Southern Nuclear

Southern Nuclear
Operating Company, Inc.
3535 Colonnade Parkway
Birmingham, AL 35243
Tel 205.992.7079

March 31, 2020

Docket Nos.: 52-025
52-026

ND-20-0289

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Southern Nuclear Operating Company
Vogtle Electric Generating Plant Units 3 and 4
Transmittal of NPDES Permit Renewal Application

Ladies and Gentlemen:

In accordance with Section 3.0 of the Vogtle Electric Generating Plant (VEGP) Environmental Protection Plan (Units 3 and 4), Appendix B to Combined Operating Licenses NPF-91 and NPF-92, enclosed is a copy of the VEGP National Pollutant Discharge Elimination System (NPDES) Permit No. GA0039420 permit renewal application. As required by the Georgia Environmental Protection Division, this application was submitted electronically via the Georgia EPD Online System (GEOS).

Enclosure 1 contains a copy of the application that was submitted in GEOS along with the attachments included in the on-line submittal.

This letter contains no regulatory commitments. This letter has been reviewed and determined not to contain security-related information.

If you have any questions, please contact Ms. Amy Chamberlain at (205) 992-6361.

Respectfully submitted,

Amy C. Ch

Amy C. Chamberlain
Manager, Regulatory Affairs
Southern Nuclear Operating Company

Enclosure: 1) Vogtle Electric Generating Plant Units 3 and 4 National Pollutant Discharge Elimination System Permit No. GA0039420 Renewal Application cc:

Southern Nuclear Operating Company / Georgia Power Company
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File AR.01.02.06

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Other
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Dr. W. R. Jacobs, Jr., Ph.D., GDS Associates, Inc.
Mr. S. Roetger, Georgia Public Service Commission
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Southern Nuclear Operating Company

ND-20-0289
Enclosure 1

Vogtle Electric Generating Plant (VEGP) Units 3 and 4

National Pollutant Discharge Elimination System Permit No. 0039420 Permit Renewal Application

(Enclosure 1 consists of 561 pages, including this cover page)

March 30, 2020 Log: ND-20-EVC-0316

Vogtle Electric Generation Plant Units 3&4 NPDES Permit GA0039420
Permit Renewal Application

Mr. Ian McDowell, Environmental Engineer
Industrial Permitting Unit
Watershed Protection Branch
Environmental Protection Division
2 Martin Luther King Jr. Drive, S.E., East Tower, Suite 1152
Atlanta, Georgia 30334

Mr. McDowell,

As required, Southern Nuclear Operating Company, Inc. (SNC) will submit the Permit Renewal Application for NPDES Permit No. GA0039420 via the Georgia EPD Online System (GEOS) on March 31, 2020. Currently, each of the units remains under construction with targeted in-service dates of 2021 and 2022 for Vogtle Units 3 and 4, respectively. This letter attachment provides a high-level summary of the application contents and outlines SNC's approach to the completion of the application based on the status of the facility construction. Where necessary, SNC has highlighted changes between the current permit and changes deemed necessary based on the current plant design and operational procedures.

Outfall Characterization Sampling

As discussed in the meeting between SNC and GA EPD on December 6, 2019, sampling of the external outfalls was not performed to support this renewal application. As of the date of this application, the facility remains under construction. Although batch discharges of hydrostatic test and system flush have been occurring, this water consists of demineralized groundwater that has not been subjected to the processes associated with the generation of power. As such, the analytical data used for NPDES Permit GA0026786 (Plant Vogtle Units 1&2) was included to support this renewal application since this data is considered representative of the future discharges from Units 3&4 during operation.

Discharge Flow Rates

During the preparation of this application, SNC reviewed the likely discharges associated with the internal outfalls. This permit renewal application includes minor modifications to the discharge flow rates based on the current design documents and operational procedures. It should be noted that the application includes the likely maximum flow rates which have been included on a per unit basis. Where appropriate, SNC has included average flow rates from similar processes for Plant Vogtle Units 1&2 in the outfall flow descriptions. As each unit becomes operational, it is expected that future permit renewals will include actual operational data.

Changes to Permitted Outfalls

As the design, construction and start-up testing activities have progressed, SNC has identified necessary changes to internal outfalls based on the final construction of the plant process water conveyances. As part of this permit renewal application and pursuant to Part II.A.1. Notification of Changes, SNC is providing notice of intent to remove internal outfalls for the service water system (SWS) blowdown (Outfalls 008 and 009) from the permit and modify the intermittent flow characterization for internal Outfalls 002A and 003A. The following provides the basis for these changes.

1. Removal of Monitoring Requirements for Internal Outfalls 008 and 009

The final construction of the blowdown lines is such that the blowdown from the SWS cooling towers flows into the basins of the natural draft cooling towers. The basis for the removal of the monitoring requirements associated with Outfalls 008 and 009 is:

- The process water from both the SWS cooling towers and cooling tower blowdown are similar in nature and are both subject to the effluent limitation guidelines in 40 CFR 423.15(a)(10)(i-iii).
- The maximum SWS blowdown (per unit) of approximately 0.3 million gallons per day (250 gallons per minute (gpm)) is *de minimis* when compared to the ~7,000,000 gallons contained in the circulating water system and maximum blowdown of 18.3 mgd (5,280 gpm). The addition of the SWS discharge into the cooling tower basins has been accounted for in the design and is not expected to lower the cycles of concentration or increase the pollutants in the cooling tower blowdown. A revised Flow Diagram is included as an attachment to the GEOS application.
- This change does not cause an increase in the pollutant loading. The monitoring performed for Outfalls 002 and 003 will ensure that the discharge from both the SWS and CWS are in compliance with the effluent limitation guidelines.

2. Intermittent Flow Characterization for Outfalls 002A and 003A

SNC will be required to discharge process water from both the Unit 3 and Unit 4 Cooling Tower basins to the storm drains during refueling outages and possibly after hot functional testing (startup activity). This requirement is due to the final configuration of the blowdown lines which do not facilitate gravity draining of the cooling tower basins to the mixing sump. The initial refueling outage for each unit will be scheduled 12 months following commercial operation with subsequent outages scheduled on an 18 month frequency. Additionally, the process water may require removal following hot functional testing for each unit. SNC requires this change to facilitate maintenance of the cooling towers.

The current permit allows for intermittent discharges of emergency overflow of process water from the cooling tower basins to the storm drains via Outfalls 002A and 003A. The emergency overflow events occur infrequently and are generally the result of an imbalance or equipment malfunction in the cooling tower system. These two outfalls were initially permitted based on operating experience from Plant Vogtle Units 1&2.

The modification to the intermittent flow characterization for external outfalls 002A and 003A will result in between six to seven million gallons of process water from the cooling tower being manually pumped to the storm drain system over 48 hours (3-3.5 million gallons per day); which translates to a flowrate of approximately 2500 gallons per minute for approximately two days. The permit application identifies outfalls 002A and 003A as the cooling tower emergency overflows to storm drains. For the remainder of this document, the discharge associated both the emergency overflows and the process water discharged during refueling outages (and startup activities) is identified as the Units 3 and 4 Emergency Cooling Tower Overflow and Alternate Discharge to Storm Drains. Prior to manual discharge of the process water from the cooling tower basins to the storm drains, representative samples will be collected to verify that free available chlorine and total residual chlorine are not present above reporting limits.

3. Addition of Industrial Storm Water Outfalls 013 and 014

Three internal outfalls 002A, 003A, and 012 Passive Cooling System discharge process water on infrequent basis to the storm drains. Each of these internal outfalls flow via the storm water system to two permanent storm water detention basins prior to discharging to a water of the state. While these are intermittent process water discharges, it is not feasible to sample the industrial storm water prior to comingling with industrial wastewater. Consistent with the permitting approach for Plant Vogtle 1&2, SNC is requesting that the annual benchmark sampling associated with steam electric generating plants along with the allowable non-stormwater discharges be included in the NPDES permit. As summarized in the permit application, the stormwater within the construction footprint is currently governed by numerous NOIs under the NPDES General Permits No. GAR100001 authorizing stormwater discharges associated with construction activities.

In order to support the permit modification to facilitate the additional discharge of process water to the storm drains, SNC offers the following information and/or data.

1. Summary of the storm water characteristics of Vogtle 3&4 as related to the comingling of the process water from the cooling towers.
2. Summary of discharge characteristics of the process water
3. Analysis of alternatives that will prevent and/or lessen the degradation associated with the proposed activity.

<u>Storm Water Characteristics</u> –

The process water from Outfalls 002A, 003A and 012 co-mingles with storm water from the Plant Vogtle Units 3&4 power block as well as other undeveloped areas within the owner controlled area. A series of subsurface storm drains and engineered ditches convey the storm water to a permanent on-site storm water retention basin. Water from this basin then discharges to Debris Basin #2 that was installed during the construction of Plant Vogtle Units 1&2. This outfall is currently being sampled under the General construction storm permit and is proposed for sampling as Outfall 013 after construction is complete. The following table presents a summary of the available storage capacity along with comparison of the percentage of process water and storm water for reasonable storm events.

Discharge Comparisons During Rain Events				
	Remaining Storage Capacity (gal)		% Process Flow Rate Comingeld with Storm Water	
	Emergency Overflow	Alternate Intermittent Discharge	Emergency Oveflow	Alternate Intermittent Discharge
2 Year Storm	23,125,957	16,365,957	19%	24%
5 Year Storm	18,049,685	11,289,685	7%	9%
10 Year Storm	13,776,727	7,016,727	4%	5%
25 Year Storm	12,835,436	6,075,436	3%	4%
50 Year Storm	9,445,815	2,685,815	2%	2%
100 Year Storm	7,385,778	625,778	2%	2%

It should be noted that the remaining storage capacity was calculated by subtracting the estimated maximum volume of the discharge plus the expected storm water volume from the design volume of the detention basins. Sufficient capacity exists within the basin to facilitate storage and measured discharge of the co-mingled process water and industrial storm water. The percentage of process water discharge rate compared to the storm water discharge rates does not account for any additional co-mingling or attenuation within the ponds. This is considered extremely conservative as retention and dilution will have occurred prior to discharge.

Summary of Process Water Characteristics

As previously stated, Plant Vogtle Units 3&4 are currently under construction and discharges from the cooling towers have not occurred. Consistent with the initial and this permit renewal application, samples were not collected. In order to support the reasonableness of the discharges, SNC has evaluated the monitoring results for the cooling towers associated with Plant Vogtle Units 1&2 from 2017 to 2019. SNC used the monitoring results (average, 95% Upper Confidence Interval, and the maximum detected concentration) to calculate the expected range of the mass of contaminants in the cooling tower process water. Non-detect values were assigned ½ the detection limit in the calculations. This comparison is based on the expected discharge of up to 3.5 million gallons per day (Alternate Discharge) and the allowable daily maximum concentrations in 40 CFR 423.13(d)(1). It should be noted that this comparison was limited to chromium and zinc as SNC intends to verify that free available chlorine and total residual chlorine are less than reporting limits prior to discharge. The following table presents a summary of the calculated pollutant discharge on a daily basis.

	Permitted Discharge Allocation - 40 CR 423.13(d)(1)						
	Daily Maximum Concentration	Discharge Allocation (lbs)			Data Comparison		
	(mg/L)	Emergency Overflow Allocation	Alternate Discharge Allocation	Cooling Tower Blowdown	Alternate Discharge Allocation (lbs)		
					Avg	95% UCL	Max
Chromium, total	0.2	0.028	0.204	0.470	0.012	0.016	0.066
Zinc, total	1	0.140	1.019	2.348	0.064	0.079	0.253
Free Availble Chlorine	0.5	0.070	Not Applicable Due to Dechlorination				

As expected, the permit limit based allocation for the Alternate Discharge exceeds the current permitted allocation. However, based on the actual data collected for chromium and zinc between 2017 and 2019, 95% of the mass of chromium and zinc expected to be discharged during the draining of the cooling tower basins is less than the currently permitted allocation for the emergency overflows. The maximum detected concentrations of chromium and zinc slightly exceed the emergency overflow allocation. Given that both of the discharges are intermittent and infrequent, no adverse impact to the receiving water body is expected.

Summary of Antidegradation Alternatives Analysis

Federal regulations (40 CFR 131.12) and EPD rules (391-3-6-.03(2)(b)) outline the antidegradation requirements when pollutants are discharged to surface water. As discussed in

Summary of Changes to Permitted Outfalls

Based on the information provided above, SNC offers the following:

- With the exception of a two year, 24-hour storm, the process water discharge represents < 10% of the storm water discharge from the site.
- The total design storage capacity of the retention basins is approximately 31.5 million gallons. The seven million gallons of process water is approximately 22% of the total storage capacity of the retention basins.
- Sufficient storage is available in the retention basins to accommodate both the storm water and process water during reasonable storm events.
- While the daily maximum concentrations allowed by 40 CFR 423 exceed the current permitted allocation, actual data demonstrates little to no degradation potential for the surface water as a result of the increase in the discharge.
- Practicable alternatives include ensuring free available chlorine and total residual chlorine are less than reporting limits and the use of best management practices to lessen the potential for degradation of the surface water as a result of the infrequent intermittent alternate discharge from the cooling towers.

The aforementioned summary provides the basis for the permit renewal application. If you have any questions or require additional information, please contact Mr. Jim DeLano at (205) 992-5419.

Sincerely,

Dale L. Fulton

Dale L. Fulton
Environmental Affairs Manager

Georgia National Pollutant Discharge Elimination System Application Part 1

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

STATE OF GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

For EPD Use Only
Assigned Permit No GA0039420

Georgia National Pollutant Discharge Elimination System Application Part 1

This application includes Information not subject to disclosure under Georgia Law.	☐	Yes	☑	No

Please check all of the applicable box(s) and enter the associated information:							
☐	New discharger		☑	Existing NPDES discharger		☐	Change of Information
				Existing NPDES Permit No.	GA0039420		
Describe Modification Requested:							

POLLUTANT CHARACTERISTICS

INSTRUCTIONS: Complete A through J to determine whether you need to submit any permit application forms to the EPA. If you answer "yes" to any questions, you must submit this form and the supplemental form listed in the parenthesis following the question. Mark "X" in the box in the third column if the supplemental form is attached. If you answer "no" to each question, you need not submit any of these forms. You may answer "no" if your activity is excluded from permit requirements; see Section C of the instructions. See also, Section D of the instructions for definitions of bold-faced terms.

	Mark "X"			Mark "X"	
Specific Questions	Yes	No	Specific Questions	Yes	No
A. Is this facility a **publicly owned treatment works** which results in a **discharge** to **waters of the U.S.**? (FORM 2A)		X	B. Does or will this facility (either existing or proposed) include a **concentrated animal feeding operation or aquatic animal production facility** which results in a **discharge** to **waters of the U.S.**? (FORM 2B)		X
C. Is this a facility which currently results in **discharges** to **waters of the U.S.** other than those described in A or B above? (FORM 2C)	X		D. Is this a proposed facility (other than those described in A or B above) which will result in a **discharge** to **waters of the U.S.**? (FORM 2D)		X
E. Does or will this facility treat, store, or dispose of **hazardous wastes**? (FORM 3)			F. Do you or will you inject at this facility industrial or municipal effluent below the lowermost stratum containing, within one quarter mile of the well bore, underground sources of drinking water? (FORM 4)		
G. Do you or will you inject at this facility any produced water or other fluids which are brought to the surface in connection with conventional oil or natural gas production, inject fluids used for enhanced recovery of oil or natural gas, or inject fluids for storage of liquid hydrocarbons? (FORM 4)			H. Do you or will you inject at this facility fluids for special processes such as mining of sulfur by the Frasch process, solution mining of minerals, in situ combustion of fossil fuel, or recovery of geothermal energy? (FORM 4)		
I. Is this facility a proposed **stationary source** which is one of the 28 industrial categories listed in the instructions and which will potentially emit 100 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an attainment area? (FORM 5)			J. Is this facility a proposed **stationary source** which is NOT one of the 28 industrial categories listed in the instructions and which will potentially emit 250 tons per year of any air pollutant regulated under the Clean Air Act and may affect or be located in an **attainment area**? (FORM 5)		

SECTION I. FACILITY INFORMATION

Facility Type of Ownership: Corporation

Please check the applicable box

POTW	Non-POTW		Federal	
☐ 2A – Municipal Wastewater Discharge Application	☐2B – Concentrated Animal Feeding Operation and Aquatic Animal Production ☑2C – Industrial Wastewater Discharge Application ☐2D – New Sources & New Dischargers ☐2F – Industrial Stormwater		2C – Industrial Wastewater Discharge Application 2D – New Sources & New Dischargers 2F – Industrial Stormwater	
	☐2E – Non-Process Wastewater	☐Sanitary Wastewater ☐Cooling Wastewater	2E – Non-Process Wastewater	Sanitary Wastewater Cooling Wastewater

Permittee Organization Formal Name: Southern Nuclear Operating Company, Inc.

Permittee Mailing Address: 3535 Colonnade Parkway BIN N-218-EC

Permittee City: Birmingham	Permittee State: AL	Permittee Zip Code: 35243	Permittee County: Jefferson

Facility Site Name: SOUTHERN NUCLEAR OPERATING CO., INC. (PLANT VOGTLE UNITS 3 & 4)

Facility Site Address: 7821 River Road

Facility Site City: Waynesboro	Facility Site State: GA	Facility Site Zip Code: 30830	Facility Site County: Burke

Is the facility located on Indian Lands? No	Facility Site tribal land indicator: :

Facility Site Latitude/Longitude (ex. 34.543, -84.804): (33.140766 , -81.769929)

Program Facility Name : SOUTHERN NUCLEAR OPERATING CO., INC. (PLANT VOGTLE UNITS 3 & 4)	Program Facility ID : GA0039420

If there are any NPDES Permits that are associated with this facility provide the corresponding NPDES Permit No. and check the applicable box(s).

EPA Major (check one): ☑ *yes* ☐ *no* ☐ *unknown*	Primary Industry (check one): ☑ *yes* or ☐ *no* ☐ *unknown*
SIC Code(s): 1. 4911	SIC Code Indicator: 4911
NAICS Code(s): 1. 221113	NAICS Code Indicator: 221113
Total Design Flow (MGD): 77.8	Annual Average Daily Flow (MGD): 11

SECTION II. CONTACT INFORMATION

1. Facility Contact Affiliation Type:

☑ Owner Contact ☐ Contractor ☐ Permit Contact ☐ Engineer ☐ Facility/Project Contact ☐ Unknown

Facility Contact First Name Jim

Facility Contact Last Name: DeLano

Facility Contact Title: Lead Environmental Specialist

Facility Contact E-mail Address: jmdelano@southernco.com

Facility Contact Phone: 205-992-5419

Address Line1: 3535 Colonnade Parkway

Address Line2: BIN N-218-EC

City: Birmingham

State: AL

Zip: 35243

SECTION III. OPERATOR INFORMATION

Facility Organization Formal Name: Southern Nuclear Operating Company, Inc.

Is operator also the owner?: ☐ *yes* or ☑ *no*

Status:
☐ Federal ☐ State ☑ Private ☐ Public ☐ Other

Operator Contact E-mail Address: jmdelano@southernco.com

Operator Contact Phone: 205-992-5419

SECTION IV. OTHER ENVIRONMENTAL PERMITS

Section III. Table No. 1 - Provide the name and permit nos. for all permits issued to this facility

Name of Permit	Permit No.
Permit to Operate a Public Water System	GA0330056
Underground Injection Control Well Operating Permit Mixed Waste Non-Domestic Septic System	GAX000483
Surface Water Withdrawal Permit	017-0191-11
Vogtle Units 3&4 Ready-Mixed Concrete Batch Plant (expires 3/31/2020)	GA0039276
Department of the Army Permit (Section 404 and 10 Permit)	SAS-2007-01837
Groundwater Withdrawal Permit (Vogtle Units 1-4)	017-0003
Air Quality - Part 70 Operating Permit (Vogtle Units 1-4)	4911-033-0030-V-04-0
NPDES for Stormwater Associated with Construction Activity for Stand Alone Construction Projects	GAR100001 (Each active NOI has not been listed separately)
Air Quality - Vogtle 3&4 Construction (Operations c/o Bechtel)	1629093-0039-S-03-1
Nuclear Regulatory Commission Combined Licenses Vogtle Electric Generating Plant Units 3 &4	NPF-91 and NPF-92
Certificate of Registration	060319550154B
Nationwide Permit No. 5 Verification for REMP Sampling	SAS-2019-00885

2. Does your facility require any additional permits not listed above? ☐ Yes ☑ No	2a. If yes, what are they and what is the timeframe to obtain them?

SECTION V. NATURE OF BUSINESS

Generation of electricity through the use of nuclear fuel.

Vogtle Electric Generating Plant Units 3&4 are owned by Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and the City of Dalton, Georgia.

SECTION VI. OUTFALL IDENTIFICATION AND WATER QUALITY

Permitted Feature Identifier	Permitted Feature Type	Permitted Feature Latitude/ Longitude	Receiving Waterbody for Permitted Feature	River Basin	Does Discharge enter 305 (b)/303(d) Listed Waters? (Yes or No)	Discharge listed in a TMDL? (Yes or No	Name and Year of TMDL
001	External Outfall	33.148055/-81.752500	Savannah River	Savannah	No	No	
002	Internal Outfall	33.148055/-81.752500	Savannah River	Savannah	No	No	
003	Internal Outfall	33.148055/-81.752500	Savannah River	Savannah	No	No	
004	Internal Outfall	33.148055/-81.752500	Savannah River	Savannah	No	No	
005	Internal Outfall	33.148055/-81.752500	Savannah River	Savannah	No	No	
006	Internal Outfall	33.148055/-81.752500	Savannah River	Savannah	No	No	
007	Internal Outfall	33.148055/-81.752500	Savannah River	Savannah	No	No	
010	Internal Outfall	33.148055/-81.752500	Savannah River	Savannah	No	No	
011	External Outfall	33.154722/-81.758888	Savannah River	Savannah	No	No	
012	Internal Outfall	33.130000/-81.776666	Daniels Branch of Beaverdam Creek	Savannah	No	No	
002A	Internal Outfall	33.130000/-81.776666	Daniels Branch of Beaverdam Creek	Savannah	No	No	
003A	Internal Outfall	33.130000/-81.776666	Daniels Branch of Beaverdam Creek	Savannah	No	No	
013	External Outfall	33.130000/-81.776666	Daniels Branch of Beaverdam Creek	Savannah	No	No	
014	External Outfall	33.139660/-81.778903	Daniels Branch of Beverdam Creek	Savannah	No	No	

(30 Day) Average Flow (MGD)	(30 Day) Maximum Flow (MGD)	If Receiving Water is Listed, Is the Receiving Water 1. Supporting designated use 2. Not supporting designated use 3.Assessment pending	If Receiving Water(s) is Not supporting the Designated Uses, What is it Listed For?
11	50	SupportingUse	
5.6	22	SupportingUse	
5.6	22	SupportingUse	
0.07	2.2	SupportingUse	
0.07	2.2	SupportingUse	
.02	.12	SupportingUse	

.02	.12	SupportingUse
7.2	61	SupportingUse
1.4	1.4	SupportingUse
14	14	SupportingUse
.5	3	SupportingUse
.5	3	SupportingUse
20	20	SupportingUse
34	34	SupportingUse

Note: Georgia's 305(b)/303(d) list can be found on EPD's website at *http://epd.georgia.gov/georgia-305b303d-list-documents*
Note: Georgia's list of TMDLs can be found on EPD's website at http://epd.georgia.gov/total-maximum-daily-loading

SECTION VII. EFFLUENT LIMITS AND CONDITIONS

1. Is there an effluent limit, standard, guideline, or categorical pretreatment standard established for this type of discharge in 40 CFR Part 400-471, as amended or elsewhere pursuant to 301, 306, 307, 316, 318, or 405 of the Clean Water Act?

☑ Yes ☐ No

If you answered "yes", to question No. 1 above, please complete the following table below by providing the name of the discharge category and the specific citation to the regulation, if applicable, that establishes the limitation or condition.

If you answered "no" to question No. 1 above, please proceed to Section No. VIII.

Section VII, Table No. 1

Part	Part Name	Subpart Code	Subpart Name	Description
423	Steam Electric Power Generating	423	Steam Electric Power Generating	Steam Electric Power Generating

2. Are any of the applicable effluent limitations applicable to the discharge(s) expressed in terms of production?

☐ Yes ☑ No

If you answered "yes", complete the following table below. For an existing discharge, list an actual measurement of your average or maximum level of daily production. For new discharges, list an average or maximum projected daily production. (indicate in the table whether the production figures given are average or maximum level.) Express the production in terms and units used in the applicable discharge limitation. If you answered "no" to question No.2 above, please proceed to Section VIII.

If you answered "no" to question No. 2 above, please proceed to Section VIII.

Section VII, Table No. 2 – Applicable Effluent Limit Guidelines

1. AVERAGE DAILY PRODUCTION			**2. AFFECTED OUTFALLS**
a. QUANTITY PER DAY	b. UNITS OF MEASURE	c. OPERATION, PRODUCT, MATERIAL, ETC.	

SECTION VIII. 40 CFR 122.21(R) COOLING WATER INTAKE STRUCTURES

Directions:	*Answer questions 1 through 4 below for your cooling water intake structure(s) (CWIS). If your answer to any one of these questions is "No", then the requirements of 40 CFR 125.94 through 125.99 do not apply to your facility. However, the State reserves the right to establish BPJ requirements as allowed in 40 CFR 125.90(b) for facilities.*

1.	Do you own or operate a cooling water intake structure(s)?	
	☑ Yes ☐ No	
	If you answered "yes" to question No. 1 above, please proceed to question No. 2 below.	
2.	Is the cooling water intake structure(s) withdrawing cooling water from waters of the State?	
	☑ Yes ☐ No	
	If you answered "yes" to question No. 2 above, please proceed to question No. 3 below.	
	Note: Obtaining cooling water from a public water system, using reclaimed water from wastewater treatment facilities or desalination plants, or recycling treated process wastewater effluent as cooling water does not constitute use of a cooling water intake structure.	
3.	Is the facility-wide design intake flow (DIF) for all cooling water intake structures at the facility greater than 2 MGD?	3 a.
	☑ Yes ☐ No	DIF = 73 (mgd)
	If you answered "yes" to question No. 3 above, please provide the facility-wide design intake flow (DIF) and actual intake flow (AIF) for all cooling water intake structures in box 3.a.	AIF = 62 (mgd)
	Note: Actual Intake Flow means the average volume of water withdrawn on an annual basis by the cooling water intake structures over the past three years	
4.	Is more than 25 percent of the water the facility withdraws on an actual intake flow (AIF) basis used for cooling purposes?	4 a.
	☑ Yes ☐ No	AIF = 90 %
	If you answered "yes" to question No. 4 above, please provide the AIF percentage used exclusively for cooling purposes in box 4.a.	

SECTION IX. APPLICATION REQUIREMENTS FOR ALL EXISITNG FACILITIES

- What type of facility are you?

☑ Existing Facility ☐ New Facility ☐ New Offshore Oil and Gas Facility

- *Do you withdraw greater than 125 MGD actual intake flow (AIF), as defined at 40 CFR 125.92(a), of water for cooling purposes?*

☐ Yes ☑ No

- Are you a new unit at an existing facility, as defined at 40 CFR 125.92(u)?

☐ Yes ☑ No

You will be required to upload attachments (2),(3),(4),(5),(6),(7),(8),(H)

Description of possible attachments
(2) Source water physical data
(3) Cooling water intake structure data
(4) Source water baseline biological characterization data
(5) Cooling water system data
(6) Chosen Method(s) of Compliance with Impingement Mortality Standard
(7) Entrainment Performance Studies
(8) Operational Status
(9) Entrainment Characterization Study
(10) Comprehensive Technical Feasibility and Cost Evaluation Study
(11) Benefits Valuation Study
(12) Non-water Quality Environmental and Other Impacts Study
(13) Peer Review
(H) All facilities must also submit with their permit application all information received as a result of any communication with a Field Office of the Fish and Wildlife Service and/or Regional Office of the National Marine Fisheries Service.

SECTION X. BTA STANDARD FOR IMPINGEMENT MORTALITY FOR EXISTING UNITS AT EXISTING FACILITIES

The final rule requires that existing facilities subject to this rule must comply with one of the following seven alternatives listed below identified in the national BTA standard for impingement mortality at § 125.94(c) (hereafter, impingement mortality standards).

Note: Please check the box under the applicable impingement mortality standard in which your facility currently has in operation or intends to install to comply with the referenced standard. Please also provide the appropriate documentation for the chosen alternative and attach it your application.

1. Operate a closed-cycle recirculating system as defined at § 125.92;

☑ Currently in operation ☐ Request a compliance schedule ☐ NA

2. Operate a cooling water intake structure that has a maximum through screen design intake velocity of 0.5 fps or less;

☑ Currently in operation ☐ Request a compliance schedule ☐ NA

3. Operate a cooling water intake structure that has a maximum through screen intake velocity of 0.5 fps;
   a) In the case of Option (3), which EPA considers to be a streamlined alternative, the facility must submit information to the Director that demonstrates that the maximum intake velocity as water passes through the structural components of a screen measured perpendicular to the screen mesh does not exceed 0.5 feet per second.

☐ Currently in operation ☐ Request a compliance schedule ☑ NA

4. Operate an offshore velocity cap as defined at § 125.92 that is installed before October 14, 2014;

☐ Currently in operation ☐ Request a compliance schedule ☑ NA

5. Operate a modified traveling screen that the Director determines meets the definition at § 125.92(s) and that the Director determines is the best technology available for impingement reduction;
   a) In the case of Option (5), the facility must submit a site-specific impingement technology performance optimization study that must include two years of biological sampling demonstrating that the operation of the modified traveling screens has been optimized to minimize impingement mortality. As discussed below, if the facility does not already have this technology installed and chooses this option, the Director may postpone this study till the screens are installed (see VI.G.1.d below).

☐ Currently in operation ☐ Request a compliance schedule ☑ NA

6. Operate any other combination of technologies, management practices and operational measures that the Director determines is the best technology available for impingement reduction; or
   (a) In the case of Option (6), the facility must submit a site-specific impingement study including two years of biological data collection demonstrating that the operation of the system of technologies, operational measures and best management practices has been optimized to minimize impingement mortality. If this demonstration relies in part on a credit for reductions in the rate of impingement already achieved by measures taken at the facility, an estimate of those reductions and any relevant supporting documentation must be submitted. The estimated reductions in rate of impingement must be based on a comparison of the system to a once-through cooling system with a traveling screen whose point of withdrawal from the surface water source is located at the shoreline of the source waterbody.

☐ Currently in operation ☐ Request a compliance schedule ☑ NA

7. Achieve the specified impingement mortality performance standard.
   (a) The impingement mortality performance standard in (7) requires that a facility must achieve a 12-month impingement mortality performance of all life stages of fish and shellfish of no more than 24 percent mortality, including latent mortality, for all non-fragile species that are collected or retained in a sieve with maximum opening dimension of 0.56 inches and kept for holding period of 18 to 96 hours. The Director may, however, prescribe an alternative holding period.

   The 12-month average of impingement mortality is calculated as the sum of total impingement mortality for the previous 12 months divided by the sum of total impingement for the previous 12 months. A facility must choose to demonstrate compliance with this requirement for the entire facility, or for each individual cooling water intake structure. Biological monitoring must be completed at a minimum frequency of monthly.

☐ Currently in operation ☐ Request a compliance schedule ☑ NA

SECTION XI. BTA STANDARDS FOR IMPINGEMENT MORTALITY AND ENTRAINMENT FOR NEW UNITS AT EXISTING FACILITIES

The owner or operator of a new unit at an existing facility must achieve one of two compliance alternatives under the national BTA standards for impingement mortality and entrainment for new units at existing facilities at § 125.94(e) (hereafter, new unit standards).

☐ Option No. 1

You must reduce AIF at the new unit, at a minimum, to a level commensurate with that which can be attained by the use of a closed-cycle recirculating system as defined at § 125.92(c)(1).

☐ Option No. 2

You must demonstrate to the Director that it has installed and will operate and maintain, technological or other control measures that reduce the level of adverse environmental impact from any cooling water intake structure used to supply cooling water to the new unit to a comparable level to that which would be achieved through flow reductions commensurate with the use of a closed-cycle recirculating system. Under this alternative, the owner or operator of a facility must demonstrate entrainment mortality reductions that are equivalent to 90 percent or greater of the reduction that could be achieved through compliance with the first alternative entrainment standard for new units.

US EPA Form 2C

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

Please print or type in the unshared areas only

EPA I.D. NUMBER (copy from Item 1 of Form 1)

Form Approved.
OMB No. 2040-0086.
Approval expires 3-31-98.

Form 2C NPDES

U.S. ENVIRONMENTAL PROTECTION AGENCY
APPLICATION FOR PERMIT TO DISCHARGE WASTEWATER

EXISTING MANUFACTURING, COMMERCIAL, MINING AND SILVICULTURE OPERATIONS

Consolidated Permits Program

I. OUTFALL LOCATION

For each outfall, list the latitude and longitude of its location to the nearest 15 seconds and the name of the receiving water.

A. OUTFALL NUMBER *(list)*	B. LATITUDE			C.LONGITUDE			D. RECEIVING WATER (*name*)
	1. DEG	2. MIN	3. SEC.	1.DEG.	2. MIN.	3.SEC.	
001	33	8	52.99	-81	-45	-8.99	Savannah River
002	33	8	52.99	-81	-45	-8.99	Savannah River
003	33	8	52.99	-81	-45	-8.99	Savannah River
004	33	8	52.99	-81	-45	-8.99	Savannah River
005	33	8	52.99	-81	-45	-8.99	Savannah River
006	33	8	52.99	-81	-45	-8.99	Savannah River
007	33	8	52.99	-81	-45	-8.99	Savannah River
010	33	8	52.99	-81	-45	-8.99	Savannah River
011	33	9	16.99	-81	-45	-31.99	Savannah River
012	33	7	48.00	-81	-46	-35.99	Daniels Branch of Beaverdam Creek
002A	33	7	48.00	-81	-46	-35.99	Daniels Branch of Beaverdam Creek
003A	33	7	48.00	-81	-46	-35.99	Daniels Branch of Beaverdam Creek
013	33	7	48.00	-81	-46	-35.99	Daniels Branch of Beaverdam Creek
014	33	8	22.77	-81	-46	-44.05	Daniels Branch of Beverdam Creek

CONTINUE ON REVERSE

II. FLOWS, SOURCES OF POLLUTION, AND TREATMENT TECHNOLOGIES

[redacted]

A. Attach a line drawing showing the water flow through the facility. Indicate sources of intake water, operations contributing wastewater to the effluent, and treatment units labeled to correspond to the more detailed descriptions in Item B. Construct a water balance on the line drawing by showing average flows between intakes, operations, treatment units, and outfalls. If a water balance cannot be determined (e.g., for certain mining activities), provide a pictorial description of the nature and amount of any sources of water and any collection or treatment measures.

B. For each outfall, provide a description of: (1) All operations contributing wastewater to the effluent, including process wastewater, sanitary wastewater, cooling water, and storm water runoff; (2) The average flow contributed by each operation; and (3) The treatment received by the wastewater. Continue on additional sheets if necessary.

1. OUTFALL NO. *(list)*	2. OPERATION(S) CONTRIBUTING FLOW		3. TREATMENT	
	a. OPERATION (*list*)	b. AVERAGE FLOW (*MGD*)	a. DESCRIPTION	b. LIST CODES FROM TABLE 2C-1
001	Final Plant Discharge (Combined Plant Waste Streams Units 3&4)	9	Discharge to surface water	4-A
002	Unit 3 Cooling Tower Blow Down	4.3	Dechlorination	2-E
	Unit 3 SWS Cooling Tower Blow Down	0.36	Dechlorination	2-E
003	Unit 4 Cooling Tower Blow Down	4.3	Dechlorination	2-E
	Unit 4 SWS Cooling Tower Blow Down	0.36	Dechlorination	2-E
004	Unit 3 Waste Water Retention Basin	2.6	Sedimentation (settling) and Dechlorination	1-U and 2-E
005	Unit 4 Waste Water Retention Basin	2.6	Sedimentation (settling) and Dechlorination	1-U and 2-E

CONTINUE ON PAGE 3

006	Unit 3 Liquid Radwaste Systems Discharge	0.3	Ion Exchange	2-J
007	Unit 4 Liquid Radwaste Systems Discharge	0.3	Ion Exchange	2-J
010	Radwaste Dillution Flow to Outfall	8.64	Discharge to surface water	4-A
011	Intake Screen Backwash	1.7	Discharge to surface water	4-A
012	Units 3&4 Passive Cooling System Discharge	0.3	Stabilization Ponds and Discharge to Surface Water	3-G and 4-A
002A	Unit 3 CT Emergency Overflow to Storm Drain	.24	Stabilization Ponds and Discharge to Surface Water	3-G and 4-A

	Unit 3 Alternate Discharge to Storm Drain	3	Dechlorination, Stabilization Ponds and Discharge to surface water	2-E, 3-G, and 4-A
003A	Unit 4 CT Emergency Overflow to Storm Drain	.24	Stabilization Ponds and Discharge to Surface Water	3-G and 4-A
	Unit 4 Alternate CT Discharge to Storm Drain	3	Dechlorination, Stabilization Ponds and Discharge to surface water	2-E, 3-G, and 4-A
013	Industrial Stormwater Commingled with Process Water	33	Stabilization Ponds and Discharge to Surface Water	3-G and 4-A
014	Industrial Stormwater	21	Stabilization Ponds and Discharge to Surface Water	3-G and 4-A
OFFICIAL USE ONLY *(effluent guidelines sub-categories)*				

CONTINUE ON PAGE 5

C. Except for storm runoff, leaks, or spills, are any of the discharges described in Items II-A or B intermittent or seasonal?

[X] YES (complete the following table [ ] NO (go to Section III)

1. OUTFALL NUMBER *(list)*	2. OPERATION(s) CONTRIBUTING FLOW *(list)*	3. FREQUENCY		4. FLOW				
		a. DAYS PER WEEK *(specify average)*	b. MONTHS PER YEAR (specify average)	a. FLOW RATE (MGD)		B. TOTAL VOLUME (specify with units)		C. DURATION (in days)
				1. LONG TERM AVERAGE	2. MAXIMUM DAILY	1. LONG TERM AVERAGE	2. MAXIMUM DAILY	
002/003	This internal outfall represents the blowdown from the Units 3 and 4 natural draft cooling tower. Each tower recirculates river water used to cool the main condenser, turbine building closed cooling water heat exchangers, and condenser vacuum pump seal water heat exchangers during normal plant operation. Periodic blowdown or discharge from the system is necessary to maintain the cycles of concentration in the circulating water system to prevent the build-up of solids. The normal (design) blowdown rate is expected to be approximately 4.3 mgd per unit (6 cycles of concentration. The expected maximum blowdown rate is 6.7 mgd. The discharge is routed to the Blowdown Sump which is a final mixing chamber. Also included in this internal outfall is the blowdown from the Unit 3 service water system cooling tower, which includes a two-cell mechanical draft cooling tower. When the circulating water system is not operating or a backwash cycle is operating, the SWS discharge will be routed to the wastewater retention basin. The volume discharged to the waste water retention basin during operation is expected to be de minims, less than 5,000-6,000 gallons per day. The maximum for each unit is approximately 0.36 mgd. The discharge is routed to the Blowdown Sump which is a final mixing chamber.	7	12	4.3	6.7			

002A/003A	This internal outfall is for cooling tower basin overflow to storm drains and intermittent manual draining of the cooling tower basins in support of maintenance and refueling outages. Overflow events occur infrequently and are generally the result of system imbalance or equipment malfunction within the system. The estimated flow rate in the event of an overflow of the basins is 2.88 mgd for an approximate duration of 1 to 2 hours. This would result in approximately 0.24 million gallons released within a 24 hour period. The storm drains flow to the permanent storm water basin where the cooling tower overflow will comingle with storm water. The design of the cooling tower blowdown lines does not allow the basins to drain via gravity. During maintenance, start-up and refueling outages (approximately one per unit every 12-18 months), discharge of the majority of basin will be required to be to the storm drains. The estimated volume is approximately 6-7 million gallons over 48 hours, approximately 3-3.5 mgd each event. The storm drains flow to the permanent storm water basin where the cooling tower overflow will comingle with storm water in the on-site permanent storm water basin.	1	1	.24	2.88			
004/005	This internal outfall represents the permanent collection basins (1,224,000 gallon capacity each) for plant low volume waste streams. The basins provide aeration and retention time for wastes. Each basin has two - 900 gpm (2 x 1.3 mgd) transfer pumps which discharge the effluent to the Blowdown Sump. Average flow rates are expected to be 0.1 mgd.	7	12	.01	2.6			

CONTINUE ON PAGE 7

006/007	This internal outfall represents wastewater generated in the Reactor Building and Auxiliary Building which may be slightly radioactive. Radiologically contaminated fluids are treated and monitored for radioactivity levels in accordance with Nuclear Regulatory Commission (NRC) regulations prior to release. A typical liquid waste release is 1,925 gallons per day. The discharge rate is controlled to be compatible with the available dilution flow (cooling tower blowdown). The short-term liquid radwaste discharge flow rate from both units may be up to 0.3 mgd.	3	12	.02	0.3			
010	This internal outfall point represents an internal stream consisting of river water with no additives. The discharge is routed to the Blowdown Sump to provide dilution water for radwaste discharges. Normal flow for this discharge is based on maintaining a minimum mixing flow of 8.64 mgd for liquid radwaste discharges. The maximum flow for this discharge is approximately 30 mgd.	7	12	8.64	30			
011	This external outfall represents a discharge consisting only of river water with no additives. The flow is used to backwash the intake screens and is returned directly to the Intake Canal. Normal flow for this discharge point is approximately 1.7 mgd.	7	12	1.7				
012	This internal outfall represents a discharge from the Passive Containment Cooling Water Storage Tank (PCCWST). Normal flows for this discharge are 0.3 mgd per unit. System will be used intermittently (approximately 10 to 20 minutes twice per month) for containment vessel washdowns and periotic testing. In the event of a plant emergency, full actuation of the Passive Cooling System could result in a water release exceeding 1.8 million gallons.	2	12	.3	1.8			

013	Stormwater Outfall 013 receives stormwater runoff from the Power Block and support facilities on the eastern side of the Power Block which flow to a permanent storm water basin. Discharges from 002A, 003A, and 012 also contribute to the flow through Outfall 013. The estimated design flows discharging from the permanent storm water basin range from 33 mgd for a 24-Hour, 5 Year rain event of 5.00 inches to 142 mgd for 24-Hour, 100 Year rain event of 8.20 inches. The total storage is approximately 31.5 million gallons.	1	1	33	142			
014	Stormwater Outfall 014 receives stormwater runoff from the switchyard, parking areas, and support building west of the Power Block. The estimated design flows discharging from the permanent storm water basin range from 21 mgd for a 24-Hour, 5 Year rain event of 5.00 inches to 88 mgd for 24-Hour, 100 Year rain event of 8.20 inches. The total storage is approximately 1.4 million gallons.	1	12	21	88			

III. PRODUCTION

This section has been filled out on the Part I form.

IV. IMPROVEMENTS

A. Are you now required by any Federal, State or local authority to meet any implementation schedule for the construction, upgrading or operations of wastewater treatment equipment or practices or any other environmental programs which may affect the discharges described in this application? This includes, but is not limited to, permit conditions, administrative or enforcement orders, enforcement compliance schedule letters, stipulations, court orders, and grant or loan conditions.

[ ] YES (complete the following table) [X]NO (go to Item IV-B)

1. IDENTIFICATION OF CONDITION, AGREEMENT, ETC.	2. AFFECTED OUTFALLS		3. BRIEF DESCRIPTION OF PROJECT	4. FINAL COMPLIANCE DATE	
	a. NO.	b. SOURCE OF DISCHARGE		a. REQUIRED	b. PROJECTED

B. OPTIONAL: You may attach additional sheets describing any additional water pollution control programs (or other environmental projects which may affect your discharges) you now have underway or which you plan. Indicate whether each program is now underway or planned, and indicate your actual or planned schedules for construction.

[ ] MARK "X" IF DESCRIPTION OF ADDITIONAL CONTROL PROGRAMS IS ATTACHED

V. INTAKE AND EFFLUENT CHARACTERISTICS

CONTINUE ON PAGE 9

A, B, & C: See instructions before proceeding – Complete one set of tables for each outfall – Annotate the outfall number in the space provided.

NOTE: Tables V-A, V-B, and V-C are included on separate sheets numbered V-1 through V-9.

D. Is there any discharge of pollutants present that are listed in Table 2c-3?

[X] YES [ ] NO

For every pollutant you list, describe the reasons you believe it to be present and report any analytical data in your possession :

VI. POTENTIAL DISCHARGES NOT COVERED BY ANALYSIS

Is any pollutant listed in Section V - Intake and Effluent Characteristics, Part C, a substance or a component of a substance which you currently use or manufacture as an intermediate or final product or byproduct?

[ ] YES (list all such pollutants below) [X] NO (go to Item VI-B)

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on a receiving water in relation to your discharge within the last 3 years?

[X] YES (identify the test(s) and describe their purposes below) [ ] NO (go to Section VIII)

A whole effluent toxicity test (WET) was performed on the effluent for Plant Vogtle Units 1&2 in January of 2018. Based on similarities int the waste streams, water treatment chemicals, and expected discharge characteristics, this WET test is considered to support the renewal of the application for Vogtle Units 3&4. The results indicated acceptable toxicity levels at reasonable instream water concentrations.

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V. Intake and Effulent Characteristics performed by a contract laboratory or consulting firm?

[X] YES (list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below) [ ] NO (go to Section IX)

A. NAME	B. ADDRESS	C. TELEPHONE *(area code & no.)*	D. POLLUTANTS ANALYZED *(list)*
Georgia Power Company Environmental Laboratory	2480 Maner Road SE, Atlanta, GA 30339	404-799-2126	BOD, Fluoride, Sulfate, TSS, COD, Ammonia, Phosphorus, O&G, Metals
Analytical Environmental Services, Inc.	3090 Presidential Drive, Atlanta, GA 30340	770-457-8177	All others except pH, TRC, Sulfite, Radiological, WET, and those analyzed by Georgia Power Environmental Lab

GEL Laboratories, LLC	2040 Savage Road, Charleston, SC 29407	843-556-8171	Radiological
Hydrosphere Research	11842 Research Circle	386-462-7889	Whole Effluent Toxicity

IX. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME & OFFICIAL TITLE *(type or print)*

Dale Lane Fulton / Environmental Affairs Manger

C. SIGNATURE	D. DATE SIGNED
Dale Fulton	03/31/2020

CONTINUE ON PAGE 11

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

EPA I.D. NUMBER (copy from Item 1 of Form 1) [redacted]

OUTFALL NO. 001

V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

PART A –You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	(2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	(2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	3. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
a. Biochemical Oxygen Demand (BOD)	3.69	237					1	<2.0		
b. Chemical Oxygen Demand (COD)	44	2826					1	<10		
c. Total Organic Carbon (TOC)	9.65	620					1	2.66		
d. Total Suspended Solids (TSS)	9	578					1	8		
e. Ammonia (as N)	<0.10	0					1	<.10		
f. Flow (MGD)	VALUE 17.9 (based on Vogtle 1&2 Actual Flows)		VALUE		VALUE		6	VALUE 16.6		6
g. Temperature (winter)	VALUE 12		VALUE		VALUE		1	VALUE N/A		N/A
h. Temperature (summer)	VALUE 31.0		VALUE		VALUE		1	VALUE 28.5		1
i. pH (s.u.)	MINIMUM 8.3	MAXIMUM 8.3	MINIMUM	MAXIMUM			1			

PART B – Mark “X” in column 2-a for each pollutant you know or have reason to believe is present. Mark “X” in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X” a. BELIEVED PRESENT	b. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	(2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	(2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	4. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
a. Bromide (24959-67-9)	X		<1.0	0					1	<1.0		1
b. Chlorine, Total Residual	X		<0.1	0					1	<0.1		1
c. Color	X		100	NA					1	30		1
d. Fecal Coliform	X		70	NA					1	50		1
e. Fluoride (16984-48-8)	X		0.496	32					1	0.08		1
f. Nitrate-Nitrite(as N)	X		1.71	110					1	0.2		1
g. Nitrogen, Total Organic (as N)	X		1.9	122					1	<0.5		1

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"		3. EFFLUENT							4. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS		(1) CONCENTRATION	(2) MASS	
h. Oil and Grease	X		<5.0	0					1	<5.0		1
i. Phosphorus (as P), Total (7723-14-0)	X		1.38	89					1	0.11		1
j. Radioactivity												
(1) Alpha, Total	X		<4.49	NA					1	<1.3		1
(2) Beta, Total	X		8.27	NA					1	3.10		1
(3) Radium, Total	X		<2.41	NA					1	<2.07		1
(4) Radium 226, Total	X		<0.152	NA					1	<0.194		1
k. Sulfate (as SO4) (14808-79-8)	X		53.1	3410					1	10.7		1
l. Sulfide (as S)	X		1.60	103					1	1.6		1
m. Sulfite (as SO3) (14265-45-3)	X		<0.1	0					1	0.03		1
n. Surfactants	X		<0.1	0					1	<0.1		1
o. Aluminum, Total (7429-90-5)	X		0.490	31					1	0.169		1
p. Barium, Total (7440-39-3)	X		0.073	4.7					1	0.019		1
q. Boron, Total (7440-42-8)	X		0.128	8.2					1	0.083		1
r. Cobalt, Total (7440-48-4)		X	<0.005						1	<0.005		1
s. Iron, Total (7439-89-6)	X		1.53	98					1	0.41		1
t. Magnesium, Total (7439-95-4)	X		7.25	466					1	1.49		1
u. Molybdenum, Total (7439-98-7)		X	<0.05						1	<0.05		1
v. Manganese, Total (7439-96-5)	X		0.139	8.9					1	0.069		1
w. Tin, Total (7440-31-5)		X	<0.05						1	<0.05		1
x. Titanium, Total (7440-32-6)		X	<0.05						1	<0.05		1

CONTINUE ON PAGE 13

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
	001

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark “X” in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions), mark “X” in column 2-b for each pollutant you know or have reason to believe is present. Mark “X” in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise, for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part; please review each carefully. Complete one table (all 7 pages) for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X”			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
METALS, CYANIDE, AND TOTAL PHENOLS													
1M. Antimony, Total (7440-36-0)			X	<0.02						1	<0.02		1
2M. Arsenic, Total (7440-38-2)			X	<0.02						1	<0.02		1
3M. Beryllium, Total (7440-41-7)			X	<0.005						1	<0.005		1
4M. Cadmium, Total (7440-43-9)			X	<0.005						1	<0.005		1
5M. Chromium, Total (7440-47-3)			X	<0.005						1	<0.005		1
6M. Copper, Total (7440-50-8)			X	<0.02						1	<0.02		1
7M. Lead, Total (7439-92-1)			X	<0.05						1	<0.05		1
8M. Mercury, Total (7439-97-6)			X	<0.0002						1	<0.0002		1
9M. Nickel, Total (7440-02-0)			X	<0.01						1	<0.01		1
10M. Selenium, Total (7782-49-2)			X	<0.02						1	<0.02		1
11M. Silver, Total (7440-22-4)			X	<0.01						1	<0.01		1
12M. Thallium, Total (7440-28-0)			X	<0.02						1	<0.02		1
13M. Zinc, Total (7440 -66-6)		X		0.010	0.64					1	<0.010		1
14M. Cyanide, Total (57-12-5)			X	<0.01						1	<0.01		1
15M. Phenols, Total			X	<0.005						1	<0.005		1
DIOXIN													
2,3,7,8-Tetrachlorodibenzo-Pdioxin (1764-01-6)			X										

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - VOLATILE COMPOUNDS													
1V. Accrolein (107-02-8)			X	<0.02						1	<0.02		1
2V. Acrylonitrile (107-13-1)			X	<0.005						1	<0.005		1
3V. Benzene (71-43-2)			X	<0.005						1	<0.005		1
4V. Bis (Chloromethyl) Ether (542-88-1)			X	---									0
5V. Bromoform (75-25-2)			X	<0.005						1	<0.005		1
6V. Carbon Tetrachloride (56-23-5)			X	<0.005						1	<0.005		1
7V. Chlorobenzene (108-90-7)			X	<0.005						1	<0.005		1
8V. Chlorodibromomethane (124-48-1)			X	<0.005						1	<0.005		1
9V. Chloroethane (75-00-3)			X	<0.01						1	<0.01		1
10V. 2-Chloroethylvinyl Ether (110-75-8)			X	<0.005						1	<0.005		1
11V. Chloroform (67-66-3)			X	<0.005						1	<0.005		1
12V. Dichlorobromomethane (75-27-4)			X	<0.005						1	<0.005		1
13V. Dichlorodifluoromethane (75-71-8)			X	<0.01						1			
14V. 1,1-Dichloroethane (75-34-3)			X	<0.005						1	<0.005		1
15V. 1,2-Dichloroethane (107-06-2)			X	<0.005						1	<0.005		1
16V. 1,1-Dichloroethylene (75-35-4)			X	<0.005						1	<0.005		1
17V. 1,2-Dichloropropane (78-87-5)			X	<0.005						1	<0.005		1
18V. 1,3-Dichloropropylene (542-75-6)			X	<0.005						1	<0.005		1
19V. Ethylbenzene (100-41-4)			X	<0.005						1	<0.005		1
20V. Methyl Bromide (74-83-9)			X	<0.005						1	<0.005		1
21V. Methyl Chloride (74-87-3)			X	<0.01						1	<0.01		1

CONTINUE ON PAGE 15

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X”			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - VOLATILE COMPOUNDS													
22V. Methylene Chloride (75-09-2)			X	<0.005						1	<0.005		1
23V. 1,1,2,2-Tetrachloroethane (79-34-5)			X	<0.005						1	<0.005		1
24V. Tetrachloroethylene (127-18-4)			X	<0.005						1	<0.005		1
25V. Toluene (108-88-3)			X	<0.005						1	<0.005		1
26V. 1,2-Trans-Dichloroethylene (156-60-5)			X	<0.005						1	<0.005		1
27V. 1,1,1-Trichloroethane (71-55-6)			X	<0.005						1	<0.005		1
28V. 1,1,2-Trichloroethane (79-00-5)			X	<0.005						1	<0.005		1
29V Trichloroethylene (79-01-6)			X	<0.005						1	<0.005		1
30V. Trichlorofluoromethane (75-69-4)			X	---							---		
31V. Vinyl Chloride (75-01-4)			X	<0.002						1	<0.005		1
GC/MS FRACTION - ACID COMPOUNDS													
1A. 2-Chlorophenol (95-57-8)			X	<0.01						1	<0.01		1
2A. 2,4-Dichlorophenol (120-83-2)			X	<0.01						1	<0.01		1
3A. 2,4-Dimethylphenol (105-67-9)			X	<0.01						1	<0.01		1
4A. 4,6-Dinitro-OCresol (534-52-1)			X	<0.02						1	<0.02		1
5A. 2,4-Dinitrophenol (51-28-5)			X	<0.025						1	<0.025		1
6A. 2-Nitrophenol (88-75-5)			X	<0.01						1	<0.01		1
7A. 4-Nitrophenol (100-02-7)			X	<0.0.25						1	<0.025		1
8A. P-Chloro-MCresol (59-50-7)			X	<0.01						1	<0.01		1
9A. Pentachlorophenol (87-86-5)			X	<0.025						1	<0.025		1
10A. Phenol (108-95-2)			X	<0.01						1	<0.01		1

