Prepared for

Santee Cooper
One Riverwood Drive
Moncks Corner, SC 29461

INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN – SOUTH ASH POND

WINYAH GENERATING STATION

Prepared by

Geosyntec consultants

engineers | scientists | innovators

1300 South Mint Street
Charlotte, NC 28202

Project Number: GS8100

October 2021

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Chris Jordan
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Date: 2021.10.13 15:21:00 -04'00'

INTRODUCTION

Winyah Generating Station (WGS or the Site) is a 1,260 megawatt coal-fired steam electric generating facility owned and operated by South Carolina Public Service Authority (Santee Cooper). The Site is situated between Pennyroyal and Turkey Creeks and is located in Georgetown, South Carolina. Coal combustion residuals (CCR) generated at WGS have been historically managed in existing CCR surface impoundments.

In response to the CCR Rule (40 Code of Federal Regulations (CFR) Part 257), South Carolina Public Service Authority (Santee Cooper) retained Geosyntec to prepare documentation for existing surface impoundments (SIs) at WGS. Pursuant to Section 257.82(c) of the CCR Rule, Geosyntec prepared this Inflow Design Flood Control System Plan for the South Ash Pond at WGS.

Section § 257.82(a) of the Rule states that "*The owner or operator of an existing or new CCR surface impoundment or any lateral expansion of a CCR surface impoundment must design, construct, operate, and maintain an inflow design flood control system as specified in paragraphs (a)(1) and (2) of this section.*" The Preamble to the CCR Rule provides guidance on the documentation that should be provided for the Inflow Design Flood Control System Plan.

Section § 257.82(b) of the Rule states that the *"discharge from the CCR unit must be handled in accordance with the surface water requirements under §257.3-3".* The discharge from the South Ash Pond currently meets these requirements.

The inflow design flood control system for the South Ash Pond at the Site consists of maintaining minimum operating freeboards for the SI. Justification and documentation of the adequacy of the inflow design flood control systems are presented in the sections below.

The work presented in this report was performed under the direction of Mr. Chris Jordan, P.E., of Geosyntec in accordance with §257.82(c).

SURFACE IMPOUNDMENT DESCRIPTION

The South Ash Pond, encompassing approximately 76 acres (ac), is situated immediately south of the Coal Pile and power block and is encircled by a railroad that loops around the pond (Thomas and Hutton, 2012). The northern extent of the South Ash Pond is bounded by the rail line and Coal Pile, while the southern extent is bounded by a forested area. To the west, the South Ash Pond is bounded by Pennyroyal Creek and is bordered to the east by an access road and the Discharge Channel. The maximum height of the South Ash Pond perimeter dike is 22 feet (ft) (Thomas and Hutton, 2012). The minimum crest elevation of the South Ash Pond perimeter dikes is 36.0 ft National Geodetic Vertical Datum of 1929 (NGVD 29) (35 ft NAVD 88) (McKim and Creed, 2021). The original report published in 2016 was created using NGVD 29. This report was calculated using NAVD88. A conversion from NGVD 29 to NAVD 88 is calculated by subtracting a foot from the NGVD29 elevations. A Site Map including the surface impoundment and hydraulic features associated with the South Ash Pond is provided in **Figure 1**.

The South Ash Pond historically received fly ash, boiler slag, bottom ash, low volume wastewater, and stormwater. The normal operating level in the South Ash Pond is maintained by a rectangular concrete riser structure with 4 ft-long stoplogs on a single face. The water elevation within the South Ash Pond is at elevation 15 NGVD 29 (14 ft NAVD 88) and no stoplogs are currently in place on the riser to facilitate ongoing closure activities. A 36 in. diameter reinforced concrete pipe with an upstream invert elevation of 16.93 ft NGVD 29 (15.93 ft NAVD 88) conveys water from the riser structure to the Discharge Canal (Lockwood Greene, 1978).

CATCHMENT AREAS AND DESIGN STORM EVENT

The contributing watershed area for the South Ash Pond is 75.6 ac (McKim and Creed, 2021). The impoundment is surrounded on all sides by a raised perimeter dike which limits stormwater run-on to that generated within the footprint of the pond itself. There are no longer any inflows to the pond other than rainfall that lands directly within the pond. The area was delineated using the dike crests to correspond to the pond's footprint. Since the South Ash Pond is classified as a low hazard potential surface impoundment (Geosyntec, 2021), the inflow design flood is the 100-year flood event.

STORAGE CAPACITIES

The available stormwater storage volume of the South Ash Pond was calculated by developing an area-volume curve based on topographic and bathymetric data (McKim and Creed, 2021). The lowest contour within the South Ash Pond is 16 ft NGVD 29 (15.0 ft NAVD 88). The minimum crest elevation of the South Ash Pond perimeter dikes is 36 ft NGVD 29 (35 ft NAVD 88). The surface area of each contour was measured and tabulated at each elevation. The available surface water volume in each depth increment was calculated by averaging the surface area of the upper and lower contour and multiplying by the change in elevation between each contour. Area-Capacity information is presented in Appendix A.

