INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN
40 C.F.R. PART 257.82
PLANT YATES ASH POND 3 (AP-3)
GEORGIA POWER COMPANY

EPA's "Disposal of Coal Combustion Residuals from Electric Utilities" Final Rule (40 C.F.R. Part 257 and Part 261), §257.82, requires the owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment to design, construct, operate and maintain an inflow design flood control system capable of adequately managing flow during and following the peak discharge of the specified inflow design flood. The owner or operator must prepare an inflow design flood system a written plan documenting how the inflow design flood control system has been designed and constructed to meet the requirements of this section of the rule 40 C.F.R. §257.82.

The existing CCR surface impoundment known as AP-3 is located at Georgia Power Company's Plant Yates. The facility consists of a 55-acre CCR storage area. The inflow design flood consists of the rainfall that falls within the limits of the surface impoundment as well as runoff from approximately 579 acres of adjoining watershed. Additionally, runoff from Ash Pond B' (25 acres) also flows into AP- 3. Stormwater is temporarily stored within the limits of the surface impoundment and discharged through a 48-inch diameter corrugated metal standpipe with a metal trash rack that is connected to a 42-inch diameter corrugated metal discharge pipe. The outlet of the discharge structure is located well beyond the toe of the downstream embankment and discharges to a drainage ditch that ultimately directs the flow to Ash Pond 2. The primary discharge structure is supplemented by an auxiliary spillway located in natural soil consisting of a grass-lined ditch that drains to the same ditch that receives flow from the primary discharge structure.

The inflow design flood has been calculated using the Natural Resources Conservation Service (NRCS) method, also known as the Soil Conservation Service (SCS) method, using the 100-yr storm event required for a Low hazard potential surface impoundment. Runoff curve number data was determined using Table 2-2A from the Urban Hydrology for Small Watersheds (TR-55). Appendix A and B from the TR-55 were used to determine the rainfall distribution methodology. Precipitation values were determined from National Oceanic and Atmospheric Administration (NOAA)'s Precipitation Frequency Data Server (Atlas-14).

The NRCS provided information on the soil characteristics and hydrologic groups present at the site. It was determined that the hydrological group "B" should be used to best reflect the characteristics of the soils on site. This information was placed into Hydrologic Engineering Center - Hydrologic Modeling System and used to generate appropriate precipitation curves, storm basin routing information, and resulting rating curves to evaluate surface impoundment capacity.

The initial inflow design flood study indicates current configuration of the discharge and spillway structures does not allow AP-3 the sufficient spillway/storage capacity following the peak discharge from a 100-year, 24-hour storm when analyzed under normal (and historic) operating conditions. However, the water level in AP-3 has been lowered significantly over the past few weeks to assist with vegetation control and removal. This lowering of the water level has increased available storage capacity such that overtopping is less of a concern. Furthermore, construction of diversion ditches and temporary holding ponds to manage run-on from adjoining properties to AP-3 is scheduled to begin in the 4th quarter of 2016, thereby reducing the inflow from adjoining property into AP-3.

This assessment is supported by appropriate engineering calculations which are attached.

The facility is operated subject to and in accordance with § 257.3-3 of EPA's regulations.

I hereby certify that the inflow design flood control system plan meets the requirements of 40 C.F.R. Part 257.82.

12/1/16

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Inflow Design Control System Plan:
Hydrologic and Hydraulic Calculation Summary

for

Plant Yates Ash Pond 3

Prepared by:

Southern Company Services
Technical Services

Originator: Schnabel Engineering, LLC

Reviewer: _____ 10/11/16
Jason S. Wilson Date

Approval: _____ 10/12/16
James C. Pegues Date

1.0 Purpose of Calculation

The purpose of this report is to demonstrate the hydraulic capacity of the subject CCR impoundment in order to prepare an inflow design flood control plan as required by the United States Environmental Protection Agency's (EPA) final rule for Disposal of CCR from Electric Utilities (EPA 40 CFR 257).

2.0 Summary of Conclusions

A hydrologic and hydraulic model was developed for the Plant Yates Ash Pond 3 to determine the hydraulic capacity of the impoundment. The design storm for the Plant Yates Ash Pond 3 is a 100-year rainfall event. Southern Company has selected a storm duration of 24-hours for all inflow design flood control plans. The results of routing a 100-year, 24-hour rainfall event through the impoundment are presented in Table 1 below:

Table 1 - Flood Routing Results for Plant Yates Ash Pond 3

Plant Yates	Normal Pool El (ft)	Top of Embankment El (ft)	Emergency Spillway Crest El (ft)	Peak Water Surface Elevation (ft	Freeboard* (ft)	Peak Inflow (cfs)	Peak Outflow (cfs)
Ash Pond 3	750.44	755.0	753.2	755.4	-0.4	1,724	727

*Freeboard is measured from the top of embankment to the peak water surface elevation. Negative freeboard indicates that the dam overtops during the subject storm event.