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - ACID COMPOUNDS													
11A. 2,4,6-Trichlorophenol (88-05-2)			X	<0.01						1	<0.01		1
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
1B. Acenaphthene (83-32-9)			X	<0.01						1	<0.01		1
2B. Acenaphtylene (208-96-8)			X	<0.01						1	<.01		1
3B. Anthracene (120-12-7)			X	<0.01						1	<0.01		1
4B. Benzidine (92-87-5)			X	<0.08						1	<0.08		1
5B. Benzo (a) Anthracene (56-55-3)			X	<0.01						1	<0.01		1
6B. Benzo (a) Pyrene (50-32-8)			X	<0.01						1	<0.01		1
7B. 3,4-Benzofluoranthene (205-99-2)			X	<0.01						1	<0.01		1
8B. Benzo (ghi) Perylene (191-24-2)			X	<0.01						1	<0.01		1
9B. Benzo (k) Fluoranthene (207-08-9)			X	<0.01						1	<0.01		1
10B. Bis (2-Chloroethoxy) Methane (111-91-1)			X	<0.01						1	<0.01		1
11B. Bis (2-Chloroethyl) Ether (111-44-4)			X	<0.01						1	<0.01		1
12B. Bis (2-Chloroisopropyl) Ether (102-80-1)			X	<0.01						1	<0.01		1
13B. Bis (2-Ethylhexyl) Phthalate (117-81-7)			X	<0.01						1	<0.01		1
14B. 4-Bromophenyl Phenyl Ether (101-55-3)			X	<0.01						1	<0.01		1
15B. Butyl Benzyl Phthalate (85-68-7)			X	<0.01						1	<0.01		1
16B. 2-Chloronaphthalene (91-58-7)			X	<0.01						1	<0.01		1
17B. 4-Chlorophenyl Phenyl Ether (7005-72-3)			X	<0.01						1	<0.01		1
18B. Chrysene (218-01-9)			X	<0.01						1	<0.01		1
19B. Dibenzo (a,h) Anthracene (53-70-3)			X	<0.01						1	<0.01		1

CONTINUE ON PAGE 17

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
20B. 1,2-Dichlorobenzene (95-50-1)			X	<0.01						1	<0.01		1
21B. 1,3-Di-chlorobenzene (541-73-1)			X	<0.01						1	<0.01		1
22B. 1,4-Dichlorobenzene (106-46-7)			X	<0.01						1	<0.01		1
23B. 3,3-Dichlorobenzidine (91-94-1)			X	<0.01						1	<0.01		1
24B. Diethyl Phthalate (84-66-2)			X	<0.01						1	<0.01		1
25B. Dimethyl Phthalate (131 -11-3)			X	<0.01						1	<0.01		1
26B. Di-N-Butyl Phthalate (84-74-2)			X	<0.01						1	<0.01		1
27B. 2,4-Dinitrotoluene (121-14-2)			X	<0.01						1	<0.01		1
28B. 2,6-Dinitrotoluene (606-20-2)			X	<0.01						1	<0.01		1
29B. Di-N-Octyl Phthalate (117-84-0)			X	<0.01						1	<0.01		1
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)			X	<0.01						1	<0.01		1
31B. Fluoranthene (206-44-0)			X	<0.01						1	<0.01		1
32B. Fluorene (86-73-7)			X	<0.01						1	<0.01		1
33B. Hexachlorobenzene (118-74-1)			X	<0.01						1	<0.01		1
34B. Hexachlorobutadiene (87-68-3)			X	<0.01						1	<0.01		1
35B. Hexachlorocyclopentadiene (77-47-4)			X	<0.01						1	<0.01		1
36B Hexachloroethane (67-72-1)			X	<0.01						1	<0.01		1
37B. Indeno (1,2,3-cd) Pyrene (193-39-5)			X	<0.01						1	<0.01		1
38B. Isophorone (78-59-1)			X	<0.01						1	<0.01		1
39B. Naphthalene (91-20-3)			X	<0.01						1	<0.01		1
40B. Nitrobenzene (98 -95-3)			X	<0.01						1	<0.01		1

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
41B. N-Nitrosodimethylamine (62-75-9)			X	<0.01						1	<0.01		1
42B. N-Nitrosodi-N-Propylamine (621-64-7)			X	<0.01						1	<0.01		1
43B. N-Nitrosodiphenylamine (86-30-6)			X	<0.01						1	<0.01		1
44B. Phenanthrene (85-01-8)			X	<0.01						1	<0.01		1
45B. Pyrene (129-00-0)			X	<0.01						1	<0.01		1
46B. 1,2,4-Trichlorobenzene (120 -82-1)			X	<0.01						1	<0.01		1
GC/MS FRACTION - PESTICIDES													
1P. Aldrin (309-00-2)			X	<0.0001						1	<0.0001		1
2P. a-BHC (319-84-6)			X	<0.0001						1	<0.0001		1
3P. ß-BHC (319-85-7)			X	<0.0001						1	<0.0001		1
4P. ?-BHC (58-89-9)			X	<0.0001						1	<0.0001		1
5P. d-BHC (319-86-8)			X	<0.0001						1	<0.0001		1
6P. Chlordane (57-74-9)			X	<0.0005						1	<0.0005		1
7P. 4,4'-DDT (50-29-3)			X	<0.0002						1	<0.0002		1
8P. 4,4'-DDE (72-55-9)			X	<0.0002						1	<0.0002		1
9P. 4,4'-DDD (72-54-8)			X	<0.0002						1	<0.0002		1
10P. Dieldrin (60-57-1)			X	<0.0001						1	<0.0001		1
11P. a-Enosulfan (115 -29-7)			X	<0.0005						1	<0.0005		1
12P. ß-Endosulfan (115-29-7)			X	<0.0005						1	<0.0005		1
13P. Endosulfan Sulfate (1031-07-8)			X	<0.0005						1	<0.0005		1
14P. Endrin (72-20-8)			X	<0.0002						1	<0.0002		1
15P. Endrin Aldehyde (7421-93-4)			X	<0.0002						1	<0.0002		1
16P. Heptachlor (76-44-8)			X	<0.0001						1	<0.0001		1

CONTINUE ON PAGE 19

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - PESTICIDES													
17P. Heptachlor Epoxide (1024-57-3)			X	<0.0001						1	<0.0001		1
18P. PCB-1242 (53469-21-9)			X	<0.001						1	<0.001		1
19P. PCB-1254 (11097-69-1)			X	<0.001						1	<0.001		1
20P. PCB-1221 (11104-28-2)			X	<0.001						1	<0.001		1
21P. PCB-1232 (11141-16-5)			X	<0.001						1	<0.001		1
22P. PCB-1248 (12672-29-6)			X	<0.001						1	<0.001		1
23P. PCB-1260 (11096-82-5)			X	<0.001						1	<0.001		1
24P. PCB-1016 (12674-11-2)			X	<0.001						1	<0.001		1
25P. Toxaphene (8001-35-2)			X	<0.002						1	<0.002		1

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

EPA I.D. NUMBER (copy from Item 1 of Form 1) [redacted]

OUTFALL NO. 002A/003A

V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

PART A –You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT							3. INTAKE *(optional)*		
	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS		(1) CONCENTRATION	(2) MASS	
a. Biochemical Oxygen Demand (BOD)	<2.0	0					1	<2.0		1
b. Chemical Oxygen Demand (COD)	55	1605					1	<10		1
c. Total Organic Carbon (TOC)	15.5	452					1	2.66		1
d. Total Suspended Solids (TSS)	43	1255					1	8		1
e. Ammonia (as N)	<0.10	0					1	<0.10		1
f. Flow (MGD)	VALUE 3.5		VALUE		VALUE		0	VALUE		4
g. Temperature (winter)	VALUE 12.2		VALUE		VALUE		1	VALUE		
h. Temperature (summer)	VALUE 31.8		VALUE		VALUE		1	VALUE 28.5		1
i. pH (s.u.)	MINIMUM 8.37	MAXIMUM 8.37	MINIMUM	MAXIMUM			1			

PART B – Mark “X” in column 2-a for each pollutant you know or have reason to believe is present. Mark “X” in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X”		3. EFFLUENT							4. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS		(1) CONCENTRATION	(2) MASS	
a. Bromide (24959-67-9)		X										
b. Chlorine, Total Residual	X		0.15	4.3					1	0		1
c. Color		X										
d. Fecal Coliform		X										
e. Fluoride (16984-48-8)		X										
f. Nitrate-Nitrite(as N)		X										
g. Nitrogen, Total Organic (as N)		X										
h. Oil and Grease		X										

CONTINUE ON PAGE 21

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"		3. EFFLUENT							4. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS		(1) CONCENTRATION	(2) MASS	
i. Phosphorus (as P), Total (7723-14-0)		X										
j. Radioactivity												
(1) Alpha, Total		X										
(2) Beta, Total		X										
(3) Radium, Total		X										
(4) Radium 226, Total		X										
k. Sulfate (as SO4) (14808-79-8)		X										
l. Sulfide (as S)		X										
m. Sulfite (as SO3) (14265-45-3)		X										
n. Surfactants		X										
o. Aluminum, Total (7429-90-5)		X										
p. Barium, Total (7440-39-3)		X										
q. Boron, Total (7440-42-8)		X										
r. Cobalt, Total (7440-48-4)		X										
s. Iron, Total (7439-89-6)		X										
t. Magnesium, Total (7439-95-4)		X										
u. Molybdenum, Total (7439-98-7)		X										
v. Manganese, Total (7439-96-5)		X										
w. Tin, Total (7440-31-5)		X										
x. Titanium, Total (7440-32-6)		X										

EPA I.D. NUMBER (copy from Item 1 of Form 1)	OUTFALL NUMBER
	002A/003A

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions), mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise, for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part; please review each carefully. Complete one table (all 7 pages) for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
METALS, CYANIDE, AND TOTAL PHENOLS													
1M. Antimony, Total (7440-36-0)			X	<0.06						1	<0.02		1
2M. Arsenic, Total (7440-38-2)			X	<0.05						1	<0.02		1
3M. Beryllium, Total (7440-41-7)			X	<0.005						1	<0.005		1
4M. Cadmium, Total (7440-43-9)			X	<0.005						1	<0.005		1
5M. Chromium, Total (7440-47-3)		X		<0.005	0					1	<0.005		1
6M. Copper, Total (7440-50-8)			X	<0.025						1	<0.02		1
7M. Lead, Total (7439-92-1)				<0.01						1	<0.05		1
8M. Mercury, Total (7439-97-6)				<0.0002						1	<0.002		1
9M. Nickel, Total (7440-02-0)				<0.02						1	<0.01		1
10M. Selenium, Total (7782-49-2)				<0.02						1	<0.02		1
11M. Silver, Total (7440-22-4)				<0.005						1	<0.01		1
12M. Thallium, Total (7440-28-0)				<0.02						1	<0.02		1
13M. Zinc, Total (7440-66-6)		X		0.0154	0.45					1	<0.01		1
14M. Cyanide, Total (57-12-5)			X	<0.01						1	<0.01		1
15M. Phenols, Total			X	0.0399						1	<0.005		1
DIOXIN													
2,3,7,8-Tetrachlorodibenzo-Pdioxin (1764-01-6)			X										

CONTINUE ON PAGE 23

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - VOLATILE COMPOUNDS													
1V. Accrolein (107-02-8)			X	<0.02						1	<0.02		1
2V. Acrylonitrile (107-13-1)			X	<0.005						1	<0.005		1
3V. Benzene (71-43-2)			X	<0.005						1	<0.005		1
4V. Bis (Chloromethyl) Ether (542-88-1)			X	Not Required due to no analysis						0	Not Required due to no EPA method		0
5V. Bromoform (75-25-2)			X	<0.005						1	<0.005		1
6V. Carbon Tetrachloride (56-23-5)			X	<0.005						1	<0.005		1
7V. Chlorobenzene (108-90-7)			X	<0.005						1	<0.005		1
8V. Chlorodibromomethane (124-48-1)			X	<0.005						1	<0.005		1
9V. Chloroethane (75-00-3)			X	<0.01						1	<0.01		1
10V. 2-Chloroethylvinyl Ether (110-75-8)			X	<0.005						1	<0.005		1
11V. Chloroform (67-66-3)			X	<0.005						1	<0.005		1
12V. Dichlorobromomethane (75-27-4)			X	<0.005						1	<0.005		1
13V. Dichlorodifluoromethane (75-71-8)			X	<0.01						1	<0.01		1
14V. 1,1-Dichloroethane (75-34-3)			X	<0.005						1	<0.005		1
15V. 1,2-Dichloroethane (107-06-2)			X	<0.005						1	<0.005		1
16V. 1,1-Dichloroethylene (75-35-4)			X	<0.005						1	<0.005		1
17V. 1,2-Dichloropropane (78-87-5)			X	<0.005						1	<0.005		1
18V. 1,3-Dichloropropylene (542-75-6)			X	<0.005						1	<0.005		1
19V. Ethylbenzene (100-41-4)			X	<0.005						1	<0.005		1
20V. Methyl Bromide (74-83-9)			X	<0.005						1	<0.005		1
21V. Methyl Chloride (74-87-3)			X	<0.01						1	<0.01		1

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - VOLATILE COMPOUNDS													
22V. Methylene Chloride (75-09-2)			X	<0.005						1	<0.005		1
23V. 1,1,2,2-Tetrachloroethane (79-34-5)			X	<0.005						1	<0.005		1
24V. Tetrachloroethylene (127-18-4)			X	<0.005						1	<0.005		1
25V. Toluene (108-88-3)			X	<0.005						1	<0.005		1
26V. 1,2-Trans-Dichloroethylene (156-60-5)			X	<0.005						1	<0.005		1
27V. 1,1,1-Trichloroethane (71-55-6)			X	<0.005						1	<0.005		1
28V. 1,1,2-Trichloroethane (79-00-5)			X	<0.005						1	<0.005		1
29V Trichloroethylene (79-01-6)			X	<0.005						1	<0.005		1
30V. Trichlorofluoromethane (75-69-4)			X	<0.005						1	--		0
31V. Vinyl Chloride (75-01-4)			X	<0.002						1	<0.002		1
GC/MS FRACTION - ACID COMPOUNDS													
1A. 2-Chlorophenol (95-57-8)			X	<0.01						1	<0.01		1
2A. 2,4-Dichlorophenol (120-83-2)			X	<0.01						1	<0.01		1
3A. 2,4-Dimethylphenol (105-67-9)			X	<0.01						1	<0.01		1
4A. 4,6-Dinitro-OCresol (534-52-1)			X	<0.02						1	<0.02		1
5A. 2,4-Dinitrophenol (51-28-5)			X	<0.025						1	<0.025		1
6A. 2-Nitrophenol (88-75-5)			X	<0.01						1	<0.01		1
7A. 4-Nitrophenol (100-02-7)			X	<0.025						1	<0.025		1
8A. P-Chloro-MCresol (59-50-7)			X	<0.01						1	<0.01		1
9A. Pentachlorophenol (87-86-5)			X	<0.025						1	<0.025		1
10A. Phenol (108-95-2)			X	<0.01						1	<0.01		1

CONTINUE ON PAGE 25

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - ACID COMPOUNDS													
11A. 2,4,6-Trichlorophenol (88-05-2)			X	<0.01						1	<0.01		1
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
1B. Acenaphthene (83-32-9)			X	<0.01						1	<0.01		
2B. Acenaphtylene (208-96-8)			X	<0.01						1	<0.01		1
3B. Anthracene (120-12-7)			X	<0.01						1	<0.01		1
4B. Benzidine (92-87-5)			X	<0.08						1	<0.08		1
5B. Benzo (a) Anthracene (56-55-3)			X	<0.01						1	<0.01		1
6B. Benzo (a) Pyrene (50-32-8)			X	<0.01						1	<0.01		1
7B. 3,4-Benzofluoranthene (205-99-2)			X	<0.01						1	<0.01		1
8B. Benzo (ghi) Perylene (191-24-2)			X	<0.01						1	<0.01		1
9B. Benzo (k) Fluoranthene (207-08-9)			X	<0.01						1	<0.01		1
10B. Bis (2-Chloroethoxy) Methane (111-91-1)			X	<0.01						1	<0.01		1
11B. Bis (2-Chloroethyl) Ether (111-44-4)			X	<0.01						1	<0.01		1
12B. Bis (2-Chloroisopropyl) Ether (102-80-1)			X	<0.01						1	<0.01		1
13B. Bis (2-Ethylhexyl) Phthalate (117-81-7)			X	<0.01						1	<0.01		1
14B. 4-Bromophenyl Phenyl Ether (101-55-3)			X	<0.01						1	<0.01		1
15B. Butyl Benzyl Phthalate (85-68-7)			X	<0.01						1	<0.01		1
16B. 2-Chloronaphthalene (91-58-7)			X	<0.01						1	<0.01		1
17B. 4-Chlorophenyl Phenyl Ether (7005-72-3)			X	<0.01						1	<0.01		1
18B. Chrysene (218-01-9)			X	<0.01						1	<0.01		1
19B. Dibenzo (a,h) Anthracene (53-70-3)			X	<0.01						1	<0.01		1

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
20B. 1,2-Dichlorobenzene (95-50-1)			X	<0.01						1	<0.01		1
21B. 1,3-Dichlorobenzene (541-73-1)			X	<0.01						1	<0.01		1
22B. 1,4-Dichlorobenzene (106-46-7)			X	<0.01						1	<0.01		1
23B. 3,3-Dichlorobenzidine (91-94-1)			X	<0.01						1	<0.01		1
24B. Diethyl Phthalate (84-66-2)			X	<0.01						1	<0.01		1
25B. Dimethyl Phthalate (131 -11-3)			X	<0.01						1	<0.01		1
26B. Di-N-Butyl Phthalate (84-74-2)			X	<0.01						1	<0.01		1
27B. 2,4-Dinitrotoluene (121-14-2)			X	<0.01						1	<0.01		1
28B. 2,6-Dinitrotoluene (606-20-2)			X	<0.01						1	<0.01		1
29B. Di-N-Octyl Phthalate (117-84-0)			X	<0.01						1	<0.01		1
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)			X	<0.01						1	<0.01		1
31B. Fluoranthene (206-44-0)			X	<0.01						1	<0.01		1
32B. Fluorene (86-73-7)			X	<0.01						1	<0.01		1
33B. Hexachlorobenzene (118-74-1)			X	<0.01						1	<0.01		1
34B. Hexachlorobutadiene (87-68-3)			X	<0.01						1	<0.01		1
35B. Hexachlorocyclopentadiene (77-47-4)			X	<0.01						1	<0.01		1
36B Hexachloroethane (67-72-1)			X	<0.01						1	<0.01		1
37B. Indeno (1,2,3-cd) Pyrene (193-39-5)			X	<0.01						1	<0.01		1
38B. Isophorone (78-59-1)			X	<0.01						1	<0.01		1
39B. Naphthalene (91-20-3)			X	<0.01						1	<0.01		1
40B. Nitrobenzene (98 -95-3)			X	<0.01						1	<0.01		1

CONTINUE ON PAGE 27

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X”			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
41B. N-Nitrosodimethylamine (62-75-9)			X	<0.01						1	<0.01		1
42B. N-Nitrosodi-N-Propylamine (621-64-7)			X	<0.01						1	<0.01		1
43B. N-Nitrosodiphenylamine (86-30-6)			X	<0.01						1	<0.01		1
44B. Phenanthrene (85-01-8)			X	<0.01						1	<0.01		1
45B. Pyrene (129-00-0)			X	<0.01						1	<0.01		1
46B. 1,2,4-Trichlorobenzene (120-82-1)			X	<0.01						1	<0.01		1
GC/MS FRACTION - PESTICIDES													
1P. Aldrin (309-00-2)													
2P. a-BHC (319-84-6)													
3P. ß-BHC (319-85-7)													
4P. ?-BHC (58-89-9)													
5P. d-BHC (319-86-8)													
6P. Chlordane (57-74-9)													
7P. 4,4'-DDT (50-29-3)													
8P. 4,4'-DDE (72-55-9)													
9P. 4,4'-DDD (72-54-8)													
10P. Dieldrin (60-57-1)													
11P. a-Enosulfan (115-29-7)													
12P. ß-Endosulfan (115-29-7)													
13P. Endosulfan Sulfate (1031-07-8)													
14P. Endrin (72-20-8)													
15P. Endrin Aldehyde (7421-93-4)													
16P. Heptachlor (76-44-8)													

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - PESTICIDES													
17P. Heptachlor Epoxide (1024-57-3)													
18P. PCB-1242 (53469-21-9)													
19P. PCB-1254 (11097-69-1)													
20P. PCB-1221 (11104-28-2)													
21P. PCB-1232 (11141-16-5)													
22P. PCB-1248 (12672-29-6)													
23P. PCB-1260 (11096-82-5)													
24P. PCB-1016 (12674-11-2)													
25P. Toxaphene (8001-35-2)													

CONTINUE ON PAGE 29

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

EPA I.D. NUMBER (copy from Item 1 of Form 1)

OUTFALL NO. 011

V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

PART A –You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	(2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	(2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	3. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
a. Biochemical Oxygen Demand (BOD)	<2.0	0					1	<2		1
b. Chemical Oxygen Demand (COD)	<10	0					1	<10		1
c. Total Organic Carbon (TOC)	2.01	30					1	2.66		1
d. Total Suspended Solids (TSS)	25	375					1	8		1
e. Ammonia (as N)	<0.10	0					1	<0.1		1
f. Flow (MGD)	VALUE 1.8		VALUE		VALUE		1	VALUE		1
g. Temperature (winter)	VALUE 8.9		VALUE		VALUE		1	VALUE N/A		N/A
h. Temperature (summer)	VALUE 30.2		VALUE		VALUE		1	VALUE 28.5		1
i. pH (s.u.)	MINIMUM 6.23	MAXIMUM 6.23	MINIMUM	MAXIMUM			1			

PART B – Mark “X” in column 2-a for each pollutant you know or have reason to believe is present. Mark “X” in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X” a. BELIEVED PRESENT	b. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	(2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	(2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	(2) MASS	d. NO. OF ANALYSES	4. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	(2) MASS	b. NO. OF ANALYSES
a. Bromide (24959-67-9)		X										
b. Chlorine, Total Residual		X										
c. Color		X										
d. Fecal Coliform		X										
e. Fluoride (16984-48-8)		X										
f. Nitrate-Nitrite(as N)		X										
g. Nitrogen, Total Organic (as N)		X										
h. Oil and Grease		X										

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"		3. EFFLUENT							4. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS		(1) CONCENTRATION	(2) MASS	
i. Phosphorus (as P), Total (7723-14-0)		X										
j. Radioactivity												
(1) Alpha, Total		X										
(2) Beta, Total		X										
(3) Radium, Total		X										
(4) Radium 226, Total		X										
k. Sulfate (as SO4) (14808-79-8)		X										
l. Sulfide (as S)		X										
m. Sulfite (as SO3) (14265-45-3)		X										
n. Surfactants		X										
o. Aluminum, Total (7429-90-5)		X										
p. Barium, Total (7440-39-3)		X										
q. Boron, Total (7440-42-8)		X										
r. Cobalt, Total (7440-48-4)		X										
s. Iron, Total (7439-89-6)		X										
t. Magnesium, Total (7439-95-4)		X										
u. Molybdenum, Total (7439-98-7)		X										
v. Manganese, Total (7439-96-5)		X										
w. Tin, Total (7440-31-5)		X										
x. Titanium, Total (7440-32-6)		X										

CONTINUE ON PAGE 31

EPA I.D. NUMBER *(copy from Item 1 of Form 1)*	OUTFALL NUMBER
	011

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions), mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise, for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part; please review each carefully. Complete one table (all 7 pages) for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
METALS, CYANIDE, AND TOTAL PHENOLS													
1M. Antimony, Total (7440-36-0)													
2M. Arsenic, Total (7440-38-2)													
3M. Beryllium, Total (7440-41-7)													
4M. Cadmium, Total (7440-43-9)													
5M. Chromium, Total (7440-47-3)													
6M. Copper, Total (7440-50-8)													
7M. Lead, Total (7439-92-1)													
8M. Mercury, Total (7439-97-6)													
9M. Nickel, Total (7440-02-0)													
10M. Selenium, Total (7782-49-2)													
11M. Silver, Total (7440-22-4)													
12M. Thallium, Total (7440-28-0)													
13M. Zinc, Total (7440 -66-6)													
14M. Cyanide, Total (57-12-5)													
15M. Phenols, Total													
DIOXIN													
2,3,7,8-Tetrachlorodibenzo-Pdioxin (1764-01-6)													

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - VOLATILE COMPOUNDS													
1V. Accrolein (107-02-8)													
2V. Acrylonitrile (107-13-1)													
3V. Benzene (71-43-2)													
4V. Bis (Chloromethyl) Ether (542-88-1)													
5V. Bromoform (75-25-2)													
6V. Carbon Tetrachloride (56-23-5)													
7V. Chlorobenzene (108-90-7)													
8V. Chlorodibromomethane (124-48-1)													
9V. Chloroethane (75-00-3)													
10V. 2-Chloroethylvinyl Ether (110-75-8)													
11V. Chloroform (67-66-3)													
12V. Dichlorobromomethane (75-27-4)													
13V. Dichlorodifluoromethane (75-71-8)													
14V. 1,1-Dichloroethane (75-34-3)													
15V. 1,2-Dichloroethane (107-06-2)													
16V. 1,1-Dichloroethylene (75-35-4)													
17V. 1,2-Dichloropropane (78-87-5)													
18V. 1,3-Dichloropropylene (542-75-6)													
19V. Ethylbenzene (100-41-4)													
20V. Methyl Bromide (74-83-9)													
21V. Methyl Chloride (74-87-3)													

CONTINUE ON PAGE 33

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - VOLATILE COMPOUNDS													
22V. Methylene Chloride (75-09-2)													
23V. 1,1,2,2-Tetrachloroethane (79-34-5)													
24V. Tetrachloroethylene (127-18-4)													
25V. Toluene (108-88-3)													
26V. 1,2-Trans-Dichloroethylene (156-60-5)													
27V. 1,1,1-Trichloroethane (71-55-6)													
28V. 1,1,2-Trichloroethane (79-00-5)													
29V Trichloroethylene (79-01-6)													
30V. Trichlorofluoromethane (75-69-4)													
31V. Vinyl Chloride (75-01-4)													
GC/MS FRACTION - ACID COMPOUNDS													
1A. 2-Chlorophenol (95-57-8)			X										
2A. 2,4-Dichlorophenol (120-83-2)			X										
3A. 2,4-Dimethylphenol (105-67-9)			X										
4A. 4,6-Dinitro-OCresol (534-52-1)			X										
5A. 2,4-Dinitrophenol (51-28-5)			X										
6A. 2-Nitrophenol (88-75-5)			X										
7A. 4-Nitrophenol (100-02-7)			X										
8A. P-Chloro-MCresol (59-50-7)			X										
9A. Pentachlorophenol (87-86-5)			X										
10A. Phenol (108-95-2)			X										

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - ACID COMPOUNDS													
11A. 2,4,6-Trichlorophenol (88-05-2)			X										
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
1B. Acenaphthene (83-32-9)													
2B. Acenaphtylene (208-96-8)													
3B. Anthracene (120-12-7)													
4B. Benzidine (92-87-5)													
5B. Benzo (a) Anthracene (56-55-3)													
6B. Benzo (a) Pyrene (50-32-8)													
7B. 3,4-Benzofluoranthene (205-99-2)													
8B. Benzo (ghi) Perylene (191-24-2)													
9B. Benzo (k) Fluoranthene (207-08-9)													
10B. Bis (2-Chloroethoxy) Methane (111-91-1)													
11B. Bis (2-Chloroethyl) Ether (111-44-4)													
12B. Bis (2-Chloroisopropyl) Ether (102-80-1)													
13B. Bis (2-Ethylhexyl) Phthalate (117-81-7)													
14B. 4-Bromophenyl Phenyl Ether (101-55-3)													
15B. Butyl Benzyl Phthalate (85-68-7)													
16B. 2-Chloronaphthalene (91-58-7)													
17B. 4-Chlorophenyl Phenyl Ether (7005-72-3)													
18B. Chrysene (218-01-9)													
19B. Dibenzo (a,h) Anthracene (53-70-3)													

CONTINUE ON PAGE 35

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
20B. 1,2-Dichlorobenzene (95-50-1)													
21B. 1,3-Dichlorobenzene (541-73-1)													
22B. 1,4-Dichlorobenzene (106-46-7)													
23B. 3,3-Dichlorobenzidine (91-94-1)													
24B. Diethyl Phthalate (84-66-2)													
25B. Dimethyl Phthalate (131 -11-3)													
26B. Di-N-Butyl Phthalate (84-74-2)													
27B. 2,4-Dinitrotoluene (121-14-2)													
28B. 2,6-Dinitrotoluene (606-20-2)													
29B. Di-N-Octyl Phthalate (117-84-0)													
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)													
31B. Fluoranthene (206-44-0)													
32B. Fluorene (86-73-7)													
33B. Hexachlorobenzene (118-74-1)													
34B. Hexachlorobutadiene (87-68-3)													
35B. Hexachlorocyclopentadiene (77-47-4)													
36B Hexachloroethane (67-72-1)													
37B. Indeno (1,2,3-cd) Pyrene (193-39-5)													
38B. Isophorone (78-59-1)													
39B. Naphthalene (91-20-3)													
40B. Nitrobenzene (98 -95-3)													

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X”			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
41B. N-Nitrosodimethylamine (62-75-9)													
42B. N-Nitrosodi-N-Propylamine (621-64-7)													
43B. N-Nitrosodiphenylamine (86-30-6)													
44B. Phenanthrene (85-01-8)													
45B. Pyrene (129-00-0)													
46B. 1,2,4-Trichlorobenzene (120-82-1)													
GC/MS FRACTION - PESTICIDES													
1P. Aldrin (309-00-2)													
2P. a-BHC (319-84-6)													
3P. ß-BHC (319-85-7)													
4P. ?-BHC (58-89-9)													
5P. d-BHC (319-86-8)													
6P. Chlordane (57-74-9)													
7P. 4,4'-DDT (50-29-3)													
8P. 4,4'-DDE (72-55-9)													
9P. 4,4'-DDD (72-54-8)													
10P. Dieldrin (60-57-1)													
11P. a-Enosulfan (115-29-7)													
12P. ß-Endosulfan (115-29-7)													
13P. Endosulfan Sulfate (1031-07-8)													
14P. Endrin (72-20-8)													
15P. Endrin Aldehyde (7421-93-4)													
16P. Heptachlor (76-44-8)													

CONTINUE ON PAGE 37

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - PESTICIDES													
17P. Heptachlor Epoxide (1024-57-3)													
18P. PCB-1242 (53469-21-9)													
19P. PCB-1254 (11097-69-1)													
20P. PCB-1221 (11104-28-2)													
21P. PCB-1232 (11141-16-5)													
22P. PCB-1248 (12672-29-6)													
23P. PCB-1260 (11096-82-5)													
24P. PCB-1016 (12674-11-2)													
25P. Toxaphene (8001 -35-2)													

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

EPA I.D. NUMBER (copy from Item 1 of Form 1)

[redacted]

OUTFALL NO.
013

V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

PART A –You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT							3. INTAKE *(optional)*		
	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS		(1) CONCENTRATION	(2) MASS	
a. Biochemical Oxygen Demand (BOD)	<5.0	0					1			
b. Chemical Oxygen Demand (COD)	<10	0					1			
c. Total Organic Carbon (TOC)	3.74	NA					1			
d. Total Suspended Solids (TSS)	65.5	NA					1			
e. Ammonia (as N)	<2.0	0					1			
f. Flow (MGD)	VALUE 33		VALUE		VALUE		Design Flow	VALUE		
g. Temperature (winter)	VALUE 19.9		VALUE		VALUE		1	VALUE		
h. Temperature (summer)	VALUE 31		VALUE		VALUE		1	VALUE		
i. pH (s.u.)	MINIMUM 7.78	MAXIMUM 7.78	MINIMUM	MAXIMUM	[redacted]		1	[redacted]		

PART B – Mark "X" in column 2-a for each pollutant you know or have reason to believe is present. Mark "X" in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"		3. EFFLUENT							4. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS		(1) CONCENTRATION	(2) MASS	
a. Bromide (24959-67-9)		X										
b. Chlorine, Total Residual		X										
c. Color		X										
d. Fecal Coliform		X										
e. Fluoride (16984-48-8)		X										
f. Nitrate-Nitrite(as N)		X										
g. Nitrogen, Total Organic (as N)		X										
h. Oil and Grease		X										

CONTINUE ON PAGE 39

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"		3. EFFLUENT							4. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS		(1) CONCENTRATION	(2) MASS	
i. Phosphorus (as P), Total (7723-14-0)		X										
j. Radioactivity												
(1) Alpha, Total		X										
(2) Beta, Total		X										
(3) Radium, Total		X										
(4) Radium 226, Total		X										
k. Sulfate (as SO4) (14808-79-8)		X										
l. Sulfide (as S)		X										
m. Sulfite (as SO3) (14265-45-3)		X										
n. Surfactants		X										
o. Aluminum, Total (7429-90-5)		X										
p. Barium, Total (7440-39-3)		X										
q. Boron, Total (7440-42-8)		X										
r. Cobalt, Total (7440-48-4)		X										
s. Iron, Total (7439-89-6)		X										
t. Magnesium, Total (7439-95-4)		X										
u. Molybdenum, Total (7439-98-7)		X										
v. Manganese, Total (7439-96-5)		X										
w. Tin, Total (7440-31-5)												
x. Titanium, Total (7440-32-6)		X										

EPA I.D. NUMBER (copy from Item 1 of Form 1)	OUTFALL NUMBER
	013

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark “X” in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions), mark “X” in column 2-b for each pollutant you know or have reason to believe is present. Mark “X” in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise, for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part; please review each carefully. Complete one table (all 7 pages) for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X”			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
METALS, CYANIDE, AND TOTAL PHENOLS													
1M. Antimony, Total (7440-36-0)			X										
2M. Arsenic, Total (7440-38-2)			X										
3M. Beryllium, Total (7440-41-7)			X										
4M. Cadmium, Total (7440-43-9)			X										
5M. Chromium, Total (7440-47-3)			X										
6M. Copper, Total (7440-50-8)			X										
7M. Lead, Total (7439-92-1)			X										
8M. Mercury, Total (7439-97-6)			X										
9M. Nickel, Total (7440-02-0)			X										
10M. Selenium, Total (7782-49-2)			X										
11M. Silver, Total (7440-22-4)			X										
12M. Thallium, Total (7440-28-0)			X										
13M. Zinc, Total (7440 -66-6)			X										
14M. Cyanide, Total (57-12-5)			X										
15M. Phenols, Total			X										
DIOXIN													
2,3,7,8-Tetrachlorodibenzo-Pdioxin (1764-01-6)			X										

CONTINUE ON PAGE 41

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - VOLATILE COMPOUNDS													
1V. Accrolein (107-02-8)			X										
2V. Acrylonitrile (107-13-1)			X										
3V. Benzene (71-43-2)			X										
4V. Bis (Chloromethyl) Ether (542-88-1)			X										
5V. Bromoform (75-25-2)			X										
6V. Carbon Tetrachloride (56-23-5)			X										
7V. Chlorobenzene (108-90-7)			X										
8V. Chlorodibromomethane (124-48-1)			X										
9V. Chloroethane (75-00-3)			X										
10V. 2-Chloroethylvinyl Ether (110-75-8)			X										
11V. Chloroform (67-66-3)			X										
12V. Dichlorobromomethane (75-27-4)			X										
13V. Dichlorodifluoromethane (75-71-8)			X										
14V. 1,1-Dichloroethane (75-34-3)			X										
15V. 1,2-Dichloroethane (107-06-2)			X										
16V. 1,1-Dichloroethylene (75-35-4)			X										
17V. 1,2-Dichloropropane (78-87-5)			X										
18V. 1,3-Dichloropropylene (542-75-6)			X										
19V. Ethylbenzene (100-41-4)			X										
20V. Methyl Bromide (74-83-9)			X										
21V. Methyl Chloride (74-87-3)			X										

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X”			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - VOLATILE COMPOUNDS													
22V. Methylene Chloride (75-09-2)			X										
23V. 1,1,2,2-Tetrachloroethane (79-34-5)			X										
24V. Tetrachloroethylene (127-18-4)			X										
25V. Toluene (108-88-3)			X										
26V. 1,2-Trans-Dichloroethylene (156-60-5)			X										
27V. 1,1,1-Trichloroethane (71-55-6)			X										
28V. 1,1,2-Trichloroethane (79-00-5)			X										
29V Trichloroethylene (79-01-6)			X										
30V. Trichlorofluoromethane (75-69-4)			X										
31V. Vinyl Chloride (75-01-4)			X										
GC/MS FRACTION - ACID COMPOUNDS													
1A. 2-Chlorophenol (95-57-8)													
2A. 2,4-Dichlorophenol (120-83-2)													
3A. 2,4-Dimethylphenol (105-67-9)													
4A. 4,6-Dinitro-OCresol (534-52-1)													
5A. 2,4-Dinitrophenol (51-28-5)													
6A. 2-Nitrophenol (88-75-5)													
7A. 4-Nitrophenol (100-02-7)													
8A. P-Chloro-MCresol (59-50-7)													
9A. Pentachlorophenol (87-86-5)													
10A. Phenol (108-95-2)													

CONTINUE ON PAGE 43

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - ACID COMPOUNDS													
11A. 2,4,6-Trichlorophenol (88-05-2)													
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
1B. Acenaphthene (83-32-9)			X										
2B. Acenaphtylene (208-96-8)			X										
3B. Anthracene (120-12-7)			X										
4B. Benzidine (92-87-5)			X										
5B. Benzo (a) Anthracene (56-55-3)			X										
6B. Benzo (a) Pyrene (50-32-8)			X										
7B. 3,4-Benzofluoranthene (205-99-2)			X										
8B. Benzo (ghi) Perylene (191-24-2)			X										
9B. Benzo (k) Fluoranthene (207-08-9)			X										
10B. Bis (2-Chloroethoxy) Methane (111-91-1)			X										
11B. Bis (2-Chloroethyl) Ether (111-44-4)			X										
12B. Bis (2-Chloroisopropyl) Ether (102-80-1)			X										
13B. Bis (2-Ethylhexyl) Phthalate (117-81-7)			X										
14B. 4-Bromophenyl Phenyl Ether (101-55-3)			X										
15B. Butyl Benzyl Phthalate (85-68-7)			X										
16B. 2-Chloronaphthalene (91-58-7)			X										
17B. 4-Chlorophenyl Phenyl Ether (7005-72-3)			X										
18B. Chrysene (218-01-9)			X										
19B. Dibenzo (a,h) Anthracene (53-70-3)			X										

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
20B. 1,2-Dichlorobenzene (95-50-1)			X										
21B. 1,3-Dichlorobenzene (541-73-1)			X										
22B. 1,4-Dichlorobenzene (106-46-7)			X										
23B. 3,3-Dichlorobenzidine (91-94-1)			X										
24B. Diethyl Phthalate (84-66-2)			X										
25B. Dimethyl Phthalate (131 -11-3)			X										
26B. Di-N-Butyl Phthalate (84-74-2)			X										
27B. 2,4-Dinitrotoluene (121-14-2)			X										
28B. 2,6-Dinitrotoluene (606-20-2)			X										
29B. Di-N-Octyl Phthalate (117-84-0)			X										
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)			X										
31B. Fluoranthene (206-44-0)			X										
32B. Fluorene (86-73-7)			X										
33B. Hexachlorobenzene (118-74-1)			X										
34B. Hexachlorobutadiene (87-68-3)			X										
35B. Hexachlorocyclopentadiene (77-47-4)			X										
36B Hexachloroethane (67-72-1)			X										
37B. Indeno (1,2,3-cd) Pyrene (193-39-5)			X										
38B. Isophorone (78-59-1)			X										
39B. Naphthalene (91-20-3)			X										
40B. Nitrobenzene (98 -95-3)			X										

CONTINUE ON PAGE 45

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
41B. N-Nitrosodimethylamine (62-75-9)			X										
42B. N-Nitrosodi-N-Propylamine (621-64-7)			X										
43B. N-Nitrosodiphenylamine (86-30-6)			X										
44B. Phenanthrene (85-01-8)			X										
45B. Pyrene (129-00-0)			X										
46B. 1,2,4-Trichlorobenzene (120-82-1)			X										
GC/MS FRACTION - PESTICIDES													
1P. Aldrin (309-00-2)													
2P. a-BHC (319-84-6)													
3P. ß-BHC (319-85-7)													
4P. ?-BHC (58-89-9)													
5P. d-BHC (319-86-8)													
6P. Chlordane (57-74-9)													
7P. 4,4'-DDT (50-29-3)													
8P. 4,4'-DDE (72-55-9)													
9P. 4,4'-DDD (72-54-8)													
10P. Dieldrin (60-57-1)													
11P. a-Enosulfan (115-29-7)													
12P. ß-Endosulfan (115-29-7)													
13P. Endosulfan Sulfate (1031-07-8)													
14P. Endrin (72-20-8)													
15P. Endrin Aldehyde (7421-93-4)													
16P. Heptachlor (76-44-8)													

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - PESTICIDES													
17P. Heptachlor Epoxide (1024-57-3)													
18P. PCB-1242 (53469-21-9)													
19P. PCB-1254 (11097-69-1)													
20P. PCB-1221 (11104-28-2)													
21P. PCB-1232 (11141-16-5)													
22P. PCB-1248 (12672-29-6)													
23P. PCB-1260 (11096-82-5)													
24P. PCB-1016 (12674-11-2)													
25P. Toxaphene (8001-35-2)													

CONTINUE ON PAGE 47

PLEASE PRINT OR TYPE IN THE UNSHADED AREAS ONLY. You may report some or all of this information on separate sheets (use the same format) instead of completing these pages.
SEE INSTRUCTIONS.

EPA I.D. NUMBER (copy from Item 1 of Form 1)

OUTFALL NO. 014

V. INTAKE AND EFFLUENT CHARACTERISTICS *(continued from page 3 of Form 2-C)*

PART A –You must provide the results of at least one analysis for every pollutant in this table. Complete one table for each outfall. See instructions for additional details.

1. POLLUTANT	2. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	2. EFFLUENT a. MAXIMUM DAILY VALUE (2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	b. (2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	c. (2) MASS	d. NO. OF ANALYSES	3. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	a. (2) MASS	b. NO. OF ANALYSES
a. Biochemical Oxygen Demand (BOD)	<5.0	0					1			
b. Chemical Oxygen Demand (COD)	16.2	NA					1			
c. Total Organic Carbon (TOC)	9.86	NA					1			
d. Total Suspended Solids (TSS)	<5.0	0					1			
e. Ammonia (as N)	<0.2	0					1			
f. Flow (MGD)	VALUE 21		VALUE		VALUE		Design Flow	VALUE		
g. Temperature (winter)	VALUE 20		VALUE		VALUE		1	VALUE		
h. Temperature (summer)	VALUE 31		VALUE		VALUE		1	VALUE		
i. pH (s.u.)	MINIMUM 8.01	MAXIMUM 8.01	MINIMUM	MAXIMUM			1			

PART B – Mark “X” in column 2-a for each pollutant you know or have reason to believe is present. Mark “X” in column 2-b for each pollutant you believe to be absent. If you mark column 2a for any pollutant which is limited either directly, or indirectly but expressly, in an effluent limitations guideline, you must provide the results of at least one analysis for that pollutant. For other pollutants for which you mark column 2a, you must provide quantitative data or an explanation of their presence in your discharge. Complete one table for each outfall. See the instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X” a. BELIEVED PRESENT	2. MARK “X” b. BELIEVED ABSENT	3. EFFLUENT a. MAXIMUM DAILY VALUE (1) CONCENTRATION	a. (2) MASS	b. MAXIMUM 30 DAY VALUE *(if available)* (1) CONCENTRATION	b. (2) MASS	c. LONG TERM AVRG. VALUE *(if available)* (1) CONCENTRATION	c. (2) MASS	d. NO. OF ANALYSES	4. INTAKE *(optional)* a. LONG TERM AVERAGE VALUE (1) CONCENTRATION	a. (2) MASS	b. NO. OF ANALYSES
a. Bromide (24959-67-9)		X										
b. Chlorine, Total Residual		X										
c. Color		X										
d. Fecal Coliform		X										
e. Fluoride (16984-48-8)		X										
f. Nitrate-Nitrite(as N)		X										
g. Nitrogen, Total Organic (as N)		X										
h. Oil and Grease		X										

CONTINUE ON REVERSE

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"		3. EFFLUENT							4. INTAKE *(optional)*		
	a. BELIEVED PRESENT	b. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
			(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS	(1) CONCENTRATION	(2) MASS		(1) CONCENTRATION	(2) MASS	
i. Phosphorus (as P), Total (7723-14-0)		X										
j. Radioactivity												
(1) Alpha, Total		X										
(2) Beta, Total		X										
(3) Radium, Total		X										
(4) Radium 226, Total		X										
k. Sulfate (as SO4) (14808-79-8)		X										
l. Sulfide (as S)		X										
m. Sulfite (as SO3) (14265-45-3)		X										
n. Surfactants		X										
o. Aluminum, Total (7429-90-5)		X										
p. Barium, Total (7440-39-3)		X										
q. Boron, Total (7440-42-8)		X										
r. Cobalt, Total (7440-48-4)		X										
s. Iron, Total (7439-89-6)		X										
t. Magnesium, Total (7439-95-4)		X										
u. Molybdenum, Total (7439-98-7)		X										
v. Manganese, Total (7439-96-5)		X										
w. Tin, Total (7440-31-5)		X										
x. Titanium, Total (7440-32-6)		X										

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EPA I.D. NUMBER (copy from Item 1 of Form 1)	OUTFALL NUMBER
	014

PART C - If you are a primary industry and this outfall contains process wastewater, refer to Table 2c-2 in the instructions to determine which of the GC/MS fractions you must test for. Mark "X" in column 2-a for all such GC/MS fractions that apply to your industry and for ALL toxic metals, cyanides, and total phenols. If you are not required to mark column 2-a (secondary industries, nonprocess wastewater outfalls, and nonrequired GC/MS fractions), mark "X" in column 2-b for each pollutant you know or have reason to believe is present. Mark "X" in column 2-c for each pollutant you believe is absent. If you mark column 2a for any pollutant, you must provide the results of at least one analysis for that pollutant. If you mark column 2b for any pollutant, you must provide the results of at least one analysis for that pollutant if you know or have reason to believe it will be discharged in concentrations of 10 ppb or greater. If you mark column 2b for acrolein, acrylonitrile, 2,4 dinitrophenol, or 2-methyl-4, 6 dinitrophenol, you must provide the results of at least one analysis for each of these pollutants which you know or have reason to believe that you discharge in concentrations of 100 ppb or greater. Otherwise, for pollutants for which you mark column 2b, you must either submit at least one analysis or briefly describe the reasons the pollutant is expected to be discharged. Note that there are 7 pages to this part; please review each carefully. Complete one table (all 7 pages) for each outfall. See instructions for additional details and requirements.

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
METALS, CYANIDE, AND TOTAL PHENOLS													
1M. Antimony, Total (7440-36-0)													
2M. Arsenic, Total (7440-38-2)													
3M. Beryllium, Total (7440-41-7)													
4M. Cadmium, Total (7440-43-9)													
5M. Chromium, Total (7440-47-3)													
6M. Copper, Total (7440-50-8)													
7M. Lead, Total (7439-92-1)													
8M. Mercury, Total (7439-97-6)													
9M. Nickel, Total (7440-02-0)													
10M. Selenium, Total (7782-49-2)													
11M. Silver, Total (7440-22-4)													
12M. Thallium, Total (7440-28-0)													
13M. Zinc, Total (7440-66-6)													
14M. Cyanide, Total (57-12-5)													
15M. Phenols, Total													
DIOXIN													
2,3,7,8-Tetrachlorodibenzo-Pdioxin (1764-01-6)													

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - VOLATILE COMPOUNDS													
1V. Accrolein (107-02-8)													
2V. Acrylonitrile (107-13-1)													
3V. Benzene (71-43-2)													
4V. Bis (Chloromethyl) Ether (542-88-1)													
5V. Bromoform (75-25-2)													
6V. Carbon Tetrachloride (56-23-5)													
7V. Chlorobenzene (108-90-7)													
8V. Chlorodibromomethane (124-48-1)													
9V. Chloroethane (75-00-3)													
10V. 2-Chloroethylvinyl Ether (110-75-8)													
11V. Chloroform (67-66-3)													
12V. Dichlorobromomethane (75-27-4)													
13V. Dichlorodifluoromethane (75-71-8)													
14V. 1,1-Dichloroethane (75-34-3)													
15V. 1,2-Dichloroethane (107-06-2)													
16V. 1,1-Dichloroethylene (75-35-4)													
17V. 1,2-Dichloropropane (78-87-5)													
18V. 1,3-Dichloropropylene (542-75-6)													
19V. Ethylbenzene (100-41-4)													
20V. Methyl Bromide (74-83-9)													
21V. Methyl Chloride (74-87-3)													

CONTINUE ON PAGE 51

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X”			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - VOLATILE COMPOUNDS													
22V. Methylene Chloride (75-09-2)													
23V. 1,1,2,2-Tetrachloroethane (79-34-5)													
24V. Tetrachloroethylene (127-18-4)													
25V. Toluene (108-88-3)													
26V. 1,2-Trans-Dichloroethylene (156-60-5)													
27V. 1,1,1-Trichloroethane (71-55-6)													
28V. 1,1,2-Trichloroethane (79-00-5)													
29V Trichloroethylene (79-01-6)													
30V. Trichlorofluoromethane (75-69-4)													
31V. Vinyl Chloride (75-01-4)													
GC/MS FRACTION - ACID COMPOUNDS													
1A. 2-Chlorophenol (95-57-8)													
2A. 2,4-Dichlorophenol (120-83-2)													
3A. 2,4-Dimethylphenol (105-67-9)													
4A. 4,6-Dinitro-OCresol (534-52-1)													
5A. 2,4-Dinitrophenol (51-28-5)													
6A. 2-Nitrophenol (88-75-5)													
7A. 4-Nitrophenol (100-02-7)													
8A. P-Chloro-MCresol (59-50-7)													
9A. Pentachlorophenol (87-86-5)													
10A. Phenol (108-95-2)													

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - ACID COMPOUNDS													
11A. 2,4,6-Trichlorophenol (88-05-2)													
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
1B. Acenaphthene (83-32-9)													
2B. Acenaphtylene (208-96-8)													
3B. Anthracene (120-12-7)													
4B. Benzidine (92-87-5)													
5B. Benzo (a) Anthracene (56-55-3)													
6B. Benzo (a) Pyrene (50-32-8)													
7B. 3,4-Benzofluoranthene (205-99-2)													
8B. Benzo (ghi) Perylene (191-24-2)													
9B. Benzo (k) Fluoranthene (207-08-9)													
10B. Bis (2-Chloroethoxy) Methane (111-91-1)													
11B. Bis (2-Chloroethyl) Ether (111-44-4)													
12B. Bis (2-Chloroisopropyl) Ether (102-80-1)													
13B. Bis (2-Ethylhexyl) Phthalate (117-81-7)													
14B. 4-Bromophenyl Phenyl Ether (101-55-3)													
15B. Butyl Benzyl Phthalate (85-68-7)													
16B. 2-Chloronaphthalene (91-58-7)													
17B. 4-Chlorophenyl Phenyl Ether (7005-72-3)													
18B. Chrysene (218-01-9)													
19B. Dibenzo (a,h) Anthracene (53-70-3)													

CONTINUE ON PAGE 53

1. POLLUTANT AND CAS NO. (if available)	2. MARK “X”			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
20B. 1,2-Dichlorobenzene (95-50-1)													
21B. 1,3-Dichlorobenzene (541-73-1)													
22B. 1,4-Dichlorobenzene (106-46-7)													
23B. 3,3-Dichlorobenzidine (91-94-1)													
24B. Diethyl Phthalate (84-66-2)													
25B. Dimethyl Phthalate (131 -11-3)													
26B. Di-N-Butyl Phthalate (84-74-2)													
27B. 2,4-Dinitrotoluene (121-14-2)													
28B. 2,6-Dinitrotoluene (606-20-2)													
29B. Di-N-Octyl Phthalate (117-84-0)													
30B. 1,2-Diphenylhydrazine (as Azobenzene) (122-66-7)													
31B. Fluoranthene (206-44-0)													
32B. Fluorene (86-73-7)													
33B. Hexachlorobenzene (118-74-1)													
34B. Hexachlorobutadiene (87-68-3)													
35B. Hexachlorocyclopentadiene (77-47-4)													
36B Hexachloroethane (67-72-1)													
37B. Indeno (1,2,3-cd) Pyrene (193-39-5)													
38B. Isophorone (78-59-1)													
39B. Naphthalene (91-20-3)													
40B. Nitrobenzene (98 -95-3)													

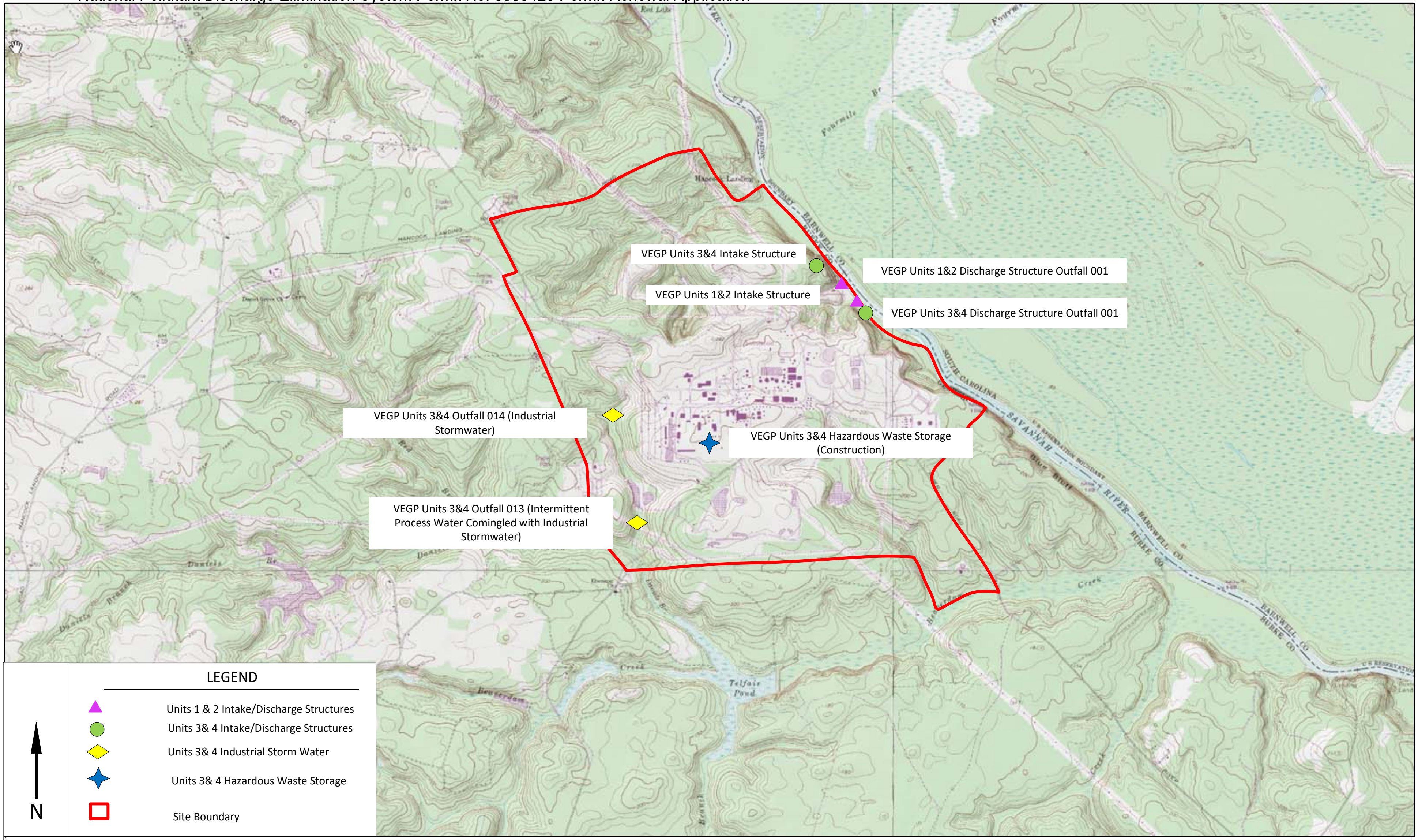
1. POLLUTANT AND CAS NO. (if available)	2. MARK “X”			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - BASE/NEUTRAL COMPOUNDS													
41B. N-Nitrosodimethylamine (62-75-9)													
42B. N-Nitrosodi-N-Propylamine (621-64-7)													
43B. N-Nitrosodiphenylamine (86-30-6)													
44B. Phenanthrene (85-01-8)													
45B. Pyrene (129-00-0)													
46B. 1,2,4-Trichlorobenzene (120-82-1)													
GC/MS FRACTION - PESTICIDES													
1P. Aldrin (309-00-2)													
2P. a-BHC (319-84-6)													
3P. ß-BHC (319-85-7)													
4P. ?-BHC (58-89-9)													
5P. d-BHC (319-86-8)													
6P. Chlordane (57-74-9)													
7P. 4,4'-DDT (50-29-3)													
8P. 4,4'-DDE (72-55-9)													
9P. 4,4'-DDD (72-54-8)													
10P. Dieldrin (60-57-1)													
11P. a-Enosulfan (115-29-7)													
12P. ß-Endosulfan (115-29-7)													
13P. Endosulfan Sulfate (1031-07-8)													
14P. Endrin (72-20-8)													
15P. Endrin Aldehyde (7421-93-4)													
16P. Heptachlor (76-44-8)													

CONTINUE ON PAGE 55

1. POLLUTANT AND CAS NO. (if available)	2. MARK "X"			3. EFFLUENT							4. INTAKE *(optional)*		
	a. TESTING REQUIRED	b. BELIEVED PRESENT	c. BELIEVED ABSENT	a. MAXIMUM DAILY VALUE		b. MAXIMUM 30 DAY VALUE *(if available)*		c. LONG TERM AVRG. VALUE *(if available)*		d. NO. OF ANALYSES	a. LONG TERM AVERAGE VALUE		b. NO. OF ANALYSES
				(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)		(1) CONCENTRATION (mg/L)	(2) MASS (lbs/day)	
GC/MS FRACTION - PESTICIDES													
17P. Heptachlor Epoxide (1024-57-3)													
18P. PCB-1242 (53469-21-9)													
19P. PCB-1254 (11097-69-1)													
20P. PCB-1221 (11104-28-2)													
21P. PCB-1232 (11141-16-5)													
22P. PCB-1248 (12672-29-6)													
23P. PCB-1260 (11096-82-5)													
24P. PCB-1016 (12674-11-2)													
25P. Toxaphene (8001-35-2)													

Attachment
Topographic Map

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420



Location: Vogtle Electric Generating Plant
Coordinates: N 33.140766 W 81.769929

Title: Vogtle Units 3&4 NPDES Permit Renewal Application Topo Map
Date: 03/6/2020

Attachment
(2) Source Water Physical Data

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

Supporting Information Required Under the Clean Water Act Section 316(b)

**For the Vogtle Electric Generating Plant
Units 3&4
Waynesboro, Georgia**

**National Pollutant Discharge Elimination System
Permit Renewal Application**

Mach 5, 2020

Changes to this document form the July, 2011 version are highlighted with revision bars. The changes are editorial in nature to reflect the current status of the permitting and operational status of the facility.