HYDROLOGIC AND HYDRAULIC ANALYSIS

A hydrologic and hydraulic analysis of the South Ash Pond was performed using *HydroCAD Version 10.0* software (HydroCAD, 2019). Stormwater inflows, and outflows from the South Ash Pond to the Cooling Pond via the Discharge Canal were used to compute maximum water elevation during the design storm event. Tailwater effects associated with discharge from the South Ash Pond to the Discharge Channel were modeled using a fixed water surface elevation within the Discharge Channel and Cooling Pond. Appendix A presents the Hydrologic and Hydraulic analysis report and documents assumptions, rainfall abstractions, drainage areas, and model results.

ROUTING RESULTS

The resulting peak water surface elevation for the 100-yr flood event based on the hydraulic and hydrologic analysis (Appendix A) is shown in **Table 1**. The South Ash Pond will effectively contain the 100-yr flood event assuming the pond is maintained at a normal operating elevation of 15 ft NGVD 29 (14 ft NAVD 88). With full containment of the design event, the South Ash Pond maintains a freeboard of 21 feet. Detailed results are presented in Appendix A.

Under peak design flood inflows, the outflow from the South Ash Pond is controlled through the existing riser structure that ultimately discharges through an NPDES outlet. The inflow design flood elevations do not overtop the dike crest and all water is routed through engineered discharge devices located within the pond.

The results from this analysis show that the inflow design flood control system adequately manages flow into the CCR unit during and following the peak discharge of the inflow design flood as specified in the CCR Rule Section 257.82. All discharges from the South Ash Pond ultimately are discharged through NPDES Outfall 002, thus complying with CCR Rule Section 257.82(b).

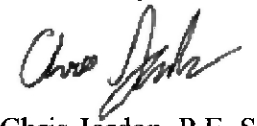
Table 1 – Peak Elevations and Freeboard

Event	***Elevation (NAVD 88) (ft)***	***Free Board (ft)***
Normal Operating Condition	14	21
100-Yr Flood	27.06	7.94

CERTIFICATION

This inflow design flood control system plan meets the requirements of this section (§257.82 Hydrologic and hydraulic capacity requirements for CCR impoundments) of the Code of Federal Regulations Title 40, Part 257, Subpart D, and was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering, and no other warranty is provided in connection therewith. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Santee Cooper. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others. Although we were not able to independently verify such data, we did evaluate it to determine whether it was consistent with other information that we developed in the course of our performance of the scope of services.

Certified by:



Date 10/14/2021

Chris Jordan, P.E. South Carolina License Number 39112
Project Engineer

REFERENCES

Geosyntec. (2021). *Hazard Potential Classification Assessment - South Ash Pond.* Greenville, SC.

HydroCAD. (2019). *HydroCAD Stormwater Modeling.* HydroCAD Software Solutions, LLC.

Lockwood Greene. (1978). *South Carolina Public Service Authority - Georgetown Generating Station.*

McKim and Creed. (2021). *Topographic Survey of the Dike Crests at Santee Cooper Winyah Generating Station.*

Santee Cooper. (2014). *Construction Permit Application - Winyah Station Runoff Pump Replacement.*

Santee Cooper. (2015). *Winyah Generating Station - NPDES Flowchart.*

Thomas and Hutton. (2012). *Topographic Survey of a Portion of Santee Cooper Winyah Generating Station.*

FIGURES

N

LEGEND

POND BOUNDARY

PIPE ALIGNMENT FROM DISCHARGE STRUCTURE TO DISCHARGE CANAL

NOTE 1: AERIAL IMAGERY TAKEN FROM ESRI, DATED 2019.

0 400' 800'

SCALE IN FEET

WINYAH GENERATING STATION
SITE MAP

Geosyntec consultants

FIGURE 1

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K:_PROJECTS\S\SANTEE COOPER\SANTEE COOPER-WINYAH\FIGURES\GC8100 - 2021 5 YEAR CCR REQUIREMENTS\SAP H&H\1 - SAP SITE MAP

APPENDIX A

Hydrologic and Hydraulic Analysis – South Ash Pond

Written by:	C. Jordan	Date:	10/7/21	Reviewed by:	A. Soroka	Date:	10/7/21
Client:	Santee Cooper	Project:	WGS SAP H&H	Project No.:	GC8100	Phase No.:	05

HYDROLOGIC AND HYDRAULIC ANALYSIS WINYAH GENERATING STATION, SECONDARY ASH POND, GEORGETOWN, SOUTH CAROLINA

1 PURPOSE AND BACKGROUND

Winyah Generating Station (WGS or the Site) is a coal-fired, electric generating facility located in Georgetown County, South Carolina. The Site is located between Pennyroyal and Turkey Creeks, tributaries to the Sampit River, and is approximately four miles southwest of Georgetown.

