

**RECEPTOR SURVEY
MARSHALL STEAM STATION ASH BASIN
NPDES PERMIT NC0004987**



**Prepared for:
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Charlotte, North Carolina**

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October 10, 2014



REPORT VERIFICATION

**PROJECT: RECEPTOR SURVEY
MARSHALL STEAM STATION ASH BASIN
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This document has been reviewed for accuracy and quality commensurate with the intended application.

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Table 1 Public and Private Water Supply Wells
(Within 0.5 Mile Radius of Ash Basin Compliance Boundary)

Section 1

Introduction

Duke Energy Carolinas, LLC's (Duke Energy) Marshall Steam Station (MSS) is located on Lake Norman in Catawba County near Terrell, North Carolina (Figure 1). MSS is a coal-fired electricity generating facility with a capacity of 2,090 megawatts which began commercial operation in 1965.

Coal ash residue from the MSS coal combustion process has historically been disposed of in the station's ash basin. The ash basin system consists of a single cell, impounded by an earthen dike, located on the southeast end of the ash basin. Clarified effluent is discharged to Lake Norman through a discharge tower located within the ash basin. The discharge from the ash basin is permitted by the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) under the National Pollutant Discharge Elimination System (NPDES) Permit NC0004987.

HDR Engineering, Inc. of the Carolinas (HDR) has completed a receptor survey to identify water supply wells, public water supplies, surface water bodies, and wellhead protection areas (if present) within a 0.5 mile radius of the MSS ash basin compliance boundary (Figure 1).¹ The compliance boundary for groundwater quality in relation to the ash basin is defined in accordance with 15A NCAC 02L .0107(a) as being established at either 500 feet from the waste boundary or at the property boundary, whichever is closer to the source.

The survey activities performed and the findings of those activities are presented in Sections 3 and 4, respectively.

¹ A *Drinking Water Supply Well and Receptor Survey, Marshall Steam Station Ash Basin, NPDES Permit NC0004987* report dated September 30, 2014 (submitted to NCDENR under separate cover), was completed to satisfy the requirements outlined in The Coal Ash Management Act 2014 – General Assembly of North Carolina Senate Bill 729 Ratified Bill (Session 2013) and the NCDENR August 13, 2014 Notice of Regulatory Requirements.

Section 2

Background

2.1 Plant and Ash Basin Description

MSS is a coal-fired electricity generating facility with a capacity of 2,090 megawatts located in Catawba County, North Carolina near the community of Terrell. The site is located north of NC Hwy 150, east of Sherrills Ford Road and south of Island Point Road, and is generally situated between residential properties and Lake Norman (Figure 1). The ash basin is situated between the MSS to the south, primarily residences to the west and north, and Lake Norman to the east.

A topographic divide is located along Sherrills Ford Road and along Island Ford Road. The topography at the site generally slopes downward from that divide toward Lake Norman.

The ash basin was constructed in 1965 and is located approximately 2,000 feet northeast of the power plant, as shown on Figure 1. The waste boundary associated with the ash basin is approximately 382 acres in area and is also shown on Figure 1. The approximate pond elevation for the ash basin is 790 feet. The normal pond elevation of Lake Norman is approximately 760 feet.

The ash basin system is an integral part of the station's wastewater treatment system, which receives inflows from the ash removal system, coal pile runoff, landfill leachate, FGD wastewater, the station yard drain sump, stormwater flows, and station wastewater. During station operations, inflows to the ash basin are highly variable due to the cyclical nature of station operations. Inflows from the station to the ash basin are discharged into the southeast portion of the ash basin. The ash basin pond elevation is controlled by the use of concrete stop logs. The discharge from the ash basin is through a concrete discharge tower located in the eastern portion of the ash basin. The concrete discharge tower drains through a 30-inch diameter slip-lined corrugated metal pipe which discharges into Lake Norman.

2.2 Description of Surrounding Properties

Properties located within a 0.5 mile radius of the MSS ash basin compliance boundary generally consist of undeveloped land and Lake Norman to the east, residential properties located to the north and west, the MSS station and several residences to the south, and commercial properties to the southeast along NC Hwy 150.

Figure 1 depicts the general land use surrounding the MSS.

Section 3

Receptor Survey Activities

3.1 NCDENR Records Review

On July 10, 2014, Mr. Justin Schumacher with HDR contacted Mr. Sean McGuire, Geographic Information System (GIS) Specialist with the NCDENR Department of Environmental Health (DEH) Public Water Supply Section (PWSS), by telephone. Mr. McGuire stated that the Public Water Supply Water Sources GIS point data set was in the process of being updated. The most current GIS data set of public water supply locations available from North Carolina state agencies was provided by Mr. McGuire via electronic mail on July 14, 2014. The GIS point data for the public water supply wells includes, but is not limited to information such as public water supply (PWS) system identification numbers, ownership information, PWS source type, well depth, and well yield. HDR reviewed the GIS data set to identify public water supply sources within a 0.5 mile radius of the MSS ash basin compliance boundary.