3.0 Methodology

3.1 HYDROLOGIC ANALYSES

The Plant Yates Ash Pond 3 is classified as a low hazard structure. The design storm for a low hazard structure is a 100-year rainfall event. A summary of the design storm parameters and rainfall distribution methodology for these calculations is summarized below in Table 2.

Table 2 – Plant Yates Ash Pond 3 Storm Distribution

Hazard Classification	Return Frequency (years)	Storm Duration (hours)	Rainfall Total (Inches)	Rainfall Source	Storm Distribution
Low	100	24	8.0	NOAA Atlas 14	SCS Type II

The drainage area for the Plant Yates Ash Pond 3 was delineated based on LiDAR data acquired for the Plant in 2014. Discharge from Ash Pond B' contributes to the total runoff draining to Ash Pond 3. The drainage area of the Ash Pond 3 sub-basin and other hydrologic parameters contained herein do not include the area of Ash Pond B'.

Outflow from Ash Pond B' was computed separately and the discharge hydrograph was routed into Ash Pond 3. Runoff characteristics were developed based on the Soil Conservation Service (SCS) methodologies as outlined in TR-55. An overall SCS curve number for the drainage area was developed based on the National Engineering Handbook, Part 630, Chapter 9 which provides a breakdown of curve numbers for each soil type and land use combination. The NRCS web-soil survey of the watershed was utilized to estimate the run-off potential of the basin. A table of the pertinent basin characteristics of Ash Pond 3 is provided in Table 2.

Table 3 – Ash Pond 3 Drainage Basin Characteristics

Drainage Basin Area, mi^2	0.99
Hydrologic Curve Number, CN	68
Hydrologic Methodology	SCS
Time of Concentration (minutes)	50
Lag Time (minutes)	30
Hydrologic Software	USACE HEC-HMS

Runoff values were determined by importing the characteristics developed above into a hydrologic model with the US Army Corps of Engineers HEC-HMS program.

3.2 HYDRAULIC ANALYSES

Storage values for the Ash Pond were determined by developing a stage-storage relationship utilizing contour data. The spillway system for Plant Yates Ash Pond 3 consists of a primary spillway and an auxiliary spillway. The primary spillway consists of a 48-inch corrugated metal pipe riser and a 42-inch diameter corrugated metal pipe outlet conduit. The auxiliary spillway consists of an earthen channel with a control section width on the order of 15-feet at elevation 753.2 feet. Table 4 below summarizes the pertinent spillway characteristics.

Table 4 – Ash Pond 3 Hydraulic Characteristics

	Material / Size	**US Invert, ft**	**DS Invert, ft**	**Length, ft**
Principal Spillway	48" dia. CMP Standpipe	750.44	-	-
Principal Spillway	42" dia. CMP pipe		727.84	236
Auxiliary Spillway	Earthen Channel, 20 ft wide	753.2	-	-

Based on the spillway attributes listed above, a rating curve was developed and incorporated into HEC-HMS to determine the pond performance during the design storm. As previously stated, discharge from Ash Pond B' contributes to the inflow into Ash Pond 3. The downstream invert of Ash Pond 3's principal spillway conduit is submerged during normal operating conditions. Tailwater effects were considered in this analysis by calculating the approximate water surface elevations in the downstream channel at a range of flow rates using the USACE Hydrologic Engineering Center's River Analysis System (HEC-RAS) computer program. The Federal Highway Administration's (FHWA's) Culvert Analysis software, HY-8, version 7.2 was utilized to calculate the submerged outlet rating curve for the Ash Pond 3 principal spillway conduit. Results are shown in Table 1.

4.0 SUPPORTING INFORMATION

4.1 CURVE NUMBER

Hydrologic Soil Group	**Cover Description** (Cover type, treatment, and hydrologic description; % impervious; connected or unconnected, etc)	**CN**	**Area (Acres)**	**Product (CN*Area)**
B	Industrial / Roads	88	19.9	1752.0
B	Open Space - Fair Cover	69	72.2	4984.8
B	Residential - 2 Acre	65	101.5	6596.9
B	Ash	96	50.6	4858.9
B	Woods - Fair Cover*	60	361.9	21711.7
W	Water	100	27.2	2715.6