The purpose of this computation package is to evaluate the hydraulic capacity of the South Ash Pond to support spillway capacity assessment requirements, static factor of safety analyses, and hazard rankings required by the United States Environmental Protection Agency's (USEPA's) Coal Combustion Residuals (CCR) Rule. The South Ash Pond is regulated by the CCR Rule as an existing CCR surface impoundment. Under the CCR Rule, a low hazard ranking classification is associated with the 100-year (yr) precipitation event. Since the South Ash Pond is classified as a low hazard surface impoundment, the 100-yr storm frequency is analyzed herein.

The South Ash Pond, encompassing approximately 76 acres (ac), is situated immediately south of the Coal Pile and power block and is encircled by a railroad that loops around the pond (McKimm and Creed, 2021). (Note that 76 ac is the area contained within the dike crest boundary. The area of the limits of CCR is slightly less at approximately 75 ac.) The northern extent of the South Ash Pond is bounded by the rail line and Coal Pile, while the southern extent is bounded by a forested area. To the west, the South Ash Pond is bounded by Pennyroyal Creek and is bordered to the east by an access road and the Discharge Channel. The minimum crest elevation of the South Ash Pond perimeter dikes is 36 ft National Geodetic Vertical Datum of 1988 (NGVD 88) (McKim and Creed, 2021). A Site Map including the surface impoundment and hydraulic features associated with the South Ash Pond is provided in **Figure 1**.

The South Ash Pond impounds CCRs in the form of fly ash, boiler slag, and bottom ash.

2 METHODOLOGY AND INPUT PARAMETERS

Stormwater runoff volumes and associated discharges to the South Ash Pond were modeled using *HydroCAD Version 10.0* software (HydroCAD, 2019). *HydroCAD* utilizes frequency-based precipitation events, in conjunction with watershed properties, to calculate peak runoff by several accepted methods. The Soil Conservation Service (SCS) Technical Release 20 (TR-20) method was applied in *HydroCAD* to calculate stormwater runoff volumes (SCS, 1982).

Written by:	C. Jordan	Date:	10/7/21	Reviewed by:	A. Soroka	Date:	10/7/21
Client:	Santee Cooper	Project:	WGS SAP H&H	Project No.:	GC8100	Phase No.:	05

The following parameters and assumptions were selected for calculating stormwater runoff volumes to the South Ash Pond.

Rainfall

The 72-hour (hr) duration precipitation event was used in this analysis. The rainfall depth corresponding to the 72-hr duration precipitation event for the 100-yr frequency return period for the Site is 12.5 inches (in.) (NOAA, 2021). The design storm hydrograph was developed using SCS Type III rainfall distribution and was directly input to the *HydroCAD* model.

Drainage Areas and Curve Numbers

The contributing watershed area for the South Ash Pond is 75.6 ac (McKimm and Creed, 2021). The area was delineated using the dike crests to correspond to the pond's direct drainage area. The pond was assigned a curve number (CN) based on guidance provided in Technical Release 55 (TR-55) (SCS, 1986) representing the type of ground cover in that area. The South Ash Pond was assumed to be approximately 92% ash (CN = 86), 3% sparse vegetation (CN = 68), and 11% water (CN = 100) (Weighted CN = 86). The contributing watershed area and CN is summarized in **Table 1** and was directly input into the *HydroCAD* model.

Times of Concentration Calculations

The time of concentration represents the time required for runoff to flow from the most hydraulically remote point of the drainage area to the point under investigation. The flow path from the most remote point within the South Ash Pond is characterized by sheet flow and shallow concentrated flow (shown in **Figure 2**).

HydroCAD applied the Overton and Meadows formulation to calculate travel time for sheet flow for distances less than 300 ft (NRCS, 2010):

$$T_t = \frac{0.007(nL)^{0.8}}{P_{2-24}^{0.5} S^{0.4}}$$

where: T_t = travel time for overland sheet flow (hr);

n = Manning's roughness coefficient for sheet flow (--);

L = flow length (ft);

$P_{2\text{-}24}$ = 2 yr, 24 hr rainfall (in.); and

S = slope of hydraulic grade line (or land slope) (feet per feet [ft/ft]).

A Manning's roughness coefficient of 0.011 was used to represent sheet flow in the South Ash Pond. The sheet flow length was limited to 100 ft, because sheet flow beyond 100 ft typically transitions to shallow concentrated flow. The rainfall depth for the 2 yr, 24 hr frequency storm event is 4.38 in. (NOAA, 2021). The parameters used to model sheet flow within the South Ash Pond are shown in **Table 2**.

