impoundment compliance boundary. The three inactive ash ponds are contiguous, and share a common groundwater monitoring well network. For these reasons, and for the purposes of this exercise, the inactive basin complex was considered as one unit.
- Ash Pond #3. **HIGH RISK**. Arsenic, boron, cobalt, selenium, thallium, and vanadium were detected above respective 2L Standard or IMAC at or beyond the impoundment compliance boundary. The three inactive ash ponds are contiguous, and share a common groundwater monitoring well network. For these reasons, and for the purposes of this exercise, the inactive basin complex was considered as one unit.

- Population Served by Water Supply Wells Within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary:

  - Active Ash Pond. **LOW RISK.** Based on the information presented in the CSA Report, there are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
  - Polishing Pond. **LOW RISK.** Based on the information presented in the CSA Report, there are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
  - Ash Pond #1. **LOW RISK.** Based on the information presented in the CSA Report, there are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
  - Ash Pond #2. **LOW RISK.** Based on the information presented in the CSA Report, there are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.
  - Ash Pond #3. **LOW RISK.** Based on the information presented in the CSA Report, there are no reported supply wells within 1,500 feet downgradient of the impoundment compliance boundary.

- Population Served by Water Supply Wells within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary:

  - Active Ash Pond. **LOW RISK.** Based on information in the CSA Report and groundwater modeling presented in the CAP Report,

there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.

- Polishing Pond. **LOW RISK.** Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.
- Ash Pond #1. **LOW RISK.** Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.
- Ash Pond #2. **LOW RISK.** Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.
- Ash Pond #3. **LOW RISK.** Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.

- Proximity of 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells:

  - Active Ash Pond. **LOW RISK**. Exceedances of 2L Standard or IMAC are detected generally in the down-gradient direction of the impoundment. Water supply wells in the vicinity, whatever the distance from the basin, are located up-gradient of the impoundment.
  - Polishing Pond. **LOW RISK**. Exceedances of 2L Standard or IMAC are detected generally in the down-gradient direction of the impoundment. Water supply wells in the vicinity, whatever the distance from the basin, are located up-gradient of the impoundment.
  - Ash Pond #1. **LOW RISK**. Exceedances of 2L Standard or IMAC are generally detected in the down-gradient direction of the impoundment. Water supply wells are located up-gradient of the impoundment.
  - Ash Pond #2. **LOW RISK**. Water supply wells are up-gradient of the impoundment.

- Ash Pond #3. **LOW RISK**. There are no water supply wells present within 1,500 feet of the impoundment compliance boundary.

- Groundwater Emanating from the Impoundment that Exceeds 2L Standard or IMAC and that Discharges into a Surface Water Body:

  - Active Ash Pond. **HIGH RISK**. Constituents, including, but not limited to, arsenic and boron, are detected above their 2L Standard or IMAC that are potentially discharging to the Neuse River.
  - Polishing Pond. **HIGH RISK**. Constituents, including, but not limited to, arsenic and boron, are detected above their 2L Standard or IMAC that are potentially discharging to the Neuse River.
  - Ash Pond #1. **HIGH RISK**. Arsenic, boron, cobalt, selenium, thallium, and vanadium were detected above their 2L Standard or IMAC and are potentially discharging to the Neuse River.
  - Ash Pond #2. **HIGH RISK**. Ash Pond #2 is immediately east, and down-gradient of Ash Pond #1.
  - Ash Pond #3. **HIGH RISK**. Ash Pond #3 is immediately south of Ash Ponds #1 and #2.

- Exposure to Coal Combustion Residuals and Contaminated Soil by Ingestion or Fugitive Emissions:

  - Active Ash Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
  - Polishing Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
  - Ash Pond #1. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
  - Ash Pond #2. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
  - Ash Pond #3. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors:

    - Active Ash Pond. **INTERMEDIATE RISK**. Horizontal extent of groundwater contamination needs to be better refined. Mounding and limited radial flow in the vicinity of the active ash basin was noted in the CAP Report.
    - Polishing Pond. **INTERMEDIATE RISK**. Horizontal extent of groundwater needs to be better refined. Mounding and limited radial flow in the vicinity of the active ash basin was noted in the CAP Report.
    - Ash Pond #1. **INTERMEDIATE RISK**. Cobalt was detected in the deeper aquifer above 2L Standards or IMAC. Vertical extent of contamination is not defined. Mounding and limited radial flow in the vicinity of the Ash Pond #1 was noted in the CAP Report.
    - Ash Pond #2. **LOW RISK**. Cobalt was detected in the deeper aquifer above 2L Standards or IMAC. Vertical extent of contamination is not defined.
    - Ash Pond #3. **LOW RISK**. In addition to gaps noted above, the horizontal extent of contamination is not fully delineated to the south of Ash Pond #3.

Surface Water Supporting Factors and Other Considerations:

- NPDES Wastewater and Ash Disposal Methods:

    - Active Ash Pond. **INTERMEDIATE RISK.** Permitted wastewater outfall included combined flow from ash pond, cooling water, and coal pile discharge. No FGD treatment unit were built or put into operation for this facility.
    - Polishing Pond. **INTERMEDIATE RISK.** Permitted wastewater outfall included combined flow from ash pond, cooling water, and coal pile discharge. No FGD treatment unit were built or put into operation for this facility.
    - Ash Pond #1. **INTERMEDIATE RISK.** Permitted wastewater outfall included combined flow from ash pond, cooling water, and coal pile discharge. No FGD treatment unit were built or put into operation for this facility.
    - Ash Pond #2. **INTERMEDIATE RISK.** Permitted wastewater outfall included combined flow from ash pond, cooling water, and coal pile discharge. No FGD treatment unit were built or put into operation for this facility.

- Ash Pond #3. **INTERMEDIATE RISK.** Permitted wastewater outfall included combined flow from ash pond, cooling water, and coal pile discharge. No FGD treatment unit were built or put into operation for this facility.