On August 15, 2014, HDR reviewed the NCDENR Division of Water Resources (DWR) Source Water Assessment Program (SWAP) online database for public water supply sources to identify wells located within a 0.5 mile radius of the ash basin compliance boundary, to confirm the location of wells included in the Public Water Supply Water Sources GIS point data set, and to identify wellhead protection areas located within a 0.5 mile radius of the compliance boundary. The NCDENR SWAP database provides detailed assessments of all public drinking water intakes and wellhead protection areas in North Carolina. The website address is: (<http://swap.ncwater.org/website/swap/viewer.htm>).

3.2 Catawba County Records Review

HDR contacted the Catawba County Environmental Health Department to inquire about the location and details (if available) for registered private water supply wells located in Catawba County within a 0.5 mile radius of the ash basin compliance boundary. On August 20, 2014, Ms. Brooke Ahrens with HDR contacted Mr. Mike Cash, Environmental Health Supervisor with the

Catawba County Environmental Health Department. Mr. Cash indicated that Catawba County began collecting well record information for private water supply wells in 1998. Mr. Cash provided well record information for four wells located within a 0.5 radius of the compliance boundary.

Mr. Chad Hearn with HDR contacted the Catawba County Utilities and Engineering Department on April 15, 2014 to inquire about municipal water supply to properties located in Catawba County within a 0.5 mile radius of the ash basin compliance boundary. Mr. Jonathan Greer, Project Manager with the Utilities and Engineering Department indicated that the City of Hickory provides municipal water supply to properties located within a 0.5 mile radius of the compliance boundary.

3.3 Utility Department Records Review

HDR contacted the City of Hickory Public Utilities Department to inquire about municipal water supply to properties located within a 0.5 mile radius of the ash basin compliance boundary. On August 20, 2014, Ms. Brooke Ahrens of HDR contacted Ms. Tracy Church with the City of Hickory, by telephone. Ms. Ahrens subsequently provided Ms. Church a list of properties where neither a water supply well or a water meter was observed in the field to confirm municipal water service to these addresses. Ms. Church reviewed the City's billing records to confirm which properties were currently connected to the City's water service.

3.4 HDR Field Survey

HDR personnel performed a field reconnaissance on March 31, 2014 to attempt to identify water supply wells and surface waters located within a 0.5 mile radius of the ash basin compliance boundary. A windshield survey was conducted from public roadways to identify water meters, valves, and any potential well heads/well houses. Prior to conducting the field reconnaissance, HDR personnel reviewed orthophotography obtained from NC OneMap GeoSpatial portal (dated 2010) to identify potential well heads/well houses and surface waters within a 0.5 mile radius of the ash basin compliance boundary.

In addition, HDR personnel contacted Duke Energy site personnel to identify water supply wells located on Duke Energy property.

3.5 USGS Hydrography Review

HDR reviewed the United States Geological Survey (USGS) National Hydrography Dataset (NHD) obtained from the USGS National Map Viewer (<http://viewer.nationalmap.gov/viewer/>) to identify surface waters within a 0.5 mile radius of the ash basin compliance boundary. Hydrography data obtained from the USGS NHD is included on Figure 1.

Section 4

Findings

Details of the findings from the local and state records review and field survey activities are provided in Sections 4.1 through 4.5. A general summary of the receptor survey findings is provided in Section 4.6.

4.1 NCDENR Records

Four public water supply wells were identified in the Public Water Supply Water Sources GIS point data set (obtained from NC OneMap GeoSpatial Portal) and on the NCDENR SWAP online database within a 0.5 mile radius of the ash basin compliance boundary. These wells are identified with PWS preceding the Public Water Supply System ID Number. Available well information for the identified public wells is provided in Table 1. The locations of these wells are identified on Figure 1.

One of the public wells identified is registered to Duke Energy Carolinas LLC (PWS ID: 0118676). HDR contacted MSS personnel to confirm the location of the well. Mr. George Tolbert, Environmental Coordinator at MSS, confirmed that one water supply well is located on the MSS site in the location depicted by the Public Water Supply Water Sources GIS point data set, as shown on Figure 1.

No wellhead protection areas were identified on the NCDENR SWAP online database within a 0.5 mile radius of the ash basin compliance boundary.

4.2 Catawba County Records

Based on records reviewed, the Catawba County Environmental Health Department has record of four registered private water supply wells located within a 0.5 mile radius of the ash basin compliance boundary. These wells are identified with PRW preceding the identification number as it is referenced to available well information provided in Table 1. The locations of these wells are identified on Figure 1.