Shallow concentrated flow travel time was computed using the Upland Method (NRCS, 2010).

$$T_t = \frac{L}{V}$$

where: T_t = travel time (seconds [s]);

L = flow length (ft); and

V = average velocity (feet per second [ft/s]).

The average velocity was computed using the following equation (NRCS, 2010).

$$V = K_v S^{0.5}$$

where: V = average velocity (ft/s);

K_v = velocity factor (ft/s); and

S = slope of hydraulic grade line (or land slope) (ft/ft).

A velocity factor of 16.1 ft/s, representing flow across an unpaved surface, was used to calculate shallow concentrated flow travel time within the South Ash Pond. The parameters used to describe shallow concentrated flow within the South Ash Pond are presented in **Table 2**.

Written by:	C. Jordan	Date:	10/7/21	Reviewed by:	A. Soroka	Date:	10/7/21
Client:	Santee Cooper	Project:	WGS SAP H&H	Project No.:	GC8100	Phase No.:	05

Inflows

In the *HydroCAD* model, stormwater inflow associated with the South Ash Pond is represented by Sub-Catchment 8S. Pond 1P represents the South Ash Pond. The *HydroCAD* model routing diagram is provided in **Appendix A**.

Storage Capacities

The available stormwater storage volume of the South Ash Pond between elevations 15.0 ft and 36 ft NAVD 88 was calculated by developing an area-volume curve based on topographic and bathymetric data (McKimm and Creed, 2021). The lowest contour within the South Ash Pond is 15.0 ft NAVD 88. The minimum crest elevation of the South Ash Pond perimeter dikes is 36ft NAVD 88. The surface area of each contour was measured and tabulated at each elevation. The available surface water volume in each depth increment was calculated by averaging the surface area of the upper and lower contour and multiplying by the change in elevation between each contour. The cumulative storage volume of the South Ash Pond between these elevations is 295.4 acre-feet (ac-ft). The South Ash Pond is maintained at a normal operational pool elevation of 28.73 ft NGVD 29 (27.73 ft NAVD 88).

Outlet Structures

The normal operating level in the South Ash Pond is maintained by a rectangular concrete riser structure with 4 ft long stop logs on a single face. A 36 in. diameter reinforced concrete pipe with an upstream invert elevation of 15.93 ft NAVD 88 conveys water from the riser structure to the Discharge Canal (Lockwood Greene, 1978).

The tailwater effects associated with discharge from the South Ash Pond to the Discharge Canal were modeled using a fixed water surface elevation within the Discharge Canal and Cooling Pond. This tailwater surface elevation was estimated by conservatively assuming 2.5 ft depth of water over the Cooling Pond emergency spillway during the 100 yr storm event. The top of the stop log bolted to the top of the concrete spillway of the Cooling Pond is at elevation 20.65 ft NAVD 88 (Thomas and Hutton, 2015). The water surface of the Discharge Canal and Cooling Pond was assumed to be at 22.15 ft NAVD 88 (20.65 ft NAVD 88 plus an additional 2.5 ft of water).

3 RESULTS OF ANALYSES

The resulting peak water surface elevation and storage volume for the 100-yr storm event is shown in **Table 5**. The South Ash Pond will effectively contain the 100-yr storm event when operated under its current condtions.

4 REFERENCES

HydroCAD. (2019). *HydroCAD Stormwater Modeling.* HydroCAD Software Solutions, LLC.

Lockwood Greene. (1978). *South Carolina Public Service Authority - Georgetown Generating Station.*

McKim and Creed. (2021). *Topographic Survey of the South Ash Pond.*

NOAA. (2021). *Precipitation-Frequency Atlas of the United States.* Atlas 14, Volume 2, Version 3.0, National Oceanic and Atmospheric Administration.

NRCS. (2010). National Engineering Handbook, Part 630: Hydrology.

Santee Cooper. (2014). *Construction Permit Application - Winyah Station Runoff Pump Replacement.*

Santee Cooper. (2015). *Winyah Generating Station - NPDES Flowchart.*

SCS. (1982). *Technical Release Number 20 (TR-20).* National Technical Information Service.

SCS. (1986). *Technical Release Number 55 (TR-55).* Soil Conservation Service. National Technical Information Service.