- CCR Impoundments Footprint Siting in Natural Drainage Way or Stream:

  - Active Ash Pond. **LOW RISK.** A review of the aerial photographs and USGS topographic maps revealed that the existing CCR impoundments are located in the floodplain of the Neuse Fear River. It is not clear that the basin was sited on top of a stream.
  - Polishing Pond. **LOW RISK.** A review of the aerial photographs and USGS topographic maps revealed that the existing CCR impoundments are located in the floodplain of the Neuse Fear River. It is not clear that the basin was sited on top of a stream.
  - Ash Pond #1. **LOW RISK.** A review of the aerial photographs and USGS topographic maps revealed that the existing CCR impoundments are located in the floodplain of the Neuse Fear River. It is not clear that the basin was sited on top of a stream.
  - Ash Pond #2. **LOW RISK.** A review of the aerial photographs and USGS topographic maps revealed that the existing CCR impoundments are located in the floodplain of the Neuse Fear River. It is not clear that the basin was sited on top of a stream.
  - Ash Pond #3. **LOW RISK.** A review of the aerial photographs and USGS topographic maps revealed that the existing CCR impoundments are located in the floodplain of the Neuse Fear River. It is not clear that the basin was sited on top of a stream.

- Potential to Impact Surface Water Based on Total Ash Amount at Facility:

  - Active Ash Pond. **HIGH RISK.** The reported total amount of CCR in the impoundment is 4,590,000 tons.
  - Polishing Pond. **LOW RISK.** The reported total amount of CCR in the impoundment is 9,000 tons.
  - Ash Pond #1. **LOW/INTERMEDIATE RISK.** The reported total amount of CCR in the impoundment is 190,000 tons.
  - Ash Pond #2. **LOW/INTERMEDIATE RISK.** The reported total amount of CCR in the impoundment is 440,000 tons.
  - Ash Pond #3. **LOW/INTERMEDIATE RISK.** The reported total amount of CCR in the impoundment is 670,000 tons.

- Potential to Impact Surface Water Based on Dilution:

    - Active Ash Pond. **LOW/INTERMEDIATE RISK.** The Neuse River has a 7Q10 = 263 cfs with an average flow =1,100cfs.
    - Polishing Pond. **LOW/INTERMEDIATE RISK.** The Neuse River has a 7Q10 = 263 cfs with an average flow =1,100cfs.
    - Ash Pond #1. **LOW/INTERMEDIATE RISK.** The Neuse River has a 7Q10 = 263 cfs with an average flow =1,100cfs.
    - Ash Pond #2. **LOW/INTERMEDIATE RISK.** The Neuse River has a 7Q10 = 263 cfs with an average flow =1,100cfs.
    - Ash Pond #3. **LOW/INTERMEDIATE RISK.** The Neuse River has a 7Q10 = 263 cfs with an average flow =1,100cfs.

- Development Density of Single-Family Residences Along Lake/Reservoir Shoreline:

    a. Active Ash Pond. **LOW RISK.** This metric was not applied because the facility is located along the Neuse River.
    b. Polishing Pond. **LOW RISK.** This metric was not applied because the facility is located along the Neuse River.
    c. Ash Pond #1. **LOW RISK.** This metric was not applied because the facility is located along the Neuse River.
    d. Ash Pond #2. **LOW RISK.** This metric was not applied because the facility is located along the Neuse River.
    e. Ash Pond #3. **LOW RISK.** This metric was not applied because the facility is located along the Neuse River.

- Classification of the Receiving Waters:

    - Active Ash Pond. **INTERMEDIATE/HIGH RISK.** The Neuse River is a Class WS IV nutrient sensitive waters (NSW).
    - Polishing Pond. **INTERMEDIATE/HIGH RISK.** The Neuse River is a Class WS IV nutrient sensitive waters (NSW).
    - Ash Pond #1. **INTERMEDIATE/HIGH RISK.** The Neuse River is a Class WS IV NSW.
    - Ash Pond #2. **INTERMEDIATE/HIGH RISK.** The Neuse River is a Class WS IV NSW.
    - Ash Pond #3. **INTERMEDIATE/HIGH RISK.** The Neuse River is a Class WS IV NSW.

- Proximity to Water Supply Intake:

    - Active Ash Pond. **INTERMEDIATE RISK.** A review of drinking water supply intakes revealed that facility is approximately 2 miles from the intake, and due to the sinuosity of the Neuse River, the intake is approximately 11 "run-of-river" miles from the intake.
    - Polishing Pond. **INTERMEDIATE RISK.** A review of drinking water supply intakes revealed that facility is approximately 2 miles from the intake, and due to the sinuosity of the Neuse River, the intake is approximately 11 "run-of-river" miles from the intake.
    - Ash Pond #1. **INTERMEDIATE RISK.** A review of drinking water supply intakes revealed that facility is approximately 2 miles from the intake, and due to the sinuosity of the Neuse River, the intake is approximately 11 "run-of-river" miles from the intake.
    - Ash Pond #2. **INTERMEDIATE RISK.** A review of drinking water supply intakes revealed that facility is approximately 2 miles from the intake, and due to the sinuosity of the Neuse River, the intake is approximately 11 "run-of-river" miles from the intake.
    - Ash Pond #3. **INTERMEDIATE RISK.** A review of drinking water supply intakes revealed that facility is approximately 2 miles from the intake, and due to the sinuosity of the Neuse River, the intake is approximately 11 "run-of-river" miles from the intake.

Dam Safety Supporting Factors and Other Considerations:

- Hazard Classification:

    - Active Ash Pond (WAYNE-022). **HIGH RISK.** Embankment is 20 feet tall and has a volume of 2,720 acre-feet therefore is medium in size with downstream hazards being potential loss of life due to two structures being in the inundation area of potential breach.
    - Polishing Pond (WAYNE-034). **LOW RISK.** Embankment is less than 25 feet tall and has a volume of less than 50 acre-feet therefore is small in size and currently classified as exempt from the dam safety law.
    - Ash Pond #1 (WAYNE-031). **LOW RISK.** Embankment is less than 25 feet tall and has a volume of 198 acre-feet therefore is small in size and currently classified as exempt from the dam safety law because of size and the fact that the impoundment is dry.
    - Ash Pond #2 (WAYNE-032). **LOW RISK.** Embankment is less than 25 feet tall and has a volume of 715.5 acre-feet therefore is small in size and currently classified as exempt from the dam safety law because of size and the fact that the impoundment is dry.