Introduction

Georgia Power Company (GPC), Oglethorpe Power Corporation, the Municipal Electric Authority of Georgia, and the City of Dalton, Georgia, an incorporated municipality in the State of Georgia acting through its Board of Water, Light, and Sinking Fund Commissioners (Dalton Utilities), are the owners of the Vogtle Electric Generating Plant (VEGP) site and its existing facilities (Units 1&2).

Southern Nuclear Operating Company (SNC) is the plant licensee and operates VEGP Units 1&2 under contract with the owners. GPC and SNC are subsidiaries of Southern Company. SNC is the licensed operator for all existing Southern Company nuclear generating facilities.

The 3,169 acre VEGP site is on the southwest side of the Savannah River in eastern Burke County, in east-central Georgia. The site is approximately 100 miles northwest of Savannah, Georgia, and approximately 26 miles southeast of Augusta, Georgia, and across the river from the U.S. Department of Energy's Savannah River Site (SRS) in Barnwell County, South Carolina.

In August, 2006, SNC submitted an application to the U.S. Nuclear Regulatory Commission (NRC) for an Early Site Permit (ESP) for the addition of two new units (Units 3&4) at the VEGP site. As part of the process of granting an ESP the NRC must first determine that a site is environmentally suitable for the generation of nuclear power, and if a nuclear reactor could be safely sited, constructed, and operated at the selected location. As part of the ESP application, SNC submitted an Environmental Report detailing the anticipated impacts associated with the construction and operation of the VEGP Units 3&4. The NRC conducted an independent evaluation of SNC's application which included a detailed review of the ESP Environmental Report, numerous responses to Requests for Additional Information prepared by SNC, consultations with Federal, State and local agencies, and Tribal Nations, consideration of public comments, and numerous site visits and audits.

In August, 2008, the NRC staff published their *Final Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site (FEIS)*, concluding that construction and operation of Vogtle Units 3&4 would not result in any significant adverse environmental impacts that could not be mitigated or redressed (NRC Accession # ML082240145).

In March 28, 2008, SNC submitted an application for a Combined License (COL) for VEGP Units 3&4 to the NRC to construct and operate two Westinghouse AP1000 reactors. As part of the COL application, SNC submitted a supplemental Environmental Report detailing all New and Significant information related to the project. Again, the NRC performed an independent review of the COL Environmental Report, and held additional public meetings, solicited public comments and sought consultations with Federal, State and local agencies, and Tribal Nations.

In August, 2009, the Commission issued the Early Site Permit for VEGP Units 3&4 (ESP-004) and an accompanying Limited Work Authorization (LWA) to SNC, for the VEGP Units 3&4 site (NRC Accession # ML092290157).

In November, 2009, SNC, in anticipation of construction of the VEGP Units 3&4 Cooling Water Intake Structure (CWIS), submitted an Application for Certification and Authorization Pursuant to Sections 401 and 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 (Joint Individual Permit) to the U.S. Army Corps of Engineers (USACE).

Concurrent with that effort, SNC submitted requests to Georgia Department of Natural Resources' Environmental Protection Division (EPD) for a Stream Buffer Variance and 401 Water Quality Certification. SNC received them on April 29, 2010 and June 1, 2010, respectively.

In September, 2010 the USACE Issued a Joint Individual Permit (SAS-2007-01837) to SNC authorizing the impacts to Waters of the U.S. associated with the construction of the VEGP Units 3&4 CWIS and Discharge.

In March, 2011, the NRC staff published their *Final Supplemental Environmental Impact Statement for a Combined License (COL) for Vogtle Electric Generating Plant Units 3 and 4 (FSEIS)*, recommending to the NRC Commission that the COL's and LWA be issued. SNC currently expects the NRC to issue the COL for the construction and operation of VEGP Units 3&4 in late 2011.

In July of 2011, SNC submitted applications for a Permit to Withdraw or Divert Surface Water and an Application for a Permit to Discharge Process Water for the Vogtle Electric Generating Plant Units 3 and 4 to the Georgia Department of Natural Resources' Environmental Protection Division. SNC was issued Surface Water Withdrawal Permit No. 017-0191-11 in December 2014 and the Plant Vogtle Units 3 and 4 NPDES Permit No. GA0039420 in September 2015.

In February 2012, the Commission a Combined License (COL) to SNC construct and operate two Westinghouse AP1000 reactors (NRC Accession # ML113360395). The AP1000 design is based on Westinghouse pressurized water reactor (PWR) technology. Major components include a single reactor pressure vessel, two steam generators (SGs), and four reactor coolant pumps for converting reactor thermal energy into steam. A single high pressure turbine and three low pressure turbines drive a single electric generator. The AP1000 was certified by the NRC under 10 CFR 52, Appendix D. The Rated Thermal Power (RTP) of the AP1000 reactor is 3,400 MWt, with a nuclear steam supply system rating of 3,415 MWt (core plus reactor coolant pump heat). The gross and minimum net electrical outputs of the AP1000 design are approximately 1,200 MWe (with an 87°F circulating water cold water temperature) and 1,117 MWe respectively, with maximum station and auxiliary service loads of 83 MWe. Both units remain under construction with scheduled in-service dates in 2021 and 2022 for Units 3 and 4, respectively.

CWA Section 316(b) Requirements

According to the Clean Water Act, Section 316(b) Phase I - Track I Rule, new facilities with a design intake flow equal to or greater than 10 MGD, must meet the following requirements:

(1) Cooling water intake flow must be at a level commensurate with that achievable with a closed-cycle, recirculating cooling system; (40 CFR125.84(b)(1)).

(2) Through-screen intake velocity must be less than or equal to 0.5 feet per second; (40 CFR 125.84(b)(2)).

(3) Location and capacity-based limits on proportional intake flow must be met (for fresh water rivers or streams, intake flow must be less than or equal to 5 percent of the mean annual flow; for lakes or reservoirs, intake flow may not disrupt natural thermal stratification or turnover pattern (where present) of the source water except in cases where the disruption is determined to be beneficial to the management of fisheries for fish and shellfish by any fishery management agency(ies); for estuaries or tidal rivers, intake flow must be less than or equal to 1 percent of the tidal excursion volume; for oceans, there are no proportional flow requirements); (40 CFR 125.84(b)(3)) and;

(4) Design and construction technologies for minimizing impingement mortality and entrainment must be selected and implemented if certain conditions exist where the cooling water intake structure is located. (40 CFR 125.84(b)(4) and (5))

The following application is intended to comply with the requirements for all new facilities specific to 316(b) Track I.

The chosen method of compliance with the impingement mortality standard is the closed-cycle cooling option, as defined at 40 CFR 125.92.

VEGP Units 3 &4 will utilize a closed-cycle cooling system for each unit. Each unit's cooling tower is a hyperbolic natural draft structure. Water will circulate at a nominal design rated of 600,000 gallons per minute. The cooling tower basin has a storage volume of between 6.0 and 7.0 x 10^6 gal of water. The cooling towers utilize natural convection to remove heat added by cooling the condenser from the water as it falls through the fill material located in the tower. The water falls to the basin beneath the tower and, in the process, gives up some of its heat to the atmosphere

All New Facilities

As previous stated, both units are still under construction and the cooling water intake structure and cooling water systems have not been completed. Scheduled in-service dates are 2021 and 2022, for Units 3&4 respectively. SNC is submitted the supporting 316(b) new facility information and were appropriate, updating the information to reflect the current status. As of the date of this application, the CWIS has not been used to withdraw the source water.

a. Source Water Physical Data

All new facilities must provide the source water physical data required at 40 CFR 122.21(r)(2) in their permit applications. These data are needed to characterize the facility and evaluate the type of waterbody and species affected by the cooling water intake structure. This information will also be used by the permit writer to evaluate the appropriateness of the design and construction technologies selected by the applicant for use at their site in subsequent permit proceedings. Specific data items that must be submitted include:

(1) a narrative description and scale drawings showing the physical configuration of all source waterbodies used by the facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation;

The 3,169-acre VEGP site occupies a Coastal Plain bluff on the southwest bank of the Savannah River in eastern Burke County, Georgia. VEGP Units 3&4 will be approximately 220 feet above mean sea level (msl). This site is at River Mile (RM) 151; approximately 30 river miles upstream of the U.S. Highway 301 Bridge and directly across the river from SRS. The site is approximately 100 miles northwest of Savannah, Georgia, and approximately 26 miles southeast of Augusta, Georgia. **(NRC 2008, p. 2-1)**

SNC has selected the Westinghouse Electric Company, LLC (Westinghouse) AP1000 certified plant design for VEGP Units 3&4. VEGP Units 3&4 will be constructed west of the existing VEGP Units 1&2 plant complex.

VEGP Units 3&4 will share a common CWIS and certain support structures such as office buildings, water, wastewater, and waste-handling facilities. VEGP Units 3&4 will use a closed-cycle, recirculating cooling system which includes two concrete natural-draft hyperbolic cooling towers (one per unit) and a common CWIS and discharge line. The Savannah River will be the source for make-up water for the circulating water cooling system and will provide water to replace cooling tower evaporative water losses, drift losses, and blowdown discharge.

The Savannah River is a freshwater river with portions of its watershed in South Carolina, North Carolina and Georgia. The total size of the Savannah River watershed is approximately 10,579 mi^2; 5870 mi^2 of which are in Georgia; 4530 mi^2 in South Carolina; and 179 mi^2 in North Carolina **(USACE 1996)**. The confluence of the Seneca and Tugaloo Rivers, which is now part of Hartwell Reservoir, is considered the upstream end of the Savannah River **(USACE 1996)**. The Savannah River flows 288.9 mi from Hartwell Dam to its mouth, where it enters the Atlantic Ocean at Tybee Island, Georgia. The VEGP site is l at River Mile (RM) 151. Three large dams, constructed and operated by the United States Army Corps of Engineers (USACE), lie upstream of the site; Hartwell Dam, at Savannah RM 288.9, is 138 mi upstream of the VEGP site and is capable of storing 4230 million m^3 (3,430,000 acre-feet (ac-ft)) of water (**USACE 1996)**. The dam was completed and began filling in February 1961 **(USACE 1996)**. Richard B. Russell Dam, at Savannah RM 259.1, is 108 mi upstream of the VEGP site and is capable of storing 1836 million m^3 (1,488,155 ac-ft) of water **(USACE 1996)**. This was the last of the three large dams to be completed, and it began filling in October 1983. At Savannah RM 221.6, J. Strom Thurmond Dam is 71 mi upstream of the VEGP site. Its reservoir is capable of storing 4564 million m^3 (3,700,000 ac-ft) of water. J. Strom Thurmond Dam, first of the three dams to be completed, began filling in December 1951 **(USACE 1996).**

Between J. Strom Thurmond Dam and the VEGP site lies Stevens Creek Dam (RM 208.1), the city of Augusta (approximately RM 200), New Savannah Bluff Lock and Dam (RM 187.7), and the mouths of several small creeks (**USACE 1996**). Stevens Creek Dam, operated by SCE&G, functions as a re-regulating reservoir to mitigate the large flow variations from J. Strom Thurmond Dam and to generate hydroelectric power. New Savannah Bluff Dam, constructed and operated by USACE, is part of the inactive Savannah River Below Augusta Navigation Project **(USACE 1996)**.

Channel modifications have been made to the Savannah River to allow for a 9-ft deep by 90-ft wide navigation channel from the Savannah Harbor to the city of Augusta. By 1980, shipping along the river had essentially ceased, and maintenance of the channel was discontinued **(USACE 2006a, p. 6)**. Consequently, Hartwell, Russell, and Thurmond dams are no longer operated for navigation, and minimum discharges from J. Strom Thurmond Dam are based on the needs of downstream water users with less concern for navigation **(USACE 2006a)**.

In 2006, SNC performed a bathymetric survey in the Savannah River adjacent to the VEGP site (Figure 1 - Savannah River Bathometry at VEGP). The Savannah River in the vicinity of the VEGP Units 3&4 proposed CWIS is approximately 325 ft wide with an average water depth between 7 and 10 feet.

The climate in the upper Savannah River watershed is temperate, with generally mild winters and long summers. The annual mean temperature for the basin is 60°F. January, which is usually the coldest month of the year, frequently has night temperatures of 20°F or lower. July and August, the hottest months of the year, have many days with temperatures over 90°F. In the lower section of the basin, the winters are milder and the summer temperatures higher **(USACE 1996)**.

Savannah River water temperature data were collected monthly by the Georgia Department of Natural Resources (GDNR) at Shell Bluff Landing, approximately 11 river miles upstream of the VEGP site, from January 30, 1973 to August 13, 1996 **(Frazier 2006)**. Savannah River water temperature data are also collected from multiple locations as part of the ongoing environmental monitoring at the Savannah River Site. From the 2009 data **(SRS 2010)**, the following water temperature statistics were generated:

		Savannah River Water Temperatures - 2009 Location				
Parameter	**Unit**	**RM-118.8**	**RM-129.1**	**RM-141.5**	**RM-150.4**	**RM-160**
		Range (Mean)	**Range (Mean)**	**Range (Mean)**	**Range (Mean)**	**Range (Mean)**
Temperature	°F	51.6-81.3 (67.4)	48.6-75.4 (63.3)	50.7-81.3 (66.1)	48.7-79.5 (65.1)	48.7-78.4 (65.8)

(2) an identification and characterization of the source waterbody's hydrological and geomorphological features, as well as the methods used to conduct any physical studies to determine the intake's zone of influence and the results of such studies; and

As mentioned previously, the Savannah River watershed extends into the mountains of North Carolina, South Carolina, and Georgia near Ellicott Rock, the point where the borders of those three states meet.

Within the three states, the Savannah River basin includes portions of 44 counties and two major metropolitan centers, Augusta and Savannah. The lower 50 mi reach of the Savannah River is tidally influenced **(USACE 1996)**. The Savannah River watershed and sub-basins, are delineated by the National Weather Service **(NWS 2005)** and further subdivided by USGS Hydrologic Unit Code (HUC-12) sub-basins **(USGS 2006f).** The Savannah River at the VEGP site lies within HUC-12 – 030601061101.

The Savannah River watershed traverses three distinct physiographic provinces: the Mountain, Piedmont, and Coastal Plain. The Mountain and Piedmont provinces are within the Appalachian Mountain range, with the border between them extending from northeast to southwest, crossing the Tallulah River at Tallulah Falls (the Tallulah River and the Chattooga River form the Tugalo). The Fall Line, or division between the Piedmont province and the Coastal Plain province, also crosses the basin in a generally northeast to southwest direction, near Augusta, Georgia **(USACE 1996)**.

Watershed elevations range from 5,030 ft msl at Little Bald Peak in North Carolina, to near sea level at Savannah and sea level where the river meets the ocean. The approximate range of elevations for each physiographic region is **(USACE 1996)**: 5,030 to 1,800 ft msl within the Mountain province, 1,800 to 500 ft msl within the Piedmont province, and 500 to 0 ft msl within the Coastal Plain province.

The Savannah River, together with certain of its tributaries, forms the border between the states of Georgia and South Carolina. The confluence of the Seneca and Tugaloo rivers, formerly known as "The Forks" but now inundated by Hartwell Lake, marks the upstream end of the Savannah River. The length of the Savannah River from The Forks to its mouth on the Atlantic Ocean is about 312 mi **(USACE 1996)**.

The following principal streams make up the Savannah River stream system **(USACE 1996)**:

- The Tallulah and Chattooga Rivers combine to form the Tugaloo River at River Mile 358.1
- Twelve Mile Creek and the Keowee River join to form the Seneca River at River Mile 338.5.
- The Tugaloo and Seneca rivers join to form the Savannah River proper at River Mile 312.1, at the point known as The Forks.

The entire 312-mi length of the Savannah River is regulated by a series of three USACE multipurpose projects, forming a chain along the Georgia–South Carolina border 120 mi long. The three lakes, from upstream to downstream, are:

- Hartwell Lake and Dam, with 3,430,000 ac-feet of storage
- Richard B. Russell Lake and Dam, with 1,488,155 ac-ft of storage
- J. Strom Thurmond (also known as Clarks Hill) Lake and Dam, with 3,700,000 ac-ft of storage.

There are generally two periods of maximum rainfall in the upper basin: February–March and July–August, although heavy rainfall has occurred in practically every month. The mean annual precipitation decreases from 83.5 in. at the upper end of the watershed, near Highlands, North Carolina, down to 49.2 in. at Savannah, Georgia **(USACE 1996)**.

The VEGP site is bordered on the east by the Savannah River and by Beaverdam Creek to the south. The SRS is directly across the river to the east. The site is on a high, steep bluff on the west bank of the Savannah River. State Road 23 (River Road) runs roughly parallel to the river, about 4 miles from the VEGP site. It runs along the ridge line that separates local drainage running northeast to the river from runoff draining generally to the southwest. An unnamed, highly incised creek drains the area of the site north of River Road into the Savannah River just upstream of the site. To the west, the site is drained by the Red Branch and Daniels Branch, which join with Beaverdam Creek just upstream of Telfair Pond, south of the site. Beaverdam Creek intercepts three streams draining runoff from north of State Road 23 before it reaches the site. **(Southern 2008a, p. 2.3.1-3)**

Although the ~~Since the~~ VEGP 3&4 CWIS has ~~not~~ been constructed, no physical studies have been performed to determine the intake's hydraulic zone of influence since the facility remains under construction. However, in May, 2008, Southern Company personnel completed a hydraulic zone of influence survey at the existing VEGP Units 1&2 CWIS, which is similar to and located approximately 2070 ft downstream of the location of the Units 3&4 CWIS. The Savannah River adjacent to the intake canal was surveyed both upstream and downstream over a sufficient distance to define the hydraulically-affected zone. Acoustic Doppler Current Profiling (ADCP) data were collected by navigating a boat-mounted ADCP unit parallel to the shoreline. The first transect was within 10 feet of the river bank or VEGP Units 1&2 cooling water intake canal and subsequent transects were performed at 10 foot intervals and concluded halfway across the river channel. Data from 11 parallel transects were collected and used to determine the hydraulic zone of influence. The boundary demarcating the area of greatest extent of hydraulic influence from VEGP Units 1&2 was determined to be where the occurrence of water velocities and vectors were predominantly unrelated to the VEGP Units 1&2 CWIS. **(Southern 2008b, Enclosure 1, p. 2)**

During normal operations of VEGP Units 1&2, only two of the four available water intake pumps are in operation. When the ADCP survey was conducted, three water intake pumps were operating. Based on a maximum of four operating pumps, intake flows at full pump design capacity would be 127 MGD or 196 cfs. During the May, 2008 survey, the intake flow was calculated at 71.2 MGD or 110 cfs (56% of full capacity). At the time of the survey, the average flow on the Savannah River at the Vogtle site was 4,482 cfs. Six ADCP transects were completed to measure the Savannah River flow (three prior to survey and three after survey). The river flows varied by less than 2% (4,443 – 4,506 cfs) during the monitoring event. **(Southern 2008b, Enclosure 1, p. 2)**

With the intake pump rates and Savannah River flows during the May, 2008 survey event as described, the VEGP Units 1& 2 CWIS zone of hydraulic influence occupied a total area of 1.10 acres, which includes the entire VEGP Units 1&2 intake canal and extends a short distance into the Savannah River. The area of VEGP Units 1&2 CWIS hydraulic influence in the Savannah River accounted for 12% (0.14 acres) of the total zone of hydraulic influence **(Southern 2008b, Enclosure 1, p. 2).**

The VEGP Unit 1&2 intake canal is approximately 120 ft wide where it meets the Savannah River, which is similar to the proposed Units 3&4 intake canal design. The VEGP Units 1&2 withdrawal rates during the study (72 mgd) were comparable to the expected maximum withdrawal rates for Units 3&4 (74 mgd max daily, 62 mgd monthly average). Therefore, SNC expects that the VEGP Units 3&4 CWIS will have a similarly small hydraulic zone of influence. **(Southern 2008b, Enclosure 1, p. 2)**

(3) locational maps.

Location maps are provided in:
Figure 2 – 50 Mile Vicinity Map

Figure 3 – 6 Mile Vicinity Map
Figure 4 – Intake Structure Location Map

b. Cooling Water Intake Structure Data

All new facilities must submit the cooling water intake structure data required at 40 CFR 122.21(r)(3) to characterize the cooling water intake structure and evaluate the potential for impingement and entrainment of aquatic organisms. Information on the design of the intake structure and its location in the water column will allow the permit writer to evaluate which species or life stages would potentially be subject to impingement and entrainment. A diagram of the facility's water balance would be used to identify the proportion of intake water used for cooling, make-up, and process water. The water balance diagram also provides a picture of the total flow in and out of the facility, allowing the permit writer to evaluate compliance with the Track I flow reduction requirements (if applicable). Specific data on the intake structure include:

(1) a narrative description of the configuration of each of your cooling water intake structures and where it is located in the waterbody and in the water column;

The VEGP Units 3&4 CWIS consists of the intake canal, the intake structure, the make-up pumps, and the chlorination system. The location of the new intake system for VEGP Units 3&4 is shown in Figures 2-4. Engineering drawings of the CWIS and canal are also referenced in Item b(5) below and show the CWIS and canal in greater detail.

The new CWIS will be constructed at the shore end of the intake canal and contain nine individual pump bays. Three 50-percent-capacity, vertical, wet-pit make-up pumps will be provided for each new unit, resulting in a total of six make-up pumps for the two new units. The CWIS and canal are sized to support three AP1000 units, should SNC determine to pursue a third unit in the future. However, the mechanical components supporting only VEGP Units 3 &4 will be installed. No equipment installation or other action relative to a third unit will be taken at this time. **(NRC 2008, p. 4-25)**

The VEGP Units 3&4 intake canal will be approximately 200 ft long and 120 ft wide at the mouth (CWIS entrance), getting wider as it approaches the river. Portions of the canal not directly adjacent to the CWIS will have an earthen bottom at about elevation 70 ft mean sea level (msl). The sides of the canal will be reinforced and protected to prevent damage from erosion and flooding. The intake canal will act as a siltation basin and will incorporate a debris screen at the mouth of the canal. Similar to the VEGP Units 1&2 canal, a 1-foot high weir wall will be constructed at the bottom of the debris screen and is intended, in part, to deter fish from entering the intake canal. At the maximum makeup water demand of 115 cfs (57.5 cfs per unit), the design through-screen intake velocity complies with the less than 0.5 fps required by CWA Section 316(b). The intake canal will be located in a straight run of the Savannah River with the mouth of the canal almost perpendicular to the River; thus further minimizing the potential for fish to enter the canal. **(NRC 2008, p. 5-31)**

(2) latitude and longitude in degrees, minutes, and seconds for each of your cooling water intake structures;

The VEGP Units 3&4 CWIS is located at N 33° 09' 17" W 81° 45' 32"

(3) a narrative description of the operation of each of your cooling water intake structures, including design intake flows, daily hours of operation, number of days of the year in operation, and seasonal changes, if applicable;

The maximum design flow rate from the Savannah River for VEGP Units 3&4 is 51,000 gpm (8500 gpm per pump). One make-up pump will be located in each of the six pump bays, along with dedicated traveling dual flow screens and trash racks. The through-trash-rack and through-screen-mesh velocity will be less than 0.5 fps at 7Q10. Debris collected by the trash racks and the traveling water screens' debris will be collected in a debris basin for cleanout and disposal as solid waste.

VEPG Units 3&4 will be used as a base load electric generating facility and are designed to operate year round. The Westinghouse AP1000 units are expected to operate with a maximum capacity factor of 93 percent (annualized), considering scheduled outages and other plant maintenance. Accordingly, the cooling water intake structure is projected to operate 24 hours a day, 365 days a year without any seasonal variation.

~~A~~ Surface Water Withdrawal Permit No. 017-0191-11 was issued by the ~~application is being submitted to the~~ Georgia Environmental Protection Division – Watershed in December 2014. ~~concurrent with this document.~~

(4) a flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges;

Figure 5 – Flow Diagram (from SSW Permit App).

(5) engineering drawings of the cooling water intake structure.

Engineering drawings of the CWIS are provided in Attachment 1

c. Source Water Baseline Biological Characterization Data

All new facilities must submit the source water baseline biological characterization data required in 40 CFR 122.21(r)(4) with their permit application. This information will characterize the biological community in the vicinity of the cooling water intake structure as well as the operation of the cooling water intake structures. The Director may use this information in subsequent permit renewal proceedings to determine if the applicant's design and construction technology plan should be revised. This supporting information must include existing data (if available), which may be supplemented with new field studies if the applicant so chooses.

The applicant must submit the following specific data:

(1) a list of the data that are not available and efforts made to identify sources of the data;

An exhaustive records search was performed to support the development of the VEGP ESP FEIS and COL FSEIS. SNC is not aware of any data that are not available.

Because the SRS is directly across the Savannah River from VEGP, the Middle Savannah River has been extensively studied for 60 years. The Environmental Report prepared for the VEGP ESP application includes a bibliography that illustrates the range of aquatic studies that have been conducted by scientists at the University of Georgia's Savannah River Ecology Laboratory (SREL), Westinghouse Savannah River Company's Savannah River Technology Center (now Savannah River Nuclear Solutions - Savannah River National Laboratory), the Academy of Natural Sciences of Philadelphia, and other academic groups over the last several decades. While comprehensive, that bibliography does not include, for example, the many master's theses and doctoral dissertations done at SREL that have dealt with the biota of the Savannah River and its tributaries. SREL alone lists 2,996 publications in its reprint file. Not all of these publications are specific to the Savannah River and its tributaries, but the number gives an indication of the amount of ecological research done in the vicinity of VEGP since 1951. A good deal of this research has focused on the aquatic communities of the Savannah River and the tributaries that drain the SRS. **(Southern 2008a, p. 2.4-7)** The results of numerous studies that were performed in the vicinity of VEGP were reviewed by SNC as part of the process of evaluating the potential impacts associated with the operation of the CWIS for VEGP Units 3&4. Those studies that are most relevant to 316(b) are listed below and their conclusions summarized.

In 1977, R.W. McFarlane, et al **(McFarlane 1978, p. 42 & 66)**., conducted a Clean Water Act Section 316(b) demonstration which included detailed assessments of both the adult fish and icthyoplankton communities in the Savannah River, the impacts associated with impingement and entrainment at the SRS intake structures, and the thermal impacts associated with the discharge of cooling water from the SRS reactors. At the time, SRS operated 3 CWIS with a combined capacity to pump over 951 mgd from the Savannah River with an estimated average though screen velocity of 1.25 fps. Even at those high volumes and screen velocities, the average impingement rate for the combined intake structures averaged just 7.3 fish per day. Bluespotted sunfish was the species most often impinged. Relatively small numbers of fish eggs were collected in spring 1977, and most (96.4%) of these were eggs of American shad. Based on the cooling water withdrawals and egg densities in the Savannah River, an estimated 6.8 million eggs could have been drawn into the SRS intake canals, the equivalent of the egg production of 19 American shad females. Larval fish first appeared in samples in March, peaked in density in late April, and did not appear in meaningful numbers after June 8. Based on larval fish densities and the volume of water withdrawn for cooling, an estimated 19.6 million larvae were entrained in spring 1977, representing 9.1% of the estimated 216 million larvae passing the SRS intakes and susceptible to entrainment. The study suggested that shad and herring suffered the highest entrainment losses, not surprisingly given the fact that they produce enormous numbers of eggs and young and are subject to very high natural mortality rates. The SRS pumping stations have not operated in more than 20 years, however.

In 1983, Georgia Power Company published its pre-operational biological study of the VEGP site **(Wiltz 1983)**, including the Savannah River. Georgia Power characterized numerous aquatic communities including resident and anadromous fish, larval fish and plankton.

From 1983 to 1985, Paller, et al., performed numerous studies characterizing the fish and icthyoplankton populations on the Savannah River in the vicinity of the SRS and VEGP. His studies also focused on impingement and entrainment rates and impacts of the SRS's three intake structures.

In 1987, the Comprehensive Cooling Water Study **(Du Pont 1987)** described resident fish and icthyoplankton populations in the Savannah River in the vicinity of the SRS (and VEGP). The study further evaluated the impingement and entrainment rates and thermal impacts associated with the three intake and discharge systems at SRS. Relying heavily on the previous work of Paller, et al., data were reviewed from twelve stations on the Savannah River, including three at the VEGP site. Rates of impingement at the three SRS structures averaged 18 fish per day in 1984 and 7.7 fish per day in 1985. SRS entrainment rates were calculated to be approximately 8.3% and 12.1% of the total susceptible icthyoplankton entrained in 1984 and 1985, respectively.

By far the most exhaustive studies conducted on this section of the Savannah River are those performed by the Academy of Natural Science Philadelphia – Patrick Center for Environmental Research (ANSP). These studies provide significant data for making qualitative determinations concerning aquatic impacts of VEGPs cooling water systems. Initiated in 1951 and continuing to present, these studies are designed to assess the potential aquatic impacts of SRS. Covering the Savannah River from river mile 160 to river mile 123 (VEGP is at river mile 150.5), the ANSP work represents the “longest comprehensive study of a large river in the United States”. ANSP conducts four types of studies on the Savannah River; comprehensive, cursory, diatometer, and ‘Plant Vogtle’. Each study is designed to look for special patterns of biological disturbance and temporal patterns of change associated with the Savannah River along the boundary of the SRS and includes basic water chemistry, diatoms/periphyton, protazoa, aquatic insects, macro-invertebrates, and fish. The Plant Vogtle studies, performed from 1985-1997, were conducted to differentiate any potential impacts between the two sites. Two stations, one at River Mile 151.2, the other at river mile 149.8 were established. After 1997, the Vogtle studies were combined with the comprehensive study. Review of the 2000 ANSP report, which is a cumulative report comparing results from all the study years, indicated no statistically significant impacts associated with the operation of VEGP Units 1&2.

Marcy et al’s *Fishes of the Middle Savannah River Basin* (**Marcy et al. 2005)** is the best and most comprehensive source of information available on the distribution, abundance and habitats of important Savannah River fish species. Bennett and McFarlane’s *The Fishes of the Savannah River Plant: National Environmental Research Park* **(Bennett and McFarlane 1983)**, while less recent, also contains a wealth of useful information on the habitat preferences, spawning habits, and diet of Savannah River fishes.

With regard to impacts of CWIS on fishes of the Middle Savannah River, the best source of information is the document entitled *Impingement and Entrainment at the River Water Intakes of the Savannah River Plant* **(DOE 1987)**. Although the CWIS proposed for VEGP will only use a fraction (approximately 1/14th) of the water that was used by the SRS production reactors in the 1980s and will employ closed-cycle cooling (as opposed to SRS’s once-through cooling system), this study offers insights into which groups (shad and herring) and which species (spotted sucker, for example) appear to be most vulnerable to entrainment as ichthyoplankton and which species (bluespotted sunfish and threadfin shad, for example) appear to be most vulnerable to impingement as juveniles and adults. This study also indicated that there was a strong seasonal component to impingement, with most impingement occurring in the spring, rather than winter months.

A list of additional sources of information available is provide in Attachment 2

(2) if available, a list of species (or relevant taxa) in the vicinity of the cooling water intake structure, and identification of the species and life stages that would be most susceptible to impingement and entrainment (including both nekton and meroplankton) (Species identified should include the range of species in the system including the forage base);

Information on the fishes of the middle Savannah River can be found in hundreds of publications. Four documents are particularly comprehensive and informative: *The Fishes of the Savannah River Plant* **(Bennett and McFarlane 1983)**, the eight-volume Comprehensive Cooling Water Study prepared by Du Pont (1987), the *Savannah River Biological Surveys for Westinghouse Savannah River Company* **(Arnett 2001),** and *Fishes of the Middle Savannah River Basin* **(Marcy et al. 2005)**. The most recent study, Marcy et al., lists 98 species of fish known to occur in the Middle Savannah River. Also, as mentioned above, the CWISs at SRS have been the object of many impingement and entrainment studies. Attachment 3 contains three table (Tables 3-1, 3-8 and 6-1) from Paller et al., **(Paller et al. 1986)** that list the total number and percent composition of fish larvae (Table 3-1) and eggs (Table 3-8) entrained and total number and relative abundance of fish impinged (Table 6-1) at the three CWISs at SRS. Again, it is important to note that the intake structures at SRS were once-through facilities withdrawing considerably higher volumes of water at much higher velocities that are planned for VEGP 3&4. The most important of these species are discussed in greater detail below.

Ichthyofauna of the Middle Savannah River

The fishes of the Middle Savannah River include three groups: resident freshwater species, which are found in the area year-round; diadromous species, which are present during seasonal migrations; and marine/estuarine species, which are sometimes found in the Middle Savannah River well upstream of the saltwater-freshwater interface. Resident fishes include a variety of minnows (family Cyprinidae), suckers (family Catastomidae), catfish (family Ictaluridae), sunfish (family Centrarchidae), and perch (family Percidae). Diadromous species include eels (family Anguillidae), shad and river herring (family Clupeidae), and striped bass (family Moronidae). Marine/estuarine species that are sometimes collected in the vicinity of VEGP include striped mullet, needlefish, and hogchoker. Relatively small numbers of these marine “strays” are collected, and they are of little commercial or recreational importance.

Resident Fish of the Middle Savannah River

The Savannah River and mouths of creeks draining into the Savannah River were sampled intensively during the period 1983 - 1985 by the SRS as part of the Comprehensive Cooling Water Study. In a 1983 - 1984 study of seasonal patterns of distribution and abundance, fish were collected in November, January, June, and August using electrofishing gear and hoop nets. Electrofishing collections were dominated by centrarchids, which made up almost 50 percent of all fish collected. Redbreast sunfish (*Lepomis auritus*), bluegill, and largemouth bass (*Micropterus salmoides*) appeared most frequently in electrofishing collections, representing 16.7, 14.1, and 8.9 percent, respectively, of fish collected. They were followed by spotted sucker (*Minytrema melanops*; 8.5 percent), spotted sunfish (*L. punctatus*; 7.9 percent), chain pickerel (*Esox niger*; 5 percent), and bowfin (*Amia calva*; 5 percent). Hoop net collections were numerically dominated by flat bullhead (*Ameiurus platycephalus*; 29.2 percent), channel catfish (*Ictalurus punctatus*; 21 percent), redbreast sunfish (9.7 percent), and white catfish (*A. catus*; 9 percent). **(DuPont 1987, p. v243, 250-281)**

These species are all commonly found in large southeastern Coastal Plain river systems in habitats ranging from sloughs and backwaters to oxbow lakes to small tributary streams to small impoundments on these tributary streams **(Lee et al. 1980; Manooch 1984)**. As such, they are considered habitat generalists that can avail themselves of a range of habitats. Research has shown that fish species with very specific habitat requirements (for spawning, for example) are more likely to go extinct than those with more general habitat requirements **(Angermeier 1995)**. It follows that these generalists are more likely to thrive in large river systems that are subject to periodic droughts and floods.

The 1983-1984 SRS study included separate surveys of “small fish.” These surveys were intended to develop relative abundance estimates of small, schooling species that serve as the forage base for a variety of top-of-the-food-chain predators, including such recreationally important species as largemouth bass, black crappie (*Pomoxis nigromaculatus*), striped bass (*Morone saxatilis*), white bass (*M. chrysops*) and hybrid bass (*M. saxatilis* X *M. chrysops*). Shiners (genus *Notropis*) made up 89 percent of all fish collected in the small fish surveys **(Du Pont 1987, p. v243, 250-281)**. Brook silversides (*Labidesthes sicculus*), lined topminnow (*Fundulus lineolatus*), golden shiner (*Notemigonus crysoleucas*), and mosquitofish (*Gambusia* spp.) also appeared regularly in the small fish surveys. All of these species are common residents of swamps, bayous, and streams in the southeastern U.S. The 1983 - 1984 study did not distinguish between the various species of *Notropis* collected. A follow-up survey of small, minnow-like fish in the Savannah River and its tributaries found that three species of Notropids made up more than two-thirds of the minnows collected: coastal shiner (*Notropis petersoni*; 39.6 percent), dusky shiner (*N. cummingsae*; 17.4 percent), and spottail shiner (*N. hudsonius*; 10.4 percent). **(Du Pont 1987, p. v243, 250-281)**

As mentioned previously, the ANSP long-term study provides valuable information on the distribution and abundance of fishes in the vicinity of VEGP. The study encompasses the Savannah River from river mile 160 to river mile 123 (VEGP is at river mile 150.5) with two of the ANSP study sample locations near VEGP. Station 2A lies just upstream of VEGP at River Mile 151.2 and station 2B lies just downstream at River Mile 149.8. **(Arnett 2001, p. 3, 9-13)**.

Results from instream electroshocking conducted by boat during the 2000 ANSP sampling showed the same species and species groups dominating the Savannah River fish community as were seen in the 1983 - 1985 ANSP study: spottail shiner (*Notropis hudsonius;* 34.59 percent), bannerfin shiner (*Cyprinella leedsi*; 22.08 percent), bluegill (*Lepomis macrochirus*; 14.24 percent), whitefin shiner (*Cyprinella nivea*; 7.14 percent), brook silverside (*Labidesthes sicculus*; 4.92 percent), and redbreast sunfish (*Lepomis auritus*; 4.57 percent). Other commonly collected species included coastal shiner, largemouth bass, spotted sucker, redear sunfish and rosyface chub **(Arnett 2001, p. 222-223).**

Diadromous Fish of the Middle Savannah River

Sturgeons (Acipenseridae)

The shortnose sturgeon (*Acipinser brevirostrum*) is an anadromous fish that spawns in large Atlantic coastal rivers from New Brunswick, Canada, to north Florida **(Scott and Crossman 1973, p 80-82)**. A species of commercial importance around the turn of the century, the shortnose sturgeon is now listed by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) as an endangered species. The decline of the species has been attributed to the impoundment of rivers, water pollution, and overfishing; recruitment rates appear to be too low to replenish depleted populations.

Shortnose sturgeon grow slowly, reach sexual maturity late in life, and live as long as 30 years. Fish from southern populations can grow faster and mature earlier than those from northern populations. Spawning occurs in or adjacent to deep areas of rivers with significant currents during

each spring when water temperatures warm to 9°-12°C degrees (48°-54°F) **(Jenkins and Burkhead 1994, p. 203-207)**. This can happen as early as February in Georgia and South Carolina.
Adults apparently return to natal streams to spawn at 2 to 5 year intervals. Eggs are demersal and adhesive after fertilization, sinking quickly and adhering to submerged limbs, stones, and gravel. The interaction of water temperature, current velocity, and substrate type determines suitability of spawning habitat and hatching success. Few sturgeon larvae or juveniles have ever been collected, so little is known of their distribution and movement. Substrate in the vicinity of VEGP was characterized as "shifting sands" based on sampling conducted originally in 1972 and subsequently confirmed in 2006 **(GPC 1972, Southern 2006)**.

Before 1982, shortnose sturgeon were not known to occur in the middle reaches of the Savannah River. From 1982 through 1985, intensive sampling of the ichthyoplankton in the mid-reaches of the Savannah River was conducted. During the 1982 - 1985 studies, 12 shortnose sturgeon larvae were collected from the Savannah River near SRS **(Paller et al. 1984, p. xix, Paller et al. 1985, p. 2-119 – 2-120, and Paller et al. 1986, p. 3-111 – 3-112)**. Westinghouse Savannah River Company conducted a biological assessment to evaluate the potential impacts of SRS operations on shortnose sturgeon and concluded that "existing and proposed operations (specifically L-Reactor) of the Savannah River Plant will not affect the continued existence of the shortnose sturgeon in the Savannah River" **(Muska and Matthews, 1983, p. 6-8)**. This conclusion was based on the fact that (1) shortnose sturgeon spawned in the Savannah River up and downriver of SRS, (2) passage up and downstream was not blocked by thermal effluents, (3) entrainment was unlikely because shortnose sturgeon eggs are demersal, adhesive, and negatively buoyant, and (4) impingement of healthy juvenile and adult sturgeon on cooling water system screening devices is highly unlikely given their strong swimming ability. NMFS concurred with the DOE determination that SRS operations did not threaten the Savannah River population of shortnose sturgeon **(Du Pont 1987b, p. VI-145)**.

A South Carolina Wildlife and Marine Resources Division (now South Carolina Department of Natural Resources) study of seasonal movement and spawning habitat preferences of Savannah River shortnose sturgeon found two probable spawning sites, one upstream of VEGP at river miles 171-173 and the other downstream of VEGP at river miles 111-118 **(Hall, Smith and Lamprecht 1991)**. A companion radiotelemetry study indicated that spawning occurred between river mile 111 and river mile 142 at water temperatures of 9.8°- 16.5°C (50°- 62°F) **(Collins and Smith 1993, p. 490)**.

From 1984 - 1992, more than 97,000 shortnose sturgeon were stocked in the Savannah River as part of a state and federal recovery program **(Smith et al. 2001, p. 5-6)**. Recaptures of marked fish after an average time of 7.2 years indicated that fish stocked as juveniles made up at least 38.7 percent of the adult population. Some of the stocked sturgeons did not imprint on the Savannah River and were later found in the Edisto River (SC), the Ogeechee River (GA), the Cooper River (SC), and Winyah Bay (SC).

Population estimates and catch-per-unit-effort data from 1997 - 2000 suggested that the adult population was larger in 2000 than 1990, but juveniles were still rare. This suggests that a recruitment bottleneck exists during early life stages. Water quality degradation in the nursery habitat is believed to be at least partially responsible for the poor recruitment in the Savannah River. **(Smith et al. 2001, p. 9-11)**

A related species, the Atlantic sturgeon (*A. oxyrhynchus*), also is found in coastal rivers from Canada (Labrador) to north Florida. Like the shortnose sturgeon, the Atlantic sturgeon is anadromous, ascending coastal rivers to spawn as early as February – March in Florida and as late as July in Canada **(Jenkins and Burkhead 1994)**. There is evidence, however, for fall spawning migrations in some South Carolina rivers **(Collins et al. 2000)**. There are also indications that Atlantic sturgeon in southeastern rivers, including the Savannah, spawn further downstream than shortnose sturgeon in the same rivers, but still "well above" the salt wedge.

Shad and River Herring (Clupeidae)

Three clupeids ascend the Savannah River to spawn in its middle reaches: the American shad (*Alosa sapidissima*), the hickory shad (*A. mediocris*), and the blueback herring (*A. aestivalis*). Two other clupeids, gizzard shad (*Dorosoma cepedianum*) and threadfin shad (*D. petenense*), are also found in the Savannah River, but do not move between the Savannah River and the open ocean, and thus are not anadromous in the strictest sense. Gizzard shad are found in brackish water, and have been referred to as a "semi-anadromous" species. The American shad is the most important clupeid in terms of the commercial and recreational fishing opportunities it provides. American shad once provided an important commercial fishery in the lower Savannah River, but a decline in the population in the 1980s and 1990s reduced the number of commercial fishermen pursuing shad. This is illustrated by NMFS and Georgia DNR data on commercial landings in Georgia. From 1970 to 1975, commercial fishermen in Georgia landed from 161,700 pounds to 531,500 pounds of American shad annually **(NMFS 2006)**. Over a recent five year period (1999-2004), however, landings ranged from a low of 27,699 lbs in 2002 to a high of 58,081 lbs in 2000 **(GDNR 2005)**. The total value of American shad landed over the 1999-2004 period ranged from $22,682 in 2002 to $45,496 in 1999.

Clemson University researchers estimated the population of American shad that reached the New Savannah River Bluff Lock and Dam to be 157,685 fish in 2001 and 217,077 in 2002. This suggests that substantial numbers of spawning American shad pass VEGP during their annual spawning run: New Savannah River Bluff Lock and Dam are at river mile 187, approximately 35 river miles upstream of VEGP. **(Bailey, Isely, and Bridges 2004)** Hickory shad are smaller and less numerous than American shad. They support a modest commercial and recreational fishery. Blueback herring are smaller still, but are netted by commercial operators who sell them for live bait. Blueback herring are the bait of choice for anglers who pursue striped and hybrid bass in Clarks Hill, Russell, and Hartwell reservoirs.

Studies performed at SRS from 1983 - 1985 indicated that clupeid eggs and larvae were particularly susceptible to entrainment. In fact, in Paller, et al. (1986), Clupeidae comprised 59 percent of the total icthyoplankton entrained into the SRS cooling water intake pumps (all once- through facilities). Within this group the threadfin and gizzard shad dominated the larvae, and American shad dominated the egg collections.

Striped bass

The striped bass is an anadromous species, but in the Savannah River the degree of anadromy is greatly reduced. Unlike striped bass in the northeast and middle Atlantic, which spend their adult lives in the Atlantic Ocean and ascend coastal rivers to spawn, Savannah River striped bass tend to spawn in the lower, tidally-influenced part of the river and move upstream to nontidal portions of the river after spawning. Fish fitted with radio transmitters have traveled as far upstream as the New Savannah Bluff Lock and Dam (river mile 187) after spawning. Dudley et al. (1977) theorized that "excessively warm coastal waters" in summer at the mouth of the Savannah River may have led to the development of this behavioral pattern in Savannah River striped bass; water temperatures along the Georgia coast may reach 86°F, exceeding those tolerated by striped bass. **(Dudley, Mullis and Terrell 1977)**

During the 1980s, Savannah River striped bass suffered a precipitous population decline. From 1980 to 1988, catch-per-unit-effort of large striped bass in the lower Savannah River declined by more than 90 percent **(Reinert et al. 2005)**. Not surprisingly, the decline in large adult striped bass was accompanied by a steep decline in egg production. The population decline was attributed to operation of a tide gate, installed in the lower estuary by the U.S. Army Corps of Engineers in 1977. The tide gate, which was intended to prevent sediment from accumulating in the harbor, had the unintended effect of increasing salinity upstream in important striped bass spawning areas and speeding the transport of eggs and larvae from upstream spawning sites to the harbor, where they encountered high salinities and industrial pollutants. Because of the population decline, the states of Georgia and South Carolina declared moratoriums on the harvest of striped bass (from the mouth of the Savannah River to New Savannah Bluff Lock and Dam) in 1988 and 1990, respectively **(Reinert et al. 2005)**. In response to concerns about the impact of the tide gate on anadromous fisheries, the Corps of Engineers discontinued operation of the tide gate in 1991. A long-standing program of stocking striped bass in the estuary was modified in the early 1990s. Based on research findings, Georgia DNR began stocking larger fish further up-river and improved its transportation and handling methods to reduce stress responses in stocked fish. From 1990 to 2002, 1.6 million striped bass of various sizes and ages were stocked in the Savannah River.

Electrofishing surveys were instituted in order to measure the effectiveness of the stocking programs. Catch-per-unit-effort of adult striped bass in the Savannah River increased sharply in the 1990s in response to the stocking programs **(Reinert et al. 2005)**. The importance of the stocking program was demonstrated by the fact that more than 70 percent of striped bass collected were hatchery-bred fish. The success of the stocking program (and a preponderance of 2-and 3-year old fish) led Georgia DNR to suspend Savannah River stocking in 2003 and 2004.

Egg production has been slower to recover. Egg densities in 2000 were approximately 10 percent of densities recorded in the late 1970s **(Reinert et al. 2005)**. However, with the return of suitable spawning conditions and the increased abundance of large spawning females in the estuary, egg production is expected to increase as well.

Based on fishing reports, striped bass numbers up and downstream of VEGP have increased in response to downstream habitat restoration efforts and stocking programs, and a popular catch and release fishery has developed **(Babb 1999, 2005)**. In its 2005 "Fishing Prospects" newsletter, Georgia DNR notes that "the number of striped bass in the river has increased substantially in recent years. However, it is important for anglers to realize that most of the stripers they catch were stocked and the number of naturally-reproducing striped bass remains low" **(GDNR 2005)**. South Carolina DNR announced in July 2005 that Savannah River striped bass restoration efforts had been so successful that the harvest moratorium on Savannah River striped bass, in place since 1991, would end on October 1, 2005 **(Creel 2005)**. Although the population is currently dominated by hatchery-bred fish, the striped bass population of the Savannah River is obviously expanding and, if current trends continue, should return to levels seen in the 1960s and 1970s. Striped bass populations in river systems up and down the Atlantic coast have largely rebounded as a result of commercial and recreational harvest restrictions that followed enactment of the Atlantic Striped Bass Conservation Act (16 U.S.C. § 1851) in 1984.

American eel (Anguilla rostrata)

The American eel occurs in rivers and streams along the east coast of the U.S. from Maine to Florida. The American eel is catadromous, growing to sexual maturity in freshwater and migrating hundreds of miles into the Atlantic Ocean (the Sargasso Sea) to spawn. Adults do not return to freshwater after spawning. Eggs spawned in the Sargasso Sea drift westward and northward with ocean currents and develop into larvae, then nektonic glass eels, which swim west across the Continental Shelf and enter east coast estuaries, where they darken and become elvers (at about 65 mm in length). At about 100 mm, elvers become fully-pigmented juvenile (yellow) eels. Males, which tend to remain in estuarine areas, grow rapidly and mature into adults at age 3 to 10 years **(Jenkins and Burkhead 1994)**. Females tend to move inland, into tidal freshwater rivers and upriver tributaries, where they mature into adults at age 4 to 18 years.

American eel numbers along the Atlantic coast were relatively stable through the 1970s. Fisheries managers and commercial fishermen noticed a decline in numbers of eels ascending coastal streams in the 1980s and 1990s **(Haro et al. 2000)**. Responding to concerns of state and federal agency biologists, the Atlantic States Marine Fisheries Commission in April 2000, issued an Interstate Fishery Plan for American Eel that summarized and synthesized information on the population decline and proposed a range of measures that will ensure the species' recovery and continued viability.

The US Fish and Wildlife Service (FWS), on July 6, 2005 announced in a 90-day Finding that it was initiating a status review to determine if listing the American eel as a protected species was warranted. The Federal Register (FR) notice listed an array of threats to the species (e.g., commercial harvest, habitat loss and degradation, changes in oceanic conditions) and concluded that "…we find that the petition presents substantial scientific and commercial information indicating that listing the American eel may be warranted." In the discussion of population status, the FR pointed out that population declines have been most dramatic in Canada and New England and populations may be stable in the southeastern U.S. In 2007 the FWS completed the status review and determined that listing the American eel as either a threatened or endangered species is not warranted **(FR 2007)**.

American eels in the Middle Savannah River Basin are fully pigmented juveniles (yellow eels) and are mostly females **(Marcy et al. 2005, p. 90)**. McCord (2004) observed high densities of yellow eels in the Middle Savannah River in relatively shallow, non-navigable reaches offering pool/riffle habitats with rocks and submerged aquatic vegetation. In the vicinity of VEGP, eels are found in the Savannah River mainstem, in the Savannah River swamp, in tributary streams, and in small impoundments on these tributaries **(Marcy et al. 2005, p. 91)**. There is scant information on current population trends in South Carolina and Georgia, but commercial landings of eels in Georgia declined more than 80 percent from 1983 to 1995 **(ASMFC 2000, p. 24)**. Resource agency biologists in South Carolina and Georgia do not monitor eel population trends in the Savannah River, but anecdotal information suggests that eel numbers are lower now than in the 1970s and 1980s.

Other Important Aquatic Populations

As discussed previously in this section, the ANSP has monitored the freshwater mussels of the middle Savannah River since 1951 as part of a larger monitoring program designed to assess potential impacts of the SRS on the general health of the river. The 2000 ANSP survey **(Arnett 2001, p. 93-107)** summarizes changes in the mussel community of the middle Savannah River over the period from 1951-2000 as follows: a generally decreasing abundance and diversity of native species, an increasing dominance of "hardier forms," and an increasing scarcity of juveniles of some species. These changes were attributed to increased competition over the last several decades with the non-native Asiatic clam and changes in the flow characteristics of the Savannah River associated with "the construction of dikes, upriver dams, and removal of meanders…". Mollusks have been collected at five locations: one upstream of VEGP, one immediately downstream of VEGP, and three further downstream of VEGP. ANS scientists collected 16 mussel species between 1951 and 2000, none of which are state or federally listed. Mollusks found in the vicinity of VEGP include fingernail clams, peaclams, the Asiatic clam (*Corbicula fluminea*), and native mussels **(Arnett 2001, p. 93-107)**.