4.3 Utility Department Records

On August 21, Ms. Tracy Church with the City of Hickory Public Utilities Department indicated the City currently provides municipal water service to 12 of the properties located within a 0.5 mile radius of the ash basin compliance boundary where a water supply well or municipal water service meter was not observed during HDR's field reconnaissance.

Ms. Church also indicated that several properties where a water supply well or municipal water service meter was not observed in the field were not currently connected to the City's water service.

4.4 HDR Field Survey

During the field reconnaissance, HDR field personnel identified 57 private water supply wells at properties located within a 0.5 mile radius of the ash basin compliance boundary. Fifty-three of the 57 identified wells are included on Figure 1 as "field identified" private water supply wells.

Catawba County provided records for 4 of the 57 identified wells, plus the well record for the public water supply well owned by Duke Energy Carolinas, LLC (PWS ID: 0118676). The wells that Catawba County had records for are included on Figure 1 as "recorded" private water supply wells. These four wells (PRW-1 through PRW-4), along with the four public water supply wells (described in Section 4.1) are the only wells included in Table 1. The locations of the four public water supply wells included in NCDENR's records and located within a 0.5 mile radius of the compliance boundary were confirmed in the field, and by Duke Energy personnel (PWS ID: 0118676).

From the public roadway, HDR personnel identified municipal water service meters for several properties located within a 0.5 mile radius of the ash basin compliance boundary along Sherrills Ford Road and the neighborhood where Cape Cove Drive is located. Wells are not shown on Figure 1 at these properties.

For properties where water supply wells were not visible from a public right-of-way, HDR was not able to confirm the location or presence of a well. As described in Section 4.3, the City of Hickory indicated that several properties where a water supply well or municipal water service meter was not observed in the field were not currently connected to the City's water service. Therefore, it is assumed that the properties which are not currently connected to the City's water service and where a water supply well was not observed from a public right-of-way are supplied water by private water supply wells. Approximate locations based on structures identified during the field reconnaissance and/or orthophotography review are included on Figure 1 as "assumed" private water supply wells. A total of 17 assumed private water supply wells are located within a 0.5 mile radius of the ash basin compliance boundary.

Several surface water bodies were identified and/or confirmed during HDR's field reconnaissance. The surface water bodies located within a 0.5 mile radius of the ash basin compliance boundary generally toward Lake Norman from the topographic divide along Sherrills Ford Road.

4.5 Summary of Receptor Survey Findings

A summary of the receptor survey findings is provided below. The identified water supply wells and surface water bodies are shown on Figure 1. Available property and well information for the 8 water supply wells registered with Catawba County and NCDENR is provided in Table 1.

- A total of 57 private water supply wells were identified within a 0.5 mile radius of the ash basin compliance boundary. The Catawba County Environmental Health Department had records for 4 of the 57 identified private water supply wells.
- 17 private water supply wells are assumed at residences located within a 0.5 mile radius of the ash basin compliance boundary.
- Four public water supply wells were identified within a 0.5 mile radius of the ash basin compliance boundary. The Catawba County Environmental Health Department had records for one of the public water supply wells (PWS ID: 0118676, owned by Duke Energy Carolinas, LLC).

- Several surface water bodies that flow from the topographic divide along Sherrills Ford Road toward Lake Norman were identified within a 0.5 mile radius of the ash basin.
- No wellhead protection areas were identified within a 0.5 mile radius of the ash basin compliance boundary.

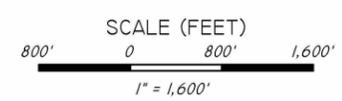
FIGURES



LEGEND:

- - - - - DUKE ENERGY PROPERTY BOUNDARY
- — — — — WASTE BOUNDARY
- — — — — ASH BASIN COMPLIANCE BOUNDARY
- - - - - ASH BASIN COMPLIANCE BOUNDARY COINCIDENT WITH DUKE ENERGY PROPERTY BOUNDARY
- - - - - 0.5 MILE OFFSET FROM ASH BASIN COMPLIANCE BOUNDARY
- — — — — STREAM
- PUBLIC WATER SUPPLY WELL
- FIELD IDENTIFIED PRIVATE WATER SUPPLY WELL
- RECORDED PRIVATE WATER SUPPLY WELL
- ASSUMED PRIVATE WATER SUPPLY WELL