- Ash Pond #3 (WAYNE-033). **LOW RISK.** Embankment is less than 25 feet tall and has a volume of 765 acre-feet therefore is small in size and currently classified as exempt from the dam safety law because of size and the fact that the impoundment is dry.

- Proximity to Waters of the State:
  - Active Ash Pond (WAYNE-022). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.
  - Polishing Pond (WAYNE-034). **HIGH RISK.** Impoundment is directly adjacent to waters of the state
  - Ash Pond #1 (WAYNE-031). **INTERMEDIATE RISK.** Potential coal combustion residual migration is constrained by physical barrier. There is approximately 350 feet of land between the embankment and the waters of the state.
  - Ash Pond #2 (WAYNE-032). **INTERMEDIATE RISK.** Potential coal combustion residual migration is constrained by physical barrier. There is approximately 350 feet of land between the embankment and the waters of the state.
  - Ash Pond #3 (WAYNE-033). **INTERMEDIATE RISK.** Potential coal combustion residual migration is constrained by physical barrier. There is approximately 450 feet of land between the embankment and the waters of the state.

- Volume of Facility:
  - Active Ash Pond (WAYNE-022). **INTERMEDIATE RISK.** Impoundment has a volume of 2,720 acre-feet.
  - Polishing Pond (WAYNE-034). **LOW RISK.** Impoundment has a volume of 24 acre-feet.
  - Ash Pond #1 (WAYNE-031). **LOW RISK.** Impoundment has a volume of 198 acre-feet.
  - Ash Pond #2 (WAYNE-032). **LOW RISK.** Impoundment has a volume of 715.5 acre-feet.
  - Ash Pond #3 (WAYNE-033). **LOW RISK.** Impoundment has a volume of 765 acre-feet.

- Free Water Content:
  - Active Ash Pond (WAYNE-022). **LOW RISK.** Less than 25% of reservoir area is covered by water.
  - Polishing Pond (WAYNE-034). **LOW RISK.** Impoundment is dry. Less than 25% of reservoir area is covered by water.

- Ash Pond #1 (WAYNE-031). **LOW RISK.** Impoundment is dry and forested. Less than 25% of reservoir area is covered by water.
- Ash Pond #2 (WAYNE-032). **LOW RISK.** Impoundment is dry and forested. Less than 25% of reservoir area is covered by water.
- Ash Pond #3 (WAYNE-033). **LOW RISK.** Impoundment is dry and forested. Less than 25% of reservoir area is covered by water.

- Offsite Drainage Area:

  - Active Ash Pond (WAYNE-022). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 129.6 acres.
  - Polishing Pond (WAYNE-034). **LOW RISK.** Impoundment has an offsite drainage area of 0 acres.
  - Ash Pond #1 (WAYNE-031). **LOW RISK.** Impoundment has an offsite drainage area of 0 acres.
  - Ash Pond #2 (WAYNE-032). **LOW/INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 76.6 acres.
  - Ash Pond #3 (WAYNE-033). **LOW/INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 90.6 acres.

- Overall Dam Safety Risk Classification

  - Active Ash Pond (WAYNE-022). **HIGH RISK** before any repairs are made and **LOW RISK** once repairs are made.
  - Polishing Pond (WAYNE-034). **LOW RISK** before any repairs are made.
  - Inactive Ash Pond #1 (WAYNE-031). **LOW RISK** before any repairs are made.
  - Inactive Ash Pond #2 (WAYNE-032). **LOW RISK** before any repairs are made.
  - Inactive Ash Pond #3 (WAYNE-033). **LOW RISK** before any repairs are made.

Marshall Steam Station

Groundwater Supporting Factors and Other Considerations:

- Amount of Stored CCR Reported in an Impoundment:
  - Ash Basin. **HIGH RISK**. There are an estimated 16,020,000 total tons of CCR stored in the impoundment.
- Position of CCR Relative to the Water Table:
  - Ash Basin. **HIGH RISK**. Based on the data from the CSA Report, it appears that the bottom of the Ash Basin is situated below the water table.
- Exceedance of 2L Standard or IMAC at or Beyond the Established CCR Impoundment Compliance Boundary:
  - Ash Basin. **HIGH RISK**. Several constituents were detected at or beyond the compliance boundary above the 2L Standard or IMAC including antimony, boron, chromium, cobalt, and vanadium.
- Population Served by Water Supply Wells Within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary:
  - Ash Basin. **HIGH RISK.** Duke identified approximately 42 water supply wells within 1,500 feet of the impoundment compliance boundary. Assuming 2.5 users per well, there are at least 105 persons using water supply wells within 1,500 feet of the impoundment compliance boundary.
- Population Served by Water Supply Wells within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary:
  - Ash Basin. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.

- Proximity of 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells:

    - Ash Basin. **HIGH RISK**. There are several exceedances of the 2L Standard or IMAC within 500 feet of a water supply well.

- Groundwater Emanating from the Impoundment that Exceeds 2L Standard or IMAC and that Discharges into a Surface Water Body:

    - Ash Basin. **HIGH RISK.** Several constituents were detected above the 2L Standard or IMAC in seeps potentially associated with the Ash Basin, including arsenic, boron, chromium, cobalt, lead, selenium, thallium and vanadium that are potentially discharging to a surface water body. Several constituents were detected above the 2L Standard or IMAC or the NC 2B Surface Water Criteria in a surface water tributary adjacent to the unlined Phase 1 ash landfill which was constructed over the Ash Basin and included boron, cobalt, and vanadium. Several constituents were detected above the 2L Standard or IMAC in groundwater samples collected downgradient of the Ash Basin and adjacent to surface waters. These constituents included arsenic, boron, cobalt, thallium, and vanadium.