In 2007, The Catena Group conducted mussel surveys in the Savannah River from Augusta downstream to Savannah. Their study identified 23 species, bringing the total number of mussel species known in the basin to 29. They also noted that "In general mussels were most abundant in the thalweg at the base of the river bank, and rare to absent in the shifting sand dominated runs in the center of the channel. **(Catena 2007, p. 5)**

The only federally listed fish species known to occur in the Savannah River in the vicinity of VEGP is the endangered shortnose sturgeon (*Acipenser brevirostrum*). This anadromous species, first documented in the middle Savannah River in the early 1980s by SRS researchers, is known to spawn up and downstream of VEGP **(DOE 1997, p. 5-5, Table 5-4)**. A related species, the Atlantic sturgeon (*Acipenser oxyrinchus*), has been designated a Species of Concern by the NMFS **(NMFS 2004)** and has been proposed for listing under the Endangered Species Act **(FR 2010)**, also ascends the Savannah River to spawn in fresh water but little is known about its spawning habits in the Savannah River.

The robust redhorse (*Moxostoma robustum*), a species thought to be extinct, was rediscovered by Georgia DNR biologists in 1991 in the Oconee River, near Toomsboro, Georgia **(USFWS 1998)**. Since 1991, remnant populations have also been found in portions of the Pee Dee River (NC-SC), the Savannah River (SC-GA), and Ocmulgee River (GA) **(RRCC 2003)**. This large sucker (up to 30 inches long and 17 pounds) has large molar-like pharyngeal teeth that its uses to crush and eat bivalves, both native mussels and non-native Asiatic clams (*Corbicula* sp.). Once common in Atlantic slope river systems from the Pee Dee to the Altamaha, the species' range has been severely reduced by dams, which blocked its movement, and by streamside erosion, which led to siltation of feeding and spawning areas. The robust redhorse has no federal status, but has been designated an endangered species by the State of Georgia. The decline of the species has been attributed to habitat loss (dams and impoundments on native streams) and habitat degradation (pollution, siltation from agricultural and silvicultural activity in watersheds). The non-native flathead catfish, introduced to many southeastern streams by fishermen, may also have contributed to the robust redhorse's decline as this large, aggressive catfish feeds on native catastomids and competes with them for food (crayfish and clams).

The robust redhorse was first documented in the middle Savannah River in 1997, when a single adult was collected near VEGP **(RRCC 1998, p. 13; Barrett 2000)**. Since that time, robust redhorse have been found at several locations between the Augusta Shoals area and U.S. Highway 301, which is approximately 30 miles down-river from VEGP **(Barret 2000; Hendricks 2002, p. 11)**.

Spawning has been documented in both the Augusta Shoals and New Savannah Bluff Lock and Dam areas **(Freeman and Freeman 2001; Hendricks 2002)**. The Robust Redhorse Conservation Committee, a multi-agency group, has worked on the recovery of the species since 1995, rearing young redhorse at hatcheries and stocking them in streams in Georgia and the Carolinas. This group was instrumental in stocking fingerling robust redhorse in the Broad River, a major tributary of the Savannah River that empties into Clarks Hill Reservoir. Fish from these stockings have been found as juveniles in both the Broad River and Clarks Hill Reservoir.

The bluebarred pygmy sunfish (*Elassoma okatie*), is a rare species of fish that, until recently, was known only from the Edisto River, New River and eastern Savannah River drainages in South Carolina. During faunal surveys conducted in 1995 and 1996 by the Army Corps of Engineers, the species was found at a single location on the Fort Gordon army installation in Georgia. Subsequent studies performed at Fort Gordon in 1997 and 1998 using more selective equipment found bluebarred pygmy sunfish in four of the five principal streams at the installation **(USACE, 2007)**.

The bluebarred pygmy sunfish is a small fish rarely exceeding an inch in length. The female's base coloration is pinkish-brown with light beige vertical bars while males are blue-grey to black with iridescent blue vertical bars **(Sandel et al. 2006)**. The bluebarred pygmy sunfish is found in specific micro-habitats consisting of roadside ditches and backwaters of creek or rivers with brown stained (tannin) water and abundant vegetation including bladderwort, duckweed, alligatorweed, pondweed, spatterdock, rushes and grasses **(Marcy et al. 2005, p. 302)**.

Georgia Power **(Wiltz 1982b, Table 1)** conducted surveys in the late 1970s of the resident fishes of Beaverdam Creek, a six-mile long stream that drains much of the area south and west of the Vogtle site. Daniels Branch, a tributary, was also sampled. Wiltz collected no pygmy sunfish (genus *Elassoma*) and no *Lepomis* or *Enneacanthus* species with which it could be easily confused. All sunfish captured were common species (e.g., redbreast, bluegill) or species not likely to be confused with the bluebarred pygmy sunfish. This suggests that few, if any, representatives of the genus *Elassoma* were in the Beaverdam Creek drainage in the late 1970s when the surveys were conducted. The blackwater streams of the SRS, across the river from Plant Vogtle, have been sampled since the early 1950s by SRS scientists, none of whom (based on Marcy et al. 2005) has ever captured a bluebarred pygmy sunfish. According to the distribution map in Marcy et al. **(Marcy et al. 2005, p. 303)** a population of bluebarred pygmy sunfish has been found in a small stream in Allendale County, SC, south of the SRS.

In April, 2007 Georgia Power fisheries biologists performed a habitat assessment of Mallard Pond drainage (which discharges into the Savannah just upstream of the VEGP 3&4 CWIS) in order to determine the presence or absence of those habitats commonly associated with populations of bluebarred pygmy sunfish. Survey results indicate that neither Mallard Pond nor the pond drainage contains the vegetation types and flow characteristics regarded as the preferred habitat type for the bluebarred pygmy sunfish. Based on the April survey results and the fact Wiltz **(1982)** collected no bluebarred pygmy sunfish in the Beaverdam Creek drainage, it appears unlikely that the species is present at the VEGP site.

The only pygmy sunfish that has appeared, irregularly, in Savannah River fish samples collected by the ANSP is *Elassoma zonatum*, the banded pygmy sunfish **(see Arnett 2001, Table E-9)**. Given that pygmy sunfishes (*Elassoma* spp.) are creatures of backwaters, bayous, oxbows, and swamps rather than river channels, it is unlikely that operation of new CWIS would affect this group (or the bluebarred sunfish in particular).

(3) if available, identification and evaluation of the primary period of reproduction, larval recruitment, and period of peak meroplankton abundance for relevant taxa;

In 1984 and 1985, icthyoplankton sampling was performed a 26 transects along the Savannah River between river miles 29.6 and 187.1. The 1984 results indicated that icthyoplankton was dominated by American shad (14.0%), gizzard and/or threadfin shad (10.8%), and crappie (13.5%). Blueback herring, unidentified cluepids, *Lepomis* spp., spotted suckers and striped bass were also collected in high numbers. Icthyoplankton samples also were collected within the SRS cooling water intake canals with those samples dominated by crappie (24.1%) unidentified cluepids (24.2%), gizzard and/or threadfin shad (11.6%) and blueback herring (12.6%). Fish spawning in the Savannah River generally takes place in early spring, between February and July with icthyoplankton densities peaking in May **(Du Pont 1987, p. V-454)**.

During 1985 sampling, American shad numerically dominated the river ichthyoplankton, comprising 50.8% of the assemblage. Density of American shad in the SRS intake canals was 1/27th of that in the rivers. Much of this difference may be related to the low water velocities in the intake canals, which probably caused American shad eggs to settle to the bottom. The relative proportions of striped bass eggs and larvae were similar in the river and intake canals but densities were twice as high in the river. On the other hand, unidentified clupeids, gizzard and/or threadfin shad, carp and spotted suckers occurred in the intake canals in densities 2 to 3 times those in the river **(Du Pont 1987, p. V-462)**.

Attachment 4 is a series of tables (Tables V-4.65, V-4.72 through V-4.77) from the Comprehensive Cooling Water Study showing mean icthyoplankton densities by month and corresponding river water temperature for key species in the Savannah River.

Studies of the vertical distribution of larvae in the river showed an absence of significant differences between top and bottom samples at all but one of the study sites. Egg densities, however, exhibited significant differences between top and bottom at over half the transect sites. In all cases the bottom densities were higher than the top densities **(Paller et al. 1986, p. 3-36 – 3-39)**.

<u>(4) if available, information sufficient to provide data representative of the seasonal and daily biological activity in the vicinity of the cooling water intake structure;</u>

Between 1984 and 1985 the Comprehensive Cooling Water Study looked at seasonal variations in biological activity within the Savannah River near SRS. Factors affecting the seasonal variations in species abundance include migration, mortality, recruitment of juvenile fish, changes in water level affecting sample collection efficiency, and seasonal changes in behavior and habitat preference that affect the a species susceptibility to capture. Some of the most important behavioral changes observed were due to increased movement and activity associated with the spawning season. The behavioral changes brought migratory fishes into the study area and made some of the resident fishes more susceptible to capture as they moved into shallower water to spawn. Fish collected by electrofishing were used to estimate catch per unit effort (CPUE) or the number of fish per 100 m of shoreline. The CPUE at sample stations in the Savannah River in 1983 - 1984 ranged from a high of 1.0 to 10.8 fish/100 m during November to a low of 0.3 to 2.6 fish/100 m during August. The low CPUEs during August and January were probably the result of high water levels that enabled fish to move out of the river and creeks and into the floodplain swamp. There were statistically significant differences between the river sample stations during all months, probably due to habitat variation and the tendency of fishes to congregate in areas with food or shelter **(Du Pont 1987)**. Attachment 5 is a series of tables (Tables V-4.15 through V-4.18) from the Comprehensive Cooling Water Study showing the seasonal changes and relative abundance of fishes captured in the study area. It is worth noting that two of the stations shown in Table V-4.17 and V-4.18, Stations NTR and TR, are located in the immediate vicinity of VEGP at RM 152.0 and 150.4, respectively.

(5) if available, identification of all threatened or endangered species that might be susceptible to impingement and entrainment at your cooling water intake structures;

The only federally listed species known to occur in the Savannah River that may be susceptible to impingement and entrainment at the VEGP 3&4 CWIS is the shortnose sturgeon (*Acipenser brevirostrum*). No designated or proposed critical habitats have been identified in the vicinity of the VEGP site. There is also one candidate species, the Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) proposed for listing (FR 2010).

In January, 2008, the NRC, in support of developing the ESP FEIS, and to fulfill their ESA Section 7 consultation obligations, prepared and submitted Biological Assessments (BA) to the FWS and NMFS on federally listed Threatened and Endangered Species with the potential to occur within the project area. In both cases, both FWS and NMFS indicated that the construction and operation of the VEGP Units 3&4 CWIS was not likely to adversely impact the shortnose sturgeon.

The BA prepared for FWS in support of the ESP FEIS is provided in Attachment 6.
The BA prepared for NMFS in support of the ESP FEIS is provided in Attachment 7.
The BA prepared for FWS in support of the COL FSEIS is provided in Attachment 8.

Concurrence letters from NMFS and FWS are discussed below and included in Attachment 9.

The NRC also prepared an analysis regarding potential impacts on Atlantic sturgeon for consultations with NMFS. Copies of that assessment and the concurrence letter from NMFS are provided in Attachment 10.

(6) documentation of any public participation or consultation with Federal or State agencies undertaken in collecting the data;

Numerous tribes and State and Federal agencies were contacted as part of the ESP and COL application processes. The first, hosted by the NRC, was a public scoping meeting to discuss environmental issues related to the VEGP ESP application in Waynesboro, Georgia, on October 19, 2006.

In September, 2007, the NRC issued the draft ESP EIS for public comment. During that comment period, the NRC conducted a public meeting on October 4, 2007, in Waynesboro, Georgia, to describe the results of their environmental review, answer questions, and provide members of the public with information to assist them in formulating comments on the draft ESP EIS. After the comment period closed, the NRC considered and dispositioned all comments received. These comments are addressed in ESP FEIS Appendix D – Scoping Meeting Comments and Responses and ESP FEIS Appendix E – Comments on Draft Environmental Impact Statement and Responses. Also, ESP FEIS Appendix B – lists the Federal, State, regional, Tribal, and local organizations that were contacted during the course of the NRC staff's review of potential environmental impacts from the siting of VEGP Units 3&4. Correspondence information relative to the ESP review can be found in ESP FEIS Appendix F.

The draft COL SEIS was published in September 2010 followed by a 75-day public comment period. The NRC held a public outreach meeting in Waynesboro, Georgia, on October 7, 2010. During this public meeting, the NRC staff described the results of their environmental review for the COL, provided members of the public with information to assist them in formulating comments on the SEIS, and accepted comments. A summary of the public outreach meeting can be found at the NRC Public Electronic Reading Room found on the Internet at the following Web address: http://wba.nrc.gov:8080/ves/, Accession No. ML082190977. Comments received on the Draft SEIS are addressed in COL FSEIS Appendix E – Comments on Draft Supplemental Environmental Impact Statement and Responses.

Key consultation correspondence during the COL evaluation process for VEGP Units 3&4 are identified in COL FSEIS Appendix F - Table F-1 with copies of the correspondence listed in Table F-1 included at the end of FSEIS Appendix F. A list of pertinent correspondence generated during the preparation of the COL FSEIS is located in FSEIS Appendix C.

COL FSEIS Appendix B – lists the Federal, State, regional, Tribal, and local organizations that were contacted during the course of the NRC staff's independent review of potential environmental impacts from the siting of VEGP Units 3&4.

In January, 2008, the NRC, in support of developing the ESP FEIS, and to fulfill their ESA Section 7 consultation obligations, prepared and submitted Biological Assessments (BA) to the FWS and NMFS on federally listed Threatened and Endangered Species with the potential to occur within the project area. In both cases, neither FWS nor NMFS indicated that the construction and operation of the VEGP Units 3&4 CWIS was likely to adversely impact the shortnose sturgeon.

There were additional opportunities for public comments on impacts to the aquatic environmental in connection with SNC’s submittal of a Joint Individual Permit application to the USACE for construction of the VEGP Units 3&4 CWIS and discharge.

A complete list of those organizations contacted is provided in Appendixes B of both the ESP FEIS and the COL FSEIS. Additional information on key ESP/COL consultation correspondences can be found in Appendixes F of both the ESP FEIS and COL FSEIS.

Copies of other inter-agency correspondences/consultations related to aquatic resources are provided in Attachment 11. Included in Attachment 11 are letters from:

EPA – comments on Draft EIS
EPA – comments on FEIS
EPA – comments on Draft SEIS
EPA – comments on FSEIS
Georgia Department of Natural Resources – comments on the Draft EIS
National Marine Fisheries Service – comments on the Draft USACE Joint Individual permit
South Carolina Department of Natural Resources – comments on the Draft EIS
South Carolina Department of Natural Resources – comments on the Draft EIS (2)
South Carolina Department of Natural Resources – comments on the Draft USACE 404 permit
US Fish and Wildlife Service – comments on Draft EIS
US Fish and Wildlife Service – comments on USACE 404 permit

(7) if the above data are supplemented with data collected in actual field studies, a description of all methods and quality assurance procedures for data collection, sampling, and analysis, including a description of the study area; identification of the biological assemblages to be sampled or evaluated (both nekton and meroplankton); and data collection, sampling, and analysis methods. The sampling or data analysis methods used must be appropriate for a quantitative survey and based on a consideration of methods used in other biological studies performed within the same source waterbody. The study area should include, at a minimum, the area of influence of the cooling water intake structure.

Starting in March of 2009, GPC Environmental Services staff conducted an aquatic impingement and entrainment assessment of the VEGP Unit 1&2 RWI. The study included four primary components:

1) source water (Savannah River) ichthyoplankton sampling,
2) intake canal ichthyoplankton sampling,
3) impingement sampling via the VEGP Units 1&2 traveling screen wash system, and
4) performance of work under a quality assurance/quality control plan to ensure that work was performed in a high quality manner consistent with standard scientific practices, and as it pertains to sampling methodology, perform a comparison between collection gear types and data between two sampling locations upstream of the intake structure.

The objective of the impingement/entrainment assessment studies was to characterize the current impingement and entrainment rates at the VEGP Unit 1&2 RWI and use that information to infer impingement and entrainment rates for the similarly-designed VEGP Units 3&4 RWI.

The impingement study collected 168 organism (21 taxa; 19 fish taxa and two crustaceans) representing 10 taxonomic families. Impinged fish represented eight families. The Centrarchidae (sunfishes) were the most speciose family represented in the impingement data with seven species. Twelve of the 21 species collected were represented by five or fewer individuals. **(GPC 2009, p. 12)**

Based on 168 organisms collected at the VEGP Units 1&2 RWI, the estimated annual impingement rate is 2,580 organisms. Fish comprised 91.6 percent (2,365) of the estimate and crustaceans comprised the remainder. At the 95-percent upper confidence limit (UCL), annual impingement may range up to 3,229 organisms. The actual biomass of impinged organisms during the study was 985.4 g (~2.2 lbs). Accounting for all impinged organisms encountered in the sample, calculated annual biomass impingement rate is 15,028 g (33.1 lbs). At the 95-percent UCL, the annual rate of biomass impingement may range up to 18,692 g (or 41.2 lbs). **(GPC 2009, p. 12, 17)**

Three species, black crappie, hogchoker, and gizzard shad, together accounted for 73.8 percent of impinged biomass. The report also noted that a single large specimen each of black crappie and gizzard shad together accounted for 45.2 percent of the annual impingement biomass. And, that at the time of collection, those specimens were observed in states of relatively advanced decay indicating mortality before becoming impinged, unlike the vast majority of other specimens collected during the study. Accounting for the single specimens of crappie and gizzard shad that are believed to have died before being impinged, the biomass estimate could be conservatively overestimated as much as 45.2 percent. Assuming this observation to be reasonable, the revised annual rate of impinged biomass would be 8,271 g (~18.2 lbs). At the 95% UCL, this revised, annual biomass estimate would range up to 10,021 g or about 22.1 lbs. **(GPC 2009, p. 15)**

Therefore, the study results indicated that annual impingement at the VEGP Units 1&2 RWI could affect up to 3,229 organisms with a total biomass of between 18 and 41 lbs. **(GPC 2009, p. 15)**

The entrainment study was conducted between March and July, 2008 and identified 16 species among 23 taxa representing 13 families. Of the seven remaining taxa, four were identifiable to family, two to genus, and one to class. No protected species were collected. A total of 910 fish eggs and larvae were collected from source water samples. The numerically most dominant taxa group was Unidentified Cyprinidae (minnows) with 184 specimens accounting for 20.2 percent of the total sample, followed in decreasing order by American shad (*Alosa sapidisimma*) with 166 individuals (18.2 percent) and unidentified Clupeidae (herrings) (165 individuals or 18.1 percent).

Source water peak organism abundance was observed from April 23 to May 8, 2008 and was marked primarily by relatively high numbers of egg, yolk-sac and post-yolk-sac life stages of unidentified Cyprinidae, American shad, and unidentified Clupeidae. Peak abundance for yearling or older life stages occurred from early June through mid-July. **(GPC 2008, p. 19)**

In terms of entrainment into the VEGP Units 1&2 CWIS, 25 individuals comprised three fish species and four taxonomic families/groups collected via pumped entrainment samples between March and July, 2008. No protected species were collected. Of the three species, yellow perch (*Perca flavescens*) was the most abundant (40 percent) followed by yellow bullhead (*Ameiurus natalis*) and pirate perch (*Aphredoderus sayanus*), each accounting for four percent of the sample catch. As for the unidentified taxa, members of the Catostomidae (suckers) were the most dominant (20 percent) followed by the Centrarchidae (sunfishes) with 16 percent of the sample. **(GPC 2008, p. 21)**

The vast majority of the entrained sample organisms (52 percent) were collected in March, followed by 20 percent in April and 16 percent in the month of July. The majority of entrainment sample organisms were collected at night (72 percent) vs. day (28 percent). **(GPC 2008, p. 25)**

Fish eggs and larvae from source water samples were approximately 36.4 times more numerous than from entrainment samples collected during the same period. As was noted above, the three most abundant source water taxa were not the same as those found in entrainment samples. The numerically most dominant source water taxa were unidentified Cyprinidae (20.2 percent), American shad (18.2 percent), and unidentified Clupeidae (18.1 percent); whereas, the most abundant entrainment sample taxa were yellow perch (40 percent), unidentified Catostomidae (20 percent), and unidentified *Lepomis* (16 percent). Estimated daily entrainment rate at the VEGP Units 1&2 RWI were calculated as 1,230 organisms (eggs and larvae) whereas the estimated daily source water drift was 312,039 organisms. **(GPC 2008, p. 23)**

For addition details regarding the VEGP Units 1&2 impingement and entrainment studies see the Impingement Report provided in Attachment 12 and the Entrainment Assessment Report provided in Attachment 13. These reports specifically describe the methods and quality assurance procedures for data collection, sampling, and analysis, include a description of the study area; identification of the biological assemblages sampled; data collection, sampling, and analysis methods and sample results.

d. Source Water Flow Data

All facilities must demonstrate compliance with the source water flow requirements in Secs. 125.84(b)(3) and (c)(2). Information to show that a new facility is in compliance with these requirements must be submitted to the Director in accordance with Secs. 125.86(b)(3) and (c)(1).

If your facility is located on a freshwater river or stream, you must submit data that supports that you are withdrawing less than five (5) percent of the annual mean flow. The documentation might include either publicly available flow data from a nearby U.S. Geological Survey (USGS) gauging station or actual instream flow monitoring data that the facility has collected itself. The waterbody flow should be compared with the total design flow of all cooling water intake structures at the new facility.

Since 2005 the USGS has maintained a gauging station (USGS Gauge #021973269, Savannah River at Waynesboro Station) at the VEPG site. The stream gauge is located just downstream of the Units 1&2 CWIS. The 5 years of annual mean flow data from USGS Gauge #021973269, Savannah River at Waynesboro, is provided in Attachment 14. Long term river flow records in the Savannah River are available from USGS gaging stations upstream (USGS Gauge #02197000, Savannah River at Augusta) and downstream (USGS Gauge #02197500, Savannah River at Burtons Ferry Bridge near Millhaven) of VEGP. The annual mean flow data for Water Years 1952 through 2010 from USGS Gauge #02197000, Savannah River at Augusta has also been provided in Attachment 15.

Using the Waynesboro gauge data, the estimated maximum VEGP Units 3&4 surface water withdrawals as a percentage of the Savannah River annual mean flow for the past five Water Years (October-September) is:

Water Year	Annual Mean Flow in cubic feet per second	Est. % River Withdrawal at Total Design Flow
2006	6,988	1.6%
2007*	5,979	1.9%
2008*	4,798	2.4%
2009*	5,308	2.2%
2010	10,910	1.1%

*Drought year

References

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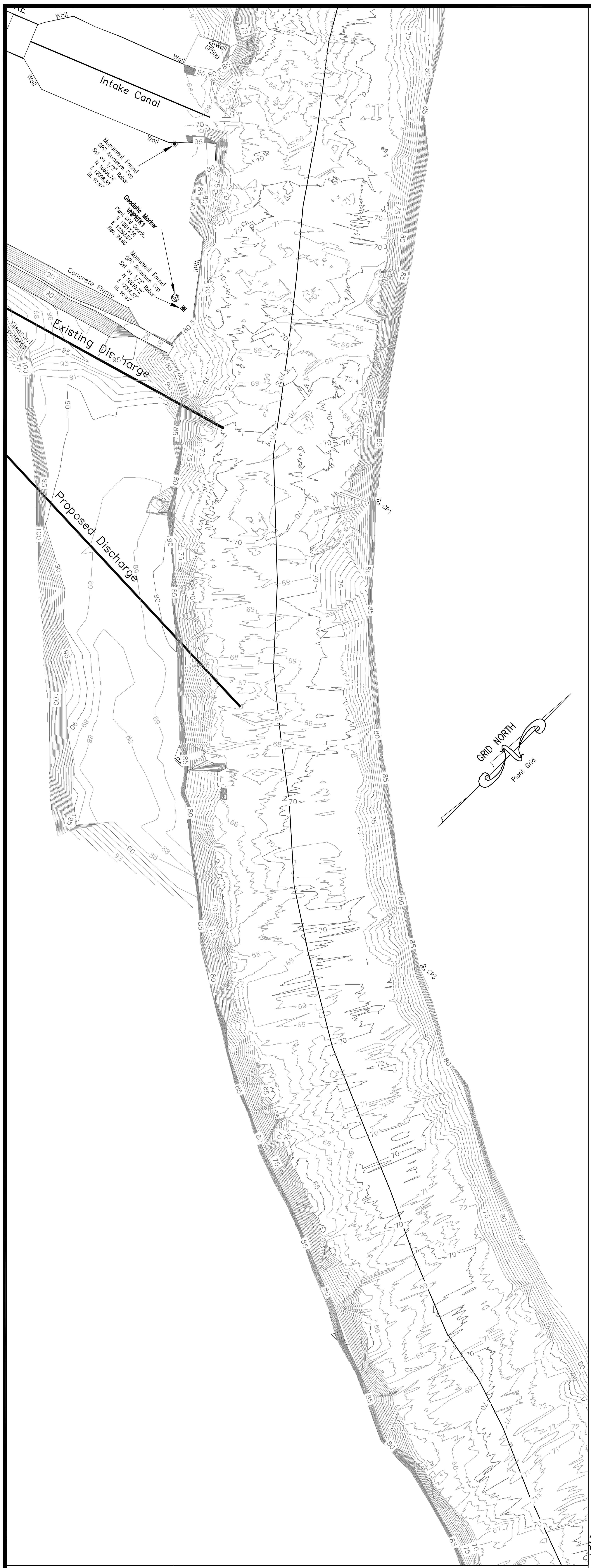
Figure 1

Savannah River Bathymetry at Vogtle Electric Generating Plant



GRAPHIC SCALE

100 0 50 100 200 400

(In Feet)
1 inch = 100 feet

PATH – T:\Working\PLANTS\VOGTLE\20050490 River Survey\Plant Vogtle River Survey.dwg

REVISION BLOCK

APPROVALS

GEORGIA POWER CO., ATLANTA, GA.
Land Department
Plant Vogtle
New Unit Early Permit Study
Savannah River Hydrographic Study – Topographic Map
Burke County, Georgia

DR.	TR.	Checked
JFW		
SCALE 1" = 100'		DATE 2/16/2006

DRAWING NUMBER
H-993-4

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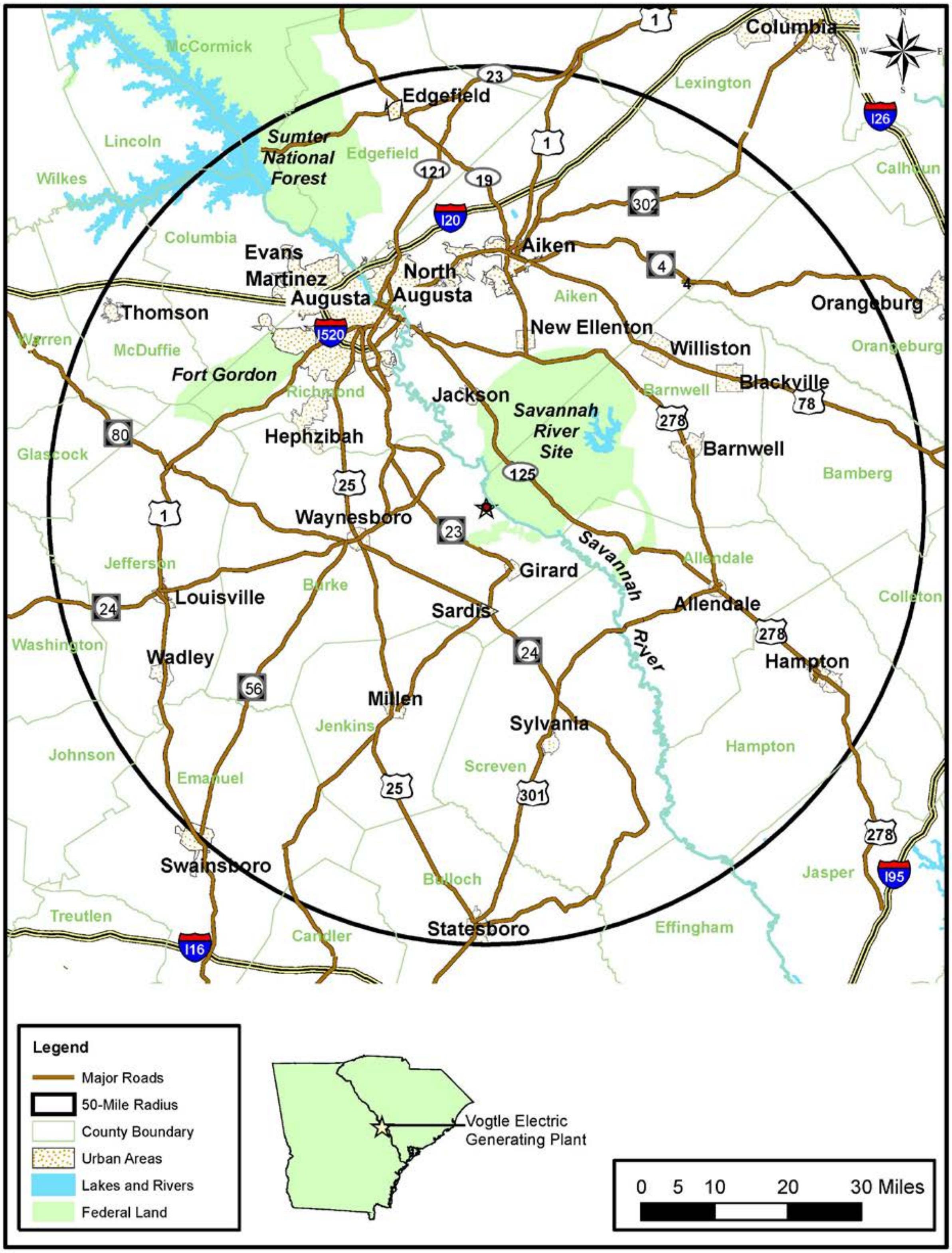
Figure 2

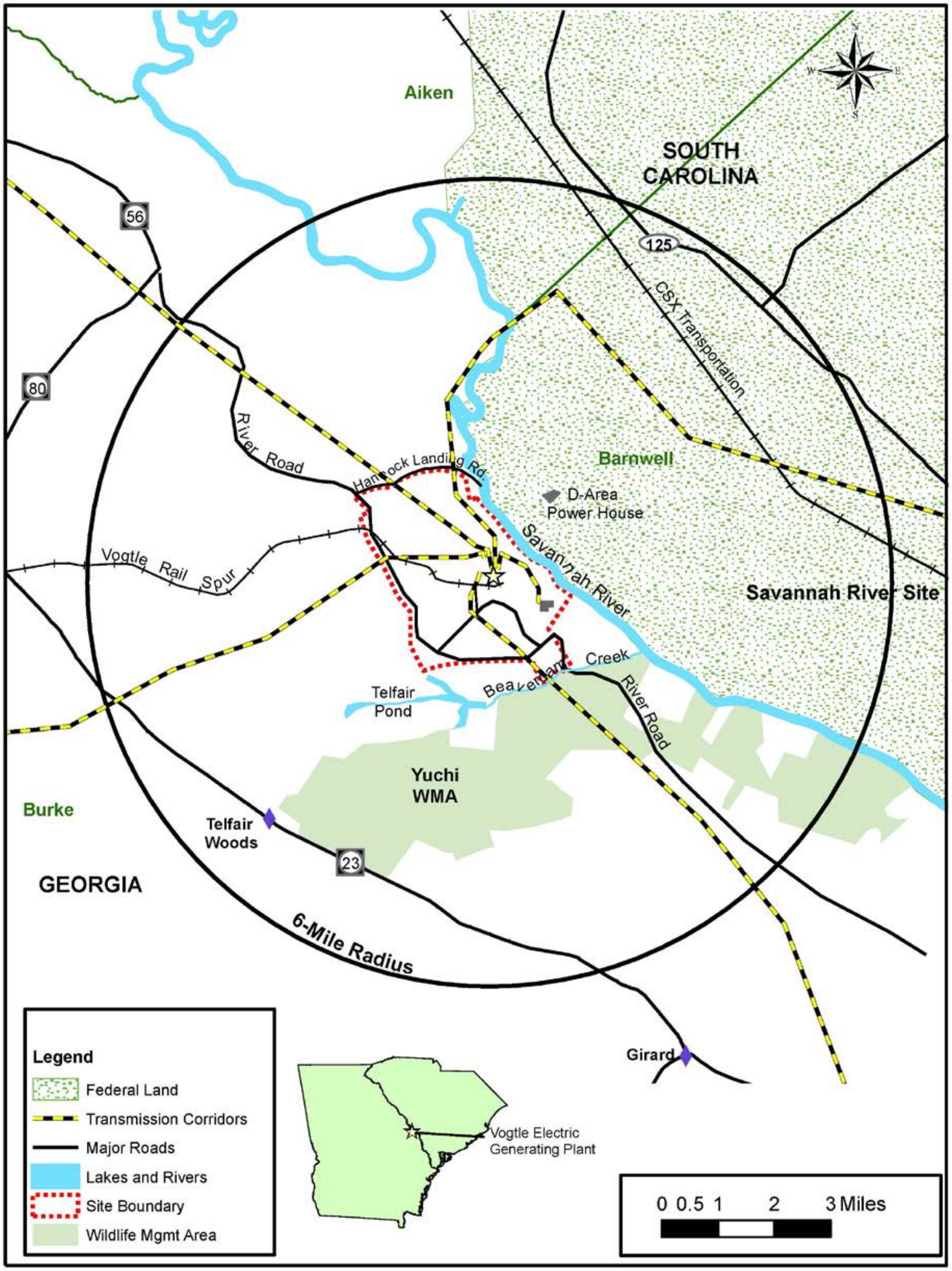
Vogtle Electric Generating Plant
50 Mile Vicinity Map



50-Mile Vicinity

Figure 3

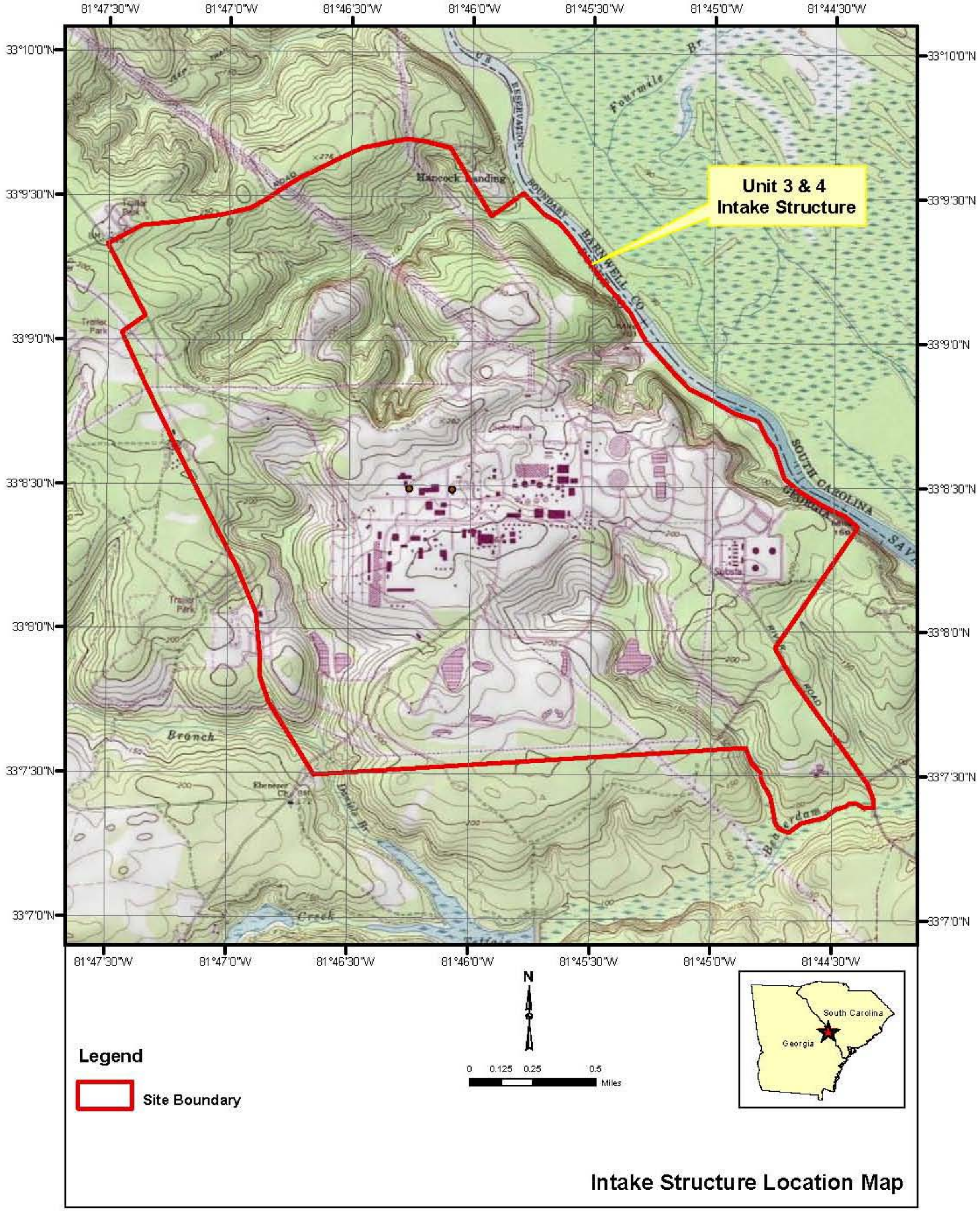
Vogtle Electric Generating Plant
6 Mile Vicinity Map



6-Mile Vicinity

Figure 4

Vogtle Electric Generating Plant Intake Structure Location Map

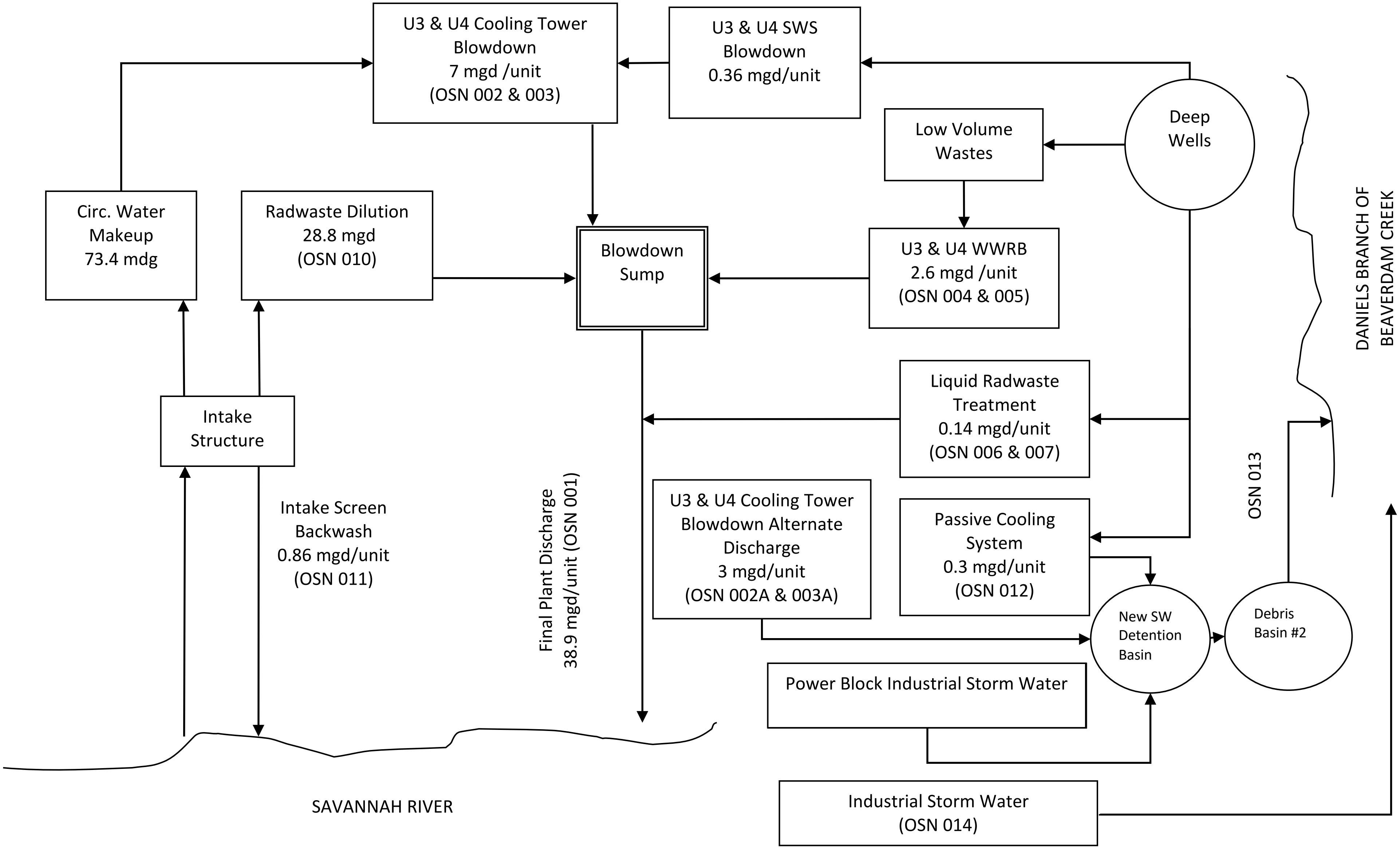


Intake Structure Location Map

Figure 5

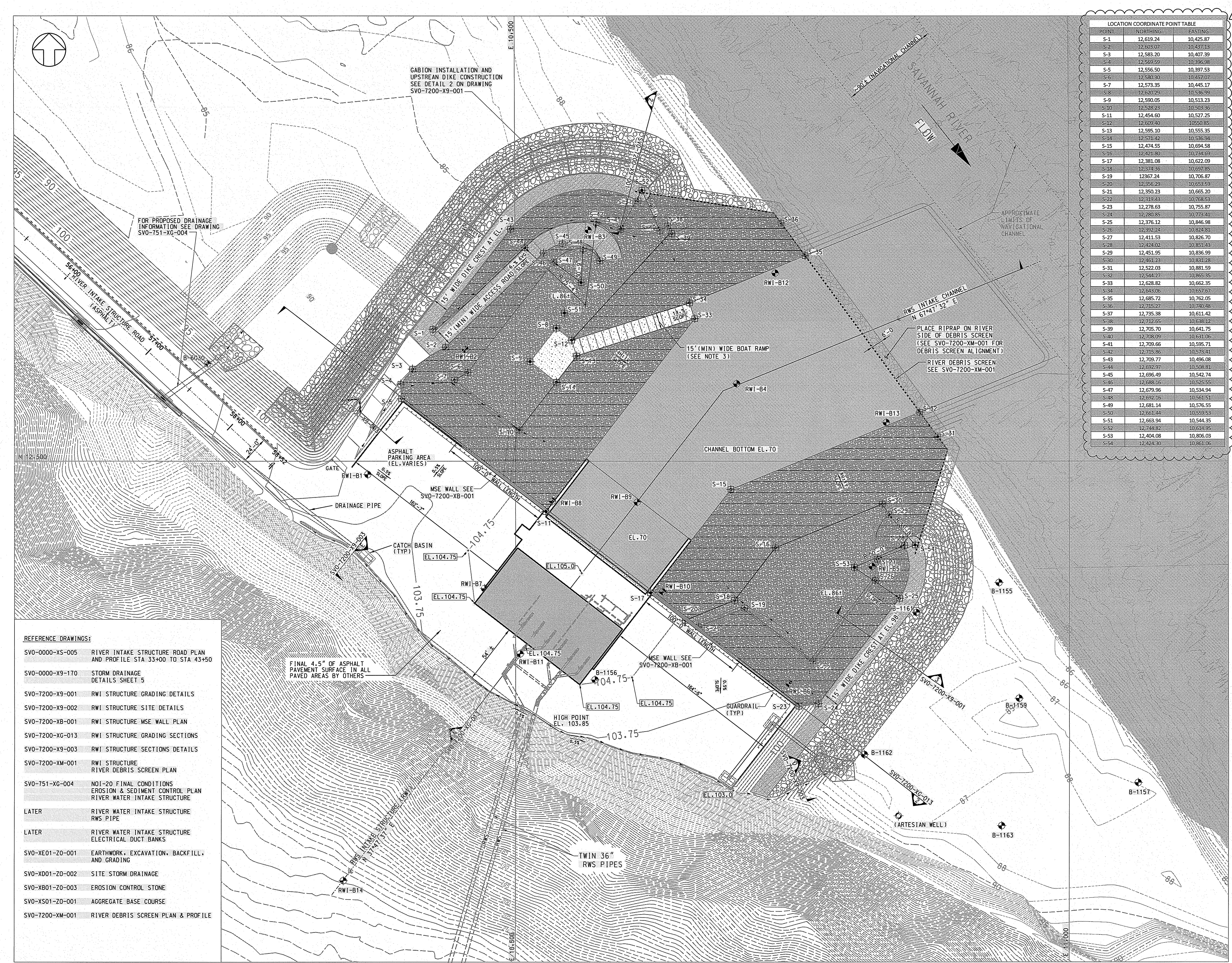
Vogtle Electric Generating Plant Units 3 and 4 Flow Diagram

Vogtle Electric Generating Plant Units 3 and 4 Flow Diagram
NPDES Permit No. GA0039420



Attachment 1

Engineering Drawings of Vogtle Electric Generating Plant – Units 3&4 Cooling Water Intake Structure



LOCATION COORDINATE POINT TABLE		
POINT	NORTHING	EASTING
S-1	12,619.24	10,425.87
S-2	12,603.07	10,437.13
S-3	12,583.20	10,407.39
S-4	12,569.59	10,396.98
S-5	12,556.50	10,397.53
S-6	12,580.30	10,457.07
S-7	12,573.35	10,445.17
S-8	12,620.29	10,536.99
S-9	12,590.05	10,513.23
S-10	12,528.23	10,503.36
S-11	12,454.60	10,527.25
S-12	12,609.40	10550.85
S-13	12,595.10	10,555.35
S-14	12,571.42	10,536.94
S-15	12,474.55	10,694.58
S-16	12,421.80	10,734.69
S-17	12,381.08	10,622.09
S-18	12,374.36	10,697.85
S-19	12367.24	10,706.87
S-20	12,356.29	10,653.59
S-21	12,350.23	10,665.20
S-22	12,319.43	10,768.53
S-23	12,278.63	10,755.87
S-24	12,280.85	10,773.41
S-25	12,376.12	10,846.98
S-26	12,392.24	10,824.81
S-27	12,411.53	10,826.70
S-28	12,424.02	10,851.43
S-29	12,451.95	10,836.99
S-30	12,461.23	10,831.28
S-31	12,522.03	10,881.59
S-32	12,544.27	10,865.35
S-33	12,628.82	10,662.35
S-34	12,643.06	10,657.67
S-35	12,685.72	10,762.05
S-36	12,715.27	10,740.48
S-37	12,735.38	10,611.42
S-38	12,712.65	10,638.12
S-39	12,705.70	10,641.75
S-40	12,708.09	10,631.06
S-41	12,709.66	10,595.71
S-42	12,715.86	10,573.41
S-43	12,709.77	10,496.08
S-44	12,692.97	10,508.81
S-45	12,696.49	10,542.74
S-46	12,688.16	10,525.55
S-47	12,679.96	10,534.94
S-48	12,692.16	10,561.51
S-49	12,681.14	10,576.55
S-50	12,661.44	10,559.53
S-51	12,663.94	10,544.35
S-52	12,744.82	10,614.95
S-53	12,404.08	10,806.03
S-54	12,424.30	10,861.06

LEGEND:

——100——	PROPOSED MAJOR CONTOUR
————	PROPOSED MINOR CONTOUR
- — —100- — —	EXISTING MAJOR CONTOUR
- - - - - -	EXISTING MINOR CONTOUR
-·-·-·-·-	CENTER LINE
————	NEW EDGE OF ROAD
—X—X—X—	EXISTING FENCE LINE
———→	SURFACE WATER FLOW DIRECTION
N 5000.00 E 10000.00	PROPOSED FINAL GRADE SPOT ELEVATION WITH COORDINATE
215.37	PROPOSED FINAL GRADE SPOT ELEVATION
●	EROSION CONTROL RISER PIPE
⊞	PROPOSED STORM WATER INLET
═══	PROPOSED STORMWATER PIPE
═══RWS═══	RAW WATER SYSTEM
B-1163	BORING LOCATION AND ID
S-00	SURGE STONE SLOPE COORDINATE POINT
◎	EXISTING ARTESIAN WELL
▨	CONCRETE
▨	SURGE STONE SLOPE PROTECTION (SEE DETAILS 2 & 3 ON SVO-7200-X9-001)
▨	SURGE STONE SURFACING (SEE DETAILS ON SVO-7200-X9-002)
▨	GRADED AGGREGATE SURFACE (SEE DETAIL 3, SHEET SVO-7200-X9-002)
▨	RIP-RAP (SEE DETAIL 1, SHEET SVO-7200-X9-001)
⊞	GABIONS (SEE DETAIL 2, SHEET SVO-7200-X9-001)
▨	WATER

NOTES

1. ENSURE POSITIVE DRAINAGE SO THAT RUNOFF WILL FLOW BY GRAVITY AWAY FROM BUILDING AND ACROSS BACKFILLED AREAS AND/OR LANDSCAPE AREAS TO NEW OR EXISTING STORM DRAIN INLETS, SWALES OR DITCHES.
2. SUBCONTRACTOR SHALL VERIFY LOCATION OF ALL EXISTING UTILITIES BEFORE BEGINNING CONSTRUCTION.
3. CONCRETE BOAT RAMP SHALL BE 6-INCH THICK WITH SAME JOINT, CONCRETE STRENGTH, SUBGRADE PREPARATION, AND WIRE MESH REINFORCEMENTS AS CONCRETE DITCH SHOWN ON DRAWING SVO-0000-X9-170.
4. COORDINATES LISTED IN THE LOCATION COORDINATE POINT TABLE ARE FOR SURVEY REFERENCE ONLY AND NOT FOR QUANTITY CALCULATIONS.

REFERENCE DRAWINGS:

SVO-0000-XS-005	RIVER INTAKE STRUCTURE ROAD PLAN AND PROFILE STA 33+00 TO STA 43+50
SVO-0000-X9-170	STORM DRAINAGE DETAILS SHEET 5
SVO-7200-X9-001	RWI STRUCTURE GRADING DETAILS
SVO-7200-X9-002	RWI STRUCTURE SITE DETAILS
SVO-7200-XB-001	RWI STRUCTURE MSE WALL PLAN
SVO-7200-XG-013	RWI STRUCTURE GRADING SECTIONS
SVO-7200-X9-003	RWI STRUCTURE SECTIONS DETAILS
SVO-7200-XM-001	RWI STRUCTURE RIVER DEBRIS SCREEN PLAN
SVO-751-XG-004	NOI-20 FINAL CONDITIONS EROSION & SEDIMENT CONTROL PLAN RIVER WATER INTAKE STRUCTURE
LATER	RIVER WATER INTAKE STRUCTURE RWS PIPE
LATER	RIVER WATER INTAKE STRUCTURE ELECTRICAL DUCT BANKS
SVO-XE01-Z0-001	EARTHWORK, EXCAVATION, BACKFILL, AND GRADING
SVO-XD01-Z0-002	SITE STORM DRAINAGE
SVO-XB01-Z0-003	EROSION CONTROL STONE
SVO-XS01-Z0-001	AGGREGATE BASE COURSE
SVO-7200-XM-001	RIVER DEBRIS SCREEN PLAN & PROFILE

0 30' 60' 90'
SCALE: 1" = 30'

SAFETY CLASSIFICATION: E

"REVIEW AND APPROVAL DOCUMENTED PER DAPP 5-15"

REVISION		
0	ISSUED FOR CONSTRUCTION	
1	REVISED LOCATION COORDINATE POINT TABLE	

STONE & WEBSTER, INC.
128 S. TRYON STREET, SUITE 400
CHARLOTTE, NC 28202
704-343-7500

PLANT APPLICABILITY
APPLIES TO ALL AP1000 PLANTS EXCEPT:
NONE
X APPLIES TO THE FOLLOWING AP1000 PLANTS ONLY:
SVO
APPL REVIEWER N/A

STATUS ☐ PRE ☒ CFC ☐ CAE ☐ DES ☐ OPEN ITEMS
DATABASE FILE ID SVO-7200-XG-012.dgn
THIRD ANGLE PROJECTION

P.E. STAMP
GEORGIA REGISTERED No. 34462 PROFESSIONAL ENGINEER CRAIG F HAMM
Craig F Hamm
4-8-11

PREPARER	NP	N.P	4-8-11
CHECKER	KS	RH FOR	4-8-11
REVIEWER	SB (RE)		04-08-11
REVIEWER	RS (CSA)	RS	4-8-011
REVIEWER	CH (CSA)	CH	4-8-11
REVIEWER	JH (CSA)	JH	4-8-11
REVIEWER	JH (CONST)	NA	N/A
APPROVER	PRC (LDE)	PRC	4-8-11
REVIEWER	N/A	PRC	N/A
APPROVED	DS (PE)	GS for DS	4-8-11

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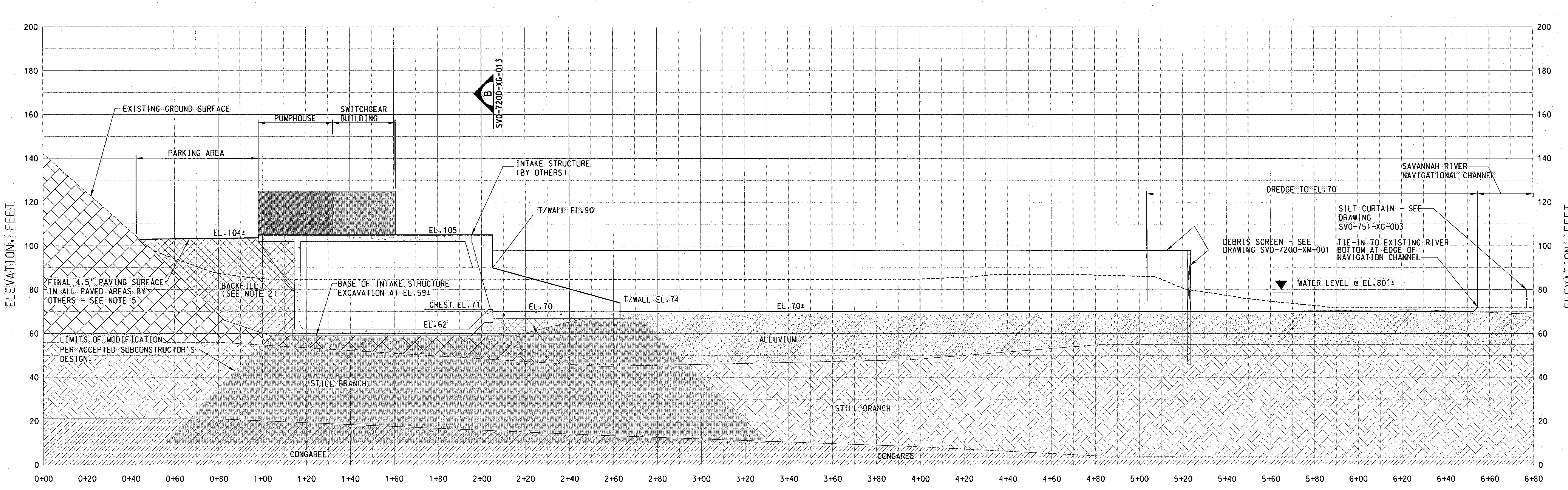
Shaw Stone & Webster, Inc.
AP1000
ADVANCED PASSIVE LIGHT WATER REACTOR
SOUTHERN COMPANY
ALTN DWG NO. N/A SHEET OF

TITLE
VOGTLE ELECTRIC GENERATING PLANT RWI STRUCTURE UNITS 3 & 4 SITE DEVELOPMENT GRADING PLAN

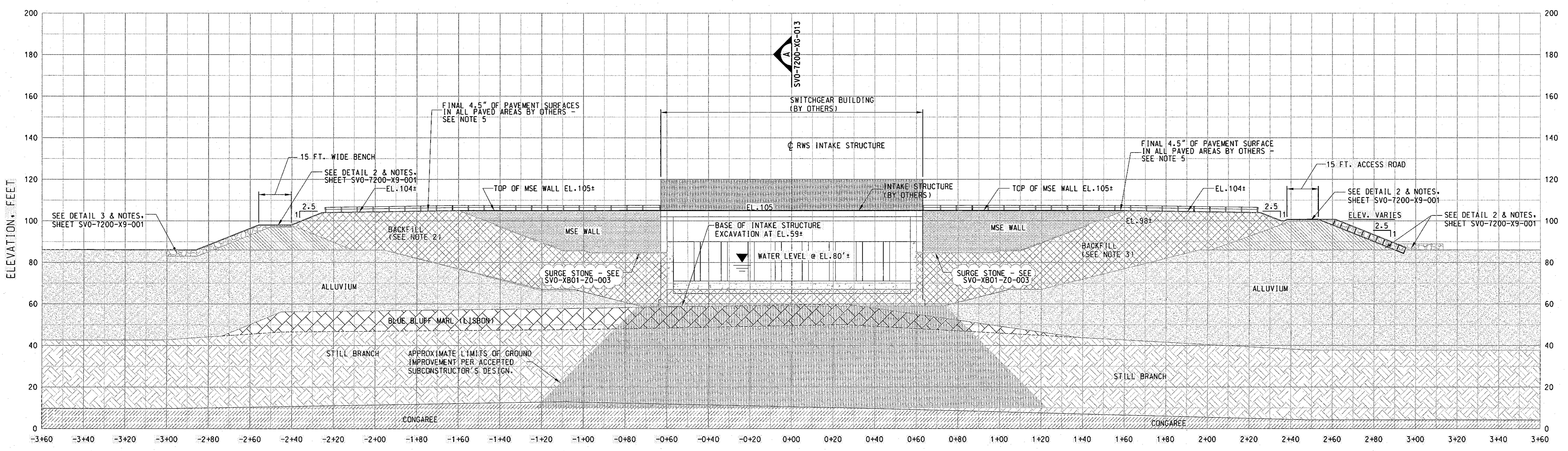
SIZE E
DWG NO. SVO-7200-XG-012
REV. 1
DATE 04-07-11
SCALE 1"= 30'
WEIGHT N/A
SHEET 1 OF 1

nathan.patrick
4/8/2011
11:27:57 AM
c:\projectwise\nuclear\nathan.patrick\dms00925\SV0-7200-XG-012.dgn



SECTION (A) (LOOKING NORTHWEST)

SVO-7200-XG-012



SECTION (B) (LOOKING SOUTHWEST)

SVO-7200-XG-012

LEGEND:

- WATER LEVEL
- ▨ HYDRAULIC BARRIER
- ▨ BACKFILL
- ▨ ALLUVIUM
- ▨ BLUE BLUFF MARL (LISBON)
- ▨ STILL BRANCH
- ▨ CONGAREE
- ▨ SWITCHGEAR BUILDING
- ■ PUMPHOUSE

REFERENCE SPECIFICATIONS:

SVO-XB01-Z0-003	EROSION CONTROL STONE

REFERENCE DRAWINGS:

SVO-7200-A0-001	RWI STRUCTURE SWITCHGEAR AND PUMPHOUSE BUILDING ARCHITECTURAL PLAN AT ELEVATION 105'-0"
SVO-7200-S0-001	RWI STRUCTURE PLAN AT ELEVATION 105'-0" GENERAL ARRANGEMENT
SVO-751-XG-003	NOI-AREA 20 EROSION AND SEDIMENT CONTROL INTERMEDIATE CONDITIONS
SVO-7200-XG-012	RWI STRUCTURE GRADING PLAN
SVO-7200-X9-001	RWI STRUCTURE GRADING DETAILS
SVO-7200-X9-002	RWI STRUCTURE SITE DETAILS
SVO-7200-XM-001	RWI STRUCTURE DEBRIS SCREEN PLAN

NOTES:

1. THE SUBSURFACE STRATUM AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AS INTERPRETED BY THE AVAILABLE BORINGS. THE ACTUAL SUBSURFACE CONDITIONS MAY DIFFER FROM CONDITIONS AS SHOWN.
2. BACKFILL SHALL MEET STRUCTURAL FILL 'B' REQUIREMENTS IN ACCORDANCE WITH SPECIFICATION SVO-XE01-Z0-001.
3. EMBANKMENT FILL SHALL MEET HYDRAULIC BARRIER FILL REQUIREMENTS IN ACCORDANCE WITH SPECIFICATION SVO-XE01-Z0-001.
4. SEE TYPICAL ASPHALT PAVEMENT DETAIL ON SVO-7200-X9-002 FOR SURFACING DETAILS IN AREAS TO BE PAVED WITH ASPHALT PAVEMENT. SUBCONTRACTOR IS RESPONSIBLE FOR PLACEMENT OF GRADED AGGREGATE BUT NOT ASPHALT PAVEMENT COURSE. GRADES SHOWN ON DRAWINGS REPRESENT TOP OF ASPHALT UNLESS OTHERWISE INDICATED.