Thomas and Hutton. (2015). *Topographic Survey of the Cooling Pond at Santee Cooper Winyah Generating Station.*

TABLES

Table 1 – Watershed Areas and Curve Numbers

Drainage Area ID	Land Use Description	CN	Area (Acres)	Total Area (Acres)	Weighted CN
SAP	Brush, Poor	67	2.4	75.6	86
	CCR	86	69.9		
	Water	100	3.3		

Table 2 – Input Parameters Describing Sheet Flow and Open Channel Flow

Time of Concentration - Sheet Flow Contribution							Time of Concentration - Shallow Concentrated Flow Contribution					Total Time of Concentration {Tc} (minutes)
Drainage Area	Surface Description	Manning's No. {n}	Flow Length {L} (ft)	2-Year, 24-Hour Rainfall {I} (in)	Land Slope {S} (ft/ft)	Time of Concentration from Sheet Flow {$T_{c,\ sheet}$} (minutes)	Surface Description	Velocity Factor (ft/s)	Flow Length {L} (ft)	Land Slope {S} (ft/ft)	Time of Concentration from Shallow Concentrated Flow {$T_{c,\ scf}$} (minutes)	
SAP	Smooth	0.011	100	4.38	0.0700	0.6	Unpaved	16.1	3900	0.007	48.3	48.9

Table 3 – Stage – Storage Volumes

Elevation (ft)	Area (ac)	Incremental Volume (ac-ft)	Cumulative Volume (ac-ft)
15	2.0	0.0	0.0
16	2.6	2.3	2.3
17	3.1	2.8	5.1
18	3.5	3.3	8.4
19	3.9	3.7	12.1
20	4.4	4.2	16.2
21	4.9	4.6	20.9
22	5.8	5.4	26.2
23	6.4	6.1	32.3
24	7.2	6.8	39.1
25	8.8	8.0	47.1
26	11.2	10.0	57.1
27	13.1	12.2	69.3
28	14.7	13.9	83.2
29	16.8	15.8	99.0
30	18.4	17.6	116.6
31	20.2	19.3	135.9
32	23.0	21.6	157.5
33	28.2	25.6	183.0
34	33.3	30.7	213.7
35	41.4	37.3	251.1
36	47.4	44.4	295.4

Table 6 – Peak Elevation and Volume

Pond ID	Storm Event	Peak Water Surface Elevation (ft)	Water Volume (ac-ft)
SAP	100-yr, 72-hr	27.06	70.14

FIGURES

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LEGEND

POND BOUNDARY

PIPE ALIGNMENT FROM DISCHARGE STRUCTURE TO DISCHARGE CANAL

NOTE 1: AERIAL IMAGERY TAKEN FROM ESRI, DATED 2019.

0 400' 800'

SCALE IN FEET

WINYAH GENERATING STATION
SITE MAP

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FIGURE 1

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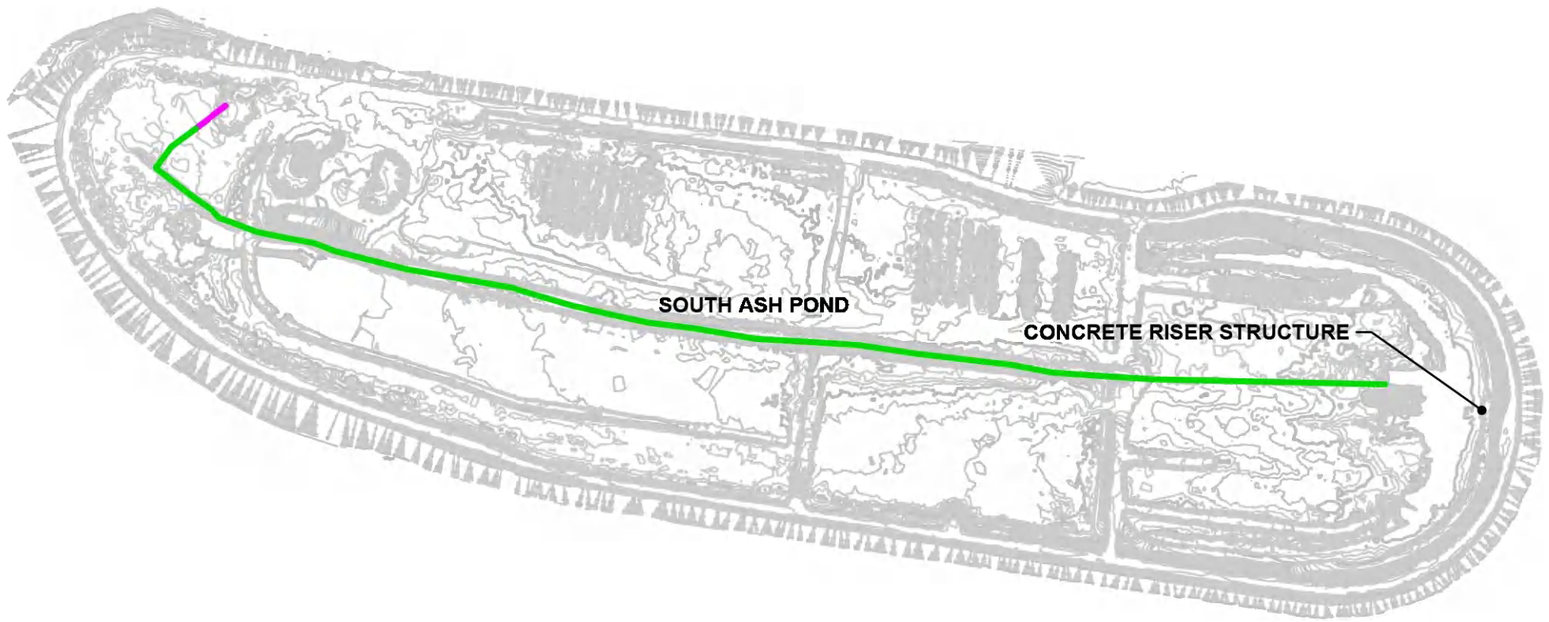
K:_PROJECTS\S\SANTEE COOPER\SANTEE COOPER-WINYAH\FIGURES\GC8100 - 2021 5 YEAR CCR REQUIREMENTS\SAP H&H\1 - SAP SITE MAP