- Exposure to Coal Combustion Residuals and Contaminated Soil by Ingestion or Fugitive Emissions:

    - Ash Basin. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors:

    - Ash Basin. **INTERMEDIATE RISK**. There is a moderate degree of uncertainty with the data presented in the CSA Report, CAP Report, and subsequent characterization by Duke Energy related to the impoundment. The horizontal extent of contamination remains unclear until adequate background information can be determined and whether there is any potential current or historical on- or off-site hydraulic influence on observed contaminant distribution.

Surface Water Supporting Factors and Other Considerations:

- NPDES Wastewater and Ash Disposal Methods:
    - Ash Basin. **HIGH RISK**. The CCR impoundment is located at a facility that currently generates cooling water, dry fly ash, wet bottom ash, and FGD waste.
- CCR Impoundments Footprint Siting in Natural Drainage Way or Stream:
    - Ash Basin. **HIGH RISK**. A review of the aerial photographs and USGS topographic maps revealed that the CCR impoundment is located in a landscape position that depict contours indicating that the basin is sited within an arm of a reservoir.
- Potential to Impact Surface Water Based on Total Ash Amount at Facility:
    - Ash Basin. **HIGH RISK**. The reported total amount of CCR in the impoundment is 22,270,000 tons.
- Potential to Impact Surface Water Based on Dilution:
    - Ash Basin. **INTERMEDIATE RISK**. Lake Norman has a 7Q10 = 60.
- Development Density of Single-Family Residences Along Lake/Reservoir Shoreline:
    - Ash Basin. **INTERMEDIATE RISK**. Within 2 miles of the facility are greater than 400 single family residences that are sited along the shoreline.
- Classification of the Receiving Waters:
    - Ash Basin. **HIGH RISK**. Lake Norman is Class WS-IV, CA and B waters.
- Proximity to Water Supply Intake:
    - Ash Basin. **HIGH RISK**. A review of drinking water supply intakes revealed that the water supply intake is within 10 miles.

Dam Safety Supporting Factors and Other Considerations:

- Hazard Classification:
    - Ash Basin (CATAW-054). **HIGH RISK.** Embankment is 37 feet tall and has a volume of 1,250 acre-feet therefore is medium in size with downstream hazards being potential loss of life due to several structures being in the inundation area of potential breach.
- Proximity to Waters of the State:
    - Ash Basin (CATAW-054). **HIGH RISK**. Impoundment is directly adjacent to waters of the state.
- Volume of Facility:
    - Ash Basin (CATAW-054). **LOW RISK**. Impoundment has a volume of 1250 acre-feet.
- Free Water Content:
    - Ash Basin (CATAW-054). **INTERMEDIATE RISK** before being dewatered. **LOW RISK** after being dewatered. 25 to 75% of reservoir area is covered by water.
- Offsite Drainage Area:
    - Ash Basin (CATAW-054). **HIGH RISK**. Impoundment has an offsite drainage area of 1,171 acres.
- Overall Dam Safety Risk Classification
    - Ash Basin (CATAW-054). **HIGH RISK** before any repairs are made, **INTERMEDIATE RISK** once repairs are made, and **LOW RISK** once repairs are made and impoundment has been dewatered.

Mayo Steam Electric Plant

Supporting Factors and Other Considerations:

- Amount of Stored CCR Reported in an Impoundment:
    - Ash Pond. **INTERMEDIATE RISK.** There are an estimated 6,350,000 total tons of CCR stored in the impoundment.
- Position of CCR Relative to the Water Table:
    - Ash Pond. **HIGH RISK**. According to the data provided in the CSA Report, CCR are located below the water table.
- Exceedance of 2L Standard or IMAC at or Beyond the Established CCR Impoundment Compliance Boundary:
    - Ash Pond. **HIGH RISK**. Monitoring well CW-02 has detections of Boron greater than the 2L Standard or IMAC. CW-02 appears to be at a location near the compliance boundary but it is unclear if this well is located exactly at the compliance boundary or just inside the boundary. CW-03 has detections of Vanadium greater than the IMAC. MW-16S has a detection of Cobalt greater than the IMAC.
- Population Served by Water Supply Wells Within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary:
    - Ash Pond. **LOW/INTERMEDIATE RISK**. Four water supply wells appear to be located within 1,500 feet of the compliance boundary. With the assumption of 2.5 users per well, there would be approximately 10 users.
- Population Served by Water Supply Wells within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary:
    - Ash Pond. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.

- Proximity of 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells:

    - Ash Pond. **HIGH RISK**. MW-14BR has detections of Vanadium, Iron, Manganese and Cobalt greater than the 2L Standards or IMAC. MW-14 is expected to be in a downgradient or side-gradient location in regards to the impoundment. This monitoring well appears to be less than 500 feet from residential well DW-4 (Duke water supply well survey) although some degree of uncertainty exists for the horizontal distance given the water supply well survey map is a separate figure from the master site figure (2-1). The DW-4 location has two other water supply wells (DW-3 and DW-5) located on adjacent properties. One well is location to the north of DW-4 and one well to the south. These wells would be covered by the horizontal distance of 500 to 1,500 feet for this category.

- Groundwater Emanating from the Impoundment that Exceeds 2L Standard or IMAC and that Discharges into a Surface Water Body:

    - Ash Pond – Groundwater Risk Ranking. **HIGH RISK**. Identified seeps S-02B and S-08 which appear to discharge into Crutchfield Branch have detected concentrations (but not limited to) of Boron and Cobalt greater than the 2L Standards or IMAC. S-08 also has detections of Vanadium greater than the IMAC. Engineered toe drains S-01 and S-02 have detected concentrations of Boron (but not limited to) greater than the 2L Standard. The seeps appear to discharge into Crutchfield Branch.