0 10' 20' 40' 60'
HORIZONTAL SCALE: 1" = 20'

0 10' 20' 40' 60'
VERTICAL SCALE: 1" = 20'

SAFETY CLASSIFICATION: E

CONFIDENTIAL

Shaw Stone & Webster, Inc.

AP1000
ADVANCED PASSIVE LIGHT WATER REACTOR

SOUTHERN COMPANY

ALTN DWG NO. N/A SHEET OF

"REVIEW AND APPROVAL DOCUMENTED PER DAPP 5-15"

0	REVISION ISSUED FOR CONSTRUCTION

STONE & WEBSTER, INC.
128 S. TRYON STREET, SUITE 400
CHARLOTTE, NC 28202
704-343-7500

PLANT APPLICABILITY
APPLIES TO ALL AP1000 PLANTS EXCEPT:
NONE
APPLIES TO THE FOLLOWING AP1000 PLANTS ONLY:
X SVO
APPL REVIEWER N/A

STATUS
☐ PRE ☒ CFC ☐ CAE ☐ DES ☐ OPEN ITEMS
DATABASE FILE ID SVO-7200-XG-013.dgn
THIRD ANGLE PROJECTION

P.E. STAMP
GEORGIA REGISTERED PROFESSIONAL ENGINEER No. 34462 CRAIG F HAMM
Craig F Hamm 3-31-11

PREPARER	NP	N.P.	3-28-11
CHECKER	KS	KS	3/29/11
REVIEWER	SB (RE)		03-23-11
REVIEWER	RS (CSA)	MH FOR RS	3/30/11
REVIEWER	CH (CSA)	CH	3/31/11
REVIEWER	RP (CONST)		03-23-11
REVIEWER	(MECH)		N/A
APPROVER	PRC (LDE)	DW FOR PRC	3/31/11
REVIEWER	N/A		N/A
APPROVED	DS (PE)	DS	3/31/11

TITLE
VOGTLE ELECTRIC GENERATING PLANT
RWI STRUCTURE UNITS 3 & 4
SITE DEVELOPMENT
GRADING SECTIONS

SIZE E | DWG NO. SVO-7200-XG-013 | REV. 0
DATE 03-01-11 | SCALE AS NOTED | WEIGHT N/A | SHEET 1 OF 1

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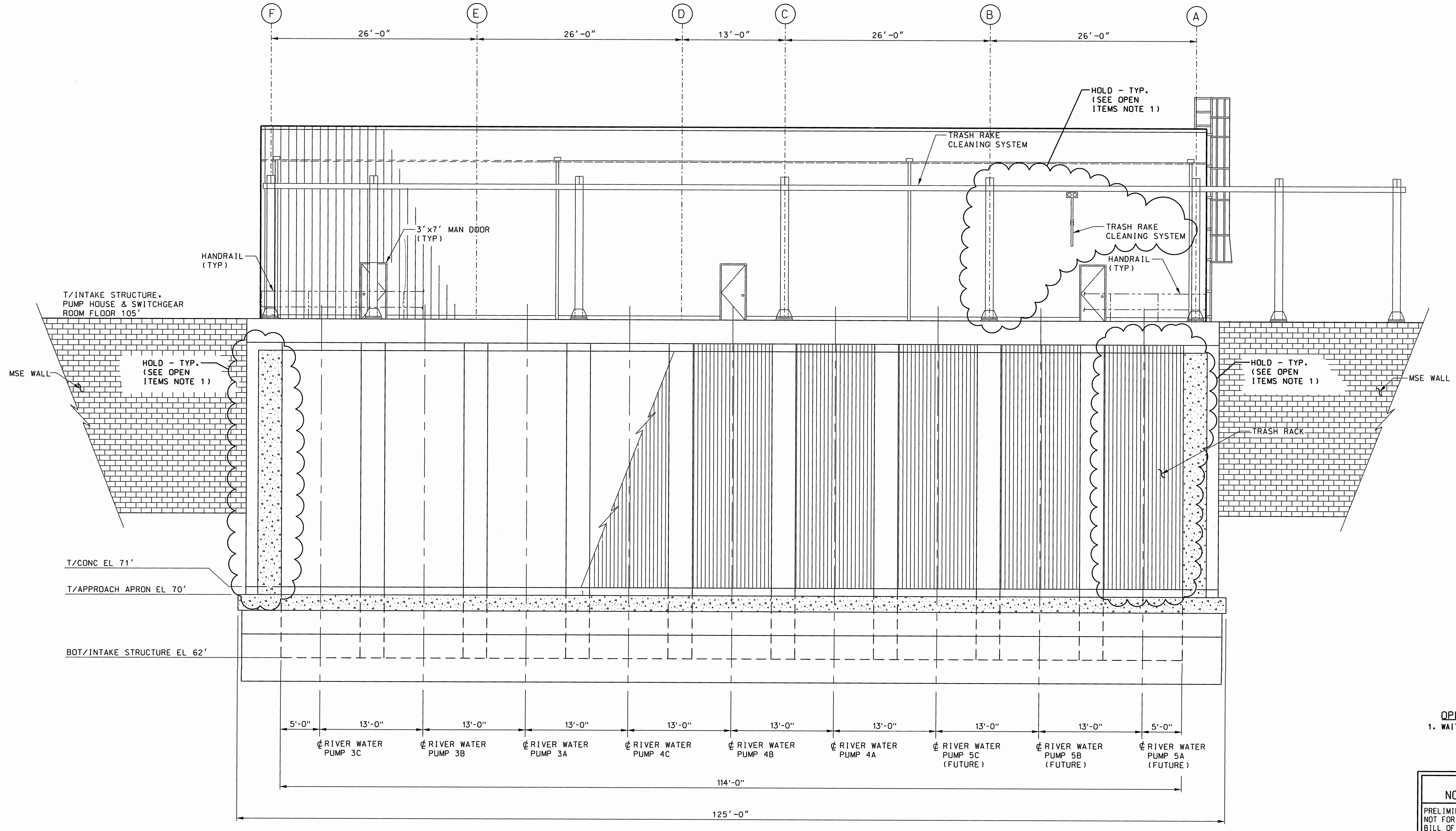

SECTION C SVO-7200-SO-001

0 2' 4' 8' 12' 16'
SCALE: 3/16"=1'-0"

OPEN ITEMS

1. WAITING FOR VENDOR INFORMATION.

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PRELIMINARY REVIEW PACKAGE DRAWINGS ARE NOT FOR CONSTRUCTION OR FABRICATION. BILL OF MATERIALS, SHOP DRAWINGS, ETC., CREATED FROM THESE DRAWINGS MAY BE REVISED AT THE EXPENSE OF THE CONTRACTOR.

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SOUTHERN COMPANY
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THIS DRAWING SUPERSEDES DRAWING NO. SVO-751-SO-006

A	REVISION	ISSUED FOR REVIEW NOT FOR CONSTRUCTION
B		ISSUED FOR 60% REVIEW NOT FOR CONSTRUCTION
C		GENERAL REVISION ISSUED FOR 60% REVIEW A REVISED 60% DRAWING NOT FOR CONSTRUCTION

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PEF003582
128 South Tryon Street, Suite 400
Charlotte, NC 28202
704-343-7500

PLANT APPLICABILITY
APPLIES TO ALL AP1000 PLANTS EXCEPT: NONE
APPLIES TO THE FOLLOWING AP1000 PLANTS ONLY: X SVO
APPL REVIEWER RG

STATUS ☒ PRE ☐ CFC ☐ CAE ☐ DES ☒ OPEN ITEMS
DATABASE FILE ID SVO-7200-SO-004.DGN
THIRD ANGLE PROJECTION

P.E. STAMP

PREPARER	JM	JLM	6/16/10
CHECKER	KS	KS	6-16-10
REVIEWER	RG (RE)	RG	6-16-10
REVIEWER	GG	gg	6/16/10
REVIEWER	(CONST)		6/16/10
REVIEWER	(ELEC)	ODD	6/16/10
REVIEWER	(MECH)		6/16/10
APPROVER	PC (LDE)	PRL	6/16/10
REVIEWER	N/A	PRL	N/A
APPROVED	DS (PE)	JE	6/16/10

TITLE
VOGTLE ELECTRIC GENERATING PLANT
RWI STRUCTURE UNITS 3 & 4
GENERAL ARRANGEMENT
SECTION C

SIZE E
DWG NO. SVO-7200-SO-004
REV. C
DATE 04/26/10
SCALE AS NOTED
WEIGHT N/A
SHEET 1 OF 1

jamie.martin
6/15/2010
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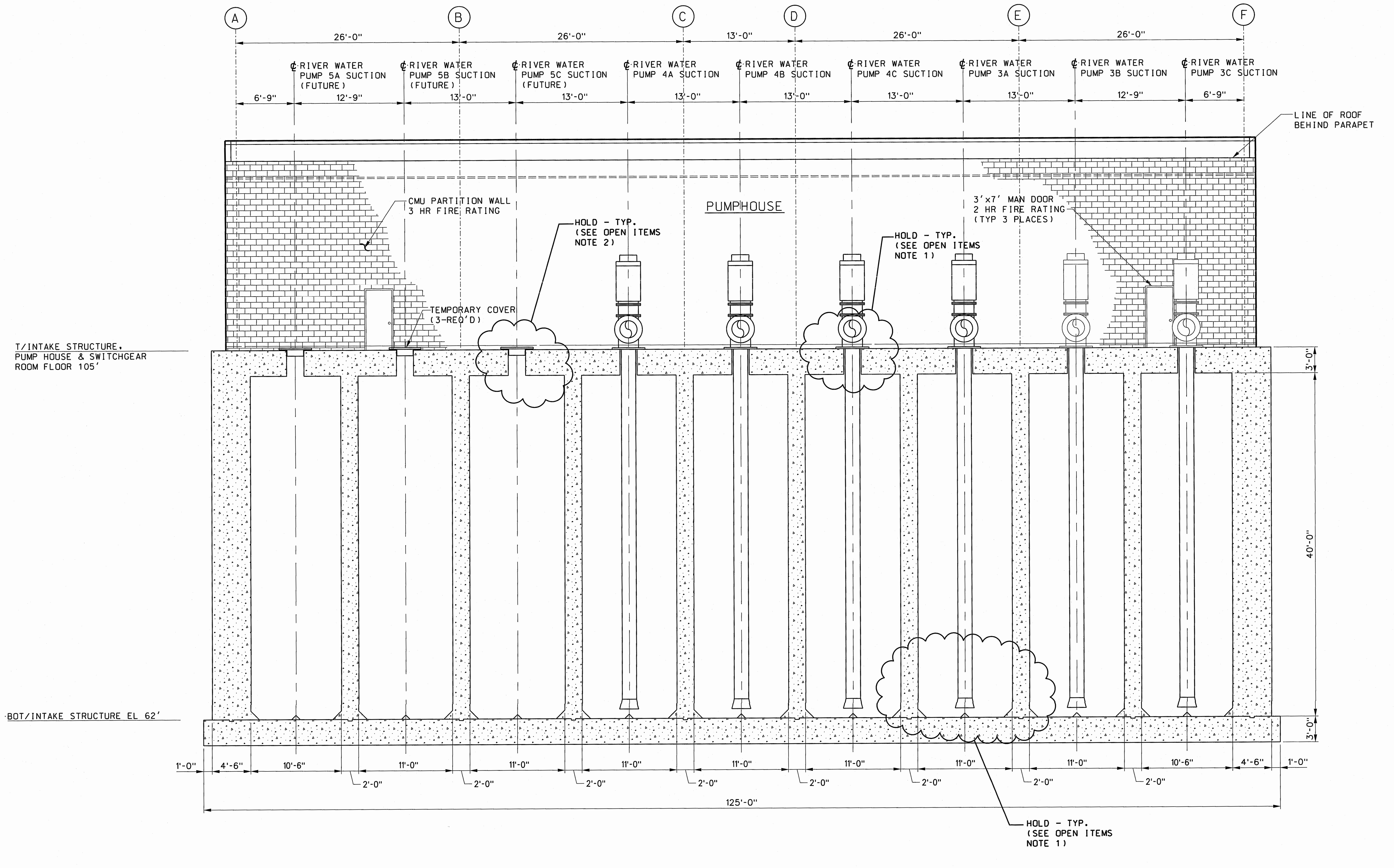

SECTION (B) SVO-7200-SO-001

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SCALE: 3/16"=1'-0"

OPEN ITEMS
1. WAITING FOR VENDOR INFORMATION.
2. DETAIL PF FLOOR PLUG TO BE PROVIDED LATER.

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AP1000
ADVANCED PASSIVE LIGHT WATER REACTOR

SOUTHERN COMPANY

ALTN DWG NO. N/A
SHEET OF

A	REVISION ISSUED FOR REVIEW NOT FOR CONSTRUCTION
B	ISSUED FOR 60% REVIEW NOT FOR CONSTRUCTION
C	GENERAL REVISION ISSUED FOR 60% REVIEW A REVISED 60% DRAWING NOT FOR CONSTRUCTION

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128 SOUTH TRYON STREET, SUITE 400
CHARLOTTE, NC. 28202
704-343-7500 RJA

PLANT APPLICABILITY
APPLIES TO ALL AP1000 PLANTS EXCEPT:
NONE
APPLIES TO THE FOLLOWING AP1000 PLANTS ONLY:
X SVO
APPL REVIEWER RG

STATUS ☒ PRE ☐ CFC ☐ CAE ☐ DES ☒ OPEN ITEMS
DATABASE FILE ID SVO-7200-SO-003.DGN
THIRD ANGLE PROJECTION

P.E. STAMP

PREPARER	JM	JGM	6/17/10
CHECKER	KS	KJ	6-17-10
REVIEWER	RG (RE)		6/17/10
REVIEWER	GG		6/17/10
REVIEWER	(CONST)		6/17/10
REVIEWER	(ELEC)		6/17/10
REVIEWER	(MECH)		6/17/10
APPROVER	PC (LDE)	PRC	6/17/10
REVIEWER	N/A		N/A
APPROVED for	DS (PE)	JE	6/17/10

TITLE
VOGTLE ELECTRIC GENERATING PLANT
RWI STRUCTURE UNITS 3 & 4
GENERAL ARRANGEMENT
SECTION B

SIZE E
DWG NO. SVO-7200-SO-003
REV. C
DATE 04/26/10
SCALE AS NOTED
WEIGHT N/A
SHEET 1 OF 1

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6/17/2010
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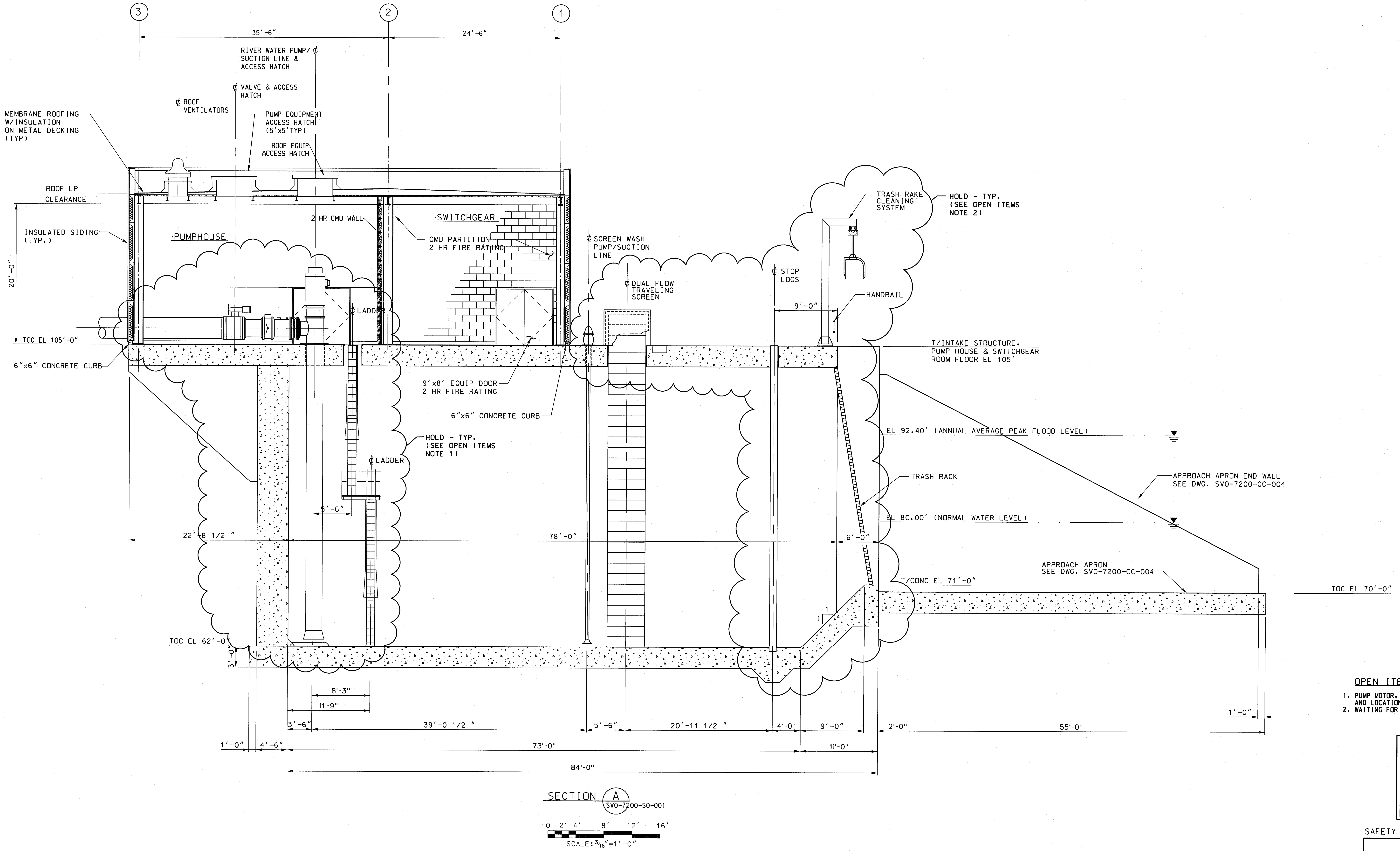

SECTION A
SV0-7200-S0-001

OPEN ITEMS

1. PUMP MOTOR, PUMP VALVE, PIPE SUPPORT, SIZES, LADDERS AND LOCATION HAVE NOT BEEN DETERMINED.
2. WAITING FOR VENDOR / MECHNICAL INFORMATION.

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AP1000
ADVANCED PASSIVE LIGHT WATER REACTOR
SOUTHERN COMPANY
ALTN DWG NO. N/A
SHEET OF

THIS DRAWING SUPERSEDES DRAWING NO. SVO-751-SO-004

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Charlotte, NC 28202
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PLANT APPLICABILITY
APPLIES TO ALL AP1000 PLANTS EXCEPT:
NONE
X APPLIES TO THE FOLLOWING AP1000 PLANTS ONLY:
SVO
APPL REVIEWER RG

STATUS
☒ PRE ☐ CFC ☐ CAE ☐ DES ☒ OPEN ITEMS
DATABASE FILE ID SVO-7200-SO-002.DGN
THIRD ANGLE PROJECTION

P.E. STAMP

PREPARER	JM	JGM	6/16/10
CHECKER	KS	KS	6-16-10
REVIEWER	RG (RE)	MM	6-16-10
REVIEWER	GG		6/16/10
REVIEWER	(CONST)		6/16/10
REVIEWER	(ELEC)		6/16/10
REVIEWER	(MECH)		6/16/10
APPROVER	PC (LDE)	PCL	6/16/10
REVIEWER	N/A	PCL	N/A
APPROVED	DS (PE)	JE	6/16/10

TITLE
VOGTLE ELECTRIC GENERATING PLANT
RWI STRUCTURE UNITS 3 & 4
GENERAL ARRANGEMENT
SECTION A

SIZE E
DWG NO. SVO-7200-SO-002
REV. C
DATE 04/26/10
SCALE AS NOTED
WEIGHT N/A
SHEET 1 OF 1

jamie.martin
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Attachment 2

A List of Publications Relating to Aquatic Communities of Middle Reaches of Savannah River, including Savannah River Site Tributaries

A List of Publications Relating to Aquatic Communities of Middle Reaches of Savannah River, including Savannah River Site Tributaries

The following is a list of publications relating to aquatic communities of middle reaches of Savannah River, including Savannah River Site tributaries. Many of these can be properly characterized as field studies.

Academy of Natural Sciences of Philadelphia (ANSP). 1953. Savannah River biological survey, South Carolina and Georgia, June 1951-May 1952. Final Report for E. I. du Pont de Nemours and Company Savannah River Plant. Acad. Nat. Sci. Phila.

Academy of Natural Sciences of Philadelphia (ANSP). 1957. Savannah River biological survey, South Carolina and Georgia, August-September 1955, May 1956. Progress Report for E.I. du Pont de Nemours and Company Savannah River Plant. Acad. Nat. Sci. Phila. 210 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1961. Savannah River biological survey, South Carolina and Georgia, May-June and August-September 1960 for the E. I. du Pont de Nemours and Company. Acad Nat. Sci. Phila.

Academy of Natural Sciences of Philadelphia (ANSP). 1966. Savannah River biological survey, South Carolina and Georgia, May-June and September, 1965, for the E. I. du Pont de Nemours and Company. Mad. Nat. Sci. Phila. 112 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1970. Savannah River biological survey, South Carolina and Georgia, May and August 1968 for the E. I. du Pont de Nemours and Company. Acad. Nat. Sci. Phila. 130 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1974. Savannah River biological survey, South Carolina and Georgia, May and September 1972 for the E. I. du Pont de Nemours and Company. Acad. Nat. Sci. Phila. 173 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1977. Savannah River biological survey South Carolina and Georgia. August 1976 for the E. I. du Pont de Nemours and Company. Rept. No. 77-37. Acad. Nat. Sci. Phila. 118 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1980. Savannah River Cursory Surveys for E. I. du Pont de Nemours & Company 1979. Report No. 80-5. Acad: Nat. Sci. Phila.

Academy of Natural Sciences of Philadelphia (ANSP). 1981. Savannah River biological surveys, South Carolina and Georgia, June and September 1980 for the E. I. du Pont de Nemours Company. Rept. No. 8 1-14. Acad. Nat. Sci. Phila. 128 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1985. Savannah River Biological Surveys, June and September 1984 for E. I. du Pont de Nemours & Company. Report No. 85-14. Acad. Nat. Sci. Phila. 173 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1990. 1988 Savannah River biological survey in the vicinity of Georgia Power and Light’s Vogtle Nuclear Power Plant site for E. I. du Pont de Nemours & Company. Rept. No. 89-17F. 128 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1991a. 1990 Savannah River biological survey in the vicinity of Georgia Power and Light’s Vogtle Nuclear Power Plant site for Westinghouse Savannah River Company. Rept. No. 91-18F. 151 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1991b. Savannah River biological surveys, June and September 1989 for Westinghouse Savannah River Company. Rept. No. 90-25F. Acad. Nat. Sci. Phila. 221 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1992c. 1991 Savannah River biological survey in the vicinity of Georgia Power and Light's Vogtle Nuclear Power Plant Site for Westinghouse Savannah River Company. Report No. 92-27F. Acad. Nat. Sci. Phila. 169 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1993. Savannah River cursory surveys for Westinghouse Savannah River Company 1992. Report No. 93-8F. Acad. Nat. Sci. Phila. 93 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1993. Spawning and nursery use of the Savannnah River Swamp by fishes and effects of the 1992 K-Reactor power ascension test. Report 93-7F for Westinghouse Savannah River Co.

Academy of Natural Sciences of Philadelphia (ANSP). 1994a. 1993 Savannah River biological survey in the vicinity of Georgia Power and Light's Vogtle Nuclear Power Plant site for Westinghouse Savannah River Company. Rept. No. 94-9F. 188 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1994b. Savannah River biological surveys 1993 for Westinghouse Savannah River Company. Rept. No. 94-14F. 341 pp.

Academy of Natural Sciences of Philadelphia (ANSP). 1995. 1994 Savannah River biological survey in the vicinity of Georgia Power and Light's Vogtle Nuclear Power Plant site. Rept. No. 95-11F for Westinghouse Savannah River Company.

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Academy of Natural Sciences of Philadelphia (ANSP). 1997. 1996 Savannah River biological surveys for Westinghouse Savannah River Company. Rept. No. 97-14F. 336 pp.

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Attachment 3

Tables 3-1, 3-8 and 6-1 From *Distribution and Abundance of Ichthyoplankton in the Mid-Reaches of the Savannah River and Selected Tributaries (Paller et. al. 1986).*

Table 3-1. Number and percent composition of larval fish entrained at 1G, 3G and 5G pumphouses. February - July 1983.

	Pumphouse				
Taxa	1G (x 1000)	3G (x 1000)	5G (x 1000)	Total (x 1000)	Percent compo-sition
Clupeidae					
American shad	90	80	4	174	0.6
blueback herring	1434	1146	68	2648	9.~~4~~5
other shad	4315	5782	365	10462	37.~~3~~4
unident. clupeids	1641	1572	90	3303	11.8
Esocidae					
unident. pickerel	129	53	9	191	0.7
Cyprinidae					
carp	26	80	17	123	0.4
unident. cyprinids	814	1026	690	2530	9.0
Catostomidae					
spotted sucker	853	573	237	6 1~~7~~63	5.9 ~~6.3~~
other suckers		13	20	33	0.1
Ictaluridae					
unident. catfish		13		13	0.05
Aphredoderidae					
pirate perch	388	400	28	816	2.9
Atherinidae					
brook silverside			7	7	0.02
Percichthyidae					
striped bass	13		2	15	0.05
Centrarchidae					
unident. crappie	2170	1599	184	3953	14.1
unident. sunfish	233	40	2	275	1.0
other centrarchids	129	133	7	269	1.0
Percidae					
yellow perch	142	320	33	495	1.8
other percids	388	187	52	627	2.2
Other	129	213	26	368	1.3
Total				~~28,065~~ 27965	100.02

Table 3-8. Number and percent composition of egg entrainment at 1G, 3G and 5G pumphouse. February - July 1983.

Taxa	Pumphouse 1G (x 1000)	 3G (x 1000)	 5G (x 1000)	Total (x 1000)	Percent composition
American shad	3275	1885	333	5493	58.6
blueback herring	17	65	12	94	1.0
striped bass		1053	186	1239	13.2
perch	111	53	9	173	1.8
other eggs	1184	1016	179	2379	25.4
Total				9378	100.0

Table 6-1. Total number and relative abundance of fish species impinged at 1G, 3G and 5G pumphouses. September 1982 - August 1983.

Taxa	Total Number	Percent Abundance
Atlantic sturgeon	1	0.03
bowfin	8	0.22
American eel	17	0.47
blueback herring	21	0.58
hickory shad	13	0.36
American shad	4	0.11
gizzard shad	188	5.22
threadfin shad	305	8.46
unidentified clupeid	3	0.08
redfin pickerel	26	0.72
chain pickerel	16	0.44
unidentified pickerel	3	0.08
spottail shiner	68	1.89
golden shiner	6	0.17
ohoopee shiner	1	0.03
coastal shiner	1	0.03
bannerfin shiner	1	0.03
pugnose minnow	1	0.03
unidentified minnow	5	0.14
unidentified cyprinid	2	0.06
creek chubsucker	1	0.03
lake chubsucker	12	0.33
chubsucker	2	0.06
spotted sucker	8	0.22
unidentified catostomid	4	0.11
white catfish	23	0.64
channel catfish	15	0.42
snail bullhead	6	0.17
flat bullhead	35	0.97
brown bullhead	3	0.08
yellow bullhead	6	0.17
unidentified ictalurid	24	0.65
tadpole madtom	2	0.06
speckled madtom	1	0.03
pirate perch	99	2.75
mudminnow	2	0.06
flier	177	4.91

Table 6-1 (continued). Total number and relative abundance of fish species impinged at 1G, 3G and 5G pumphouses. September 1982 - August 1983.

Taxa	Total Number	Percent Abundance
warmouth	234	6.49
redbreast sunfish	211	5.85
pumpkinseed	65	1.80
bluegill	67	1.86
redear sunfish	34	0.94
spotted sunfish	96	2.66
bluespotted sunfish	1259	34.93
mud sunfish	25	0.69
banded sunfish	33	0.92
dollar sunfish	51	1.42
unidentified sunfish	4	0.11
largemouth bass	8	0.22
white crappie	8	0.22
black crappie	108	3.00
unidentified crappie	1	0.03
unidentified centrarchid	166	4.61
unidentified killifish	2	0.06
mosquito fish	5	0.14
blackbanded darter	7	0.19
tesselated darter	1	0.03
yellow perch	26	0.72
hogchoker	84	2.33
Total	3,604	100.03

Attachment 4

Tables V-4.65, V-4.72 through V-4.77 From the *Comprehensive Cooling Water Study* (Du Pont 1987)

TABLE V-4.65

Percent Abundance and Average Density (no./1,000 m^3) of Fish Larvae and Eggs Collected from the Savannah River Tributaries, Oxbows, and the Savannah River Canals (February-July 1985)

	River*		Creeks**		Oxbows†		Intake Canals††	
Taxa	Percent Abundance	Density	Percent Abundance	Density	Percent Abundance	Density	Percent Abundance	Density
Sturgeon	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0
Gar	0.0	0.0	0.0	0.0	0.0	0.0	0.2	<0.1
Unid. Clupeidae	3.3	2.2	8.3	3.9	14.9	65.5	10.1	5.0
Blueback herring	2.2	1.4	19.3	10.2	5.9	27.6	3.5	1.0
American shad	50.8	37.8	13.0	10.3	0.7	3.4	1.7	1.4
Gizzard and/or threadfin shad	9.9	7.1	6.5	4.2	47.6	221.6	18.5	12.0
Mudminnow	0.0	0.0	<0.1	<0.1	0.0	0.0	0.0	0.0
Pickerel	<0.1	<0.1	0.2	0.1	0.0	0.0	0.2	<0.1
Needlefish	<0.1	<0.1	0.0	0.0	0.0	0.0	0.0	0.0
Minnow (Cyprinidae)	3.7	2.2	1.2	0.5	<0.1	0.1	3.1	1.3
Carp	4.6	3.1	0.0	0.0	<0.1	0.2	9.1	6.5
Unid. sucker	0.4	0.3	0.5	0.5	0.0	0.0	0.3	0.3
Spotted sucker	8.1	8.4	0.0	9.1	<0.1	0.2	41.7	23.4
Catfish and/or			14.1					
bullhead	<0.1	<0.1	<0.1	<0.1	0.0	0.0	<0.1	0.2
Swampfish	<0.1	<0.1	0.0	0.0	0.0	0.0	<0.1	<0.1
Pirate perch	0.1	0.1	<0.1	<0.1	0.0	0.0	0.0	0.6
Topminnow	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.0	0.0
Mosquitofish	<0.1	<0.1	0.0	0.0	<0.1	0.2	0.0	0.0
Brook silverside	0.1	<0.1	3.9	2.5	0.2	0.6	0.4	0.1
Striped bass	5.4	3.7	0.1	<0.1	0.1	0.2	5.6	1.8
Unid. sunfish	0.3	0.3	1.8	0.9	1.8	8.8	0.3	0.2
Sunfish (<u>Lepomis</u>)	0.7	0.4	11.4	5.6	18.9	87.7	0.2	0.2
Crappie	0.3	0.2	0.9	0.5	2.8	14.5	0.5	0.1
Darter	0.7	1.0	12.1	7.0	2.5	11.5	3.0	1.0
Yellow perch	0.2	0.1	0.8	0.4	3.6	18.4	0.0	0.1
Unid. larvae	9.2	6.4	14.3	8.9	1.0	4.8	1.8	1.5
Unid. eggs								
Total	99.9	74.8	100.0	64.6	100.1	465.4	100.2	56.7
Number larvae and eggs collected	22,698		2,050		10,322		605	

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* Twenty-one transects between RM 89.3 and 187.1.

** Mouths of 17 tributary creeks.

† Five oxbows.

†† 1G (RM 157.1) and 3G (RM 155.3) intake canals.

Source: Paller et al., 1986b.

TABLE V-4.72

Mean Ichthyoplankton Densities (no./1,000 m^3) and Temperatures (°C) in the Savannah River During February 1984

River Mile	Temp. (°C)	American Shad	Blue back Herring	Striped Bass	Other Shad*	Unid. Cyprinids	Sunfish	Crappie	Total Ichthyo-plankton**
					Lower Farfield				
29.6	9.6	0.2	0.0	0.0	0.0	0.0	0.0	0.7	1.3
40.2	9.4	0.5	0.0	0.0	0.0	0.0	0.0	2.3	5.3
50.2	9.6	0.0	0.0	0.0	0.0	0.0	0.8	2.2	3.1
60.0	9.4	0.0	0.0	0.0	0.0	0.0	0.6	3.9	6.2
69.9	9.2	0.0	0.0	0.0	0.0	0.0	0.4	0.9	4.4
79.9	9.2	0.0	0.0	0.0	0.0	0.0	0.0	1.7	3.0
89.3	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.8	2.0
97.5	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.0
110.0	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.0
120.0	8.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
					Nearfield				
128.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
129.1	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8
137.7	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9
141.5	9.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.9
141.7	9.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
150.4	9.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
150.8	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
152.0	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
152.2	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
155.2	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
155.3	9.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
155.4	9.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
157.0	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
157.1	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
157.3	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
					Upper Farfield				
166.6	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
176.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
187.1	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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* Gizzard and threadfin shad.

** Totals include taxa shown plus not shown.

Source: Paller et al., 1985.

TABLE V-4.73

Mean Ichthyoplankton Densities (no./1,000 m^3) and Temperatures (°C) in the Savannah River During March 1984

River Mile	Temp. (°C)	American Shad	Blue-back Herring	Striped Bass	Other Shad*	Unid. Cyprinids	Sunfish	Crappie	Total Ichthyo-plankton**
Lower Farfield									
29.6	14.5	1.7	1.7	0.0	0.0	1.4	9.2	25.0	52.6
40.2	14.5	2.6	2.9	0.0	0.6	0.0	3.7	36.6	51.4
50.2	14.5	2.3	2.3	0.0	0.0	0.3	1.3	13.2	25.8
60.0	14.1	1.5	10.3	0.0	0.0	0.0	1.1	42.1	62.0†
69.9	13.8	1.4	3.1	0.0	0.0	2.4	1.9	16.2	32.1††
79.9	13.8	2.2	6.7	0.0	0.0	0.0	0.6	13.2	30.7
89.3	14.1	2.7	3.4	0.0	0.0	0.3	0.8	11.0	31.4
97.5	13.9	5.5	15.8	0.0	0.7	0.0	0.0	11.0	43.0
110.0	13.2	0.9	4.3	0.0	0.8	0.3	0.0	8.5	27.0
120.0	13.1	2.3	2.2	0.0	0.0	1.5	0.2	3.0	22.5
Nearfield									
128.9	13.1	1.1	1.1	0.0	0.0	0.0	0.2	6.7	21.6
129.1	13.1	1.1	1.3	0.0	0.0	2.9	0.3	6.0	17.5
137.7	12.8	0.6	0.3	0.0	0.0	0.7	0.7	10.9	19.5
141.5	12.6	0.7	0.9	0.0	0.0	0.0	0.3	14.7	22.2
141.7	12.4	1.8	0.0	0.0	0.0	0.0	0.0	21.9	32.0
150.4	12.5	0.0	1.1	0.0	0.0	0.0	0.8	18.4	25.4
150.8	12.4	0.3	0.0	0.0	0.3	0.4	0.4	16.8	23.2
152.0	12.5	0.0	0.0	0.0	0.0	0.0	1.5	14.3	17.7
152.2	12.5	0.3	0.0	0.0	0.0	0.0	1.3	9.5	12.9
155.2	12.3	0.3	0.0	0.0	0.0	0.0	0.0	15.2	16.4
155.3	12.5	0.0	1.7	0.0	0.0	0.0	0.6	41.2	54.3¶
155.4	12.3	0.3	0.7	0.0	0.0	0.0	0.9	15.8	20.4
157.0	11.7	0.0	0.0	0.0	0.0	0.0	0.7	18.7	22.8
157.1	12.4	0.0	0.0	0.0	0.0	0.0	0.7	31.6	37.0
157.3	11.4	0.9	0.6	0.0	0.0	0.3	0.0	19.9	22.7
Upper Farfield									
166.6	11.7	0.4	0.0	0.0	0.0	0.0	0.0	3.1	5.3
176.0	11.5	0.2	0.0	0.0	0.0	0.0	0.0	1.5	2.4
187.1	11.2	0.0	0.0	0.0	0.0	0.0	0.4	1.0	2.1

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* Gizzard and threadfin shad.
** Totals include taxa shown plus taxa not shown.
† Significantly different ($p < 0.0019$) from RM 50.2.
†† Significantly different ($p < 0.0019$) from RM 60.0.
¶ Significantly different ($p < 0.0019$) from RM 155.2

Source: Paller et al., 1985.

TABLE V-4.74

Mean Ichthyoplankton Densities (no./1,000 m^3) and Temperatures (°C) in the Savannah River During April 1984

River Mile	Temp. (°C)	American Shad	Blue-back Herring	Striped Bass	Other Shad*	Unid. Cyprinids	Sunfish	Crappie	Total Ichthyo-plankton**
Lower Farfield									
29.6	17.1	5.4	0.4	0.0	1.5	2.0	6.5	2.3	22.9
40.2	16.6	5.2	1.0	0.0	1.3	4.0	8.7	8.1	37.9
50.2	16.4	6.2	2.1	0.0	0.6	8.5	4.2	6.5	33.9
60.0	16.5	4.7	2.8	0.0	0.0	4.6	1.2	8.9	26.5
69.9	16.2	3.1	0.9	0.0	2.0	14.1	3.3	5.6	42.6
79.9	16.1	3.8	3.2	0.0	0.9	9.2	0.0	2.3	25.7
89.3	15.9	15.6	2.4	0.0	0.3	19.6	2.8	0.4	51.3†
97.5	15.7	23.0	5.5	0.0	1.2	6.0	0.7	1.9	50.4
110.0	16.0	20.8	2.4	0.0	0.0	9.2	0.5	3.3	45.3
120.0	15.8	21.8	1.4	0.0	0.0	12.4	0.6	2.0	49.4
Nearfield									
128.9	15.8	13.7	1.1	0.0	1.4	5.9	2.4	3.1	35.7
129.1	15.8	13.6	0.6	0.0	0.0	5.6	1.7	4.7	35.4
137.7	15.5	27.6	2.0	0.0	0.0	6.2	4.5	6.8	61.6††
141.5	15.5	24.0	5.1	0.0	1.8	6.6	6.7	15.3	76.9
141.7	15.4	32.0	0.9	0.0	0.0	4.3	7.1	5.8	56.6
150.4	15.2	7.6	2.9	0.0	0.0	0.7	4.5	5.8	31.2
150.8	14.9	6.4	1.5	0.0	0.0	0.6	1.3	6.2	29.7
152.0	14.8	11.6	2.3	0.0	0.0	0.0	1.5	8.9	32.9
152.2	14.7	20.0	0.6	0.0	0.0	0.3	0.0	7.0	45.0
155.2	14.3	24.8	1.7	0.0	0.6	0.6	0.0	5.1	43.3
155.3	14.6	0.0	1.6	0.0	0.0	1.1	0.0	11.1	23.3
155.4	14.4	14.9	0.3	0.0	0.3	0.3	0.0	8.4	35.5
157.0	14.4	25.4	1.4	0.0	0.6	0.7	0.9	5.2	57.5
157.1	14.7	0.0	6.1	0.0	0.0	0.6	1.0	10.6	25.3¶
157.3	14.4	20.8	1.6	0.0	0.3	0.0	2.1	5.9	48.5
Upper Farfield									
166.6	14.4	3.2	2.9	0.0	0.6	0.2	0.0	0.0	15.4¶¶
176.0	14.1	2.1	0.5	0.0	0.5	1.9	0.7	0.0	10.3
187.1	13.9	0.0	0.0	0.0	0.4	0.8	0.0	0.3	5.1

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* Gizzard and threadfin shad.
** Totals include taxa shown taxa plus not shown.
† Significantly different ($p < 0.0019$) from RM 79.9.
†† Significantly different ($p < 0.0019$) from RM 129.1.
¶ Significantly different ($p < 0.0019$) from RM 157.0.
¶¶ Significantly different ($p < 0.0019$) from RM 157.3.

Source: Paller et al., 1985.

TABLE V-4.75

Mean Ichthyoplankton Densities (no./1,000 m^3) and Temperatures (°C) in the Savannah River During May 1984

River Mile	Temp. (°C)	American Shad	Blue-back Herring	Striped Bass	Other Shad*	Unid. Cyprinids	Sunfish	Crappie	Total Ichthyo-plankton**
Lower Farfield									
29.6	20.7	0.0	1.6	0.0	10.7	1.8	32.0	4.1	62.7
40.2	20.5	0.2	1.3	0.0	13.1	1.3	32.8	5.3	75.6
50.2	20.3	1.5	1.1	0.0	15.9	6.3	55.4	8.0	107.7
60.0	20.5	1.3	2.0	0.0	22.8	4.9	23.4	8.5	81.5
69.9	20.3	0.3	1.4	0.0	18.6	2.1	11.1	9.4	58.2
79.9	19.9	2.1	5.6	0.0	20.9	3.4	5.9	6.8	72.5
89.3	19.8	2.6	0.4	3.0	8.9	1.1	10.3	2.5	37.2
97.5	19.8	8.3	4.3	3.6	56.7	10.6	17.3	15.8	145.3†
110.0	19.8	21.6	1.2	8.0	4.7	18.1	20.8	10.8	102.6
120.0	19.8	6.4	5.9	21.1	12.8	17.3	13.7	14.8	108.9
Nearfield									
128.9	19.6	5.7	3.0	17.0	8.7	28.1	13.8	8.2	108.3
129.1	19.5	11.1	3.0	15.9	6.3	32.1	23.6	5.6	116.5
137.7	19.1	7.8	4.0	32.2	7.6	42.0	21.9	6.7	157.6
141.5	18.8	13.9	6.5	16.4	9.4	62.7	41.5	10.7	194.6
141.7	18.8	15.0	4.3	68.4	12.2	55.2	38.6	11.0	237.1
150.4	18.7	8.1	13.1	34.9	18.7	24.5	6.9	11.7	158.9
150.8	18.6	20.9	13.9	26.8	22.5	22.1	6.6	11.5	150.1
152.0	18.6	14.6	6.1	10.5	23.6	20.9	4.6	13.5	122.8
152.2	18.6	24.3	5.0	13.7	16.9	22.9	2.8	9.1	131.1
155.2	18.7	4.7	8.5	32.1	17.0	16.4	2.4	8.3	118.5
155.3	18.9	1.1	30.5	8.2	21.8	11.1	2.3	14.5	132.3
155.4	18.7	5.2	4.5	31.6	17.9	18.9	3.0	11.4	127.2
157.0	18.5	19.1	6.4	20.3	16.1	22.8	6.6	12.5	145.0
157.1	19.0	0.3	17.1	7.1	24.8	8.6	6.3	20.1	144.2
157.3	18.2	33.4	11.5	15.8	15.6	30.9	3.8	3.3	158.5
Upper Farfield									
166.6	18.1	10.6	10.9	0.0	30.2	23.7	0.9	3.0	102.4
176.0	17.6	15.9	3.1	0.0	28.3	26.0	3.0	0.4	100.0
187.1	17.0	18.3	0.6	0.3	10.1	24.4	3.3	1.3	86.0

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* Gizzard and threadfin shad.

** Totals include taxa shown taxa plus not shown.

† Significantly different ($p < 0.0019$) from RM 79.9.

Source: Paller et al., 1985.

TABLE V-4.76

Mean Ichthyoplankton Densities (no./1,000 m^3) and Temperatures (°C) in the Savannah River During June 1984

River Mile	Temp. (°C)	American Shad	Blue-back Herring	Striped Bass	Other Shad*	Unid. Cyprinids	Sunfish	Crappie	Total Ichthyo-plankton**
Lower Farfield									
29.6	25.2	0.0	0.0	0.0	0.0	0.0	0.6	0.0	1.2
40.2	24.6	0.0	0.0	0.0	0.0	0.4	3.5	0.0	5.7
50.2	24.6	0.7	0.3	0.0	0.4	0.7	3.8	0.0	10.2
60.0	24.4	0.8	0.0	0.0	0.3	0.8	1.9	0.0	8.1
69.9	24.3	0.3	0.0	0.0	0.0	0.6	0.7	0.0	3.0
79.9	24.0	1.0	0.0	0.0	0.3	0.8	2.9	0.3	9.9†
89.3	23.6	2.4	0.0	0.0	1.5	0.5	1.4	0.0	7.6
97.5	23.7	1.0	0.0	0.0	0.5	0.6	2.2	0.0	10.3
110.0	23.7	19.8	0.0	0.0	0.3	0.6	2.6	0.0	26.8
120.0	23.4	3.9	0.0	0.0	0.4	1.5	1.9	0.0	13.1
Nearfield									
128.9	23.0	1.5	0.0	2.6	0.4	1.6	1.4	0.0	11.5
129.1	22.9	5.0	0.0	0.4	0.4	1.9	1.8	0.4	16.6
137.7	22.5	12.9	0.0	1.6	0.7	1.7	7.6	0.8	31.5
141.5	22.5	5.4	0.0	1.6	0.0	2.8	4.4	0.0	22.7
141.7	22.5	19.2	0.0	6.9	0.6	4.4	10.6	0.0	50.3
150.4	23.9	0.7	0.0	0.0	1.1	2.4	2.1	0.0	12.0††
150.8	23.2	4.7	0.0	0.0	0.9	2.9	0.8	0.0	15.5
152.0	23.3	7.6	0.5	0.3	1.4	2.5	0.7	0.0	19.5
152.2	22.9	12.8	0.0	0.0	1.3	4.0	0.9	0.0	26.3
155.2	22.8	3.7	0.0	0.0	2.5	3.6	0.8	0.3	21.0
155.3	22.8	0.0	0.6	0.0	3.9	4.8	0.7	0.6	31.6
155.4	22.5	4.4	0.0	0.0	2.0	3.6	1.6	0.0	23.7
157.0	21.9	15.3	0.3	0.0	1.2	0.7	2.3	0.0	31.2
157.1	22.6	0.0	1.8	0.0	2.3	4.1	1.9	0.0	31.1
157.3	21.8	12.8	0.0	0.0	6.0	2.8	3.1	0.0	34.6
Upper Farfield									
166.6	21.2	4.0	0.0	0.0	11.8	6.2	1.6	0.0	33.7
176.0	20.8	2.8	0.7	0.0	7.8	5.3	1.5	0.0	26.5
187.1	20.4	0.4	0.7	0.0	10.4	4.9	0.3	0.0	30.6

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* Gizzard and threadfin shad.

** Totals include taxa shown taxa plus not shown.

† Significantly different (p <0.0019) from RM 69.9.

†† Significantly different (p <0.0019) from 141.7.

Source: Paller et al., 1985.

TABLE V-4.77

Mean Ichthyoplankton Densities (no./1,000 m^3) and Temperatures (°C) in the Savannah River During July 1984

River Mile	Temp. (°C)	American Shad	Blue-back Herring	Striped Bass	Other Shad*	Unid. Cyprinids	Sunfish	Crappie	Total Ichthyo-plankton**
Lower Farfield									
29.6	26.0	0.0	0.0	0.0	0.0	0.5	1.7	0.0	2.7
40.2	25.7	0.0	0.0	0.0	0.0	0.0	1.8	0.0	2.3
50.2	25.3	0.0	0.0	0.0	0.0	0.3	0.6	0.0	3.0
60.0	25.4	0.0	0.0	0.0	0.0	0.8	4.4	0.0	8.5
69.9	25.6	0.0	0.0	0.0	0.0	0.3	0.8	0.0	1.2
79.9	25.2	0.0	0.0	0.0	0.0	0.3	0.8	0.0	1.7
89.3	25.0	0.0	0.0	0.7	0.6	2.0	0.3	0.0	4.4
97.5	24.4	0.4	0.0	0.0	0.0	0.3	1.2	0.0	4.8
110.0	25.1	0.0	0.0	0.3	0.0	0.7	0.8	0.0	2.8
120.0	24.8	0.4	0.0	0.4	0.0	0.6	0.7	0.0	3.2
Nearfield									
128.9	24.3	0.0	0.0	0.0	0.7	0.0	0.8	0.0	1.8
129.1	24.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	1.7
137.7	24.0	1.0	0.0	0.0	0.7	1.4	1.3	0.0	5.0
141.5	24.0	0.5	0.0	0.0	0.0	0.4	1.4	0.0	2.7
141.7	24.0	1.1	0.0	0.4	0.0	0.7	1.3	0.0	3.4
150.4	23.9	0.0	0.0	0.0	0.0	0.0	1.2	0.0	1.2
150.8	23.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4
152.0	23.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
152.2	23.6	0.4	0.0	0.7	0.3	0.0	0.0	0.0	2.3
155.2	23.8	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.9
155.3	23.7	0.0	0.5	0.0	0.6	0.0	1.2	0.0	5.1
155.4	23.5	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.6
157.0	22.9	0.3	0.0	0.4	0.7	0.0	0.3	0.0	1.8
157.1	23.4	0.7	0.0	0.0	0.0	0.0	0.6	0.0	1.3
157.3	22.8	0.3	0.0	0.7	0.3	0.3	0.7	0.0	3.9
Upper Farfield									
166.6	22.6	0.6	0.0	0.0	3.2	0.0	0.0	0.0	4.5
176.0	22.4	0.7	0.0	0.0	1.6	0.0	1.2	0.0	6.2
187.1	21.6	0.0	0.0	0.4	2.2	0.6	1.1	0.0	7.5

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* Gizzard and threadfin shad.

** Totals include taxa shown taxa plus not shown.

Source: Paller et al., 1985.