- NOTES:**
1. PARCEL DATA FOR THE SITE WAS OBTAINED FROM DUKE ENERGY REAL ESTATE AND IS APPROXIMATE.
 2. WASTE BOUNDARY AND STRUCTURAL FILL BOUNDARY WERE PROVIDED BY DUKE ENERGY AND ARE APPROXIMATE.
 3. ORTHOPHOTOGRAPHY WAS OBTAINED FROM NC ONEMAP GIS WEB SITE (DATED 2010).
 4. THE COMPLIANCE BOUNDARY IS ESTABLISHED ACCORDING TO THE DEFINITION FOUND IN 15A NCAC 02L .0107 (a).
 5. PUBLIC WATER SUPPLY WELL LOCATIONS OBTAINED FROM NCDENR'S PUBLIC WATER SUPPLY WATER SOURCES GIS POINT DATA SET (LAST UPDATED ON NOVEMBER 18, 2009)
 6. LOCATION OF PRIVATE WATER SUPPLY WELLS DENOTED AS "PRW" ARE APPROXIMATE AND BASED ON CATAWBA COUNTY ENVIRONMENTAL HEALTH DEPARTMENT'S AVAILABLE WELL RECORDS.
 7. HYDROGRAPHY WAS OBTAINED FROM THE USGS NATIONAL MAP VIEWER AND DOWNLOAD PLATFORM ON MARCH 24, 2014 (<http://nationalmap.gov/viewer.html>).



RECEPTOR SURVEY MAP
 DUKE ENERGY CAROLINAS, LLC
 MARSHALL STEAM STATION ASH BASIN
 NPDES PERMIT #NC0004987
 CATAWBA COUNTY, NORTH CAROLINA

DATE
 OCT. 10, 2014
 FIGURE
 1

TABLES

Table 1
Public and Private Water Supply Wells
Within 0.5 Mile Radius of Marshall Ash Basin Compliance Boundary
Duke Energy Carolinas, LLC/Marshall Steam Station

Well ID (shown on Figure 1)	Public Water System Name	Property Address (well location)	Parcel ID Number	Reported Well Use	Approximate Distance from Ash Basin Compliance Boundary (ft)	Direction from Ash Basin	Well Depth (ft-bgs)	Well Casing Depth (ft-bgs)	Well Yield (gpm)
PWS 0118622	Midway Restaurant and Marina	8693 E NC 150 Hwy Terrell, NC 28682	461708998493	Transient, Non-Community	2,325	SE	245	N/A	20
PWS 0118736	The Old Country Church	8455 E NC 150 Hwy Terrell, NC 28682	461707773629	Transient, Non-Community	1,225	S-SE	N/A	N/A	40
PWS 0118780	Mott's Grove UMC	8790 Sherrills Ford Rd Sherrills Ford, NC 28673	461803100104	Transient, Non-Community	1,475	SW	N/A	N/A	40
PWS 0118676 ²	Duke Energy Carolinas LLC	8320 E NC 150 Hwy Terrell, NC 28682	461803426350	Non-Transient, Non-Community	1,700	S	540	91	30
PRW-1	N/A	2971 Steam Plant Rd Sherrills Ford, NC 28673	460804939276	Domestic	475	W	185	80	10
PRW-2	N/A	8526 Sherrills Ford Rd Sherrills Ford, NC 28673	461803021923	Domestic	650	W	205	145	10
PRW-3	N/A	8883 Sherrills Ford Rd Sherrills Ford, NC 28673	461701097362	Domestic	2,250	W-SW	240	100	3
PRW-4	N/A	8846 Greenwood Rd Terrell, NC 28682	461708984339	Domestic	1,625	SE	206	108	37

Notes:

- Public water supply well (PWS) information obtained from NCDENR's Public Water Supply Water Sources Geographic Information System (GIS) point data set and NCDENR's SWAP online database.
- Well construction information (well depth, casing depth, and well yield) for public well PWS 0118676 obtained from well construction record provided by Catawba County Environmental Health Department.
- Private water supply well (PRW) information obtained from the Catawba County Environmental Health Department's available records on May 13, 2014. (Note: Catawba County began obtaining well records in 2008.)
- Owner and property information for private water supply wells obtained from Catawba County Interactive GIS Website.
- Distances between well and the Marshall Ash Basin Compliance Boundary are approximate and based on location information provided by NCDENR's data set, Catawba County GIS website, the Catawba County Environmental Health Department records, and observations during HDR's field survey.
- Non-Transient, Non-Community Well serves at least 25 of the same persons 6+ months per year (e.g., schools, daycares, industries).
- Transient, Non-Community Well serves 25+ people at least 60 days per year (e.g., restaurants, churches, DOT rest areas).
- N/A indicates not available
- ft-bgs indicates feet below ground surface
- gpm indicates gallons per minute
- S = South, W = West, SW = Southwest, SE = Southeast, S-SE = South-Southeast, W-SW = West-Southwest