- Exposure to Coal Combustion Residuals and Contaminated Soil by Ingestion or Fugitive Emissions:

    - Ash Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors:

    - Ash Pond. **INTERMEDIATE RISK**. The extent of potential contaminants in the area near the water supply well cluster on the northwest side of facility may require additional vertical extent and possibly horizontal extent definition. CW-04 and CW-05 are either on or very near the compliance boundary. MW-05BR is located

beyond the compliance boundary at a more close location to the water supply well cluster. The following monitoring wells have detections (but not limited to) greater the 2L Standards or IMAC as listed: CW-5 (Iron and Manganese), MW-05BR (Iron and Manganese) and MW-14BR (Cobalt, Iron, Manganese, and Vanadium). The extent of potential contaminants in the area on the south side of the facility nearest the water well cluster in that area may require additional vertical and horizontal extent definition. Monitoring well pair MW-12S and MW-12D have detections of Cobalt, Manganese, and Vanadium greater than the 2L Standards or IMAC. The intent of MW-12S and MW-12D was as a background well set for naturally occurring groundwater geochemistry in a generally up-gradient (in relation to the impoundment) location. Also, Boron detected in well CW-02 at 804 ug/L which is at a location approximately eighty feet from the compliance boundary in the up-gradient direction. The result implies a 2L Standard violation may be present at the compliance boundary for Boron.

Surface Water Supporting Factors and Other Considerations:

- NPDES Wastewater and Ash Disposal Methods:
    - Ash Pond. **LOW/INTERMEDIATE RISK**. The facility has dry fly ash handling, dry bottom ash handling, and no longer uses the ash basin for ash disposal. The dry ash is now taken to an engineered/line landfill. The facility also has constructed a ZLD system that virtually eliminates FGD waste discharges. This is achieved through an evaporation process. The small amount of FGD liquid waste that remains is use for dust control in lined landfill.
- CCR Impoundments Footprint Siting in Natural Drainage Way or Stream:
    - Ash Pond. **LOW/INTERMEDIATE RISK**. A review of the aerial photographs and USGS topographic maps revealed that the CCR impoundment is located in a landscape position that depicts contours indicating that the basins is sited in a natural drainage ways and/or streams.
- Potential to Impact Surface Water Based on Total Ash Amount at Facility:
    - Ash Pond. **HIGH RISK**. The reported total amount of CCR in the impoundment is 6,900,000 tons.

- Potential to Impact Surface Water Based on Dilution:

    - Ash Pond. **HIGH RISK**. Mayo Lake has a 7Q10 =0 cfs with an average flow =0 cfs.

- Development Density of Single-Family Residences Along Lake/Reservoir Shoreline:

    - Ash Pond. **LOW RISK**. Within 2 miles of the facility are less than 400 single family residences located along the shoreline.

- Classification of the Receiving Waters:

    - Ash Pond. **LOW/INTERMEDIATE RISK**. Mayo Lake, a reservoir, is Class WS-V waters and Crutchfield Branch is Class C.

- Proximity to Water Supply Intake:

    - Ash Pond. **INTERMEDIATE RISK**. Waters classified as a water supply V are generally upstream and draining to Class WS-IV waters; or waters previously used for drinking water supply purpose; or waters used by industry to supply the employees, but not municipalities or counties with a raw drinking water supply sources. The power generation facility at Mayo Lake is no longer using the lake for a drinking water supply.

Dam Safety Risk Supporting Factors and Other Considerations:

- Hazard Classification:

    - Ash Pond (PERSO-035). **HIGH RISK.** Embankment is 90 feet tall and has a volume of 4,100 acre-feet therefore is large in size with downstream hazards being potential loss of life due to several structures and Lake Mayo Drive being in the inundation area of potential breach.

- Proximity to Waters of the State:

    - Ash Pond (PERSO-035). **INTERMEDIATE RISK.** Potential coal combustion residual migration is constrained by physical barrier. There is approximately 2,000 feet of land along with a railyard embankment between the embankment and the waters of the state.

- Volume of Facility:
    - Ash Pond (PERSO-035). **HIGH RISK.** Impoundment has a volume of 4,100 acre-feet.
- Free Water Content:
    - Ash Pond (PERSO-035). **INTERMEDIATE RISK.** 25 to 75% of reservoir area is covered by water.
- Offsite Drainage Area:
    - Ash Pond (PERSO-035). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 332.8 acres.
- Overall Dam Safety Risk Classification
    - Ash Pond (PERSO-035). **HIGH RISK** before any repairs are made, **INTERMEDIATE RISK** once repairs are made, and **LOW RISK** once repairs are made and impoundment has been dewatered.

Roxboro Steam Electric Plant

Groundwater Supporting Factors and Other Considerations:

- Amount of Stored CCR Reported in an Impoundment:
  - East Ash Pond, West Ash Pond, and Unnamed Eastern Extension Impoundment. **HIGH RISK**. There are an estimated 19,420,000 total tons of CCR stored in the impoundments.

- Position of CCR Relative to the Water Table:
  - East Ash Pond. **HIGH RISK.** CSA Report data indicates that bedrock groundwater pressure head elevations are nearly equal to measured impoundment water levels which suggest the CCR are located below the seasonal high water table.
  - West Ash Pond. **HIGH RISK.** CSA Report data indicates that bedrock groundwater pressure head elevations are nearly equal to measured impoundment water levels which suggest the CCR are located below the seasonal high water table.
  - Unnamed Eastern Extension Impoundment. **HIGH RISK.** The impoundment has not yet been characterized, but site conditions are assumed to be similar to the East Ash Pond.