Attachment 5

Tables V-4.15 through V-4.18
From the *Comprehensive Cooling Water Study* (Du Pont 1987)

TABLE V-4.15

Seasonal Changes in the Relative Abundance (percent number) of Dominant Fishes Captured by Electrofishing in the Savannah River, Intake Canals, Thermal Creeks, and Nonthermal Creeks on the Savannah River Plant (November 1983-August 1984)

	November 1983				January 1984				June 1984				August 1984			
	TC*	NTC**	IC†	SR††	TC	NTC	IC	SR	TC	NTC	IC	SR	TC	NTC	IC	SR
Nonandromous Fishes																
Sunfish	64.3	44.2	75.4	52.9	50.0	38.9	46.7	32.9	42.1	32.7	31.6	52.0	26.9	7.1	42.9	21.1
Largemouth bass	7.1	4.2	3.7	10.2	6.7	5.6	5.4	7.4	35.3	17.4	6.7	10.0	0.0	0.0	10.2	7.9
Black crappie	0.0	0.0	0.3	1.2	0.0	1.9	8.6	2.6	2.0	3.5	1.1	3.1	3.8	7.1	0.7	7.2
Bowfin	0.0	3.1	1.1	6.1	6.7	1.9	2.3	8.7	2.0	4.9	2.5	4.5	11.5	14.2	1.4	10.2
American eel	0.0	17.7	0.5	3.4	6.7	9.3	0.0	2.9	0.0	5.6	0.0	2.4	0.0	0.0	0.0	3.0
Spotted sucker	0.0	13.5	1.3	8.3	6.7	33.3	10.1	26.1	2.0	9.7	8.1	6.8	0.0	3.6	2.0	2.3
Yellow perch	0.0	0.8	2.1	0.6	0.0	1.9	10.9	0.8	0.0	4.2	9.2	0.8	0.0	0.0	4.8	0.4
Pickerel	0.0	6.5	6.5	1.8	13.3	1.9	5.4	3.5	2.0	10.4	25.1	7.4	19.2	50.0	15.6	6.0
Shad	0.0	0.0	1.6	1.4	10.0	1.9	4.7	7.1	0.0	0.0	3.6	1.3	15.4	3.6	8.8	8.6
Anadromous Fishes																
American shad	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	2.0	0.7	0.0	0.3	0.0	3.6	0.0	6.8
Blueback herring	0.0	0.0	2.7	2.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.1	3.8	7.1	0.7	9.4
Striped bass	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.3	0.0	0.0	0.0	0.3	7.7	3.6	2.7	6.0
Other	28.6	10.0	4.8	10.7	0.0	3.4	5.1	7.4	12.6	10.9	12.1	11.0	11.7	0.0	10.2	11.1
Total number	14	260	355	1453	30	54	128	310	60	135	326	1224	26	28	147	265
Total species	5	19	21	28	11	14	21	28	12	22	24	32	14	11	24	30

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* Thermal creeks: Four Mile Creek and Beaver Dam Creek.
** Nonthermal creeks: Upper Three Runs, Steel Creek, and Lower Three Runs Creek.
† Intake canals.
†† Savannah River.

Source: Paller and Osteen, 1985.

TABLE V-4.16

Seasonal Changes in the Relative Abundance (percent number) of Fishes Captured by Hoopnetting in the Savannah River, Intake Canals, Thermal Creeks, and Nonthermal Creeks on the Savannah River Plant (November 1983-August 1984)

	November 1983				January 1984				June 1984				August 1984			
	TC*	NTC**	IC†	SR††	TC	NTC	IC	SR	TC	NTC	IC	SR	TC	NTC	IC	SR
Nonandromous Fishes																
Sunfish	0.0	0.0	53.6	19.7	20.0	0.0	23.3	7.2	21.7	21.2	44.8	29.5	16.7	4.7	16.7	3.2
American eel	0.0	7.1	1.8	3.9	0.0	3.0	0.0	0.8	4.3	12.1	0.0	4.4	0.0	0.0	0.0	0.4
Spotted sucker	0.0	0.0	0.0	0.0		0.0	6.7	11.2	4.3	1.5	2.3	0.5	0.0	0.0	0.0	0.4
Black crappie	0.0	0.0	10.7	5.3	20.0	0.0	20.0	0.0	0.0	18.2	37.9	8.1	0.0	2.3	16.7	1.4
Channel catfish	95.2	39.3	14.3	20.5	20.0	0.0	0.0	7.2	43.5	25.8	2.3	10.7	50.0	59.3	0.0	32.9
White catfish	0.0	7.1	0.0	9.7	10.0	28.4	0.0	4.0	0.0	3.0	1.1	13.8	16.7	7.0	0.0	7.9
Flat bullhead	0.0	42.9	17.9	34.7	10.0	61.2	36.7	58.4	4.3	3.0	1.1	5.5	16.7	24.4	66.7	50.4
Gar	4.8	0.0	0.0	2.5	10.0	0.0	0.0	0.0	17.4	4.5	1.1	20.8	0.0	1.2	0.0	2.1
Anadromous Fishes																
American shad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	10.6	0.0	1.0	0.0	0.0	0.0	0.0
Blueback herring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Striped bass	0.0	0.0	0.0	0.0	0.0	0.0	0.8	3.2	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.4
Other	0.0	3.6	1.7	3.7	10.0	7.4	13.3	8.0	0.0	0.0	9.4	5.4	0.0	1.1	0.0	0.9
Total number	21	56	56	513	10	67	30	125	23	66	87	384	6	86	6	280
Total species	2	5	7	13	8	5	8	12	9	14	11	24	4	9	3	16

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* Thermal creeks: Four Mile Creek and Beaver Dam Creek.
** Nonthermal creeks: Upper Three Runs, Steel Creek, and Lower Three Runs Creek.
† Intake canals.
†† Savannah River.

Source: Paller and Osteen, 1985.

TABLE V-4.17

Seasonal Changes in the Relative Abundance (percent number) of the Most Common Fishes Captured by Electrofishing in Thermal and Nonthermal Areas of the Savannah River, Intake Canals, and the Thermal and Nonthermal Tributary Creeks on the SRP (November 1984-August 1985)

	November 1984					February 1985					May 1985					August 1985				
	NTR*	TR**	IC†	NTC††	TC¶	NTR	TR	IC	NTC	TC	NTR	TR	IC	NTC	TC	NTR	TR	IC	NTC	TC
Nonandromous Fishes																				
Bowfin	1.4	0.0	1.3	0.3	8.0	8.5	14.3	10.0	0.5	7.1	5.0	0.0	0.0	1.1	10.0	9.0	3.6	2.6	1.0	3.1
American eel	3.6	0.0	0.0	10.5	10.0	0.0	0.0	0.0	8.0	5.4	3.8	0.0	0.0	7.4	10.0	1.9	0.0	0.0	4.2	1.6
Shad	1.8	0.0	0.0	0.0	2.0	2.1	0.0	0.0	0.0	8.9	0.8	0.0	0.0	0.0	0.0	1.6	3.6	9.6	0.0	1.6
Pickerel	3.2	2.8	9.3	1.8	2.0	8.5	0.0	10.0	0.5	3.6	0.8	3.8	2.8	1.7	0.0	1.0	0.0	1.7	0.8	0.0
Spotted Sucker	9.5	11.1	0.0	6.7	2.0	48.9	71.4	20.0	10.3	10.7	21.8	19.2	11.3	7.7	0.0	11.5	3.6	1.7	3.2	10.9
Sunfish	54.5	61.1	74.7	59.9	42.2	14.9	0.0	40.0	63.0	48.2	52.7	34.6	57.7	67.6	40.0	54.0	53.6	63.5	84.7	42.2
Largemouth bass	15.5	11.1	9.3	2.2	30.0	2.1	0.0	20.0	4.9	5.4	4.6	15.4	1.4	2.6	10.0	8.4	28.6	11.6	2.3	17.2
Black crappie	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	1.4	0.2	0.0	1.3	0.0	0.0	0.1	0.0
Yellow perch	1.4	0.0	4.0	0.3	0.0	0.0	0.0	0.0	0.3	0.0	2.5	3.8	23.9	3.5	0.0	0.5	0.0	6.1	0.3	0.0
Anadromous Fishes																				
Blueback herring	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
American shad	2.3	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.5	0.0	1.0	0.0	0.0	0.0	1.6
Striped bass	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	5.9	2.8	1.3	18.2	4.0	14.9	14.3	0.0	12.4	10.7	7.1	23.1	1.4	7.9	30.0	9.4	7.1	3.5	3.3	21.9
Total number	220	36	75	626	50	47	7	10	387	56	239	26	71	660	20	619	28	115	780	64
Total species	21	11	12	21	13	14	3	5	18	15	25	12	14	23	10	29	9	14	23	14

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* All river transects except those just below Beaver Dam Creek and Four Mile Creek.
** RMs 152.0 below Beaver Dam Creek and 150.4 below Four Mile Creek.
† Intake canals.
†† Upper Three Runs Creek, Steel Creek, and Lower Three Runs Creek.
¶ Four Mile Creek, Beaver Dam Creek, and Pen Branch.

Source: Paller and Osteen, 1985.

TABLE V-4.18

Seasonal Changes in the Relative Abundance (percent number) of the Most Common Fishes Captured by Hoopnetting in Thermal and Nonthermal Areas of the Savannah River, Intake Canals, and the Thermal and Nonthermal Tributary Creeks on the SRP (November 1984-August 1985)

	November 1984					February 1985					May 1985					August 1985				
	NTR*	TR**	IC†	NTC††	TC¶	NTR	TR	IC	NTC	TC	NTR	TR	IC	NTC	TC	NTR	TR	IC	NTC	TC
Nonandromous Fishes																				
Gar	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.9	0.0	0.0	14.3	0.0	1.6	0.0	0.0	0.0	0.0
American eel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spotted sucker	1.0	0.0	0.0	0.0	0.0	6.2	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0	0.0
White catfish	6.3	33.3	0.0	0.0	0.0	1.0	33.3	0.0	0.0	0.0	9.4	33.3	0.0	14.3	100.0	12.9	0.0	0.0	0.0	0.0
Flat bullhead	63.5	33.3	0.0	75.0	0.0	62.9	20.0	14.3	40.0	0.0	28.4	0.0	0.0	0.0	0.0	12.9	7.1	0.0	0.0	0.0
Channel catfish	7.3	0.0	0.0	0.0	0.0	6.2	20.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0	27.4	57.1	0.0	0.0	100.0
Sunfish¶¶	9.4	33.3	100.0	25.0	100.0	13.4	13.3	85.7	0.0	0.0	25.0	26.7	50.0	14.3	0.0	30.6	28.6	76.5	83.3	0.0
Black crappie	1.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	12.5	6.7	50.0	0.0	0.0	11.3	7.1	17.7	16.7	0.0
Anadromous Fishes																				
Blueback herring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
American shad	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.6	0.0	0.0	0.0	0.0	0.0	0.0
Striped bass	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	8.3	0.0	0.0	0.0	0.0	7.2	6.7	0.0	60.0	0.0	3.1	0.0	0.0	28.6	0.0	3.2	0.0	0.0	0.0	0.0
Total number	96	3	2	8	2	97	15	7	5	0	32	15	12	7	2	62	14	17	6	2
Total species	21	3	1	2	1	14	7	4	2	0	8	6	3	5	1	10	7	6	5	1

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* All river transects except those just below Beaver Dam Creek and Four Mile Creek.

** RMs 152.0 below Beaver Dam Creek and 150.4 below Four Mile Creek.

† Intake canals.

†† Upper Three Runs Creek, Steel Creek, and Lower Three Runs Creek.

¶ Four Mile Creek, Beaver Dam Creek, and Pen Branch.

¶¶ Includes several species of Lepomis.

Source: Paller and Osteen, 1985.

Attachment 6

Biological Assessment to US Fish and Wildlife Service for Vogtle Electric Generating Plant Early Site Permit Application

Biological Assessment
U.S. Fish and Wildlife Species

Vogtle Electric Generating Plant
Early Site Permit Application

Burke County, Georgia

January 2008

Docket No. 52-011

U.S. Nuclear Regulatory Commission
Rockville, Maryland

Contents

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Abbreviations/Acronyms

ac	acre(s)
BA	biological assessment
BMPs	best management practices
CFR	Code of Federal Regulations
cm	centimeter(s)
CWA	Clean Water Act
DOE	U.S. Department of Energy
EIS	environmental impact statement
ESP	early site permit
FR	Federal Register
ft	foot/feet
FWS	U.S. Fish and Wildlife Service
GDNR	Georgia Department of Natural Resources
ha	hectare(s)
in.	inch(es)
km	kilometer(s)
kV	kilovolt(s)
m	meter(s)
mi	mile(s)
MW(t)	megawatts thermal
NRC	U.S. Nuclear Regulatory Commission
SCDNR	South Carolina Department of Natural Resources
Southern	Southern Nuclear Operating Company, Inc.
TRC	Third Rock Consultants, LLC
USACE	U.S. Army Corps of Engineers
VEGP	Vogtle Electric Generating Plant

1.0 Introduction

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application from Southern Nuclear Operating Company, Inc. (Southern) for an early site permit (ESP) at a location identified as the Vogtle Electric Generating Plant (VEGP) ESP site. An ESP represents NRC approval of a site or sites for one or more nuclear power facilities, and is a separate action from the filing of an application for a construction permit or combined license for such a facility. Southern's ESP application addressed the impacts of constructing and operating two new nuclear units at the existing VEGP site in Burke County, Georgia. The VEGP site is approximately 42 km (26 mi) south of Augusta, Georgia (Figure 1-1). The proposed ESP site is completely within the confines of the existing VEGP site, with the new units to be constructed and operated adjacent to the existing Units 1 and 2 (Figure 1-2).

The NRC is required to prepare an environmental impact statement (EIS) as part of its review of an ESP application. As required by Title 10 of the Code of Federal Regulations (CFR) Part 51.26, the NRC has published in the *Federal Register* a Notice of Intent (71 FR 58882) to prepare an EIS, conduct scoping, and publish a draft EIS for public comment. The draft EIS was published in September 2007 (NRC 2007). The final EIS will be issued after considering public comments on the draft. The impact analysis in the EIS includes an assessment of the potential environmental impacts of the construction and operation of two new nuclear power units at the VEGP site, including potential impacts to threatened or endangered species. If approved, the ESP would not authorize Southern to begin construction of the new units; however, it would authorize limited site-preparation activities. Thus, only site-preparation activities are considered in this biological assessment (BA).

The purpose of this BA is to provide information to the U.S. Fish and Wildlife Service (FWS) concerning potential impacts of limited site-preparation activities at the VEGP site on threatened and endangered species and designated critical habitat pursuant to Section 7(a)(2) of the Endangered Species Act. The consultation is between the NRC and the FWS.

In a letter dated October 12, 2006, the NRC requested that the FWS Field Office in Brunswick, Georgia, provide information regarding Federally listed species at the proposed VEGP site. This BA examines the impacts of the proposed action on seven Federally listed species (Table 1-1) that could occur in the vicinity of the VEGP site.

The Federally listed species considered in this BA include:

- three plants: smooth coneflower (*Echinacea laevigata*), Canby's dropwort (*Oxypolis canbyi*), and relict trillium (*Trillium reliquum*).
- two birds: the wood stork (*Mycteria americana*) and red-cockaded woodpecker (*Picoides borealis*)
- one reptile: American alligator (*Alligator mississippiensis)*
- one amphibian: flatwoods salamander (*Ambystoma cingulatum*).

Table 1-1. Federally Listed Terrestrial Species Occurring in the Vicinity of the VEGP Site

Scientific Name	Common Name	Federal Status[(a)]	County of Occurrence	Distance from the VEGP Site[(b)]
Plants				
Echinacea laevigata	smooth coneflower	E	Aiken, Barnwell	< 16 km (10 mi)
Oxypolis canbyi	Canby's dropwort	E	Burke	>16 km (10 mi)
Trillium reliquum	relict trillium	E	Aiken	> 16 km (10 mi)[(c)]
Birds				
Mycteria americana	wood stork	E	Barnwell, Aiken, Burke	< 3.2 km (2 mi)
Picoides borealis	red-cockaded woodpecker	E	Barnwell, Aiken, Burke	16 km (10 mi)
Amphibians and Reptiles				
Alligator mississippiensis	American alligator	T(S/A)	Barnwell, Aiken, Burke	Occurs onsite [(d)]
Ambystoma cingulatum	flatwoods salamander	T	Burke	>16 km (10 mi)

(a) Federal status rankings determined by the FWS under the Endangered Species Act: E = Federally endangered, T = Federally threatened, T(S/A) = Threatened due to Similarity of Appearance (FWS 2004a).
(b) GDNR 2007a; SCDNR 2007; Wike et al. 2006
(c) Suitable habitat exists for the relict trillium onsite (PNNL 2006)
(d) TRC 2006

Species included in this table meet at least one of the following criteria:

- species have been recorded to occur on the VEGP site
- species have been recorded to occur within 16 km (10 mi) of the VEGP site in Aiken and Barnwell Counties, South Carolina
- species are listed by FWS (2004a) as occurring or having the potential to occur in Burke County, Georgia
- species are known to have suitable habitat on the VEGP site (PNNL 2006).

Figure 1-1. VEGP Site and the 80 km (50 mi) Vicinity (Southern 2007a)

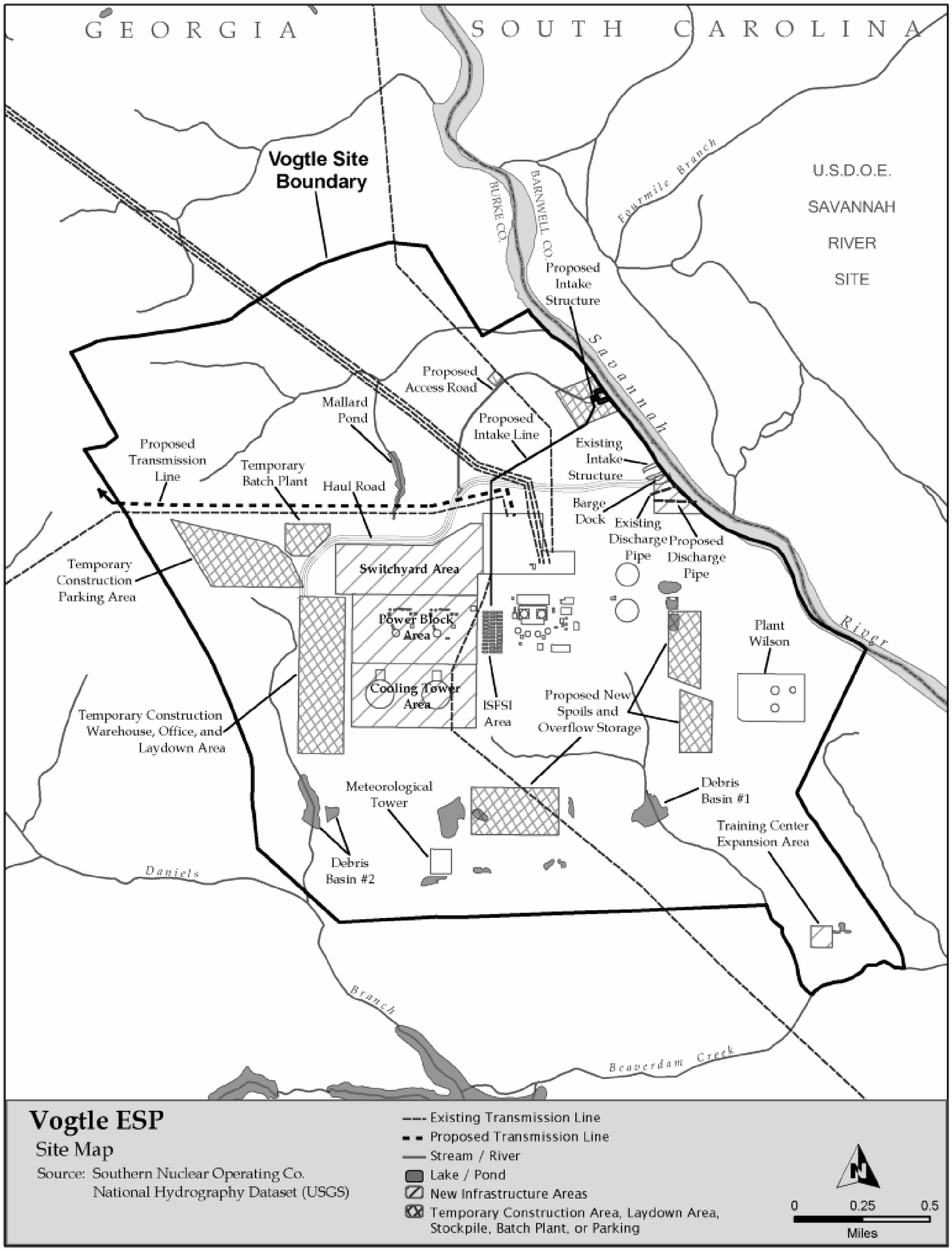

Figure 1-2. Proposed VEGP Site Footprint (Southern 2007c)

2.0 Proposed Action

The proposed Federal action is issuance of an ESP for a site at VEGP for two Westinghouse AP1000 nuclear reactors. If approved, an ESP would authorize Southern to perform, at its discretion, the limited site-preparation activities allowed by NRC regulations in 10 CFR 50.10(e)(1) and described in Section 3.9.2 of Southern's Environmental Report (ER) (Southern 2007a) and listed in the site redress plan (Southern 2007b). The site redress plan describes the measures that may be necessary to restore (i.e., redress) the site to a condition suitable for other appropriate use as required by NRC regulations in 10 CFR 52.17(c) in the event the project does not proceed to construction or the site is abandoned.

In accordance with the site redress plan, the site would be redressed in the event that the NRC issues the requested ESP, the ESP holder performs the limited site-preparation activities, the ESP is not referenced in an application for a construction permit or combined license, and no alternative use is found for the site. Any facilities or structures constructed as part of the site-preparation activities that could be used in the future may be left in place, provided they meet local zoning and pose no safety or environmental hazard.

Prerequisites to limited site-preparation activities include, but are not limited to, documentation of existing site conditions within the VEGP site and acquisition of the necessary permits (e.g., local building permits, a National Pollutant Discharge Elimination System permit [40 CFR Part 122], a Clean Water Act (CWA) Section 404 permit, and a General Stormwater Permit). After these prerequisites are completed, planned limited site-preparation activities could proceed and might include some or all the activities pursuant to 10 CFR 52.17(c) and 10 CFR 50.10(e)(1). In its ESP application, Southern requested approval to perform the following limited site-preparation activities for the two new nuclear units at the VEGP site (Southern 2007a):

- prepare the site for construction of the facilities (including such activities as clearing, grading, construction of temporary access roads, and preparation of borrow areas)
- install temporary construction support facilities (including items such as warehouses, shop facilities, utilities, concrete mixing plants, docking and unloading facilities, and construction support buildings)
- excavate for facility structures
- construct service facilities (including items such as roadways, paving, railroad spurs, fencing, exterior utility and lighting systems, transmission lines, and sanitary sewage treatment facilities)

- construct structures, systems, and components that do not prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public; including but not limited to
  - cooling towers
  - intake and discharge structures
  - circulating water lines
  - fire protection equipment
  - switchyard and onsite interconnections
  - barge slip modification.

Construction of the onsite portion of a new 500-kV transmission line to handle the power generated by the proposed new units is included in the activities Southern requested as part of the site-preparation activities. However, construction of a new transmission line offsite was not addressed in the site redress plan and, therefore, is not considered in this BA.

3.0 VEGP Site Description

The VEGP site is located on the Savannah River shoreline approximately 24 km (15 mi) east-northeast of Waynesboro, Georgia, and 42 km (26 mi) southeast of Augusta, Georgia (Figure 1-1). The existing site consists of two Westinghouse pressurized water reactors, a turbine building, a switchyard, intake and discharge structures, and support buildings. Two generating units (Units 1 and 2) are currently operating at the site (Figure 1-2). Plant Wilson, a six-unit, oil-fueled combustion turbine facility built in 1974 and owned by the Georgia Power Company, as well as ancillary structures and systems related to Units 1 and 2 are also located onsite. The existing Units 1 and 2 and Plant Wilson would remain and continue to operate. They would not be affected by this action.

The footprint for Units 3 and 4 is in a previously disturbed area adjacent to the existing VEGP Units 1 and 2 (Figure 1-2). The existing Units 1 and 2 and the proposed Units 3 and 4 would share certain support structures such as office buildings and water, wastewater, and waste-handling facilities; however, the new intake and discharge facilities for Units 3 and 4 would be separate from the Units 1 and 2 intake and discharge. Each proposed Westinghouse AP1000 reactor would have a rated thermal power level of 3400 MW(t) (Southern 2007a). For the circulating water cooling system, Southern proposed natural-draft cooling towers, and for the service water system, mechanical-draft cooling towers.

The proposed Units 3 and 4 would use a new transmission line in combination with existing transmission lines. The existing Units 1 and 2 are interconnected with the regional power grid via two 500-kV transmission lines and four 230-kV transmission lines that run through four rights-of-way. The existing transmission lines would not be modified. One new 500-kV transmission line would be constructed to handle the power generated by the proposed new Units 3 and 4. The proposed new transmission line would be routed to the Thomson substation, which is located west of Augusta, Georgia. Although the precise route of the new transmission line has not been determined, Georgia Power Company has conducted a routing study (GPC 2007). Generally, the transmission line would be routed northwest from the VEGP site, passing west of the U.S. Army Garrison, Fort Gordon, and then north to the Thomson substation. The new transmission line right-of-way would be approximately 96 km (60 mi) long and 46 m (150 ft) wide (Southern 2007a).

3.1 General Terrestrial Ecological Resources Description

The VEGP site is approximately 1282.5 ha (3169 ac) in size and is located in the sandhills of the Upper Coastal Plain Region, approximately 48 km (30 mi) southeast of the Fall Line (Eco-Sciences 2007; Southern 2007a). The site has 12 soil types and several major habitat types, including ponds, pine plantations, native upland pines, and the bottomland hardwoods that are found along stream drainages onsite and adjacent to the Savannah River (NRCS 2003a; TRC 2006). Approximately 320 ha (800 ac) of the VEGP site consists of power generation and maintenance facilities, parking lots, roads, cleared areas, and mowed grass. Previously disturbed areas onsite, including portions of the proposed Vogtle ESP site Units 3 and 4 footprint, are vegetated with a mix of planted pines and old field vegetation (Southern 2007a). Approximately 247.7 ha (612 ac) of hardwoods, 661.3 ha (1634 ac) of pine forests, and 38.8 ha (96 ac) of open areas are on the VEGP site (Southern 2007a).

The land surrounding the VEGP site consists of both developed and undeveloped parcels. Pasture or farmland, pine plantations, and abandoned (old) fields predominate the developed portions, while much of the undeveloped land is composed of oak-hickory hardwoods and sandhill-upland pine communities (Southern 2006a, 2007a). The Savannah River floodplain ranges from approximately 30 m (100 ft) to 240 m (800 ft) wide at the VEGP site. However, most of the VEGP site is situated atop steep river bluffs along the Savannah River shoreline and is separated from the floodplain (Southern 2007a).

Directly across the Savannah River from the VEGP site is the Savannah River Site, a U.S. Department of Energy (DOE) facility with restricted access (Southern 2007a). River swamp, bottomland hardwood, and upland pine-hardwood communities occur on the DOE Savannah River Site within 10 km (6 mi) of the VEGP site (Southern 2007a). The Savannah River Swamp comprises about 3800 ha (9400 ac) and borders the Savannah River on the southwestern edge of Savannah River Site, adjacent to the VEGP site (Wike et al. 2006).

Wildlife Habitat

The VEGP site is characterized by low, gently rolling sandy hills. Scrub oaks, including turkey (*Quercus laevis*), post (*Q. stellata*), and willow oak (*Q. phellos*), and longleaf pine (*Pinus palustris*) occur in the upland wooded areas that were not previously cultivated. Red oak (*Q. rubra*), water oak (*Q. nigra*), and maple (*Acer* sp.) dominate the lowland hardwood areas. Bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*) characterize the Savannah River floodplain. To prevent erosion, grasses and the small shrubby sericea lespedeza (*Lespedeza cuneata*) were planted in several open areas created during construction of Units 1 and 2 (Southern 2006a).

Longleaf Pine, Scrub-Oak, and Oak-Hickory Upland Communities

The longleaf pine-scrub oak community is found on ridge tops as well as south and west slopes in undisturbed upland areas on the VEGP site. Common canopy species in this habitat include longleaf pine, turkey oak, and bluejack oak (*Quercus incana*). The shrub layer is composed of sparkleberry (*Vaccinium arboreum)*, dwarf huckleberry (*Gaylussacia dumosa*), and yellow jessamine (*Gelsemium sempervirens*). The density and diversity of the herbaceous ground cover varies with the degree of canopy closure. Under dense shade, only clumps of slender woodoats (*Chasmanthium laxum)* are found. In more open areas, gopher weed (*Baptisia perfoliata*), jointweed (*Polygonella americana*), tread-softly (*Cnidoscolus stimulosus*), and reindeer lichen (*Cladina rangiferina*) are common (TRC 2006).

The north and east slopes in the undisturbed uplands support the more mesic oak-hickory community. The canopy in this community is mainly composed of white oak (*Quercas. alba*), white ash (*Fraxinus americana)*, mockernut hickory (*Carya alba*), and flowering dogwood (*Cornus florida)*. A few turkey oaks and a scattering of shortleaf pine (*Pinus echinata*) are also present (TRC 2006).

A steep bluff separates the dry upland forest from the intermittently flooded bottomland along the Savannah River. The bluff is completely wooded and in places still supports some very large trees, several in excess of 0.9 m (3 ft) in diameter. Common canopy species include oak, mockernut hickory, tuliptree (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), American elm (*Ulmus americana*), basswood (*Tilia americana*), and Florida maple (*Acer barbatum*). The understory is composed of smaller trees, shrubs, and vines. Common understory species include pawpaw (*Asimina triloba*), hophornbeam (*Ostrya virginiana*), muscadine (*Vitis rotundifolia*), American beautyberry (*Callicarpa americana*), crossvine (*Bignonia capreolata*), and poison ivy (*Toxicodendron radicans*). The herbaceous ground cover varies with soil moisture. On the upper slope, where the soil is drier, Christmas fern (*Polystichum acrostichoides*), white snakeroot (*Ageratina altissima*), and several species of aster are most common. On the lower slopes and around seeps, dominant plant species include mottled trillium (*Trillium maculatum*), wild ginger (*Asarum canadense*), false nettle (*Boehmeria cylindrica*), and jewelweed (*Impatiens capensis*) (TRC 2006).

Planted Pine

The planted pine plantations on the VEGP site are of various ages and differ in the stocking rates. The plantations vary from a nearly closed canopy with very little understory, to areas that resemble old fields with only scattered pine. The sparse herbaceous ground cover in areas with a closed canopy consists of bracken fern (*Pteridium aquilinum*). In the more open areas, dog fennel (*Eupatorium capillifolium*), broomsedge (*Andropogon virginicus*), and blackberry (*Rubus* sp.) are common. Loblolly (*Pinus taeda*) and longleaf pines are the primary overstory species (TRC 2006). Pine plantations are managed through prescribed burning every 3 to 5 years, timber thinning after 20 years, and aesthetic cuts after thinning. Burning is limited to 25 to 30 percent of the upland and planted pine acreage each year (Southern 2006a). Planted loblolly plantations cover approximately 142 ha (350 ac) of lands that have been reclaimed from original plant construction (Southern 2006a).

Native longleaf pine are being reestablished by Southern on or near the VEGP site. These pines are managed on a long rotation basis, allowing the trees to live from 60 to 100 years (Southern 2006a).

Streams and Wetlands

The wetlands associated with the VEGP site include those near the Savannah River, as well as those near ponds and streams located onsite. Eco-Sciences of Georgia (Eco-Sciences) was contracted by Southern to survey the VEGP site in December 2006 to determine where jurisdictional waters of the United States occur. Approximately 69 ha (170 ac) of potential jurisdictional wetlands were identified on the site during the Eco-Sciences survey (Southern 2007b). These include 48 wetlands, 6 perennial streams, 13 intermittent streams, and 3 ephemeral streams.

Principal waterbodies onsite include Mallard Pond and two streams in the southern portion of the VEGP site (Figure 1-2). Mallard Pond encompasses 2 ha (5 ac) in a hardwood cove just north of the footprint for the proposed new Units 3 and 4 (Southern 2006a). A small unnamed stream at Hancock Landing drains Mallard Pond. From Mallard Pond, it flows north and east into the Savannah River. The stream is approximately 0.6 m (2 ft) to 1.2 m (4 ft) wide and less than 0.3 m (1 ft) deep, except where beavers (*Castor canadensis*) have created dams and ponds (Southern 2007a).

Two streams are located in the southern portion of the VEGP site (Figure 1-2). One of these streams is located in the southwestern portion of the VEGP site and drains south through Debris Basin #2, into Daniels Branch, and then into Telfair Pond. Telfair Pond drains to the east via Beaverdam Creek, which enters the Savannah River approximately 3.2 km (2 mi) downstream of the existing intake structure. The other small stream is in the southeastern portion of the site and flows south through the Debris Basin #1 (Southern 2007a). This unnamed tributary flows directly into Beaverdam Creek. Although Beaverdam Creek is outside the VEGP site boundary, the two small streams mentioned above are within the site. Several wetland areas within each of these stream drainages were identified (Eco-Sciences 2007), including wetlands associated with the two debris basins. Debris Basins #1 and #2 were originally built as stormwater retention basins during construction of Units 1 and 2.

Debris Basin #1 is about 2.4 ha (6 ac) in size, and Debris Basin #2 is about 2 ha (5 ac) (Southern 2006a). Eco-Sciences found the dominant vegetation in wetlands associated with Debris Basin #1 includes black willow (*Salix nigra*), cinnamon fern (*Osmunda cinnamomea*), sweetgum, giant cane (*Arundinaria gigantea*), and red maple (*Acer rubrum*). Dominant vegetation associated with wetlands around Debris Basin #2 includes black willow, sedges (*Carex* spp.), greenbrier (*Smilax* spp.), sweetgum, and giant cane (Eco-Sciences 2007).

The natural or beaver enhanced wetlands associated with these drainages have open to closed canopies depending on water depth. In those areas with a tree canopy, the dominant species are water oak, red maple, and blackgum (*Nyssa sylvatica*). There is also a relatively dense understory of vines and shrubs composed of giant cane, trumpet creeper (*Campsis radicans*), muscadine, and American holly (*Ilex opaca*). The herbaceous ground cover is dominated by cinnamon fern and royal fern (*O. regalis*) (TRC 2006).

The general habitat along the Savannah River on the VEGP site is a mix of hardwoods and bald cypress-water tupelo. Bald cypress and water tupelo are the dominant canopy species in the wetter sites along the river. American sycamore (*Platanus occidentalis)*, boxelder (*Acer negundo*), sugarberry (*Celtis laevigata*), and swamp chestnut oak (*Quercus michauxii*) occupy the slightly higher, drier ground. The understory is composed of American holly, ironwood (*Carpinus caroliniana*), water locust (*Gleditsia aquatica*), giant cane, and buttonbush (*Cephalanthus occidentalis*). Ground cover is sparse and limited to those species that can survive both inundation and dense shade. Dominant groundcover species include richweed (*Pilea purnila*), lizard's tail (*Saururus cernuus*), sensitive fern (*Onoclea sensibilis*), and Virginia dayflower (*Commelina virginica*) (TRC 2006).

Southern has estimated that 9.1 ha (22.5 ac) of wetlands along the Savannah River would be directly affected during construction of the cooling water intake structure, the barge facility, and the discharge structure for the proposed Units 3 and 4 (Southern 2007b). Eco-Sciences (2007) identified three potential jurisdictional wetlands in the vicinity of the proposed structures. The soil in these wetlands is classified as loamy sand that is more than 91 cm (36 in.) deep. The dominant species present in two of the wetlands are bald cypress, American sycamore, and red maple. A smaller wetland (0.006 ha [0.015 ac]) is also located near the proposed water intake. The dominant species in this wetland include ironwood and giant cane.

4.0 Potential Environmental Impacts of Limited Site-Preparation Activities

This section provides information on the limited site-preparation activities of the proposed new Units 3 and 4 at the VEGP site and the impacts on the terrestrial ecosystem. Southern stated that "BMPs (best management practices) used to minimize impacts during preconstruction and construction activities begin with a programmatic construction environmental control plan being put in place" (Southern 2007b). This plan would address BMPs that would be used to minimize impacts. The plan would cover topics such as erosion and sedimentation control, sensitive resources, spill prevention and response, noise and vibration, air emissions, and general site maintenance. Southern also states that regular environmental compliance inspections of construction activities would be performed to ensure that site activities are in compliance with all applicable environmental requirements (Southern 2007b).

The site includes land developed for industrial use, previously disturbed land, and undeveloped land. Approximately 200 ha (500 ac) would be disturbed by construction of Units 3 and 4. The area that would be affected by construction activities of permanent facilities is approximately 125 ha (310 ac). An additional 77 ha (190 ac) would be disturbed for temporary facilities and spoils storage (Southern 2007b). The total acreage amounts needed for each major construction activity and the associated habitat types that would be disturbed are provided in Table 4-1. It is unlikely that each activity would disturb the entire area identified, and where possible, efforts would be made to minimize disturbance (Southern 2007b).

Temporary impacts on the 77 ha (190 ac) associated with spoils areas, parking lots, offices, warehouses, and laydown yards would occur in planted longleaf and loblolly pine habitats and in previously disturbed areas. Of the 125 ha (310 ac) that would be disturbed by construction of the powerblock, cooling towers, switchyard, roads, and simulator building, approximately 113 ha (279 ac) or 90 percent of the land area required for these activities would be previously disturbed land, open fields, or planted pine habitats. About 1.6 ha (4 ac) of land containing mixed hardwood and pine forest would be permanently removed for the simulator building.

Approximately 10.4 ha (25.7 ac) of habitat onsite would be permanently removed for construction of the new 500-kV transmission line. The new transmission line would originate in the new switchyard and would be routed west across the south end of Mallard Pond. It would follow the existing Vogtle-Scherer 500-kV right-of-way west until it exits the site boundary. The right-of-way would be 46 m (150 ft) wide, and six transmission tower structures would be located onsite. Transmission towers would be located to free span Mallard Pond and minimize habitat impacts.

Table 4-1. Habitat Types and Acreage Associated with Permanent and Temporary Construction Areas Associated with Construction of Units 3 and 4

Construction Area	Hectares (Acres) Affected	Dominant Habitat Type
Permanent		
Powerblock	30.4 (75.2)	Planted loblolly pine/previously disturbed
Cooling Tower	28.0 (69.3)	Previously disturbed/industrial
Switchyard	27.8 (68.7)	Open fields/planted loblolly pine
Cooling Water Intake Structure	5.1 (12.5)	Bottomland hardwoods/wetlands
Barge Slip/Discharge Structure	4.2 (10.3)	Bottomland hardwoods/wetlands
500-kV Transmission Line (onsite impacts only)	9.8 (24.3)	Planted loblolly pine, previously disturbed industrial, open fields
	0.6 (1.4)	Pond and bottom land hardwood
Simulator Building	1.6 (4.0)	Mixed hardwoods and pine
Onsite Roads	16.7 (41.3)	Open fields, planted pine, previously disturbed
Temporary		
Parking	18.2 (44.5)	Planted longleaf pine
Batch House	4.1 (10.2)	Planted longleaf pine
Warehouse, Office, and Laydown	26.0 (63)	Mixed planted loblolly/longleaf pine/previously disturbed
Spoils Area: two at 14.6 ha (36 ac) each	29.1 (72)	Mixed planted loblolly/longleaf pine

Source: Southern (2007b, 2007d)

The land area near Mallard Pond that would be crossed by the line is approximately 0.6 ha (1.4 ac). This land is composed of pond and bottomland hardwood habitat. The remaining 9.8 ha (24.3 ac) is a mixture of planted loblolly pine, previously disturbed industrial areas, and open fields, and is included in the 113 ha (279 ac) (Southern 2007d).

About 9.1 ha (22.5 ac) of wetlands would be directly affected by construction activities for Units 3 and 4, including approximately 5.1 ha (12.5 ac) during construction of the cooling water intake structure and 4 ha (10 ac) during the construction of the barge facility and discharge structure (Southern 2007b). Most of the acreage involved would be along the Savannah River (Southern 2007b). Although Southern included the total of 5.1 ha (12.5 ac) of wetlands in the estimate for permanent disturbance, it estimates that the actual cooling water intake structure and canal would be located on about 1.2 ha (3 ac) of wetlands. Impacts to the remaining 3.84 ha (9.5 ac) of the construction area associated with the cooling water intake structure would be temporary (Southern 2007b). Temporary construction ramps at the canal and cooling water intake structure areas would be removed and disturbed areas around the intake structure would then be stabilized and re-vegetated to preclude future erosion. Erosion and sediment controls would remain in place and would be maintained as long as necessary (Southern 2007b).

The cooling water intake structure houses the river water make-up pumps, traveling screens, screen wash pumps, and associated equipment. Southern has committed to minimize impacts to adjacent wetland areas and the Savannah River during the construction process. The construction would be conducted under a CWA Section 404 permit. In early 2007, Southern submitted the Request for Jurisdictional Determination Form to the U.S. Army Corps of Engineers (USACE) and began the Section 404 permitting process (Southern 2007b).

There is the potential for other construction activities associated with the proposed Units 3 and 4 to have indirect impacts to wetlands at the VEGP site. These activities are not likely to require a CWA Section 404 permit from the USACE. Potentially, indirect impacts (e.g., sedimentation) to Debris Basins #1 and #2, Mallard Pond, Telfair Pond, and Beaverdam Creek could occur as a result of construction activities.

In summary, an estimated 9.11 ha (22.5 ac) of wetlands habitat on the VEGP site would be altered to construct permanent structures and facilities associated with construction of the proposed Units 3 and 4 at the ESP site. This represents about 13 percent of the total 69 ha (170 ac) of wetlands currently available onsite. Within 16 km (10 mi) of the site, there are approximately 41,092 ha (101,538 ac) of wetlands, including about 33,369 ha (82,455 ac) of wetlands along the Savannah River (FWS 2004b, 2004c). Wetland habitat that would be altered is less than 0.03 percent of the total wetland acreage in the vicinity. An estimated 112.5 ha (278 ac) of upland habitat including planted pines, previously disturbed areas, and open fields would be removed during construction of permanent structures and facilities (including the onsite portion of the new transmission line), representing about 16 percent of the total 700 ha (1730 ac) of planted pine and open areas currently available onsite. The amount of planted pines that would be disturbed is less than 0.5 percent of the available forested habitat (23,788 ha [58,781 ac]) in the vicinity of the VEGP site (NRSAL 2003). An estimated 1.6 ha (4 ac) of mixed hardwood and pine habitat would be lost to permanent structures and facilities, representing much less than 1 percent of the total 247.7 ha (612 ac) of hardwood habitat available onsite. Approximately 0.6 ha (1.4 ac) of land composed of pond and bottomland hardwood would be crossed by the new transmission line onsite.

Habitats associated with temporary impacts to 77 ha (190 ac) resulting from construction of parking areas, the batch plant, warehouses, laydown yards, and spoils areas would be re-vegetated following construction activities.

5.0 Evaluation of Threatened or Endangered Terrestrial Species Potentially Occurring in the Vicinity of the VEGP Site

This section describes Federally listed or proposed threatened and endangered terrestrial species and designated and proposed critical habitat that may occur in the vicinity of the VEGP site. Table 1-1 lists the endangered, threatened, and other special-status species that may occur in the vicinity of the VEGP site. This list is composed of Federally listed species with recorded occurrences in Burke County (GDNR 2007a), species listed on the FWS website as having the potential to occur in Burke County (FWS 2004a), or species within 16 km (10 mi) of the site in Aiken and Barnwell Counties in South Carolina (SCDNR 2007).

Surveys for Federally listed species classified as threatened or endangered were conducted in spring, summer, and fall 2005 at the VEGP site by Third Rock Consultants, LLC. The surveys were conducted on 675 ha (1669 ac) of the 1283 ha (3169 ac) that comprise the VEGP site (TRC 2006). These surveys were conducted for all known areas that would be disturbed by the pre-construction and construction activities for the proposed Units 3 and 4 (Figure 5-1). A majority of the areas surveyed on the site were areas that had not been previously disturbed during the construction of Units 1 and 2 at the VEGP site or cleared for transmission lines. No Federally listed plant species were found on the VEGP site during the 2005 surveys. The American alligator was the only Federally listed species observed on the VEGP site during the 2005 surveys. One adult alligator was observed in Mallard Pond during the summer survey. It is Federally listed as "...threatened due to similarity of appearance" to the endangered American crocodile (*Crocodylus acutus*) (TRC 2006).

Seven Federally listed terrestrial plant and animal species may occur in the vicinity of the VEGP site. No designated or proposed critical habitat for terrestrial species occurs on or in the general area of the site.

Red-Cockaded Woodpecker – Endangered

The red-cockaded woodpecker (*Picoides borealis*) was listed by the FWS as endangered in 1970 (35 FR 16047). The red-cockaded woodpecker's historic range extended from north Florida to New Jersey and Maryland, as far west as Texas and Oklahoma, and inland to Missouri, Kentucky, and Tennessee. This species has been extirpated in New Jersey, Maryland, Tennessee, Missouri, and Kentucky (FWS 2007a), and currently, it is estimated that about 6000 family groups of red-cockaded woodpeckers, or 15,000 birds, remain in Florida north to Virginia and west to southeast Oklahoma and eastern Texas. This represents about 1 percent of the woodpecker's original range (FWS 2007a). Critical habitat has not been

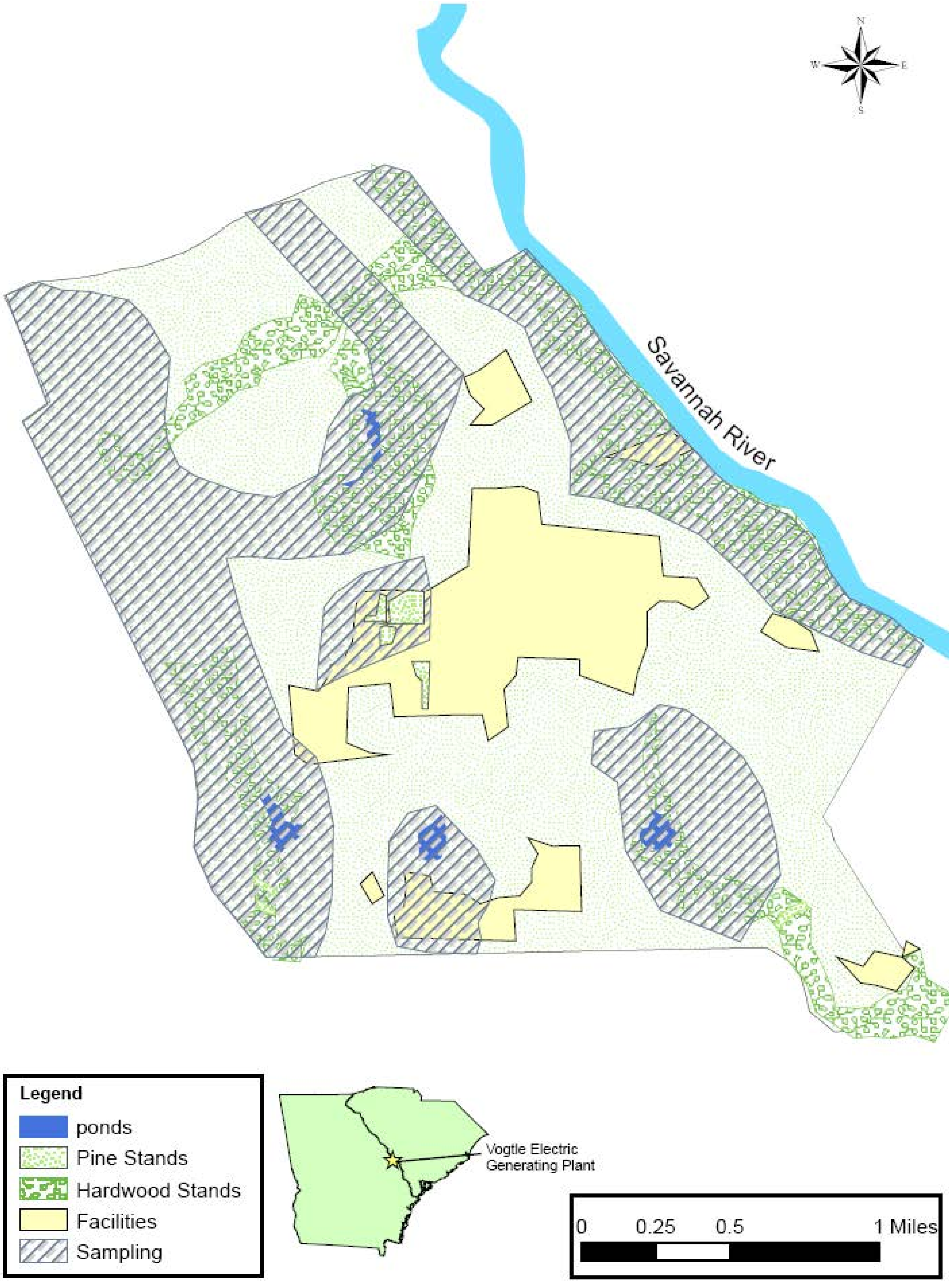

Figure 5-1. 2005 Threatened and Endangered Species Survey Locations at the VEGP Site (Southern 2007b)

established for red-cockaded woodpeckers (FWS 2007b). In 1998, there were 665 family groups of red-cockaded woodpeckers in Georgia (GDNR 1999).

The red-cockaded woodpecker is endemic to open, mature, and old growth pine ecosystems in the southeastern United States. Red-cockaded woodpeckers require open pine woodlands and savannahs with large old pines for nesting and roosting habitat for family groups (clusters). Large old pines are required as cavity trees because the cavities are excavated completely within inactive heartwood and the higher incidence of heartwood decay in older trees greatly facilitates excavation. Cavity trees must be in open stands with little or no hardwood midstory and few or no overstory hardwoods. Suitable foraging habitat consists of mature pines with an open canopy, low densities of small pines, little or no hardwood or pine midstory, few or no overstory hardwoods, and abundant native bunchgrass and forb groundcovers (FWS 2003a).

Red-cockaded woodpeckers are a cooperatively breeding species, living in family groups that typically consist of a breeding pair with or without one or two male helpers. In red-cockaded woodpeckers (and other cooperative breeders), a large pool of helpers is available to replace breeders when they die. Helpers do not disperse very far and typically occupy vacancies on their natal territory or a neighboring one (FWS 2003a). A typical territory for an active group ranges from approximately 51 to 80 ha (125 to 200 ac), but can be as large as 240 ha (600 ac). The size of the particular territory is related to both habitat and population density (FWS 2007a). Dispersal is primarily undertaken by young birds; mate loss and an apparent avoidance of inbreeding sometimes cause adults to disperse, and adults may also occasionally move to neighboring territories for unknown reasons (Walters et al. 1988). In a North Carolina study, females dispersed a maximum of 31.4 km (19.5 mi) and males a maximum of 21.1 km (13.1 mi) (Walters et al. 1988).

Southern is currently working on enrolling the VEGP site in the Georgia Department of Natural Resources (GDNR) Safe Harbor Program. Safe Harbor Agreements are arrangements that encourage voluntary management for red-cockaded woodpeckers while protecting the participating landowners and their rights for development in the event these woodpeckers become established on the private property. Landowners entering into safe harbor agreements must establish a baseline number of individuals that would be maintained in the event that they are observed. Surveys at the VEGP site conducted in February 2006 found no occurrence of red-cockaded woodpeckers onsite. Southern expects to have the Safe Harbor Agreement in place by the end of 2007 (Southern 2006a).

There are no recorded occurrences of the red-cockaded woodpecker in Burke County, Georgia (GDNR 2007a) and no active colonies within 16 km (10 mi) of the VEGP site in South Carolina (SCDNR 2007, Wike et al. 2006); however, red-cockaded woodpeckers are listed as having the potential to occur in Burke County, Georgia, (FWS 2004a) and Aiken and Barnwell Counties in South Carolina (FWS 1999). There are no known historical occurrences of the red-cockaded woodpecker on the VEGP site, and they were not identified in the 2005 threatened and endangered species survey or the 2006 Safe Harbor Program baseline survey (Southern 2006a, 2006b, 2007a; TRC 2006). In 2003, a total of 177 red-cockaded woodpeckers in 45 family groups were recorded on the DOE Savannah River Site.

Suitable habitat for foraging and nesting occurs within the VEGP site, but does not occur in the proposed construction footprint. The types of habitat that would be disturbed during construction mainly consist of previously disturbed areas, planted pines, hardwoods, wetlands along the Savannah River, and open fields. Red-cockaded woodpeckers are found mainly in large stands of old longleaf pine. Based on the distance to the closest known active colony, and the fact that red-cockaded woodpeckers have not been recorded on the VEGP site or in the general vicinity, it is unlikely red-cockaded woodpeckers are foraging on the site, and there is no evidence of nesting onsite. It is unlikely red-cockaded woodpeckers would be encountered during construction activities except as a possible transient individual. Therefore, the staff concludes that limited site-preparation activities for VEGP Units 3 and 4 are not likely to adversely affect the red-cockaded woodpecker.

Wood Stork – Endangered

Breeding populations of the wood stork (*Mycteria americana*) are Federally listed as endangered and currently occur or have recently occurred only in Alabama, Florida, Georgia, and South Carolina (49 FR 7332; FWS 1997). There were 13 active colonies of wood storks in Georgia during the 2002 breeding season with an estimated 1227 nesting pairs (FWS 2003b). No critical habitat has been designated for this species (FWS 2007c).

The wood stork is a highly colonial species, usually nesting and feeding in flocks. Its habitat includes freshwater and brackish wetlands, and it normally nests in bald cypress or red mangrove (*Rhizophora mangle*) swamps. At freshwater sites, nests are often constructed in bald cypress and swamp tupelo (*Nyssa biflora*). Wood storks in Georgia and South Carolina lay eggs from March to late May, with fledging occurring in July and August (FWS 1997).

Wood storks have a unique feeding technique (tacto-location) and typically require higher prey concentrations than other birds. They tend to rely on depressions in marshes or swamps where prey can become concentrated during low-water periods (FWS 1997). A study from a wood stork colony in east-central Georgia found the diet was mostly composed of fish, including sunfishes (*Lepomis* spp.), bowfin (*Amia calva*), redfin pickerel (*Esox americanus americanus*), and lake chubsuckers (*Erimyzon* spp.) (FWS 1997).

Wood storks in east-central Georgia forage in a wide variety of wetland habitats including hardwood and cypress swamps, ponds, marshes, drainage ditches, and flooded logging roads. Typical wood stork foraging sites have reduced quantities of both submerged and emergent macrophytes. The water in the foraging areas is either still or very slowly moving, and the depth is normally between 5 and 41 cm (2 and 16 in.). It has been suggested storks may have difficultly feeding in water with a depth more than 50 cm (20 in.) (Coulter and Bryan 1993). Differences among seasons, rainfall, and surface-water patterns often cause storks to change where and when certain habitats are used for nesting, feeding, or roosting. These hydrological changes may cause storks to shift the timing or intensity of feeding at a local wetland, or cause entire regional populations of birds to make large geographic shifts between one year and the next. Because nesting storks generally use foraging sites that are located within about 50 km (31 mi) of the colony, successful colonies are those that are in regions where birds have options to feed under a variety of rainfall and surface-water conditions. Maintaining a wide range of feeding site options requires that many different types of wetlands, both large and small, and relatively long and short annual hydro-periods be available for foraging (FWS 1997).

The closest known wood stork colonies to the VEGP site are located in Jenkins and Screvin Counties, Georgia. The Birdsville colony is located at Big Dukes Pond, a 570-ha (1400-ac) cypress swamp, which is 12.6 km (7.8 mi) northwest of Millen in Jenkins County, Georgia. The VEGP site is approximately 45 km (28 mi) from the Birdsville colony. The Chew Mill Pond colony in Jenkins County is approximately 6 km (3.7 mi) southwest of the Birdsville colony. Chew Mill Pond has a history of being a wood stork foraging site and a wading bird rookery. Researchers consider it to be an overflow or satellite colony of the Birdsville colony (Wike et al. 2006). The Jacobsons Landing colony in Screven County is approximately 43 km (27 mi) southeast of the VEGP site. In 1996, it contained an estimated 40 wood stork nests. These colonies are within the maximum radius that wood storks travel during daily feeding flights [60 to 70 km (37 to 43 mi)] (Coulter and Bryan 1993). Foraging wood storks have been recorded throughout Burke County, Georgia (Coulter and Bryan 1993; Wike et al. 2006), and in the Savannah River Swamp on the DOE Savannah River Site in South Carolina, which is adjacent to the VEGP site (Wike et al. 2006).