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SHEET FLOW

SHALLOW CONCENTRATED FLOW

NOTE 1: TOPOGRAPHIC SURVEY INFORMATION COLLECTED BY McKIM AND CREED, DATED 7-24-2021

0 400' 800'

SCALE IN FEET

WINYAH GENERATING STATION
SOUTH ASH POND FLOW PATH

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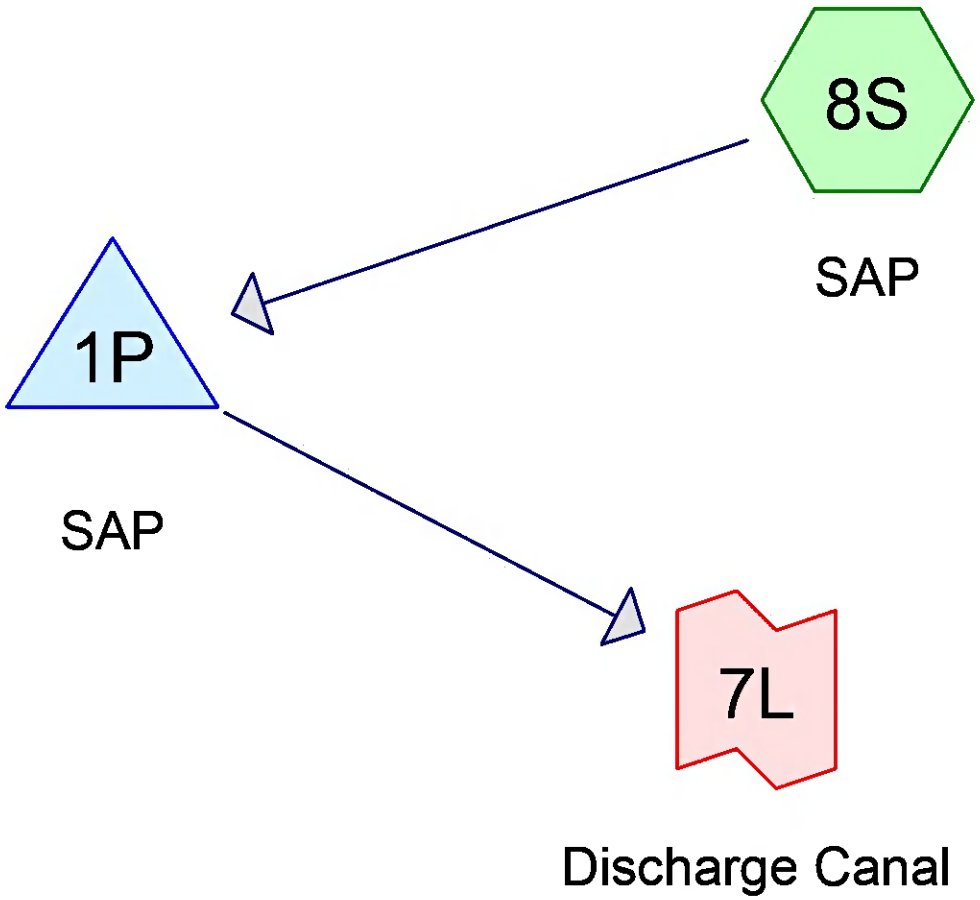
FIGURE 2

PROJECT NO: GC8100 | OCTOBER 2021

K:_PROJECTS\S\SANTEE COOPER\SANTEE COOPER-WINYAH\FIGURES\GC8100 - 2021 5 YEAR CCR REQUIREMENTS\SAP H&H\1 - SAP FLOW PATH

APPENDICES

APPENDIX A



Subcat Reach Pond Link

Routing Diagram for SAP H&H Capacity
Prepared by SCCM, Printed 9/28/2021

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
75.600	86	(8S)
75.600	**86**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
75.600	Other	8S
75.600		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	75.600	75.600		8S
0.000	**0.000**	**0.000**	**0.000**	**75.600**	**75.600**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1P	15.93	15.93	350.0	0.0000	0.013	36.0	0.0	0.0