- Exceedance of 2L Standard or IMAC at or Beyond the Established CCR Impoundment Compliance Boundary:
  - East Ash Pond. **HIGH RISK**. Manganese and Vanadium were detected beyond the compliance boundary in MW-16BR greater than the 2L Standards or IMAC. It may be determined at a later time that this well is located up-gradient of the impoundment and the presence of constituents may be due to naturally occurring geochemistry. Monitoring wells at or beyond the compliance boundary on the expected down-gradient side for this ash pond are not presently installed. Optional install locations are limited in this area but it may be necessary to reevaluate the need for additional monitoring wells.
  - West Ash Pond. **HIGH RISK.** Several constituents were detected at or beyond the compliance boundary greater than the 2L Standards or IMAC including (but not limited to) Boron, Cobalt and Vanadium. MW-5D has Boron and Cobalt detections greater than the 2L Standard. MW-5BR has detections of Vanadium greater than the 2L Standard.

- Unnamed Eastern Extension Impoundment. **HIGH RISK**. The impoundment has not yet been characterized, but site conditions are assumed to be similar to the East Ash Pond.

- Population Served by Water Supply Wells Within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary:

  - East Ash Pond. **LOW/INTERMEDIATE RISK.** DW-33 from Duke WSW survey. With the assumption of 2.5 users per well, there would be 2.5 users.
  - West Ash Pond. **LOW/INTERMEDIATE RISK.** DW-33 from Duke WSW survey. With the assumption of 2.5 users per well, there would be 2.5 users.
  - Unnamed Eastern Extension Impoundment. **LOW/ INTERMEDIATE RISK**. The impoundment has not yet been characterized, but site conditions are assumed to be similar to the East Ash Pond.

- Population Served by Water Supply Wells within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary:

  - East Ash Pond. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary. Well DW-49 is located on the adjacent industrial lot across a hydraulic divide and may be used as a public water supply.
  - West Ash Pond. **LOW RISK.** Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary.
  - Unnamed Eastern Extension Impoundment. **LOW RISK**. Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary. Well DW-49 is located on the adjacent industrial lot across a hydraulic divide and may be used as a public water supply.

- Proximity of 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells:

    - East Ash Pond. **HIGH RISK**. DW-26 (Duke WSW survey) is <500 feet with respect to MW-17BR. Monitoring well MW-17BR has detections of Vanadium (but not limited to) at 0.968 ug/L. MW-17BR is located approximately 1400 feet from the compliance boundary in what is expected to be generally up-gradient of the impoundments. The intent of this well location was to serve as background location for the naturally occurring groundwater geochemistry.
    - West Ash Pond. **INTERMEDIATE RISK**. DW-46 (Duke WSW survey) is between a horizontal distance of 500 to 1,500 feet with respect to BG-1. Monitoring well BG-1 has detections of Vanadium and Cobalt (but not limited to) at 17.1 ug/L and 1.28 ug/L.
    - Unnamed Eastern Extension Impoundment. **HIGH RISK**. The impoundment has not yet been characterized, but site conditions are assumed to be similar to the East Ash Pond.

- Groundwater Emanating from the Impoundment that Exceeds 2L Standard or IMAC and that Discharges into a Surface Water Body:

    - East Ash Pond. **HIGH RISK.** Seeps S-9 and S-13 have had detections of Boron and Vanadium that exceed the 2L Standards or IMAC. The final discharge point is the channel and associated CCR impoundment north of the CCR impoundment. The channel and associated CCR impoundment is interconnected with Hyco Reservoir. Wells MW-11BR and MW-6D have detections of Vanadium greater than the 2L Standard or IMAC. This well pair may represent a flowpath from the ash impoundment to a surface water extension of Hyco Reservoir.
    - West Ash Pond. **HIGH RISK.** Wells CW-02 and CW-02D have detections of Vanadium greater than the 2L Standard or IMAC. The wells are located adjacent to the discharge CCR impoundment below the ash basin which discharges into Hyco Reservoir. The wells are in a location generally downgradient from the CCR impoundment.
    - Unnamed Eastern Extension Impoundment. **HIGH RISK**. The impoundment has not yet been characterized, but site conditions are assumed to be similar to the East Ash Pond.

- Exposure to Coal Combustion Residuals and Contaminated Soil by Ingestion or Fugitive Emissions:

    - East Ash Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
    - West Ash Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.
    - Unnamed Eastern Extension Impoundment. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors:

    - East Ash Pond. **HIGH RISK**. Receptor sampling has detected the presence of constituents that may or may not be associated with the CCR impoundment. In light of this data additional assessment may be necessary. DEQ is currently awaiting a determination of the naturally occurring background concentrations for constituents at this facility which may have a significant impact to this ranking category.
    - West Ash Pond. **HIGH RISK.** Receptor sampling has detected the presence of constituents that may or may not be associated with the CCR impoundment. In light of this data additional assessment may be necessary. DEQ is currently awaiting a determination of the naturally occurring background concentrations for constituents at this facility which may have a significant impact to this ranking category.
    - Unnamed Eastern Extension Impoundment. **HIGH RISK**. This impoundment has just recently been identified by Duke Energy. Assessment is currently underway with respect to the extent of the impoundment and any potential groundwater contamination resulting from the impoundment. The location of this impoundment is in close proximity to residential water supply wells. DEQ is currently awaiting a determination of the naturally occurring background concentrations for constituents at this facility which may have a significant impact to this ranking category.

Surface Water Supporting Factors and Other Considerations:

- NPDES Wastewater and Ash Disposal Methods:
    - East Ash Pond. **INTERMEDIATE/HIGH RISK.** The CCR impoundment is located at a coal combustion facility that currently discharges ash pond discharge, once through cooling water, ash landfill stormwater, and FGD. The east basin is an active basin and is partially capped by a lined landfill that is sited on top of the basin.
    - West Ash Pond. **HIGH RISK.** The CCR impoundment is located at a coal combustion facility that currently discharges ash pond discharge, once through cooling water, ash landfill stormwater, and FGD.
    - Unnamed Eastern Extension Impoundment. **INTERMEDIATE/ HIGH RISK**. This impoundment has not yet been characterized but appears to be an extension of the East Ash Pond.