Wood storks were reported in the vicinity of the Savannah River Site before the site was established in 1952, and before the discovery of the Birdsville colony. Storks have been followed from the Birdsville colony to the DOE Savannah River Site. Data from the aerial wood stork surveys of the Savannah River Swamp and the studies at the Birdsville colony suggest that the Savannah River Swamp probably is not used extensively during the breeding or pre-fledging phases of the Birdsville colony. Most of the observations of storks on the Savannah River Site occur during the late-nestling or the post-fledging period, which occurs between June and September. Some of the birds observed foraging in the Savannah River Swamp may be storks from farther south, either non-breeders or birds that have already finished breeding for the year (Wike et al. 2006).

No wood storks were identified in the threatened and endangered species surveys completed in 2005, and there are no known historical records of wood storks occurring on the VEGP site (Southern 2006b; TRC 2006). The closest known colony is more than 40 km (25 mi) from the VEGP site. Although forage areas may be 60 to 70 km (37 to 43 mi) from the colony, 85 percent are within 19 km (12 mi) (Coulter and Bryan 1993). Suitable foraging habitat includes wetlands and open water with low flow rates, depths less that 50 cm (20 in.), and reduced quantities of both submerged and emergent macrophytes. These habitats exist on the VEGP site, and wood storks have been seen within 3.2 km (2 mi) of the site in the Savannah River Swamp. Foraging from June to September on the VEGP site appears possible in wetland areas along stream drainages, ponds, drainage ditches, and the wetlands along the Savannah River. During construction of the cooling water intake and discharge structures and the barge facility, suitable foraging habitat along the Savannah River may be affected. However, this species is highly mobile and any impacts associated with construction on the VEGP site would be short-term and negligible. Therefore, the NRC staff concludes that limited site-preparation activities for VEGP Units 3 and 4 are not likely to adversely affect the wood stork.

Flatwoods Salamander – Threatened

The flatwoods salamander (*Ambystoma cingulatum*) was listed by the FWS as threatened in 1999 (64 FR 15691). The historical range of the flatwoods salamander included parts of the states of Alabama, Florida, Georgia, and South Carolina that are in the lower Coastal Plain of the southeastern United States. Survey work completed since 1990 indicate that 51 populations of flatwoods salamanders are known from across the historical range. Most of these occur in Florida (36 populations or 71 percent). Eleven populations have been found in Georgia, four in South Carolina, and none have been found in Alabama. The last breeding record for Burke County was in the 1940s (FWS 2004a). Critical habitat was proposed in February 2007 in Miller and Baker Counties, Georgia (72 FR 5856). These counties are more than 290 km (180 mi) southeast of the VEGP site.

Adults and sub-adults are fossorial, occur in open mesic pine forests, and are closely associated with pine/wiregrass (*Aristida stricta*) habitats dominated by longleaf or slash pine maintained by frequent fire (Petranka 1998). During the breeding period, which coincides with heavy rains from October to December, these salamanders move to isolated, shallow, small, acidic, tannin-stained depressions (forested with emergent vegetation) that dry completely on a cyclic basis (i.e., ephemeral ponds) (72 FR 5856).

There are no recorded occurrences of flatwood salamanders within 16 km (10 mi) of the VEGP site, no known historical occurrences onsite, and they were not identified in the 2005 threatened and endangered species survey (Southern 2006b, TRC 2006; GDNR 2007a). Suitable habitat for the flatwoods salamander may occur onsite, but suitable habitat is not found within the construction area footprint for the proposed new Units 3 and 4. The types of habitat that would be disturbed during construction mainly consist of previously disturbed areas, planted pine, hardwoods, wetlands along the Savannah River, and open fields. Flatwoods salamanders are not likely to be encountered during construction at the VEGP site, and adverse impacts are unlikely. Therefore, the NRC staff concludes that limited site-preparation activities for the proposed VEGP Units 3 and 4 are not likely to adversely affect the flatwoods salamander.

American Alligator – Threatened Based on Similarity of Appearance

In 1967, the American alligator (*Alligator mississippiensis*) was classified by the FWS as endangered throughout its range, including Georgia. By 1987, following several reclassification actions in other states, it was reclassified to "...threatened based on similarity of appearance" to the American crocodile in the remainder of its range, including Georgia (52 FR 21059). The alligator is no longer biologically imperiled in Georgia. Its populations are considered disjunct, limited to suitable habitat, and stable. The reclassification helps prevent excessive take of the alligator and protects the American crocodile (52 FR 21059).

During surveys of the VEGP site made by Third Rock Consultants, LLC (TRC) in the summer of 2005, an alligator was observed in Mallard Pond (TRC 2006). Alligator habitat consists of swamps, marshes, ponds, lakes, and slow-moving streams and rivers. Alligators appear to be relatively common in the general vicinity of the VEGP site (Wike et al. 2006). Alligators in the specific location of the intake structure, barge facility, or discharge structure may be temporarily displaced, but there is ample wetland habitat in the region. The alligators may be minimally affected by construction at the VEGP site. Therefore, the NRC staff concludes that limited site-preparation activities for the proposed VEGP Units 3 and 4 are not likely to adversely affect the American alligator.

Canby's Dropwort – Endangered

Canby's dropwort (*Oxypolis canbyi*) was listed as endangered by the FWS in 1986 (51 FR 6690). This species is native to the Coastal Plain from Delaware (historical only), Maryland, North Carolina, South Carolina, and Georgia. Historically, this plant was found in Burke, Dooly, Lee, and Sumter Counties in Georgia. There is no critical habitat designated for this species (FWS 1990a).

Canby's dropwort has been found in a variety of habitats, including ponds dominated by pond cypress (*Taxodium ascendens*), grass-sedge-dominated Carolina bays, wet pine savannahs, shallow pineland ponds, and cypress-pine swamps or sloughs. The largest and most vigorous populations occur in open bays or ponds, which are wet throughout most of the year and have little or no canopy cover. Sites occupied by this species generally have infrequent and shallow inundations (5 to 30 cm [2 to 12 in.]). The species' water requirements are narrow, with too little or too much water being detrimental (FWS 1990a). Suitable habitat is normally on a sandy loam or loam soil, which is underlain by a clay layer, which along with the slight gradient of the areas result in the retention of water. Known soil types that support populations of Canby's dropwort are Rembert loam, Portsmouth loam, McColl loam, Grady loam, Coxville fine sandy loam, and Rains sandy loam. These soil types are similar in that they have a medium-to-high organic content, a high water table, and are deep, poorly drained, and acidic (FWS 1990a). None of these soil types occur on the VEGP site. Soil types found on the site include soils in the Chastain-Tawcaw association; Lucy, Osier, and Bibb soils; the Tawcaw-Shellbluff association; and Fuquay, Bonifay, and Troup series soils (NRCS 2003a). The soil types that would be disturbed during construction include Lucy, Troup, and Tawcaw-Shellbluff (Figure 5-2). Lucy and Troup soils are deep, well-drained soils occurring in the upland (NRCS 1997, 2003b). The Tawcaw-Shellbluff soils occur in the Savannah River floodplain and are acidic, poorly drained, and deep (NRCS 2002, 2003c).

Canby's dropwort has not been recorded within 16 km (10 mi) of the VEGP site. There are no known historical occurrences of Canby's dropwort on the VEGP site, and it was not identified in the 2005 threatened and endangered species survey (Southern 2006b; TRC 2006; GDNR 2007a). There are two historical records in Burke County, Georgia, around Waynesboro, Georgia (51 FR 6690), and these populations are currently thought to be extirpated (FWS 1990a).

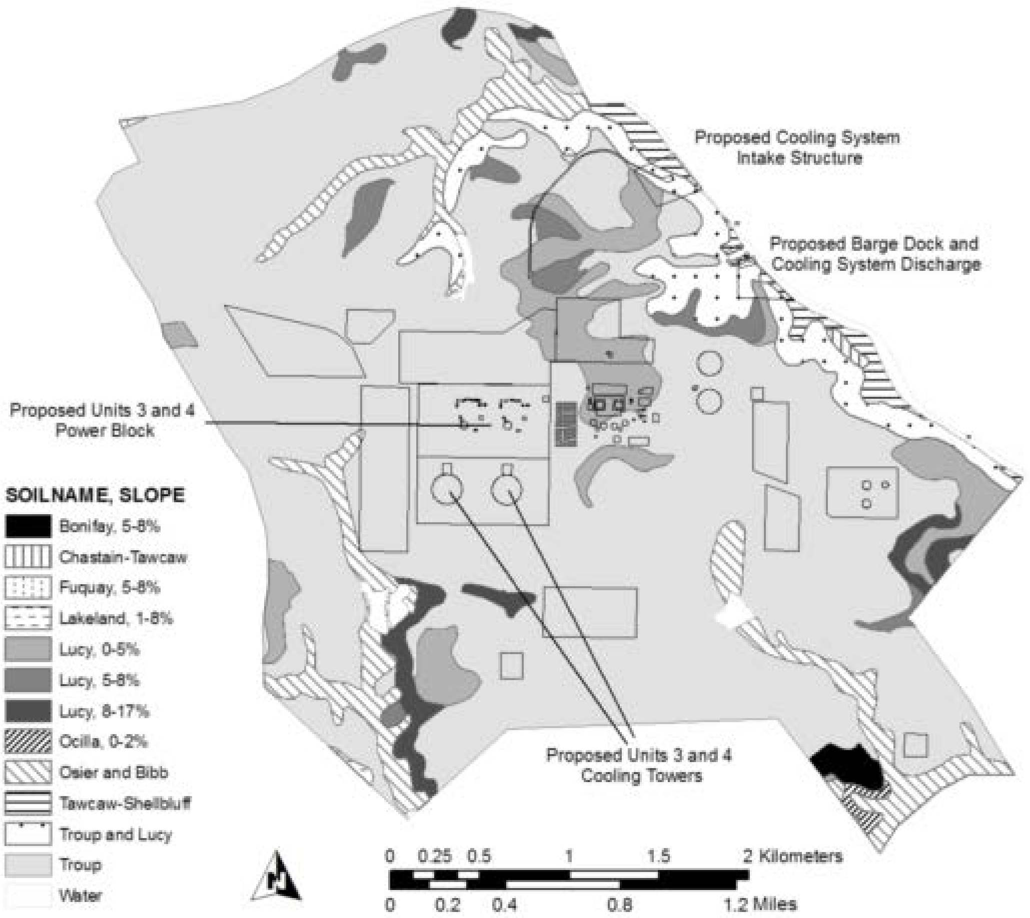

Figure 5-2. VEGP Site Soil Map (NRCS 2003a)

It is unlikely that the VEGP site contains suitable habitat for Canby's dropwort. Canby's dropwort is normally found on a sandy loam or loam soil, which is underlain by a clay layer. Soil types known to support populations of Canby's dropwort are not found on the VEGP site (NRCS 2003a). Because of the lack of suitable habitat, it is unlikely there would be construction-associated impacts to this species at the VEGP site. Therefore, the staff concludes that limited site-preparation activities for the proposed VEGP Units 3 and 4 are not likely to adversely affect Canby's dropwort.

Smooth Coneflower – Endangered

The smooth coneflower (*Echinacea laevigata*) was listed by the FWS as endangered in 1992 (57 FR 46340). The smooth coneflower occurs in meadows and open woodlands on basic or near-neutral soils (Patrick et al. 1995). The soil types that would be disturbed during construction include Lucy, Troup, and Tawcaw-Shellbluff (Figure 5-2). These soil types are generally acidic (NRCS 1997, 2002, 2003b, 2003c). The smooth coneflower is often found with eastern redcedar (*Juniperus virginiana*) or button snakeroot (*Eryngium yuccifolium*) (Patrick et al. 1995). These species are not known to occur on the VEGP site (Southern 2006a), and it is unlikely that suitable habitat occurs onsite.

The smooth coneflower is known to occur in Stephens County, Georgia (Patrick et al. 1995), and is also found in Aiken and Barnwell Counties, South Carolina more than 8 km (5 mi) from the VEGP site (SCDNR 2007). There are no known occurrences of this species in Burke County, Georgia (FWS 2004c), no historical occurrences on the VEGP site, and it was not recorded in the 2005 threatened and endangered species survey (TRC 2006; Southern 2006b). Therefore, the staff concludes that limited site-preparation activities for the proposed VEGP Units 3 and 4 are not likely to adversely affect the smooth coneflower.

Relict Trillium – Endangered

The relict trillium (*Trillium reliquum*) was listed as endangered by the FWS in 1988 (53 FR 10879). Populations of relict trillium are limited to portions of Georgia, South Carolina, and Alabama (FWS 1990b). In 1990, 14 known populations of this species occurred in Clay, Lee, Early, Talbot, Columbia, and Macon Counties, Georgia. Relict trillium is also known to occur in Aiken County, South Carolina, more than 16 km (10 mi) from the VEGP site (SCDNR 2007).

There are no known occurrences of relict trillium in Burke County (FWS 2004a), no historical occurrences on the VEGP site, and it was not recorded in the 2005 and 2007 threatened and endangered species surveys (TRC 2006; Southern 2006b; GDNR 2007b). Relict trillium is found primarily in moist hardwood forests that have had little or no disturbance in the recent past. The soils on which it grows vary from rocky clays to alluvial sands, but all exhibit a high organic matter content in the upper soil layer. Most sites appear to be free from the influence of fire, both in the recent and distant past. Timber harvesting at the known sites has been limited to selective cutting. Relict trillium does occur on less than optimum sites, such as power and sewer line rights-of-way, and apparently it can become reestablished after intense disturbance to the habitat, such as agricultural activity (FWS 1990b).

The NRC staff met with biologists from the GDNR in October 2006. During this meeting, the GDNR staff told the NRC staff that relict trillium had the potential to occur on the VEGP site in suitable habitat along the Savannah River (PNNL 2006). The forested bluff at the VEGP site provides suitable habitat for this Federally endangered species. This bluff was surveyed during the seasonal field surveys conducted in 2005 (TRC 2006). In addition, in the spring of 2007, GDNR biologists surveyed suitable habitat along the Savannah River in the vicinity of the proposed intake structure for relict trillium (GDNR 2007b). The spring 2005 and 2007 surveys were conducted during the flowering period for the relict trillium, which is the best time for positive identification of this species (Patrick et al. 1995). The relict trillium was a targeted species that received special attention during the surveys (Southern 2007b; GDNR 2007b). Although suitable habitat for the species exists within the proposed intake structure construction footprint for the two new units, relict trillium has not been identified through surveys, and it is unlikely that it occurs within the area proposed for disturbance. Therefore, the staff concludes that limited site-preparation activities for the proposed VEGP Units 3 and 4 are not likely to adversely affect relict trillium.

6.0 Conclusions

No Federally listed threatened or endangered species are known to occur at the VEGP site, with the exception of the American alligator. There are no areas designated or proposed as critical habitat for threatened and endangered species in the vicinity of the VEGP site.

The wood stork has been seen in the Savannah River Swamp within 3.2 km (2 mi) of the VEGP site. However, the closest wood stork colony is about 45 km (28 mi) from the site. The wood stork may occasionally use suitable habitat on the VEGP site for foraging or roosting. However, this species is highly mobile, and any impacts associated with the construction activities on the VEGP site would be negligible. Site-preparation activities for the new Units 3 and 4 would have no impact on known wood stork nesting, and these activities are not likely to alter foraging behavior of wood storks in the vicinity.

The red-cockaded woodpecker, relict trillium, and flatwoods salamander are not known to occur within 16 km (10 mi) of the VEGP site. Though suitable habitat may exist for these species onsite, it is not within the construction footprint. It is unlikely there is suitable habitat for the smooth coneflower and Canby's dropwort onsite. Therefore, there are no anticipated impacts on these species associated with limited site-preparation activities on the VEGP site.

The American alligator appears to be relatively common in the Savannah River near the VEGP site. Alligators may be displaced in the wetlands that would be temporarily disturbed or removed during construction, but there is ample wetland habitat in the vicinity. Therefore, there are no anticipated long-term affects to this species associated with the limited site-preparation activities.

The staff concludes that limited site-preparation activities for the proposed VEGP Units 3 and 4 are not likely to adversely affect the red-cockaded woodpecker, wood stork, relict trillium, smooth coneflower, Canby's dropwort, American alligator, or flatwoods salamander.

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Attachment 7

Biological Assessment for the Shortnose Sturgeon to National Marine Fisheries Service for Vogtle Electric Generating Plant Early Site Permit Application

Biological Assessment for the Shortnose Sturgeon

National Marine Fisheries Service

Vogtle Electric Generating Plant

Early Site Permit Application

Burke County, Georgia

January 2008

Docket No. 52-011

U.S. Nuclear Regulatory Commission
Rockville, Maryland

Contents

Figures

Abbreviations/Acronyms

ac	acre(s)
BA	biological assessment
°C	degree Celsius
CFR	Code of Federal Regulations
cm	centimeter(s)
cm/s	centimeters per second
DOE	U.S. Department of Energy
EIS	environmental impact statement
ER	Environmental Report
ESP	early site permit
FR	*Federal Register*
ft	foot/feet
ft/s	feet per second
FWS	U.S. Fish and Wildlife Service
ha	hectare(s)
in.	inch(es)
kg/yr	kilogram(s) per year
km	kilometer(s)
km^2	square kilometer(s)
km/day	kilometer(s) per day
kV	kilovolt(s)
lb/yr	pound(s) per year
m	meter(s)
m^3	cubic meter(s)
mi	mile(s)
mi^2	square mile(s)
mi/day	mile(s) per day
MSL	mean sea level
MW(t)	megawatts thermal
NMFS	National Marine Fisheries Service
NRC	U.S. Nuclear Regulatory Commission
rkm	river kilometer
RM	river mile
Southern	Southern Nuclear Operating Company, Inc.
VEGP	Vogtle Electric Generating Plant
yd^3	cubic yard(s)

1.0 Introduction

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application from Southern Nuclear Operating Company, Inc. (Southern) for an early site permit (ESP) at a location identified as the Vogtle Electric Generating Plant (VEGP) ESP site. An ESP represents NRC approval of a site or sites for one or more nuclear power facilities, and is a separate action from the filing of an application for a construction permit or combined license for such a facility. Southern's ESP application addressed the impacts of constructing and operating two new nuclear units at the existing VEGP site in Burke County, Georgia. The VEGP site is approximately 42 km (26 mi) south of Augusta, Georgia. The proposed ESP site is completely within the confines of the existing VEGP site, with the new units to be constructed and operated adjacent to the existing Units 1 and 2.

The NRC is required to prepare an environmental impact statement (EIS) as part of its review of an ESP application. As required by Title 10 of the Code of Federal Regulations (CFR) 51.26, the NRC published in the *Federal Register* a Notice of Intent (71 FR 58882) to prepare an EIS, conduct scoping, and publish a draft EIS for public comment. The draft EIS was published in September 2007 (NRC 2007a). The final EIS will be issued after considering public comments on the draft. The impact analysis in the EIS includes an assessment of the potential environmental impacts of the construction and operation of two new nuclear power units at the proposed site, including potential impacts to threatened or endangered species. If approved, the ESP would not authorize the applicant to begin construction of the new units; however, it would authorize limited site-preparation activities. Thus, only impacts to protected species resulting from site-preparation activities are considered in this biological assessment (BA).

In a letter dated October 12, 2006, the NRC requested that the National Marine Fisheries Service (NMFS), Southeast Regional Office, provide information regarding Federally listed species at the proposed Vogtle ESP site and along the route of the proposed new 500-kilovolt (kV) transmission lines.[a] The NMFS responded with a list of Federally protected species under the jurisdiction of the NMFS for the State of Georgia.[b] This list included six species of whales, five marine turtles, and the smalltooth sawfish (*Pristis pectinata*), none of which would be expected to be affected by the construction and operation of the two additional units at the VEGP site. The only listed species indicated that occurs in the Savannah River that may be affected by the proposed action is the shortnose sturgeon (*Acipenser brevirostrum*). No designated or proposed critical habitats were identified in the vicinity of the VEGP site. There were no candidate species or species proposed for listing. There were seven species of

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(a) October 12, 2006, letter from NRC to Mr. David Bernhart, Assistant Regional Administrator, National Marine Fisheries Service.

(b) October 24, 2006, letter from Mr. Walt Wilson, Fisheries Biologist, Protected Resource Division, Southeast Regional Office, National Marine Fisheries Service.

concern, six of which occur in coastal areas but not in the Savannah River. The seventh species of concern is the Atlantic sturgeon (*Acipenser oxyrinchus*), which also occurs in the Savannah River and resembles the shortnose sturgeon. Species of concern are not protected under the Endangered Species Act.

The purpose of this BA is to provide information to the NMFS concerning the potential impacts of limited site-preparation activities at the VEGP site on threatened and endangered species and designated critical habitat pursuant to Section 7(a)(2) of the Endangered Species Act. The consultation is between the NRC and the NMFS.

This BA examines the effects of the proposed action on a single listed species, the shortnose sturgeon, which is known to occur in the Savannah River adjacent to the VEGP site.

2.0 Proposed Action

The proposed Federal action is issuance of an ESP for a site at VEGP for two Westinghouse AP1000 nuclear reactors. If approved, an ESP would authorize Southern to perform, at its discretion, the limited preconstruction site-preparation activities allowed by NRC regulations in 10 CFR 50.10(e)(1) and described in Section 3.9.2 of Southern's Environmental Report (ER) (Southern 2007a) and listed in the site redress plan (Southern 2007b). The site redress plan describes the measures that may be necessary to restore (i.e., redress) the site to a condition suitable for other appropriate use as required by NRC regulations in 10 CFR 52.17(c) in the event the project does not proceed to construction or the site is abandoned.

In accordance with the site redress plan, the site would be redressed in the event that the NRC issues the requested ESP, the ESP holder performs the site-preparation and preliminary construction activities, the ESP is not referenced in an application for a construction permit or combined license, and no alternative use is found for the site. Any facilities or structures constructed as part of the site-preparation activities that could be used in the future may be left in place, provided they meet local zoning and pose no safety or environmental hazard.

Prerequisites to preconstruction activities include the acquisition of the necessary permits (e.g., local building permits, National Pollutant Discharge Elimination System permit [40 CFR Part 122], Clean Water Act Section 404 permit, and a General Stormwater Permit). Once these prerequisites have been completed, planned site-preparation activities could proceed and might include some or all of the following activities pursuant to 10 CFR 52.17(c) and 10 CFR 50.10(e)(1). In its ESP application, Southern requested approval to perform the following site-preparation activities for the two new nuclear units at the VEGP site (Southern 2007a):

- prepare the site for construction of the facilities (including such activities as clearing, grading, construction of temporary access roads, and preparation of borrow areas)

- install temporary construction support facilities (including items such as warehouses, shop facilities, utilities, concrete mixing plants, docking and unloading facilities, and construction support buildings)

- excavate for facility structures

- construct service facilities (including items such as roadways, paving, railroad spurs, fencing, exterior utility and lighting systems, transmission lines, and sanitary sewage treatment facilities)

- construct structures, systems, and components that do not prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public, including but not limited to
  - cooling towers
  - intake and discharge structures
  - circulating water lines
  - fire protection equipment
  - switchyard and onsite interconnections
  - barge slip modifications.

Construction of a new 500-kV transmission line to handle the power generated by the proposed new units is included in the activities Southern requested as part of the site-preparation activities. However, construction of a new transmission line offsite was not addressed in the site redress plan and, therefore, is not included in this BA. In addition, the proposed routing of the transmission line is northwest from the site to the Thomson substation located west of Augusta, Georgia. This transmission line would not pass through likely habitat for shortnose sturgeon or for any other potential species under the jurisdiction of the NMFS.

3.0 VEGP ESP Site Description

The proposed Southern ESP site is located in Burke County, Georgia, within the existing VEGP site boundary. The site is adjacent to the Savannah River between river kilometer (rkm) 241 and 244 (river mile [RM] 150 and 152). It is approximately 24 km (15 mi) east-northeast of Waynesboro, Georgia, and 42 km (26 mi) southeast of Augusta, Georgia (see Figure 3-1).

The Savannah River originates in the mountains of North Carolina, South Carolina, and Georgia and flows 505 km (315 mi) to the Atlantic Ocean (Marcy et al. 2005). The river and its tributaries drain more than 24,475 km^2 (9450 mi^2). The middle reach of the Savannah River, extending from the Fall line, just above Kiokee Creek in Columbia County, to the mouth of Brier Creek (Marcy et al. 2005) is typical of southeastern river basins. It is home to a diverse fish fauna, and like other southeastern rivers, its watershed is increasingly affected by the region's growing human population. The Savannah River has several habitat types that are used by fish populations. These habitat types include the main river channel; cutoff bends, or "dead rivers;" swampy habitats (such as Phinezy Swamp, adjacent to Augusta, Georgia, and locations on the U.S. Department of Energy [DOE] Savannah River Site in South Carolina); floodplains (such as in the area of the proposed water intake structure); and streams or tributaries that empty into the Savannah River (Marcy et al. 2005).

The Savannah River floodplain ranges from approximately 30 m (100 ft) to 240 m (800 ft) wide at the VEGP site. However, most of the VEGP site is situated on top of steep river bluffs along the Savannah River shoreline (Southern 2007a). The reach of the river adjacent to the VEGP site is relatively straight and does not contain the sharp bends that are a predominant feature of other reaches of the Savannah River.

Two operating pressurized water reactor generating units (Units 1 and 2) are currently located on the VEGP site. Plant Wilson, a six-unit, oil-fueled combustion turbine facility built in 1974 and owned by the Georgia Power Company, also is located on the site, approximately 1.3 km (0.8 mi) east of the existing VEGP Units 1 and 2. The existing Units 1 and 2 and Plant Wilson would remain on the site and, presumably, would continue to operate. They would not be affected by this action.

The VEGP ESP site is located in a mostly previously disturbed area adjacent to the existing units. The two new Westinghouse AP1000 nuclear reactors would share a water intake structure and a discharge structure. The intake structure would be built on a previously undisturbed floodplain. Each of the proposed Westinghouse AP1000 reactors would have a rated thermal power level of 3400 megawatts thermal (MW[t]) (Southern 2007a). Southern has indicated that both reactors would be cooled using closed-cycle, wet cooling systems with natural draft cooling towers.

Figure 3-1. VEGP Site and the 80-km (50-mi) Vicinity (Southern 2007a)

The existing VEGP site and the proposed disturbance footprint for the new units are shown in Figure 3-2.

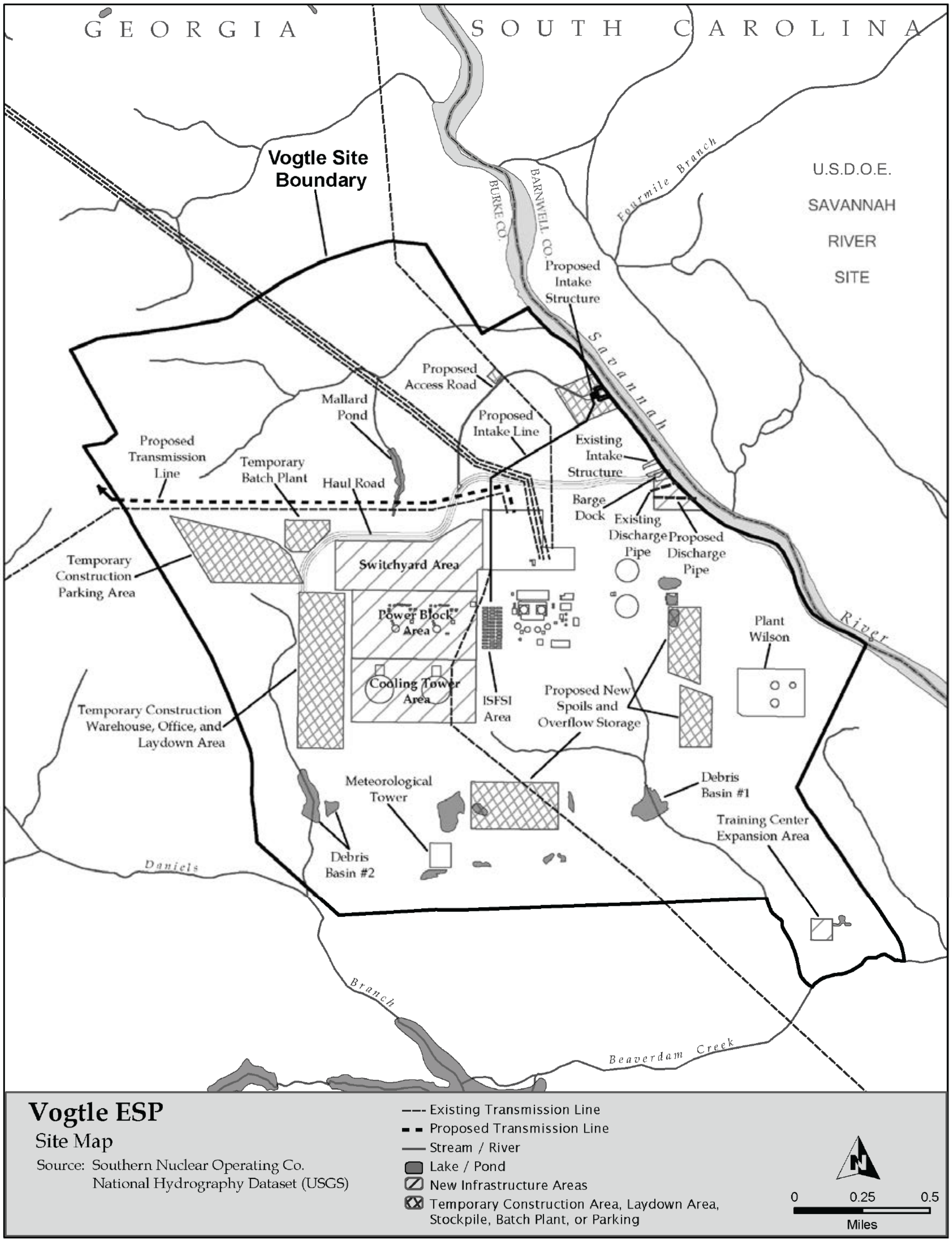

Figure 3-2. Proposed VEGP Site Footprint (Southern 2007b)

4.0 Potential Environmental Impacts of Preconstruction Site-Preparation Activities

The activities listed in Section 2.0 that could potentially affect the habitat for shortnose sturgeon include the construction of the intake and discharge structures and the barge slip. Much of this work will occur on the land. Although other work upland, such as clearing and grading or excavation, could cause erosion that might result in silt and debris entering the Savannah River, Southern has committed to instituting best management practices to mitigate erosion, sedimentation, and dust-generating activities. About 9 ha (22.5 ac) of wetland would be disturbed by construction of the intake and discharge structures and modifications to the barge slip. This total area includes approximately 5 ha (12.5 ac) (1.2 ha [3 ac] permanently and 3.8 ha [9.5 ac] temporarily) affected during construction of the cooling water intake structure and 4 ha (10 ac) affected during construction of the barge facility and discharge structure (Southern 2007c). Southern estimates that 122 m (400 ft) of shoreline would be disturbed at the cooling water intake structure and 27 m (90 ft) would be disturbed for the new barge facility (Southern 2007c). The shoreline disturbance associated with the discharge structure would be 6 m (20 ft).

The proposed location of the new cooling water intake structure is in the floodplain upriver of the existing intake structure and canal for Units 1 and 2 (see Figure 3-2) (Southern 2007c). Plan and section views of the intake structure are shown in Figures 4-1 and 4-2. The intake structure and canal would be sized for three Westinghouse AP1000 units; however, only the mechanical components supporting the proposed VEGP Units 3 and 4 would be installed (Southern 2007c). The intake canal would be approximately 73 m (240 ft) long by 52 m (170 ft) wide, with an earthen bottom at an elevation of 21 m (70 ft) above mean sea level (MSL) and vertical sheet pile sides extending to an elevation of 30 m (98 ft) MSL (Southern 2007c). The new intake structure and canal construction would disturb approximately 5 ha (12.5 ac), with most of it in the Savannah River floodplain (Southern 2007a). Southern anticipates that construction of the intake structure would occur in the summer, fall, and early winter to minimize the potential for unwanted flooding of the construction area (Southern 2007c). This timing also would minimize the impact to fish and other aquatic organisms that move into the floodplain with the high water conditions that typically occur during the months of February, March, and April.

Construction of the new cooling water intake structure, enlarged barge facility, and new discharge structure would be conducted pursuant to Section 10 of the Rivers and Harbors Act of 1899 and under Section 404 of the Clean Water Act. A Georgia General Stormwater Permit for construction would also be required (Southern 2007c). Southern has indicated that to minimize turbidity entering the river, excavation would begin at the inland or west end of the canal cofferdam face and proceed toward the river (Southern 2007c). Permanent sheet piles forming

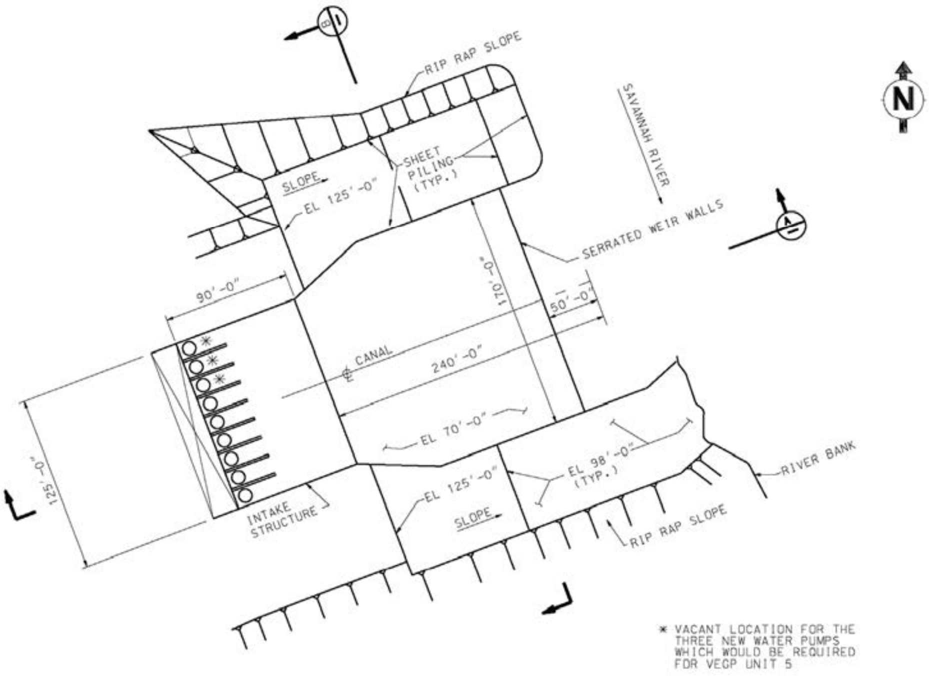

Figure 4-1. Plan View of Proposed Cooling Water Intake Structure (Southern 2007a)

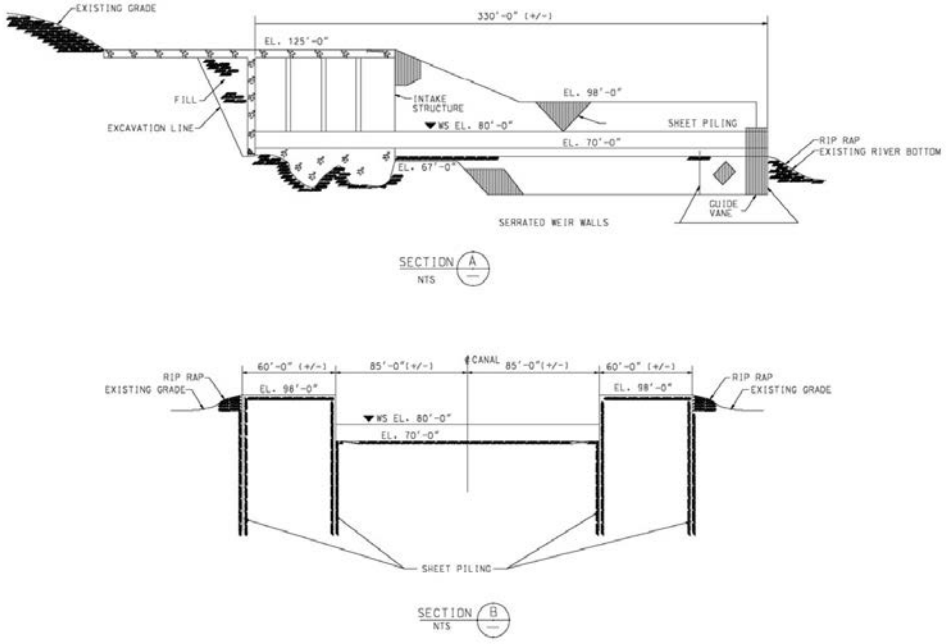

Figure 4-2. Section View of Proposed Cooling Water Intake Structure (Southern 2007a)

the north and south banks of the intake canal would be driven using a vibratory or diesel hammer to form the north and south walls of a cofferdam. Temporary sheet piling would be driven around the perimeter of the intake structure and across the east and west face of the intake canal to complete the cofferdam. The piling installations would be completed from the land side (Southern 2007c). Material within the intake area cofferdam would be excavated to an elevation of 21 m (70 ft). The interior of the cofferdam would be de-watered to 6 m (20 ft) below ordinary high water level. The ordinary high water level often is taken as the elevation of the river bank, which is approximately 26 m (85 ft) MSL at the intake structure site. However, the river reaches a level of approximately 27 m (89 ft) MSL on an annual basis during the late winter and spring months (Southern 2007c). Southern has indicated that the excavation process would include controls to manage erosion and sediment and to ensure that runoff from the excavation process would not create environmental or aesthetic problems (Southern 2007c). The discharge from the dewatering system, and potentially from a hydraulic dredge, would be managed in accordance with the Section 401 Water Quality Certification to be issued by the Environmental Protection Division of the Georgia Department of Natural Resources in support of the U.S. Army Corps of Engineers Section 404 permit to control discharge of water from the construction process to the Savannah River (Southern 2007c). This approach typically includes controls of turbidity and use of best management practices to prevent spills of oils or hazardous materials associated with operation of excavation equipment (Southern 2007c).

A tethered, floating silt curtain installed across the entrance to the intake canal would be used during excavation of the canal interior down to an elevation of 21 m (70 ft) MSL. Installation of the inner serrated weir wall and the outer serrated wall and guide vanes at the mouth of the intake would be accomplished from a barge located in the Savannah River. Southern also has committed to using appropriate environmental controls during this process to prevent spills and minimize environmental impact to the river and adjacent wetlands (Southern 2007c).

The existing barge slip is located between the existing VEGP Units 1 and 2 intake canal and the ring crane foundation. Figures 4-3 and 4-4 show plan and section views, respectively, of the proposed barge slip. The current barge slip is underlain by fill that was placed during the initial construction of VEGP Units 1 and 2 (Southern 2007c). The barge slip would be enlarged to support unloading of the Westinghouse AP1000 components and modules. The downstream sheet-pile wall would be removed and the slope excavated to extend the barge slip 27 m (90 ft) along the shoreline (Southern 2007c). The downstream sheet-pile wall would be reconstructed and the shoreline stabilized. A tethered, floating silt curtain would be installed at the entrance to the barge slip prior to excavating below 27 m (90 ft) MSL (Southern 2007c). Excavation would begin at the west end of the barge slip and proceed toward the river, thus minimizing turbidity entering the river (Southern 2007c).

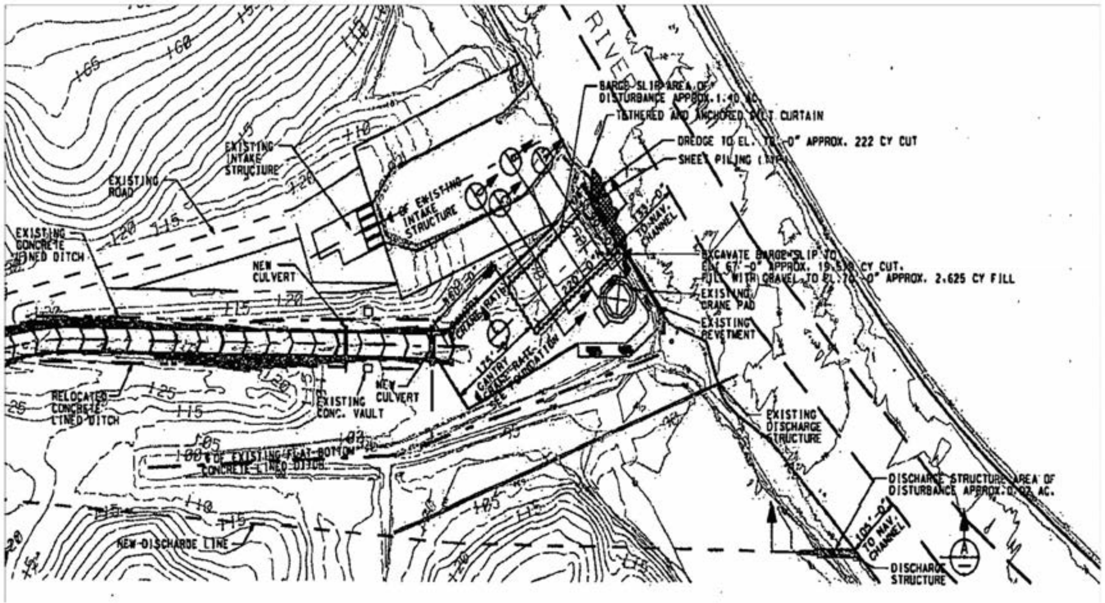

Figure 4-3. Plan View of Proposed Barge Slip (Southern 2007c)

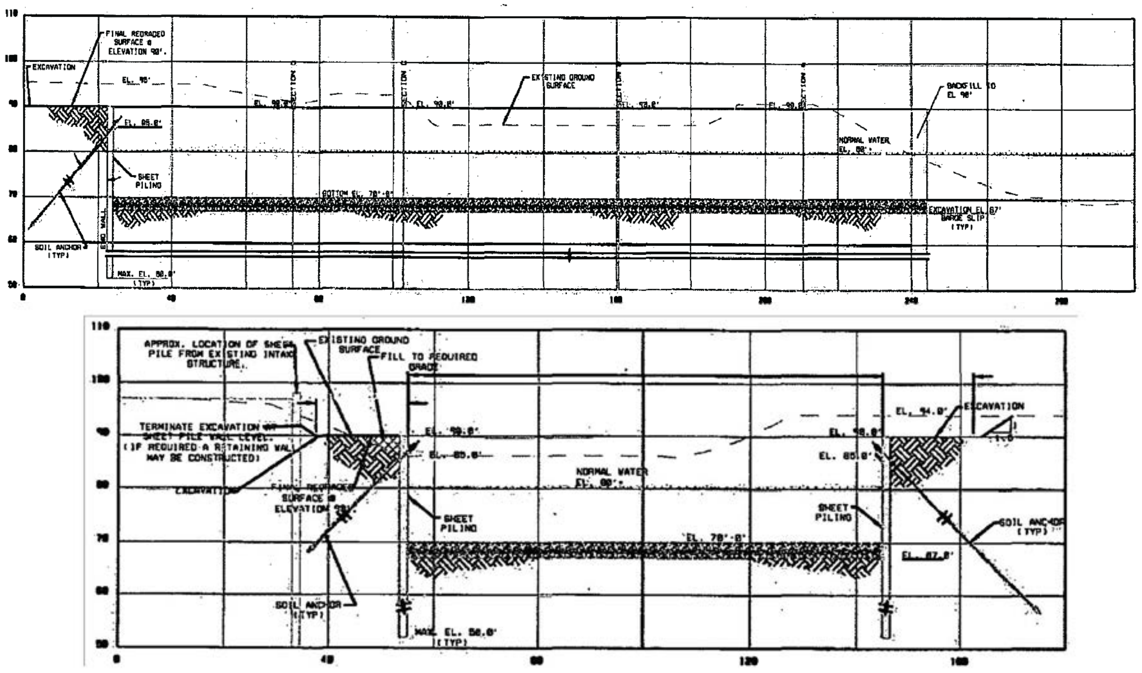

Figure 4-4. Section View of Proposed Barge Slip (Southern 2007c)

Southern estimated that approximately 230 m^3 (300 yd^3) of sediment would be dredged or excavated from the Savannah River at the east end of the barge slip (where the slip enters the river) . Dredging would be to a depth of approximately 20 m (67 ft) MSL (Southern 2007c). In addition, construction of the barge slip would require approximately 1988 m^3 (2600 yd^3) of stone fill within the barge slip basin (most of which is not in the Savannah River) to provide a stable foundation for grounding the loaded barges (Southern 2007c). Some of this fill would be placed in the area that currently is part of the river.

A bathymetry study described in Southern (2007a) indicates that there will not be a need to dredge from the end of the barge slip to the Federal navigation channel (Southern 2007c). However, river bathymetry may change and dredging could be performed in the future (NRC 2007b). In-river dredging requires authorization from the U.S. Army Corps of Engineers, which may result in time of year restrictions to protect aquatic resources.

The proposed discharge structure will be placed near the southwest bank of the Savannah River, extending about 15 m (50 ft) into the river (Southern 2007a). Plan and section views of the proposed discharge structure outfall are shown in Figures 4-5 and 4-6. The discharge pipe will be approximately 1 m (3.5 ft) in diameter, narrowing to 0.6 m (2 ft) in diameter before the discharge point (Southern 2007c). The anticipated centerline elevation of the discharge pipe is 0.9 m (3 ft) above the river bottom elevation (Southern 2007a). Construction would involve the installation of a temporary sheet-pile cofferdam (installed using a vibratory or diesel hammer [Southern 2007c]) and a dewatering system (either a well-point system or local pumps). The interior of the cofferdam would be excavated so that the pipe could be installed approximately 0.9 m (3 ft) below the invert elevation of the discharge piping and then contoured up the river bank. H-piles used for piping supports would be driven to an elevation of 15 m (50 ft) MSL. After the pipe is laid, the dewatering system would be removed, and the piping would be backfilled and graded to the required river bank slope contours. The cofferdam would be removed, and rip-rap material would be installed to stabilize the riverbed and the shoreline in the vicinity of the discharge point.

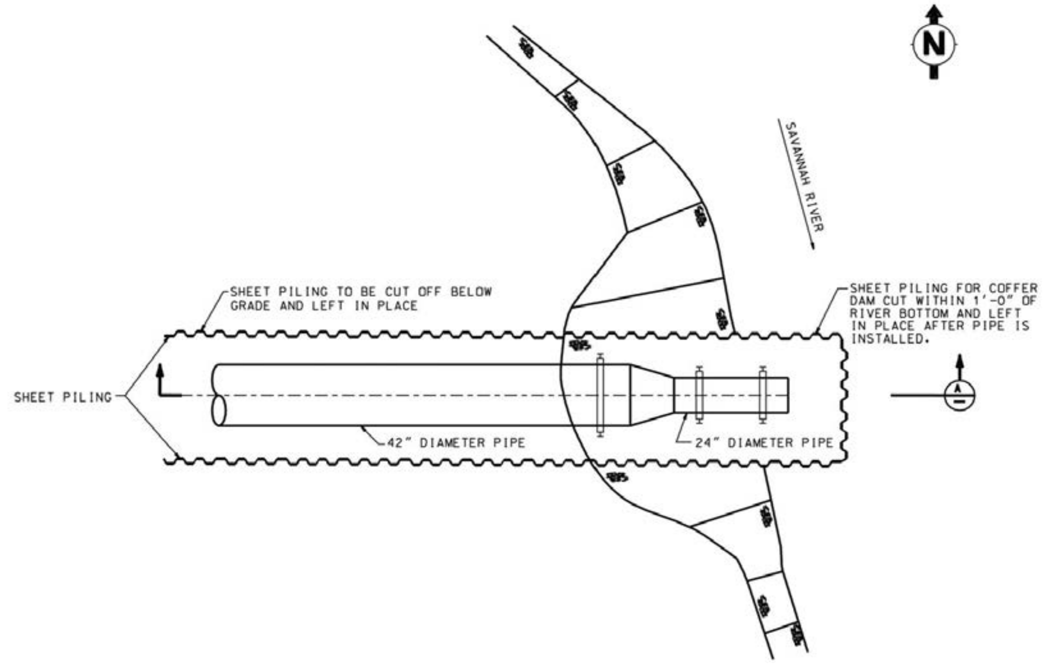

Figure 4-5. Plan View of Proposed Discharge Outfall (Southern 2007a)

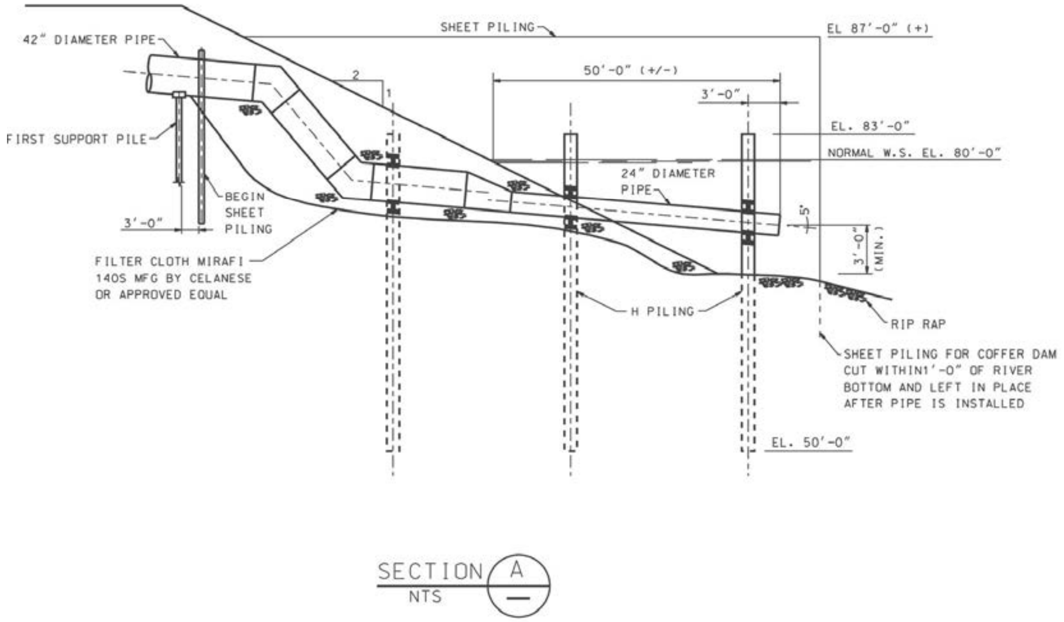

Figure 4-6. Section View of Proposed Discharge Outfall (Southern 2007a)

5.0 Shortnose Sturgeon

Shortnose sturgeon (*Acipenser brevirostrum*) are in the Family Acipenseridae, a long-lived group of ancient anadromous and freshwater fishes. The species currently is known by at least 19 distinct populations inhabiting 25 river systems ranging from New Brunswick, Canada, to northern Florida (NOAA 1998). Shortnose sturgeon were listed originally as an endangered species by the U.S. Fish and Wildlife Service (FWS) on March 11, 1967, under the Endangered Species Preservation Act (32 FR 4001). The NMFS later assumed jurisdiction for shortnose sturgeon in 1974. The species is Federally protected throughout its range.

5.1 Life History of Shortnose Sturgeon

Shortnose sturgeon are anadromous. They spawn in freshwater like the Atlantic sturgeon, but then return to the estuaries and spend much of their lives near the fresh-water/salt-water interface. Fresh tidewaters and oligohaline areas serve as nurseries for shortnose sturgeon (Flournoy et al. 1992). There is some indication that populations of shortnose sturgeon in a river may be limited by the availability of spawning and rearing habitats (Weber 1996). Seasonal migration patterns and some aspects of spawning may be partially dependent on latitude. In northern rivers, shortnose sturgeon move to the estuarine portion of rivers in summer. In southern rivers, movement to estuaries usually occurs in winter (NOAA 1998).

The distribution of shortnose sturgeon strongly overlaps that of the Atlantic sturgeon *(Acipenser oxyrinchus*), but life histories differ greatly between the two species. Atlantic sturgeon are truly anadromous, with adults and older juveniles spending a large portion of their lives at sea before returning to coastal rivers to spawn. Evidence of inter-riverine movement of shortnose sturgeon individuals by way of the Atlantic Ocean probably is rare, and populations seem to be essentially isolated in each river system that supports a population (Rogers and Weber 1995; Flournoy et al. 1992). Most shortnose sturgeon populations have their greatest abundance in the estuary portion of their respective river (Weber 1996).

Dadswell et al. (1984) provided a synopsis of biological data for shortnose sturgeon. They reported that temperature is probably the major factor governing spawning. All sources referenced by Dadswell et al. (1984) reported shortnose sturgeon spawning to occur between 9° and 12°C. The occurrence of freshets (i.e., increased fresh water flow resulting from sudden rain or melting snow) and substrate character were other factors that influenced spawning.

Spawning grounds were described as being in regions of fast water flow (i.e., 40 to 60 cm/s [1.3 to 2 ft/s]) with gravel or rubble bottoms. The locations were generally well upriver of the summer foraging and nursery grounds. In South Carolina, spawning was reported to occur in flooded, hardwood swamps along inland portions of rivers, including the Savannah River.

Richmond and Kynard (1995) reported that shortnose sturgeon eggs are demersal and adhesive after fertilization, sinking quickly and adhering to sticks, stones, gravel, and rubble on the stream bottom. Hatchlings (i.e., less than a day old) were rheotactic, photonegative, and benthic, and they vigorously sought cover. If they were denied cover, they exhibited vertical swim-up and drift behavior until cover was found. Older embryos (i.e., 1 to 8 days old) exhibited the same behaviors as hatchlings and, when denied cover, would search along the stream bottom until cover was found. Between 9 and 16 days in age, the larvae left cover and were positively rheotactic and photopositive. Three-quarters of the larvae left the bottom cover and swam in the water column. Larvae preferred deep water and silt substrate. Most 43-66 day juveniles were benthic swimmers.

A recent investigation was conducted to determine any differences in larval behavior resulting from latitudinal variation for shortnose sturgeon populations in the Connecticut River in Massachusetts and in the Savannah River. Specific parameters investigated included habitat preference and dispersal and diel activity and timing for early life stages. Yolk-sac larvae of shortnose sturgeon from both rivers preferred dark habitat and used rock cover. Both groups showed some downstream movement as yolk-sac larvae. Savannah River shortnose sturgeon used rock cover less in the first three days after hatching. The use of cover decreased with age until day 13, when all fish were foraging in the open, although they generally stayed near the bottom. Upon becoming larvae, shortnose sturgeon showed an ontogenic behavioral shift to a preference for bright, open habitat. Fish exhibited a low level of downstream movement for the whole larval period and as early juveniles. During the first 30 days, larvae swam to a mean height in the water column of 67 to 117 cm (2.2 to 3.8 ft) on all days (Parker 2007).

Shortnose sturgeon exhibit faster growth in southern rivers, but achieve larger adult size in northern rivers (NOAA 1998). Thus, shortnose sturgeon will reach sexual maturity (45 to 55 cm [17.7 to 21.6 in.] fork length) at a younger age in southern rivers (Weber 1996). Spawning by individual fish may occur only at intervals of a few years to several years.