Time span=0.00-500.00 hrs, dt=0.05 hrs, 10001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 8S: SAP Runoff Area=75.600 ac 0.00% Impervious Runoff Depth=11.13"
Flow Length=4,000' Tc=48.9 min CN=86 Runoff=412.33 cfs 70.139 af

Pond 1P: SAP Peak Elev=27.06' Storage=70.139 af Inflow=412.33 cfs 70.139 af
Outflow=0.00 cfs 0.000 af

Link 7L: Discharge Canal Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 75.600 ac Runoff Volume = 70.139 af Average Runoff Depth = 11.13"
100.00% Pervious = 75.600 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 8S: SAP

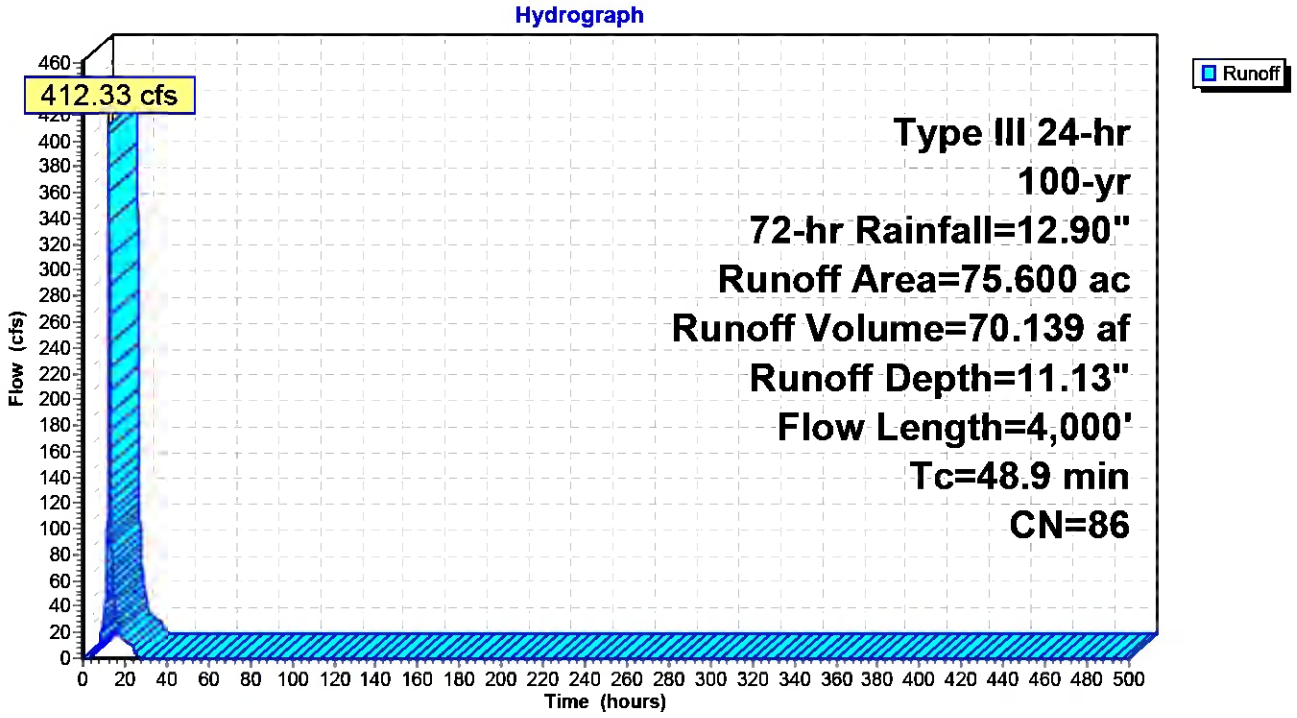
Runoff = 412.33 cfs @ 12.64 hrs, Volume= 70.139 af, Depth=11.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-500.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr, 72-hr Rainfall=12.90"

	Area (ac)	CN	Description
*	75.600	86	
	75.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	100	0.0700	2.66		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 4.38"
48.3	3,900	0.0070	1.35		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
48.9	4,000	Total			

Subcatchment 8S: SAP



Summary for Pond 1P: SAP

Inflow Area = 75.600 ac, 0.00% Impervious, Inflow Depth = 11.13" for 100-yr, 72-hr event
Inflow = 412.33 cfs @ 12.64 hrs, Volume= 70.139 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-500.00 hrs, dt= 0.05 hrs
Peak Elev= 27.06' @ 26.80 hrs Surf.Area= 13.195 ac Storage= 70.139 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