- CCR Impoundments Footprint Siting in Natural Drainage Way or Stream:
    - East Ash Pond. **HIGH RISK.** A review of the aerial photographs and USGS topographic maps revealed that the CCR impoundment is located in a landscape position that depicts contours indicating that the basins are located within the arm of a reservoir.
    - West Ash Pond. **HIGH RISK.** A review of the aerial photographs and USGS topographic maps revealed that the CCR impoundment is located in a landscape position that depicts contours indicating that the basins are located within the arm of a reservoir.
    - Unnamed Eastern Extension Impoundment. **HIGH RISK**. This impoundment has not yet been characterized but appears to be an extension of the East Ash Pond.

- Potential to Impact Surface Water Based on Total Ash Amount at Facility:
    - East Ash Pond. **HIGH RISK.** The reported total amount of CCR in the impoundment is 9,130,000 tons.
    - West Ash Pond. **HIGH RISK.** The reported total amount of CCR in the impoundment is 7,310,000 tons.
    - Unnamed Eastern Extension Impoundment. **LOW RISK**. The amount of CCR in this impoundment has not been characterized, but is anticipated to fall in the low range.

- Potential to Impact Surface Water Based on Dilution:

    - East Ash Pond. **HIGH RISK.** Hyco Lake has a 7Q10 = 0 cfs with an average flow =0 cfs.
    - West Ash Pond. **HIGH RISK.** Hyco Lake has a 7Q10 = 0 cfs with an average flow =0 cfs.
    - Unnamed Eastern Extension Impoundment. **HIGH RISK**. This impoundment has not yet been characterized but appears to be an extension of the East Ash Pond. Hyco Lake has a 7Q10 = 0 cfs with an average flow =0 cfs.

- Development Density of Single-Family Residences Along Lake/Reservoir Shoreline:

    - East Ash Pond. **INTERMEDIATE RISK.** Within 2 miles of the facility are more than 400 single family residences located along the shoreline.
    - West Ash Pond. **INTERMEDIATE RISK.** Within 2 miles of the facility are more than 400 single family residences located along the shoreline.
    - Unnamed Eastern Extension Impoundment. **INTERMEDIATE RISK**. This impoundment has not yet been characterized but appears to be an extension of the East Ash Pond.

- Classification of the Receiving Waters:

    - East Ash Pond. **INTERMEDIATE RISK.** Hyco Lake is Class WS- V and B.
    - West Ash Pond. **INTERMEDIATE RISK.** Hyco Lake is Class WS- V and B.
    - Unnamed Eastern Extension Impoundment. **INTERMEDIATE RISK**. This impoundment has not yet been characterized but appears to be an extension of the East Ash Pond.

- Proximity to Water Supply Intake:

    - East Ash Pond. **LOW RISK.** Waters classified as a water supply V are generally upstream and draining to Class WS-IV waters; or waters previously used for drinking water supply purpose; or waters used by industry to supply the employees, but not municipalities or counties with a raw drinking water supply sources. The power generation facility at Hyco Lake is no longer using the lake for a drinking water supply.

- West Ash Pond. **LOW RISK.** Waters classified as a water supply V are generally upstream and draining to Class WS-IV waters; or waters previously used for drinking water supply purpose; or waters used by industry to supply the employees, but not municipalities or counties with a raw drinking water supply sources. The power generation facility at Hyco Lake is no longer using the lake for a drinking water supply.
- Unnamed Eastern Extension Impoundment. **LOW RISK.** This impoundment has not yet been characterized but appears to be an extension of the East Ash Pond.

Dam Safety Supporting Factors and Other Considerations:

- Hazard Classification:
  - East Ash Pond (PERSO-033). **INTERMEDIATE RISK.** Impoundment has a volume of 4,947 acre-feet therefore is medium in size with downstream hazards being environmental concerns.
  - West Ash Pond (PERSO-038 & PERSO-039). **INTERMEDIATE/HIGH RISK.** Embankment is 70 feet tall and has a volume of 5,567 acre-feet therefore is large in size with downstream hazards being environmental concerns.
  - Unnamed Eastern Extension Impoundment. **N/A**. This impoundment does not have a dam and was therefore not given a rank with respect to dam safety.

- Proximity to Waters of the State:
  - East Ash Pond (PERSO-033). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.
  - West Ash Pond (PERSO-038 & PERSO-039). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.
  - Unnamed Eastern Extension Impoundment. **N/A**. This impoundment does not have a dam and was therefore not given a rank with respect to dam safety.

- Volume of Facility:
  - East Ash Pond (PERSO-033). **HIGH RISK.** Impoundment has a volume of 4947 acre-feet.
  - West Ash Pond (PERSO-038 & PERSO-039). **HIGH RISK.** Impoundment has a volume of 5567 acre-feet.

- Unnamed Eastern Extension Impoundment. **N/A**. This impoundment does not have a dam and was therefore not given a rank with respect to dam safety.

- Free Water Content:

  - East Ash Pond (PERSO-033). **LOW RISK.** Impoundment is dry. Less than 25% of reservoir area covered by water.
  - West Ash Pond (PERSO-038 & PERSO-039). **INTERMEDIATE RISK** before being dewatered. **LOW RISK** after being dewatered. 25 to 75% of reservoir area covered by water.
  - Unnamed Eastern Extension Impoundment. **N/A**. This impoundment does not have a dam and was therefore not given a rank with respect to dam safety.

- Offsite Drainage Area:

  - East Ash Pond (PERSO-033). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 313.6 acres.
  - West Ash Pond (PERSO-038 & PERSO-039). **INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 345.6 acres.
  - Unnamed Eastern Extension Impoundment. **N/A**. This impoundment does not have a dam and was therefore not given a rank with respect to dam safety.

- Overall Dam Safety Risk Classification

  - East Ash Pond (PERSO-033). **LOW RISK** before any repairs are made.
  - West Ash Pond (PERSO-038 & PERSO-039). **HIGH RISK** before any repairs are made, **INTERMEDIATE RISK** once repairs are made, and **LOW RISK** once repairs are made and impoundment has been dewatered.
  - Unnamed Eastern Extension Impoundment. **N/A**. This impoundment does not have a dam and was therefore not given a rank with respect to dam safety.