ARC II Composite CN: 68

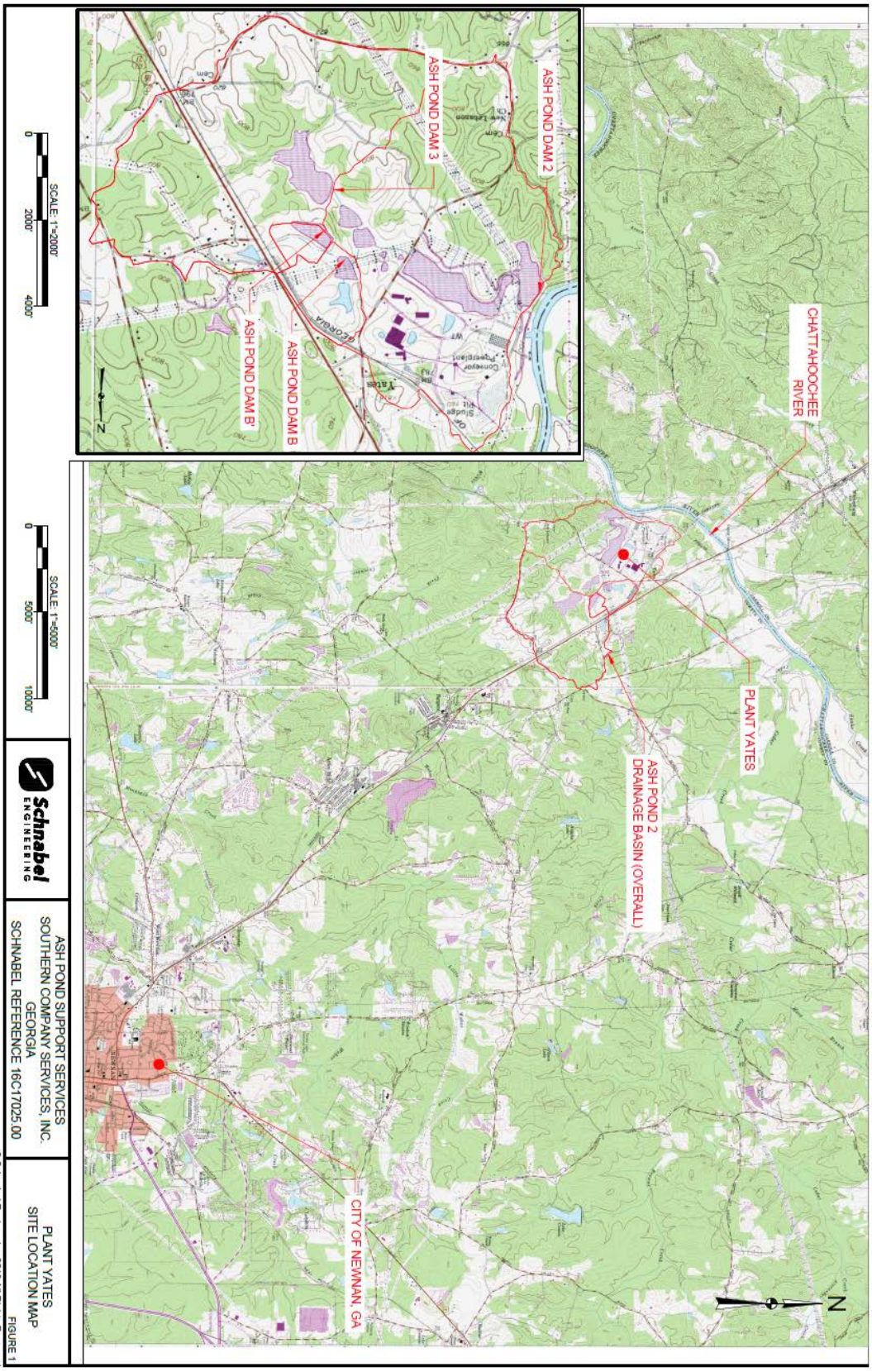
4.2 STAGE-STORAGE TABLE

EL (ft)	Area (ft^2)	Area (ac)	Inc. Volume (ac-ft)	Cum. Volume (ac-ft)
750	367032	8.4	0.0	0.0
750.44	392705.12	9.0	3.8	3.8
751	425380	9.8	5.3	9.1
752	517139	11.9	10.8	19.9
753	833060	19.1	15.5	35.4
754	1102973	25.3	22.2	57.6
755	1498062	34.4	29.9	87.5
766	4510354	103.5	758.6	846.1

4.3 RATING CURVE

Elev.	Head	Weir	Full Flow Pipe	P/S Total	E/S	Top of Dam Discharge	Total Discharge
750.44	0.00	0.00	N/A	0.00	0.00	0	0.00
750.96	0.52	14.61	98.00	14.61	0.00	0	14.61
751.64	1.20	51.22	101.00	51.22	0.00	0	51.22
752.34	1.90	102.05	104.00	102.05	0.00	0	102.05
753.07	2.63	166.20	107.00	107.00	0.00	0	107.00
753.2	2.76	178.67	107.53	107.53	0.00	0	107.53
753.81	3.37	241.07	110.00	110.00	20.01	0	130.01
754.57	4.13	327.06	113.00	113.00	67.35	0	180.35
755.35	4.91	423.95	116.00	116.00	132.41	319	567.28
757	6.56	654.72	118.00	118.00	311.12	4356	4784.90
766	15.56	2391.73	120.00	120.00	1923.38	56184	58227.00

4.4 DRAINAGE BASIN



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