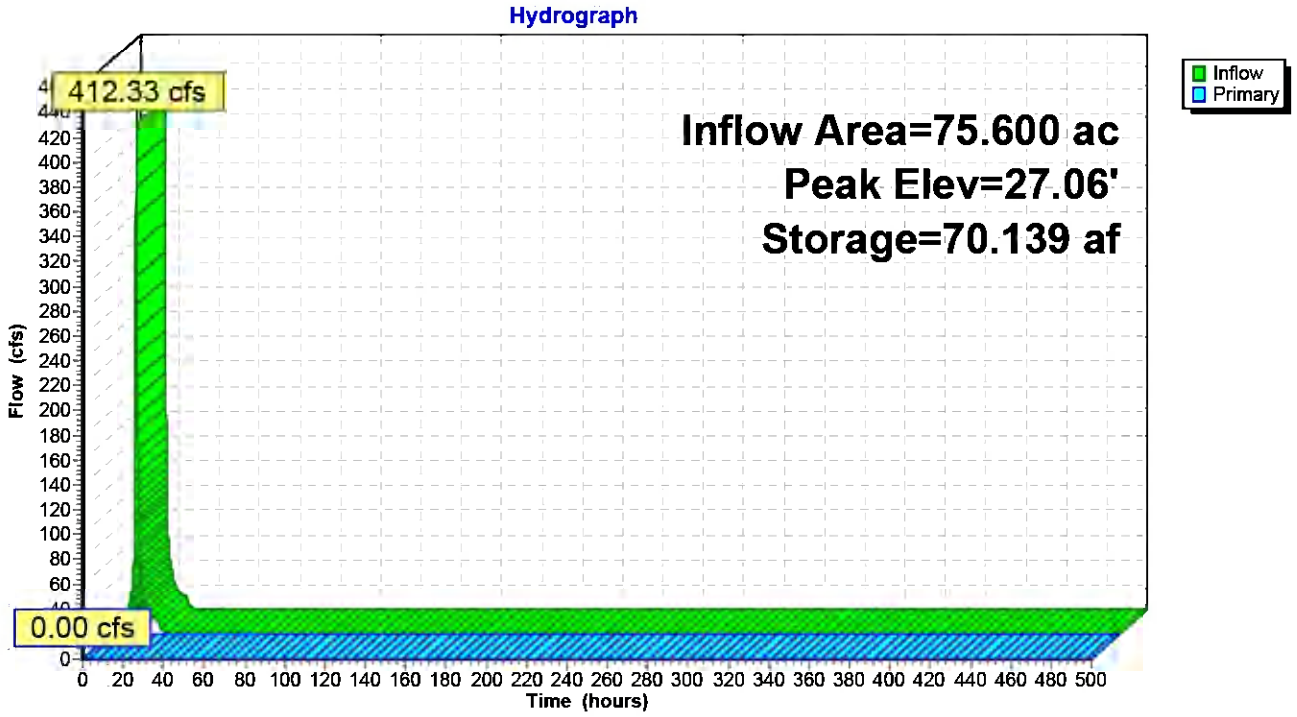
Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	295.442 af	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	1.960	0.000	0.000
16.00	2.612	2.286	2.286
17.00	3.067	2.839	5.125
18.00	3.458	3.262	8.388
19.00	3.920	3.689	12.077
20.00	4.387	4.154	16.231
21.00	4.880	4.634	20.864
22.00	5.823	5.351	26.216
23.00	6.392	6.108	32.323
24.00	7.238	6.815	39.138
25.00	8.760	7.999	47.137
26.00	11.244	10.002	57.139
27.00	13.092	12.168	69.307
28.00	14.725	13.908	83.216
29.00	16.826	15.776	98.991
30.00	18.354	17.590	116.581
31.00	20.207	19.281	135.862
32.00	22.975	21.591	157.453
33.00	28.168	25.571	183.024
34.00	33.283	30.725	213.750
35.00	41.370	37.326	251.076
36.00	47.362	44.366	295.442

Device	Routing	Invert	Outlet Devices
#1	Primary	15.93'	**36.0" Round Culvert** L= 350.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 15.93' / 15.93' S= 0.0000 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf
#2	Device 1	27.73'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.00' TW=23.15' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)
↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: SAP


Hydrograph
412.33 cfs
0.00 cfs
Inflow Area=75.600 ac
Peak Elev=27.06'
Storage=70.139 af
Inflow
Primary
Flow (cfs)
Time (hours)
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500

Summary for Link 7L: Discharge Canal

Inflow Area = 75.600 ac, 0.00% Impervious, Inflow Depth = 0.00" for 100-yr, 72-hr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-500.00 hrs, dt= 0.05 hrs

Fixed water surface Elevation= 23.15'

Link 7L: Discharge Canal