W. H. Weatherspoon Power Plant

Groundwater Supporting Factors and Other Considerations:

- Amount of Stored CCR Reported in an Impoundment:
  - Ash Pond. **LOW RISK**. There are an estimated 1,530,000 total tons of CCR stored in the impoundment.
- Position of CCR Relative to the Water Table:
  - Ash Pond. **INTERMEDIATE RISK**. Based on the data from the comprehensive site assessment, it appears that the bottom of the CCR is situated approximately level with the water table.
- Exceedance of 2L Standard or IMAC at or Beyond the Established CCR Impoundment Compliance Boundary:
  - Ash Pond. **HIGH RISK**. Several constituents were detected at or beyond the compliance boundary above the 2L Standard or IMAC including beryllium, vanadium, and thallium.
- Population Served by Water Supply Wells Within 1,500 feet Up-Gradient or Side-Gradient of the Established CCR Impoundment Compliance Boundary:
  - Ash Pond. **LOW/INTERMEDIATE RISK**. Duke identified 4 drinking water supply wells for within 1,500 of the compliance boundary (not including the onsite production wells). With the assumption of 2.5 users per well, there would potentially be 10 users.
- Population Served by Water Supply Wells within 1,500 Feet Downgradient of the Established CCR Impoundment Compliance Boundary:
  - Ash Pond. **LOW/INTERMEDIATE RISK.** Based on information in the CSA Report and groundwater modeling presented in the CAP Report, there are no water supply wells that are located in the overall downgradient groundwater flow direction of the impoundment compliance boundary. However, if CCR is found in the cooling pond, a more detailed investigation will need to be performed in this area to determine groundwater flow direction.

- Proximity of 2L Standard or IMAC Exceedances Beyond the Established CCR Impoundment Compliance Boundary with Respect to Water Supply Wells:

    - Ash Pond. **HIGH RISK**. There are several exceedances of the 2L Standards or IMAC within 500 feet of a water supply well including two on-site production wells. However, the offsite wells are believed to be up-gradient of impoundment.

- Groundwater Emanating from the Impoundment that Exceeds 2L Standard or IMAC and that Discharges into a Surface Water Body:

    - Ash Pond. **HIGH RISK**. Several constituents were detected above the 2L Standard or IMAC including beryllium, vanadium, and thallium that are potentially discharging to a surface water body.

- Exposure to Coal Combustion Residuals and Contaminated Soil by Ingestion or Fugitive Emissions:

    - Ash Pond. **LOW RISK**. Access to the site is restricted, therefore the potential for human exposure to ash and soil or fugitive emissions is negligible except to on-site workers and contractors.

- Data Gaps and Uncertainty Related to Transport of Contaminants to Potential Receptors:

    - Ash Pond. **HIGH RISK**. There is a high degree of uncertainty with the data presented in the CSA Report. There were turbidity issues with the newly installed shallow background wells that precluded an accurate determination of constituents. The vertical extent of the contamination in the area of the ash impoundment appears to be adequately established; however the horizontal extent remains unclear until adequate background information can be determined. It was determined that there may be CCR in the cooling pond which was not evaluated during the site assessment activities. If, in fact, there is CCR in the cooling pond, then the horizontal and vertical extent of any contamination resulting from this source will need to be determined.

Surface Water Supporting Factors and Other Considerations:

- NPDES Wastewater and Ash Disposal Methods:
    - Ash Pond. **LOW/INTERMEDIATE RISK.** Retired plant. Permitted wastewater outfall included combined flow from ash pond, cooling water, stormwater, and coal pile discharge. No FGD treatment units were built or put into operation for this facility.
- CCR Impoundments Footprint Siting in Natural Drainage Way or Stream:
    - Ash Pond. **LOW RISK.** The southeastern ash basin berm is sited along the confluence of Jacobs Swamp, the main-stem of the Lumber River and is adjacent to the cooling pond. However, it is unclear if the ash basin was located within the footprint of a stream channel or discrete natural drainage way.
- Potential to Impact Surface Water Based on Total Ash Amount at Facility:
    - Ash Pond. **INTERMEDIATE RISK.** The reported total amount of CCR in the impoundment is 1,700,000 tons.
- Potential to Impact Surface Water Based on Dilution:
    - Ash Pond. **LOW/INTERMEDIATE RISK.** The Lumber River has a 7Q10 = 304 cfs with an average flow = 869 cfs.
- Development Density of Single-Family Residences Along Lake/Reservoir Shoreline:
    - Ash Pond. **LOW RISK.** This metric was not applied because the facility is located along the Lumber River.
- Classification of the Receiving Waters:
    - Ash Pond. **LOW RISK.** The Lumber River is a Class C- Swamp waters.
- Proximity to Water Supply Intake:
    - Ash Pond. **LOW RISK.** There are no downstream water supply intakes within 10 miles of the facility.

Dam Safety Supporting Factors and Other Considerations:

- Hazard Classification:
  - Ash Pond (ROBES-009). **HIGH RISK.** Embankment is 28 feet tall and has a volume of 1,456 acre-feet therefore is medium in size with downstream hazards being potential loss of life due to several structures being in the inundation area of potential breach.
- Proximity to Waters of the State:
  - Ash Pond (ROBES-009). **HIGH RISK.** Impoundment is directly adjacent to waters of the state.
- Volume of Facility:
  - Ash Pond (ROBES-009). **LOW RISK.** Impoundment has a volume of 1,456 acre-feet.
- Free Water Content:
  - Ash Pond (ROBES-009). **LOW RISK.** Impoundment is completely dry. Less than 25% of reservoir area is covered by water.
- Offsite Drainage Area:
  - Ash Pond (ROBES-009). **LOW/INTERMEDIATE RISK.** Impoundment has an offsite drainage area of 56 acres.
- Overall Dam Safety Risk Classification
  - Ash Pond (ROBES-009). **HIGH RISK** before any repairs are made and **LOW RISK** once repairs are made.