A life history that restricts the species to individual drainage areas, combined with seasonally restricted use of habitats, may be directly related to the species' current endangered status. Sturgeon have long been a commercially important species, which may be a leading cause in their rapid decline worldwide. For more than a century, Atlantic and shortnose sturgeon populations were subjected to extensive fishing, likely contributing to the massive population declines along the U.S. East Coast (NOAA 1998). Before 1900, sturgeon catches averaged more than 3.0 million kg/yr (6 million lb/yr), but this harvest was sustained for less than a decade. Before the closure of most East Coast fisheries during the 1980s, catches had decreased to less than 1 percent of historical levels (Rogers et al. 1994). Although shortnose sturgeon were severely over-harvested in the past, the current greatest threats to survival of the species include barriers to its spawning grounds created by dams, loss of habitat, poor water quality, poaching, and incidental capture in gill net and trawl fisheries seeking other species (Rogers and Weber 1995; Rogers et al. 1994).

5.2 Status of Shortnose Sturgeon in the Savannah River

Shortnose sturgeon were discovered in the lower Savannah River in the late 1970s (Dadswell et al. 1984). From 1984 to 1992, more than 100,000 sturgeon (18 percent of which were tagged) were stocked in the Savannah River (Smith et al. 2001) by the South Carolina Department of Natural Resources, Marine Resources Research Institute. Information collected during the stocking efforts in the Savannah River and shortly thereafter indicated that stocked juveniles comprised a minimum of 35.4 percent of the juvenile population in the lower river nursery area. Based on records of marked fish and results from double-tagging studies, it was estimated that from 1997 to 2000, at least 37.7 percent of the adult population in the Savannah River was comprised of stocked fish. Population estimates indicated that the adult population is now increasing, but juveniles are still rare. Smith et al. (2001) attributed this to a recruitment bottleneck in the early life stages and, in part, because of water-quality degradation in the nursery habitat in the lower Savannah River. Collins et al. (2002) indicates the nursery habitat for juvenile shortnose sturgeon in the Savannah River is located in the lower river approximately from rkm 31.5 to 47.5 (RM 20 to 30), a reach that is well distant from the VEGP site.

Shortnose sturgeon larvae were collected in the vicinity of DOE’s Savannah River Site (near the VEGP site) during ichthyoplankton surveys conducted from 1982 to 1985. Differentiating shortnose sturgeon larvae from Atlantic sturgeon larvae can be difficult because of their similar appearance; however, a total of 12 of the 43 sturgeon larvae collected were identified as shortnose sturgeon (Paller et al. 1986). Four of the shortnose sturgeon larvae were taken from the river downstream from the VEGP site between rkm 128 and 193 (RM 80 and 120). The remaining eight sturgeon larvae were taken above the VEGP site between rkm 250 to 269 (RM 155 and 167). The shortnose sturgeon larvae were taken during March and the Atlantic sturgeon during April (Paller et al. 1986).

Collins and Smith (1993) captured 626 adult shortnose sturgeon in the Savannah River from 1984 to 1992. They found significantly more fish in the lower river between rkm 42 and 75 (RM 26 and 46) than in the upper river between rkm 160 and 299 (RM 99 and 185). Twenty-four adult shortnose sturgeon were implanted with radio transmitters. Telemetry data indicated that only a portion of the population participated in the upriver spawning migration. Migrating sturgeon began moving upriver from late January to mid-March traveling at speeds of up to 50 km/day (31 mi/day). Hall et al. (1991) also performed telemetry studies to determine seasonal movements and habitat areas of adult and juvenile shortnose sturgeon. They reported upriver spawning migrations from mid-February to mid-March when temperatures ranged from 9° to 12°C. Migration rates as high as 33 km/day (20.5 mi/day) were observed.

Hall et al. (1991) reported that two areas, one downstream of the VEGP site (rkm 179 to 190 [RM 111 to 118]) and one upstream of site (rkm 275 to 278 [RM 171 to 173]), were the destinations of migrating adult fish and were occupied for several days during the spawning season. Collins and Smith (1993) reported a probable spawning location between rkm 179 and 228 (RM 111 and 142). Figure 5.1 illustrates the location of probable spawning sites for the shortnose sturgeon in relationship to the VEGP site (i.e., from rkm 241 to 244 [RM 150 to 152]). Hall et al. (1991) also described the environment at the probable spawning locations indicated above. They indicated that the substrate in the river bend portions of these locations was distinctly different from other sections of the river. The sharp river bends were characterized by "...submerged timber, with scoured sand, clay, and gravel as substrate." The outside banks were hard packed clay, which was scoured by the swift currents, thus preventing any sediment accumulation. Fish located in the spawning areas were always situated in the main channel. Hall et al. (1991) reported that the maximum depths in the river bends of these two areas were 6 to 9 m (20 to 29.5 ft) , and current velocities ranged from 52 to 104 cm/s (1.7 to 3.4 ft/s) at the surface. Bottom velocities during the spawning season averaged 82 cm/s (2.7 ft/s). They theorized that the sharp bends in certain sections of the Savannah River create the necessary velocity and turbulence for spawning. Substrate in the area provided suitable attachment for the highly adhesive eggs. Dadswell et al. (1984) and Buckley and Kynard (1985) reported that spawning usually is associated with areas where the predominant substrate is composed of gravel, rubble, and cobble. Hall et al. (1991) indicated that their visual observations of the bend areas in the suspected spawning grounds in the Savannah River confirmed the presence of such materials. Collins and Smith (1993) also reported that probable spawning areas contain sharp bends with strong currents, submerged timber, and a substrate of gravel, clay, and sand.

It is unlikely that spawning activity occurs in the vicinity of the VEGP site. Aggregations indicative of spawning have been reported in stretches of the Savannah River upstream and downstream of the VEGP site over substrates unlike those found adjacent to the proposed site for construction and operation of Units 3 and 4.

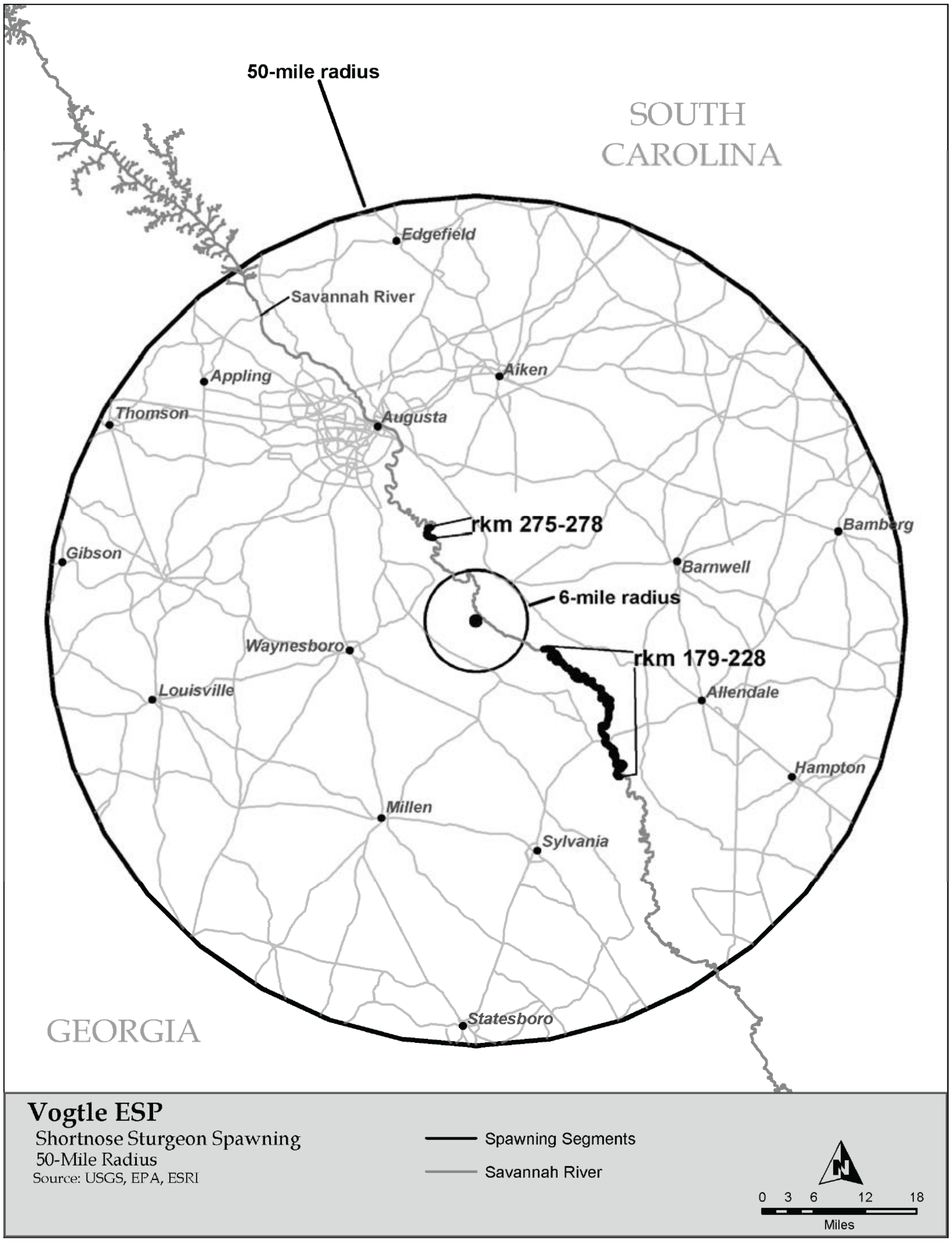

Figure 5-1. Probable Spawning Areas for Shortnose Sturgeon in the Savannah River in the Vicinity of the VEGP Site (based on data from Hall et al. 1991 and Collins and Smith 1993)

6.0 Evaluation of Potential Impacts

The probable location and river habitat at spawning sites described by Hall et al. (1991) and Collins and Smith (1993) contrast with location and river habitat at the VEGP site. The VEGP site is located 13 river kilometers (8 river miles) upstream and 34 river kilometers (21 river miles) downstream of the nearest probable spawning locations. The Savannah River adjacent to the VEGP site is relatively straight with none of the sharp bends that are predominant in the vicinity of the probable spawning locations. The maximum depth of the water in the vicinity of the proposed intake structure is approximately 3.7 to 4.0 m (12 to 13 ft) rather than the 6 to 9 m (20 to 29.5 ft) reported by Hall et al. (1991) at the suspected spawning sites. The substrate in the deeper sections of the river near the site range from "...brown, poorly graded gravel with sand" to "...poorly graded gravel" (Southern 2006) rather than the "...submerged timber with scoured sand, clay, and gravel" reported by Dadswell et al. (1984) and Buckley and Kynard (1985).

No spawning studies have observed shortnose sturgeon spawning in the river adjacent to the Vogtle site. While studies of the DOE Savannah River Site have observed and collected shortnose sturgeon larvae in ichthyoplankton surveys, it is likely that they came from the suspected spawning area upstream of the facility because two-thirds of the larvae collected were found in samples taken upstream of the Vogtle site.

The construction activities previously described are expected to have minimal impacts on the aquatic ecology of the Savannah River. The extent of benthic habitat altered during intake canal construction would be small, because most of the major construction activities would occur in the floodplain (or in the case of the barge slip, in previously disturbed areas). Likewise, there would be limited disturbance of the benthic habitat during construction of the discharge structure. A greater amount of river habitat would be disturbed during the barge slip construction activities; however, the amount of benthic habitat, open water, shoreline, and benthic fauna that would be lost is a small fraction of the total present in this area of the Savannah River. Disruption of silt and debris and its movement downstream during construction is expected to be minor based on the use of siltation curtains and best management practices. Noise impacts from pile driving would be transient. During the construction process, fish, including shortnose sturgeon, that may be inhabiting the river in the vicinity of the construction activities would likely leave temporarily or avoid the Georgia side of the river as a result of noise from pile-driving or other construction activities. This temporary habitat loss would be a very small percentage of the total aquatic habitat in this area of the Savannah River.

Although the NRC staff has concluded that because of the limited scope of the activities and the best management practices employed by Southern, site preparation activities addressed in this

BA would be temporary and unlikely to adversely affect shortnose sturgeon. Additional measures, such as imposing seasonal limitations on in-river activities, could further reduce any impact to drifting larvae. The staff finds that data on the presence of shortnose sturgeon larvae in the Savannah River in the vicinity of the VEGP site is based on studies conducted in the early 1980s. Additional ichthyoplankton studies targeting shortnose sturgeon to more properly characterize larval distribution from the upstream spawning site should be considered.

Based on this review, the staff concludes that the overall impact of preconstruction-related activities would be temporary and unlikely to adversely impact shortnose sturgeon in the Savannah River.

7.0 References

10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 52. Code of Federal Regulations, Title 10, *Energy*, Part 52, "Early Site Permits, Standard Design Certifications, and Combined Licenses for Nuclear Power Plants."

40 CFR Part 122. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 122, "EPA Administered Permit Programs: the National Pollutant Discharge Elimination System."

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Attachment 8

Biological Assessment to US Fish and Wildlife Service for Vogtle Electric Generating Plant Combined Licenses Application

Biological Assessment

U.S. Fish and Wildlife Service

Vogtle Electric Generating Plant
Combined Licenses Application

U.S. Nuclear Regulatory Commission Combined Licenses Application
Docket Nos. 52-025; 52-026

Burke County, Georgia

February 2011

U.S. Nuclear Regulatory Commission
Rockville, Maryland

Contents

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Abbreviations/Acronyms

ac	acre(s)
AP1000	Advanced Passive 1000
APP	Avian Protection Program
BA	biological assessment
CCAA	Candidate Conservation Agreement with Assurances
CFR	Code of Federal Regulations
cm	centimeter(s)
COL	combined license
CWS	circulating water system
dBA	decibel(s) (acoustic)
DOE	U.S. Department of Energy
EA	environmental assessment
Eco-Sciences	Eco-Sciences of Georgia
EMFs	electromagnetic fields
EPP	environmental protection plan
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
ESP	early site permit
FONSI	Finding of No Significant Impact
FR	Federal Register
ft	foot/feet
FWS	U.S. Fish and Wildlife Service
GDNR	Georgia Department of Natural Resources
GEIS	generic environmental impact statement
GPC	Georgia Power Company
GTC	Georgia Transmission Corporation
ha	hectare(s)
in.	inch(es)
kg/ha/mo	kilograms per hectare per month
km	kilometer(s)
kV	kilovolt(s)
lbs/ac/mo	pounds per acre per month
LWA	Limited Work Authorization
m	meter(s)

mi	mile(s)
MW(t)	megawatts thermal
NEPA	National Environmental Policy Act of 1969, as amended
NRC	U.S. Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
Plant Wilson	Allen B. Wilson Combustion Turbine Plant
RDC	Representative Delineated Corridor
ROW	right(s)-of-way
SCDNR	South Carolina Department of Natural Resources
SCE&G	South Carolina Electric and Gas
SEIS	supplemental environmental impact statement
SERPPAS	Southeast Regional Partnership for Planning and Sustainability
SPL	sound pressure level
Southern	Southern Nuclear Operating Company, Inc.
TDS	total dissolved solids
TRC	Third Rock Consultants, LLC
USACE	U.S. Army Corps of Engineers
VEGP	Vogtle Electric Generating Plant
Westinghouse	Westinghouse Electric Company, LLC

1.0 Introduction

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application from Southern Nuclear Operating Company, Inc. (Southern), acting on behalf of itself and several co-applicants (i.e., Georgia Power Company [GPC], Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and the City of Dalton, Georgia) for combined licenses (COLs) to construct and operate two Westinghouse Electric Company, LLC (Westinghouse) Advanced Passive 1000 (AP1000) pressurized water reactors (Units 3 and 4) on the site of the Vogtle Electric Generating Plant (VEGP) in Burke County, Georgia. The VEGP Site and existing facilities are owned and operated by GPC, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and the City of Dalton, Georgia. Southern is the licensee and operator of the existing VEGP Units 1 and 2, and has been authorized by the VEGP co-owners to apply for COLs to construct and operate two additional units (Units 3 and 4) at the VEGP Site.

On August 26, 2009, the NRC approved issuance of an early site permit (ESP) and a limited work authorization (LWA) for two additional nuclear units at the VEGP Site (NRC 2009) to Southern and the same four co-applicants. This approval was supported by information contained in NUREG-1872, *Final Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site, Volumes* 1 and 2 and errata (NRC 2008a). The ESP resolved many safety and environmental issues and allowed Southern to “bank” the VEGP ESP Site for up to 20 years. The LWA authorized Southern to conduct certain limited construction activities at the site in accordance with Title 10 of the Code of Federal Regulations (CFR), Sections 50.10 and 52.24(c). As permitted by NRC regulations, the COL application references the VEGP ESP.

Southern’s COL application addressed the impacts of constructing and operating two new nuclear units at the existing VEGP Site in Burke County, Georgia. The VEGP Site is approximately 42 km (26 mi) south of Augusta, Georgia. The proposed COL site is completely within the confines of the existing VEGP Site, with the new units to be constructed and operated adjacent to the existing Units 1 and 2 (Figure 1). In October 2009, as part of the COL application, Southern requested a second LWA that would authorize installation of reinforcing steel, sumps, drain lines, and other embedded items along with placement of concrete for the nuclear island foundation base slab.

Independent of the COL application and LWA request, Southern and GPC intend to construct and operate a new 500-kV transmission line to serve the proposed Units 3 and 4. The two new units would use some combination of the new and existing transmission lines. The exact route of the new transmission line has not been determined, but the new transmission line right-of-way (ROW) would be routed northwest from the VEGP Site, passing west of Fort Gordon, a U.S.

Army facility west of Augusta, Georgia, and then north to the Thomson substation. The Thomson substation is located about 32 km (20 mi) west of Augusta, Georgia. The transmission line ROW would be approximately 46 m (150 ft) wide and approximately 97 km (60 mi) long (NRC 2008a). The new transmission line would require approximately 390 towers (NRC 2008a). Each tower would require foundation excavations. Transmission line siting in Georgia is regulated under Title 22 of the Georgia Code. Construction and operation of the potential transmission line is not authorized by the NRC and approval of that activity is thus not part of the NRC's determination on the COL application. However, that activity is considered in the environmental review in assessing potential impacts of the major Federal action of issuing the requested COLs. Using the Electric Power Research Institute-Georgia Transmission Corporation (EPRI-GTC) Transmission Line Siting Methodology (EPRI-GTC 2006), Southern and GPC (GPC 2007) identified a set of potential transmission routes within what they termed the Representative Delineated Corridor (RDC), as depicted in Figure 2. The RDC was used as the basis for environmental impact analysis. Although the precise route for the planned new transmission line has not yet been determined, it will be within the RDC.

As permitted by NRC regulations in 10 CFR Part 52, which contains NRC's reactor licensing regulations, the COL application references the VEGP ESP. In accordance with the applicable provisions of 10 CFR Part 51, which are the NRC regulations implementing the National Environmental Policy Act of 1969 (NEPA), NRC is required to prepare a supplemental environmental impact statement (SEIS) as part of its review of a COL application referencing an ESP. As required by 10 CFR 51.26, the NRC published the draft SEIS for public comment in the *Federal Register* (FR) on September 3, 2010.

During April, May, and June, 2010, Southern submitted requests for three ESP license amendments associated with the previously authorized LWA construction activities. These amendment requests sought authorization to use Category 1 and Category 2 backfill materials from additional onsite sources, including three new borrow areas, and to change the classification of engineered backfill over the side slopes of the excavations for Units 3 and 4 (Southern 2010a, b, c, d). NRC prepared environmental assessments (EA) and Findings of No Significant Impact (FONSI) for each license amendment request (NRC 2010a, b, c). These ESP license amendments were issued in May 2010 (NRC 2010d), June 2010 (NRC 2010e), and July 2010 (NRC 2010f). The ESP license amendments requesting authorization to use backfill materials from three new borrow areas resulted in changes to the construction footprint on the VEGP Site. The change in the site preparation footprint for additional borrow areas resulted in an additional 108 ha (267 ac) that was cleared and excavated for backfill material.

The SEIS, together with the ESP EIS (NRC 2008a), the ESP hearing proceedings, and the ESP license amendment EAs, provides the NRC staff's evaluation of the environmental effects of constructing and operating two new AP1000 reactors at the VEGP Site.

During the review of the ESP application, as part of the NRC's responsibilities under Section 7 of the Endangered Species Act (ESA), the NRC staff prepared a biological assessment (BA) documenting potential impacts on the Federally listed threatened or endangered species as a result of the site preparation (including construction of the onsite portion of the new 500-kV transmission line) and construction of Units 3 and 4 on the VEGP Site. The BA was submitted to U.S. Fish and Wildlife Service (FWS) on January 25, 2008 (NRC 2008b), and FWS concurred with the findings on September 19, 2008 (FWS 2008).

The NRC staff has concluded that, with respect to site preparation activities and construction of Units 3 and 4 on the VEGP Site (including construction of the onsite portion of the proposed transmission line), the COL action involves similar impacts to the same Federally listed species in the same geographic area as analyzed in the ESP; that no new species have been listed or proposed and no new critical habitat designated or proposed for the action area; and that, with respect to potential impacts to listed species from the activities previously analyzed, no relevant information has changed regarding the project since the earlier BA was submitted. Therefore, pursuant to 50 CFR 402.12(g), the ESA of 1973, as amended, the NRC staff proposes to incorporate the earlier BA by reference. Furthermore, NRC has prepared this BA to document potential impacts on Federally listed threatened or endangered terrestrial species resulting from operation of Units 3 and 4, including potential impacts anticipated from construction and operation of the proposed transmission line ROW. Operation of the transmission lines includes maintenance activities, such as herbicide applications, tree removal, and mowing.

In a letter dated January 7, 2010, NRC requested that the FWS Field Office in Brunswick, Georgia, provide information regarding Federally listed species and critical habitat that may have changed since the 2008 consultation (NRC 2010g). On February 12, 2010, FWS provided a response letter indicating listed species under FWS had been adequately addressed for limited site-preparation activities on the VEGP Site (FWS 2010a). On October 20, 2010, FWS provided an updated list of Federally listed threatened or endangered species that can be expected to occur in the project area (FWS 2010b). In addition to the federally listed species, FWS provided information on the bald eagle (*Haliaeetus leucocephalus*) and the gopher tortoise (*Gopherus polyphemus*) in the response letter.

The bald eagle was Federally delisted under the ESA in August 2007. In May 2007, National Bald Eagle Management Guidelines were published to assist in understanding protections afforded to and prohibitions related to the bald eagle under the Bald Eagle Act (FWS 2010b). There are bald eagle nests in Jefferson and McDuffie Counties in Georgia, and one known location of an active nest in McDuffie County in the vicinity of the proposed new transmission line (FWS 2010b). GPC stated that it would ensure the new transmission line ROW would not come within 180 m (600 ft) of this known bald eagle nesting site (GPC 2007). Eagle nests on transmission/distribution structures or other electrical equipment have not been documented in Georgia (GPC 2006): nevertheless, one of GPC's procedures in its Avian Protection Program (APP) includes contacting the FWS to advise the agency of the situation and to obtain additional instructions or permits, if an eagle's nest is encountered on a transmission/distribution structure (GPC 2006). Potential impacts to the bald eagle related to construction and operation of proposed Units 3 and 4, including impacts from construction and operation of the proposed transmission line, are discussed in the ESP EIS (NRC 2008a).

The gopher tortoise is a Georgia state threatened species and is currently under review by the FWS to be listed as threatened (FWS 2010b). There are no known populations of the gopher tortoise on the VEGP Site or within the proposed transmission corridor (GDNR 2009; FWS 2010b). Southern submitted a draft Candidate Conservation Agreement with Assurances (CCAA) for the gopher tortoise at the VEGP Site. This CCAA is currently under review by FWS (SERPPAS 2010). The draft CCAA does not include the offsite portions of the proposed transmission line. In the October 20, 2010 letter to NRC, FWS recommended that tortoise surveys be included in surveys that are conducted where sandhills habitat exists. FWS stated that there are several areas within the proposed transmission line corridor that have sandhills habitat that may contain gopher tortoises (FWS 2010b). Potential impacts to the gopher tortoise related to construction and operation of the proposed Units 3 and 4, including impacts from construction and operation of the proposed transmission line, will be included in the final COL SEIS.

Pursuant to Section 7(c) of the ESA of 1973, as amended, NRC has prepared this BA, which examines the potential impacts of facility operation related to the proposed Units 3 and 4 at the VEGP Site on threatened or endangered species, including potential impacts from transmission line construction and operation activities. This BA evaluates the effects of the proposed action on four Federally listed threatened or endangered species identified by FWS in its October 20, 2010, letter that may occur on or in the vicinity of the VEGP Site and/or in habitats crossed by the proposed transmission line (Table 1). The consultation is between NRC and FWS.

Table 1. Federally Listed Species Potentially Occurring on and in the Vicinity of the VEGP Site and the Proposed Transmission Line Right-of-Way

Scientific Name	Common Name	Federal Status[(a)]
Vascular Plant		
Oxypolis canbyi	Canby's dropwort	E
Birds		
Mycteria americana	wood stork	E
Picoides borealis	red-cockaded woodpecker	E
Reptile		
Drymarchon couperi	Eastern Indigo Snake	T

a. Federal status rankings determined by the FWS under the Endangered Species Act: E = Endangered, T = Threatened.
Source: FWS 2010b

2.0 VEGP Site Description

The VEGP Site is located on the Savannah River shoreline approximately 24 km (15 mi) east-northeast of Waynesboro, Georgia, and 42 km (26 mi) southeast of Augusta, Georgia. The existing site consists of two Westinghouse pressurized water reactors, a turbine building, a switchyard, intake and discharge structures, and support buildings. Two generating units (Units 1 and 2) are currently operating at the site (Figure 1). The Allen B. Wilson Combustion Turbine Plant (Plant Wilson), a six-unit, oil-fueled combustion turbine facility built in 1974 and owned by GPC, and ancillary structures and systems related to Units 1 and 2 also are located onsite. The existing Units 1 and 2 and Plant Wilson would not be affected by this action.

The footprint for Units 3 and 4 is in a previously disturbed area adjacent to the existing VEGP Units 1 and 2 (Figure 1). The existing Units 1 and 2 and the proposed Units 3 and 4 would share certain support structures such as office buildings and water, wastewater, and waste-handling facilities; however, the new intake and discharge facilities for Units 3 and 4 would be separate from the intake and discharge facilities for Units 1 and 2. Each proposed Westinghouse AP1000 reactor would have a rated thermal power level of 3400 megawatts thermal MW(t) (NRC 2008a). For the circulating water cooling system for Units 3 and 4, Southern proposed natural-draft cooling towers, and for the service water system, mechanical-draft cooling towers.

The VEGP Site is approximately 1282.5 ha (3169 ac) in size and is located in the sandhills of the Upper Coastal Plain Region, approximately 48 km (30 mi) southeast of the Fall Line (Eco-Sciences 2007; NRC 2008a). The site has 12 soil types and several major habitat types, including ponds, pine plantations, native upland pines, and the bottomland hardwoods that are found along stream drainages onsite and adjacent to the Savannah River (NRCS 2003; TRC 2006).

Directly across the Savannah River from the VEGP Site is the Savannah River Site, a U.S. Department of Energy (DOE) facility with restricted access (NRC 2008a). River swamp, bottomland hardwood, and upland pine-hardwood communities occur on the Savannah River Site within 10 km (6 mi) of the VEGP Site (NRC 2008a). The Savannah River Swamp comprises about 3800 ha (9400 ac) and borders the Savannah River on the southwestern edge of the Savannah River Site, adjacent to the VEGP Site (Wike et al. 2006).

2.1 Wildlife Habitat

The VEGP Site is characterized by low, gently rolling sandy hills. Scrub oaks, including turkey (*Quercus laevis*), post (*Q. stellata*), and willow oak (*Q. phellos*), and longleaf pine (*Pinus palustris*) occur in the upland wooded areas that were not previously cultivated. Red oak (*Q. rubra*), water oak (*Q. nigra*), and maple (*Acer* sp.) dominate the lowland hardwood areas. Bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*) characterize the Savannah River floodplain.

The longleaf pine-scrub oak community is found on ridge tops as well as south and west slopes in undisturbed upland areas on the VEGP Site. Common canopy species in this habitat include longleaf pine, turkey oak, and bluejack oak (*Q. incana*). The north and east slopes in the undisturbed uplands support the more mesic oak-hickory community. The canopy in this community is mainly composed of white oak (*Q. alba*), white ash (*Fraxinus americana)*, mockernut hickory (*Carya alba*), and flowering dogwood (*Cornus florida)*. A few turkey oaks and a scattering of shortleaf pine (*P. echinata*) are also present (TRC 2006). A steep bluff separates the dry upland forest from the intermittently flooded bottomland along the Savannah River. Common canopy species include oak, mockernut hickory, tuliptree (*Liriodendron tulipifera*), sweetgum (*Liquidambar styraciflua*), American elm (*Ulmus americana*), basswood (*Tilia americana*), and Florida maple (*A. barbatum*). The planted pine plantations on the VEGP Site are of various ages and differ in the stocking rates. The plantations vary from a nearly closed canopy with very little understory, to areas that resemble old fields with only scattered pine. Loblolly (*P. taeda*) and longleaf pines are the primary overstory species (TRC 2006). Pine plantations are managed through prescribed burning every 3 to 5 years, timber thinning after 20 years, and aesthetic cuts after thinning. Burning is limited to 25 to 30 percent of the upland and planted pine acreage each year (NRC 2008a).

The wetlands associated with the VEGP Site include those near the Savannah River, as well as those near ponds and streams located onsite. Principal water bodies onsite include Mallard Pond and two streams in the southern portion of the VEGP Site (Figure 1). Southern contracted with Eco-Sciences of Georgia (Eco-Sciences) to survey the VEGP Site in December 2006 to determine where jurisdictional waters of the United States occur. Approximately 69 ha (170 ac) of potential jurisdictional wetlands were identified on the site during the Eco-Sciences survey (NRC 2008a). These include 48 wetlands, 6 perennial streams, 13 intermittent streams, and 3 ephemeral streams.

The proposed transmission line ROW is within the Piedmont and Coastal Plain Physiographic Regions of Georgia. The Piedmont is characterized by rolling hills and irregular plains. The soils are finely textured and can be highly erodible. The Coastal Plain is composed of mostly flat areas with some rolling hills with well-drained soils (GPC 2007). Using the Electric Power Research Institute-Georgia Transmission Corporation (EPRI-GTC) Transmission Line Siting Methodology (EPRI-GTC 2006), Southern and GPC identified a set of potential transmission routes within the RDC (Figure 2) (GPC 2007) that was used as the basis for environmental impact analysis. The RDC ranges from approximately 1.6 km (1 mi) to a little of 5 km (3 mi) in width and is approximately 80 km (50 mi) long. The actual routing of the 45m (150 ft) wide, up to about 97 km (60 mi) long transmission ROW would be within the RDC. The siting model takes into consideration important features, including residential and other developed areas, mining activities, wetlands and sensitive land uses, cultural resources, and endangered and other species of special interest. GPC conducted an aerial field verification of the RDC, and identified a narrowing of the modeled corridor to avoid wetlands and stream crossings and reduce the overall length and land area that potentially would be affected. The RDC depicts areas in which a transmission line should minimize adverse impact on people, places, and cultural resources; protect water resources, plants, and animals; maximize co-location of the new line; and balance these considerations to reduce the overall impact of the transmission line (GPC 2007).

In siting the new transmission line ROW, GPC would consult with the Georgia State Historic Preservation Officer, FWS, the Georgia Department of Natural Resources (GDNR), and the U.S. Army Corps of Engineers (Southern 2008). If wetlands are disturbed, construction would be conducted in accordance with necessary State and Federal permits to protect wetland areas (Southern 2008).

There are no U.S. Forest Service Wilderness Areas, Wild/Scenic Rivers, Wildlife Refuges, State Parks, or National Parks within the RDC (GPC 2007). The Savannah River and Brier Creek, a tributary of the Savannah River, are the primary waterways located in the RDC. The general wildlife habitats within the RDC include forested land, planted pine stands, open land, and open water. The exact habitat types within the new 500-kV transmission line ROW are not known at this time, but it is assumed they comprise similar habitats to those on the VEGP Site. GPC has estimated the total acreage for a 46-m (150-ft)-wide hypothetical representative ROW within the RDC to be 416 ha (1029 ac) (Southern 2007).

3.0 Proposed Federal Actions

The proposed Federal action is issuance of COLs, under the provisions of 10 CFR Part 52, for two AP1000 reactors at the VEGP Site, and an LWA for requested construction activities. The ESP EIS (NRC 2008a) disclosed the staff's analysis of the environmental impacts that could result from the construction and operation of these two new units. The draft COL SEIS (NRC 2010i) evaluated whether any new and potentially significant information has been identified that would alter the staff's conclusions regarding issues resolved in the ESP proceeding. In the draft ESP EIS and the COL SEIS, the NRC staff evaluated the impacts of construction and operation of two AP1000 units, with a total combined thermal power rating of 6800 MW(t). The proposed units would use a closed-cycle cooling system and require a single natural draft cooling tower for each unit.

4.0 Potential Environmental Impacts

This section provides information on the terrestrial impacts related to operation of the proposed Units 3 and 4 at the VEGP Site, including potential impacts from construction and operation of the proposed transmission line ROW. Construction and operation activities associated with the issuance of the COLs and LWA, including cumulative impacts, that could affect the Federally protected terrestrial species based on habitat affinities and life-history characteristics and the nature and spatial and temporal considerations of the activity are listed below:

- Construction
  - Transmission line ROW clearing and grading
  - Installation of new or upgraded transmission lines and towers
- Operation
  - Vegetation control in the transmission line ROW
  - Transmission line repairs or upgrades
  - Avian collisions with structures
  - Cooling tower operation.

4.1 Construction Impacts

The exact extent and types of wildlife habitats within the proposed new transmission line ROW are not known. Currently, Southern and GPC are evaluating the actual ROW alternatives for the transmission line within the RDC. The proposed transmission line ROW would be routed northwest from the VEGP Site, passing through Jefferson, McDuffie and Warren Counties. The ROW would pass west of Fort Gordon, and then continue north to the Thomson substation, which is approximately 32 km (20 mi) west of Augusta, Georgia. It is anticipated that the transmission line would be about 46 m (150 ft) wide and 97 km (60 mi) long and would cover approximately 416 ha (1029 ac) (Southern 2007). A hypothetical transmission line ROW that represents what the GPC believes is a feasible route within the RDC was identified as part of a 2007 study (GPC 2007). Based on the GPC analysis, habitats within the ROW could include approximately 60 ha (148 ac) of forested habitat, 37 ha (91.5 ac) of forested wetlands, 133 ha (329 ac) of planted pine, 2.6 ha (6.4 ac) of open water, and 64 ha (158 ac) of open land (GPC 2007). Other land-use categories identified as potentially being impacted, such as mine/quarry, utility, transportation, and row crops, provide little value as wildlife habitat. Construction activities would avoid wetlands to the extent practicable. In the event that wetlands are encountered, construction would be conducted in accordance with the necessary permits obtained to protect wetland areas (GPC 2007).

A wide variety of wildlife common to Georgia is expected to occur within the transmission line ROW. The greatest extent of wildlife diversity is expected to occur within areas that support an interspersion of native upland, wetland, and aquatic habitats, and less diversity is expected in disturbed or developed lands. Lower-quality wildlife habitat is represented by areas cleared for utilities, roads, agricultural and residential development; and disturbed habitats such as pastureland, and open land.

Potential impacts on Federally listed threatened and endangered species from construction on the proposed transmission line ROW would include loss of habitat (temporary and permanent), presence of humans, heavy-equipment operation, traffic, noise, and avian collisions. The use of heavy equipment would likely displace or destroy wildlife that inhabit the areas that will be developed. Larger and more mobile animals would likely flee the area, while less mobile animals such as reptiles, amphibians, and small mammals would be at greater risk of death. Although the surrounding forest and wetland habitat would be available for displaced animals, the movement of wildlife into surrounding areas would increase competition for available space and could result in increased predation and decreased fecundity for certain species. These conditions could lead to a temporary localized reduction in population size for particular species. When construction activities are completed, species that can adapt to disturbed or developed areas may readily re-colonize portions of the site where suitable habitat remains, is replanted, or restored.

Forests or forested wetlands within the corridors would be converted to and maintained in an herbaceous or scrub-shrub condition. Species dependent on forest habitats or those that are sensitive to forest fragmentation could decline or be displaced, such as the red-cockaded woodpecker (*Picoides borealis*). Wildlife also would be affected by equipment noise and traffic, and birds could be injured if they collide with new transmission towers and conductors or the equipment used to install these components. However, increased noise levels associated with installation of the transmission lines would be of short duration and likely intermittent. Thus, the impact on wildlife from noise is expected to be temporary and minor. Similarly, the potential for traffic-related wildlife mortality also is expected to be low because relatively small crews would spend only a limited time in each area as construction progresses over large geographic areas.

GPC would site the transmission line in accordance with Georgia Code Title 22, Section 22-3-161. GPC's procedures for implementing this code include consultation with FWS as well as an evaluation of impacts to special habitats (including wetlands) and threatened and endangered species. In addition, GPC would comply with all applicable laws, regulations, and permit requirements, and would use good engineering and construction practices (Southern 2008). GPC has developed an APP that includes guidelines for siting new transmission lines. When siting new transmission lines, substations, or other GPC facilities, available information on migratory and resident bird populations will be taken into account to ensure that the lines or facilities will have as little adverse impact as practicable on these bird species (GPC 2006).

In areas where agencies are concerned about the safety of protected birds, consideration of appropriate siting and placement will reduce the likelihood of collisions. When possible, areas with known bird concentrations will be avoided, and such vegetation or topographic characteristics that would naturally lead to shielding the birds from collision will be used. If this is not possible, installing visibility devices also may reduce the risk of collision. Examples of these devices are marker balls or other line visibility devices placed in varying configurations, depending on the line or locations. The effectiveness of these devices has been validated by Federal and state agencies in conjunction with Edison Electric Institute (GPC 2006).

When designing power transmission lines in high–bird-use areas or on Federal Lands, GPC construction standards for transmission, distribution, and substation equipment and facilities will reflect the most appropriate and practicable "raptor-safe" stands for new construction consistent with available information. The objective is to provide 1.5 m (60 in.) between energized conductors and grounded hardware, or to insulate energized hardware if such spacing is not possible. The design standards are consistent with raptor-safe specifications recommended by Federal wildlife agencies (GPC 2006).

4.2 Operational Impacts

Potential impacts on terrestrial habitats and Federally listed species related to the operation of the proposed Units 3 and 4 may result from cooling-system operation and operation of the transmission system. The proposed cooling system for Units 3 and 4 is a closed-cycle system employing natural draft cooling towers. The heat would be transferred to the atmosphere in the form of water vapor and drift. Vapor plumes and drift may affect wildlife habitat. In addition, bird collisions and noise-related impacts are possible with natural draft cooling towers.

Electric transmission systems potentially can affect terrestrial habitat and Federally listed species through ROW maintenance, bird collisions with transmission lines, and electromagnetic fields (EMFs). Southern estimates that one additional 500-kV transmission line would be necessary to distribute the additional power generated by Units 3 and 4 (Southern 2008). Maintenance activities on the new transmission line ROW would be the responsibility of GPC (Southern 2008). Each of these topics is discussed in the following paragraphs.

4.2.1 Impacts on Vegetation

Impacts on Federally listed species may result from cooling tower drift, icing, fogging, or increased humidity. Through the process of evaporation, the total dissolved solids (TDS) concentration in the circulating water system (CWS) increases. A small percentage of the water in the CWS is released into the atmosphere as fine droplets containing elevated levels of TDS that can be deposited on nearby vegetation. Operation of the CWS would be based on four-cycles of concentration, which means the TDS in the make-up water would be concentrated approximately four times before being released.

Depending on the make-up source water body, the TDS concentration in the drift can contain high levels of salts that, under certain conditions and for certain species, can be damaging. Vegetation stress can be caused from drift with high levels of deposited TDS, either directly by deposition onto foliage or indirectly from the accumulation in the soils. The maximum estimated cumulative deposition rate is less than 10.0 kg/ha/mo (9 lbs/ac/mo) at 490 m (1600 ft) north of the cooling towers (NRC 2008a). The location of the maximum deposition rate is in the vicinity of the proposed switchyard for Units 3 and 4, which is more than 1.6 km (1 mi) from the northern site boundary. General guidelines for predicting effects of drift deposition on plants suggest that many species have thresholds for visible leaf damage in the range of 10 to 20 kg/ha/mo (9 to 18 lbs/ac/mo) on leaves during the growing season (NRC 1996). The maximum deposition for the proposed Units 3 and 4 is below the level that could cause visible leaf damage in many common species.

Southern expects the longest vapor plume associated with the new towers would be 10 km (6 mi), but would only occur 3.9 percent of the time (NRC 2008a). The longest plume length would occur in the winter months and the shortest in the summer months. Ground-level fogging and icing do not occur currently at the cooling towers for the existing Units 1 and 2 and are not expected to occur at the new cooling towers associated with the proposed Units 3 and 4.

4.2.2 Bird Collisions with Cooling Towers

The natural draft cooling towers associated with the proposed Units 3 and 4 would be 180 m (600 ft) high (Southern 2008). The VEGP Site is located adjacent to the Savannah River, and although migratory birds pass through the vicinity of the VEGP Site, it is not located on a major American flyway. No formal bird collision surveys have been conducted at the VEGP Site. However, the Environmental Protection Plan (EPP) for VEGP Units 1 and 2 stipulates that any excessive bird-impact events be reported to NRC within 24 hours (Southern 1989). No excessive bird-impact events have been reported onsite. The conclusion presented in the *Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants* is that bird collisions with natural draft cooling towers are of small significance at all operating nuclear plants, including those with multiple cooling towers (NRC 1996).

4.2.3 Noise

The effects of noise on most wildlife species are not well understood partly because noise disturbance cannot be generalized across species or genera, and there may be response differences among individuals or groups of individuals of the same species (Larkin 1996; AMEC Americas Limited 2005). An animal's response to noise can depend on a variety of factors including the noise level, frequency distribution, duration, background noise, time of year, animal activity, age, and sex (AMEC Americas Limited 2005). The potential effects of noise on wildlife include acute or chronic physiological damage to the auditory system; increased energy expenditure; physical injury incurred during panic responses; and interference with normal activities, such as feeding; and impaired communications among individuals and groups (AMEC Americas Limited 2005). The impacts of these effects might include habitat loss through avoidance, reduced reproductive success, and mortality. Long-term noise thresholds have not been established for wildlife; evidence for habituation is limited; long-term effects are generally unknown; and how observed behavioral and physiological response might be manifested ecologically and demographically are poorly understood (AMEC Americas Limited 2005).

The noise levels from natural-draft cooling tower operation and diesel generators are estimated to be approximately 55 decibels (dBA) SPL (sound pressure level) at 300 m (1000 ft) (NRC 2008a). Researchers have found that dBA measurements contain frequencies that are out of the hearing bandwidth of birds and some mammals and are not inclusive of the total hearing range for other animals. Consequently, the dBA weighting system does not accurately characterize sound exposure or hearing response for wildlife (Dooling 2002; AMEC Americas Limited 2005). Natural-draft cooling towers emit broadband noise that is spectrally very similar to environmental (wind) noise. In the case of relatively flat spectra, the spectrum level of cooling tower and diesel generator noise, given the estimated dBA SPL, would be approximately 15 dB SPL. Cooling tower noise does not change appreciably with time (i.e., it is at steady state), and the estimated noise level at 300 m (984 ft) is well below the 80 to 85-dBA SPL threshold at which birds and small mammals are startled or frightened (Golden et al. 1980). Using the startle criterion reported by Golden et al. (1980), the noise level expected to be generated by cooling tower and diesel generator operations would only approach startle levels in the immediate vicinity (within 5 m [16.4 ft]) for noise with approximately 60 dBA SPL at 300 m [984 ft]) of the tower or generator. In addition, birds and other animals show habituation to acoustic deterrents (complex sounds designed with spectral components to be within the hearing band of the target animal). Thus, noise generated by natural draft cooling towers would be unlikely to disturb transient wildlife beyond the VEGP Site perimeter fence, which is over 300 m (984 ft) from the towers. Seasonal or long-term resident wildlife could be expected to habituate to cooling tower and generator noise.

Impacts to species as a result of their response to noise (i.e., ranging from startle to avoidance) within the distance of the VEGP perimeter fence, if any, would be negligible because of the large expanses of open habitat available into which mobile wildlife species could move if disturbed. In addition, the new towers would be near the existing VEGP Unit 1 and 2 facilities, where wildlife have likely acclimated to typical operating facility noise levels. Consequently, the potential for startle and avoidance responses by wildlife posed by the incremental noise resulting from the operation of the two new natural-draft cooling towers for the proposed Units 3 and 4 and other facilities at the VEGP Site would be minimal.

4.2.4 Transmission Line Right-of-Way Management (Cutting and Herbicide Application)

Southern stated that the same vegetation management practices currently employed by GPC for the existing Units 1 and 2 transmission line ROWs (such as hand-cutting on an as-needed basis) would be applied to the proposed new 500-kV transmission line ROW (Southern 2008).

GPC performs aerial inspections of transmission line ROWs five times each year to support routine maintenance activities. These surveys are normally conducted using a helicopter. The noise may startle and temporarily displace wildlife. However, these impacts are of short durations and occur in very localized areas. Woody growth is cleared from transmission line ROWs on a 5-year maintenance cycle. This cycle may vary based on public concerns, local ordinances, line maintenance, or environmental considerations. Vegetation management includes use of herbicides, hand tools, and light equipment. Hand cutting or herbicides are used in areas that cannot be mowed either because it is impractical or because of environmental concerns. Herbicide use is conducted in accordance with manufacturer specifications and by licensed applicators. Any spills of fuel and/or lubricants that occur as a result of equipment use in the transmission line ROWs are immediately cleaned up and reported. GPC cooperates with GDNR to manage sites considered environmentally sensitive within the transmission line ROWs (Southern 2008). GPC has developed recommendations for maintenance practices for the protection of pitcher plants, caves, nests, rookeries, and habitat such as rock outcrops that occur within GPC transmission line ROWs (Southern 2007).

GPC also has developed an APP that includes recommendations on procedures for GPC personnel to follow if a Federally Endangered Species nest is encountered within the transmission line ROW. The GPC Environmental Field Service office will provide GPC staff with FWS-compliant guidelines and/or recommendations for management of these nests (GPC 2006).

Avian mortalities resulting from collisions with conductors, guy wires, and overhead ground (static) wires have not been specifically documented on GPC system components, but are known to occur on other utilities' systems and communication systems. GPC has installed spiral vibration dampers to increase visibility on some of the transmission lines, especially along the coastal areas where the wood stork is known to nest and forage (GPC 2006). Section 4.1 of the EPP for the existing Units 1 and 2 stipulates that any excessive bird-impact events be reported to NRC within 24 hours (Southern 1989). Transmission line and ROW maintenance personnel have not reported bird deaths attributed to collisions or contact with Units 1 and 2 transmission lines (Southern 2008).

EPRI (1993) notes that factors appearing to influence the rate of avian impacts with structures are diverse and related to bird behavior, the structure attributes, and weather. Structure height, location, configuration, and lighting also appear to play a role in avian mortality. Weather such as low cloud ceilings, advancing fronts, and fog also contribute to this phenomenon. Larger birds such as waterfowl are more prone to collide with transmission lines, especially when they cross wetland areas used by large concentrations of birds (EPRI 1993).

EPRI (1993) documents electrocution of large birds, particularly eagles, as a source of mortality that could be significant to listed species. However, electrocutions do not normally occur on lines whose voltages are greater than 69 kV because the distance between lines is too great to be spanned by birds (EPRI 1993). The voltage of the proposed new transmission line is greater than 69 kV; therefore, bald eagles and other large bird populations should not be noticeably affected by transmission-line electrocutions. GPC has implemented an APP to monitor and address the impacts of transmission lines on birds. Any impact events would be coordinated with GPC's Environmental Field Services and, if necessary, coordination also would involve FWS (GPC 2006).

4.2.5 Impact of EMFs on Flora and Fauna

Electromagnetic fields (EMFs) are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NRC 1996). As discussed in the GEIS (NRC 1996), a careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures. Thus, the conclusion presented in the GEIS (NRC 1996) was that the impacts of EMFs on terrestrial flora and fauna were of small significance at operating nuclear power plants, including transmission systems with variable numbers of transmission lines. Since 1997, over a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2003). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2003).

5.0 Evaluation of Impacts on Threatened or Endangered Species

This section describes Federally listed threatened or endangered terrestrial species and designated and proposed critical habitat that may occur on or in the vicinity of the VEGP Site and/or in habitats that would be crossed by the proposed transmission line ROW (Table 1). This list is composed of the Federally listed species identified in the October 20, 2010, FWS letter to NRC (FWS 2010b).

Surveys for species of interest, including those Federally listed species classified as threatened or endangered, proposed for listing, or candidate species were performed in spring, summer, and fall 2005 at the VEGP Site by Third Rock Consultants, LLC (TRC). The surveys were conducted on 675 ha (1669 ac) of the 1283 ha (3169 ac) that comprise the VEGP Site (TRC 2006). The American alligator (*Alligator mississippiensis*) was the only Federally listed species observed on the VEGP Site during the 2005 surveys. One adult alligator was observed in Mallard Pond during the summer survey (TRC 2006). It is Federally listed as threatened because it is similar in appearance to the endangered American crocodile (*Crocodylus acutus*). It is not included in this assessment based on input from FWS in its October 20, 2010 letter to NRC (FWS 2010b). Furthermore, based on the contents of the October 2010 letter, three other species that were addressed in the ESP BA (the smooth coneflower, relict trillium, and flatwoods salamander) were not further considered in this assessment because they were not identified as occurring in the project area or the proposed transmission line ROW.

The RDC is based on the EPRI-GTC siting model, developed in Georgia, to identify a reasonable corridor for locating the proposed 500 kV transmission line. The siting model takes into consideration important features, including wetlands and sensitive land uses and endangered and other species of special interest. The RDC represents a narrowing of the modeled corridor to avoid wetlands and stream crossings and reduce the overall length and land area potentially affected (GPC 2007). GPC would site the transmission line in accordance with Georgia Code Title 22, Section 22-3-161, and has developed an APP that includes provisions for siting new transmission lines (GPC 2006). GPC's procedures for implementing this code include consultation with FWS as well as an evaluation of impacts to special habitats (including wetlands) and threatened and endangered species (Southern 2008). At this time, on-the-ground surveys for Federally listed species have not been conducted in the RDC.

Four Federally listed terrestrial plant and animal species may occur on or in the vicinity of the VEGP Site and/or in the vicinity of the RDC (FWS 2010b). These four species − the red cockaded woodpecker (*Picoides borealis*), the wood stork (*Mycteria americana*), Canby's dropwort (*Oxypolis canbyi*), and the Eastern indigo snake (*Drymarchon couperi*) – are discussed below. No designated or proposed critical habitat for terrestrial species occurs on or in the general area of the site or the RDC.

5.1 Red-Cockaded Woodpecker – Endangered

The red-cockaded woodpecker (*Picoides borealis*), was listed by the FWS as endangered in 1970 (35 FR 16047). The red-cockaded woodpecker's historic range extended from north Florida to New Jersey and Maryland, as far west as Texas and Oklahoma, and inland to Missouri, Kentucky, and Tennessee. This species has been extirpated in New Jersey, Maryland, Tennessee, Missouri, and Kentucky (FWS 2007a), and currently, it is estimated that about 6000 family groups of red-cockaded woodpeckers, or 15,000 birds, remain from Florida north to Virginia and west to southeast Oklahoma and eastern Texas. Critical habitat has not been established for red-cockaded woodpeckers (FWS 2007b). In 1998, there were 665 family groups of red-cockaded woodpeckers in Georgia (GDNR 1999).

The red-cockaded woodpecker is endemic to open, mature, and old growth pine ecosystems in the southeastern United States. Red-cockaded woodpeckers require open pine woodlands and savannahs with large old pines for nesting and roosting habitat for family groups (clusters). Large old pines are required as cavity trees because the cavities are excavated completely within inactive heartwood and the higher incidence of heartwood decay in older trees greatly facilitates excavation. Cavity trees must be in open stands with little or no hardwood midstory and few or no overstory hardwoods. Suitable foraging habitat consists of mature pines with an open canopy, low densities of small pines, little or no hardwood or pine midstory, few or no overstory hardwoods, and abundant native bunchgrass and forb groundcovers (FWS 2003).

Red-cockaded woodpeckers are a cooperatively breeding species, living in family groups that typically consist of a breeding pair with or without one or two male helpers. In red-cockaded woodpeckers (and other cooperative breeders), a large pool of helpers is available to replace breeders when they die. Helpers do not disperse very far and typically occupy vacancies on their natal territory or a neighboring one (FWS 2003). A typical territory for an active group ranges from approximately 51 to 80 ha (125 to 200 ac), but can be as large as 240 ha (600 ac). The size of the particular territory is related to both habitat quality and population density (FWS 2007a). Dispersal is primarily undertaken by young birds; mate loss and an apparent avoidance of inbreeding sometimes cause adults to disperse, and adults may also occasionally move to neighboring territories for unknown reasons (Walters et al. 1988). In a North Carolina study, females dispersed a maximum of 31.4 km (19.5 mi) and males a maximum of 21.1 km (13.1 mi) (Walters et al. 1988).

In June 2007, Southern enrolled approximately 380 ha (940 ac) of the VEGP Site in the GDNR Safe-Harbor Program for red-cockaded woodpeckers (Southern 2010c, e). Safe-Harbor Agreements are arrangements that encourage voluntary management for red-cockaded woodpeckers while protecting the participating landowners and their rights for development in the event these woodpeckers become established on the private property. Landowners entering into safe-harbor agreements must establish a baseline number of individuals that would be maintained in the event that they are observed. Currently, Southern has no baseline responsibilities under the red-cockaded woodpecker safe-harbor agreement because there are no active clusters or nest trees onsite, and there are no red-cockaded woodpecker clusters on neighboring lands within foraging distance (Southern 2010c, e; NRC 2010h).

Surveys at the VEGP Site conducted in February 2006 found no occurrence of red-cockaded woodpeckers onsite (NRC 2008a). There are no recorded occurrences of the red-cockaded woodpecker in Burke County, Georgia (GDNR 2007, GDNR 2009), and no active colonies exist within 16 km (10 mi) of the VEGP Site in South Carolina (SCDNR 2007; SCDNR 2009; Wike et al. 2006). There are no known occurrences of the red-cockaded woodpecker in the proposed RDC (GDNR 2007; GDNR 2009). However, red-cockaded woodpeckers are listed as having the potential to occur in the project area (FWS 2010b). The red-cockaded woodpecker has been recorded on Fort Gordon (Mitchell 1999), which is located in Richmond County adjacent to the RDC. In 1998, there were two active groups on Fort Gordon representing less than 1 percent of the total number of groups in Georgia. At this time, surveys for red-cockaded woodpeckers have not been conducted in the RDC, and it is not known if suitable nesting or foraging habitats exist in the vicinity of the proposed 500-kV transmission line ROW.

Red-cockaded woodpeckers are found mainly in large stands of old longleaf pine, and this type of habitat would not be disturbed during operation of Units 3 and 4. Based on the distance to the closest known active colony, and the fact that red-cockaded woodpeckers have not been recorded on the VEGP Site or in the general vicinity of the site, it is unlikely that red-cockaded woodpeckers would be affected during operational activities onsite.

Clearing activities (e.g., tree removal, noise, increased habitat fragmentation, etc.) in the transmission line ROW have the potential to affect the red-cockaded woodpecker and its habitat. Because the final transmission line ROW would be narrow (46-m [150-ft] wide), the actual extent of clearing would be limited, thereby minimizing the potential for impact on redcockaded woodpeckers. However, increased habitat fragmentation and/or removal of cavity trees could negatively impact the red-cockaded woodpecker. GPC would site the transmission line ROW in accordance with Georgia Code Title 22, Section 22-3-161. GPC’s procedures for implementing this code include consultation with FWS. GPC also has developed an APP that includes guidelines for siting new transmission lines. Available information on resident bird populations will be taken into account to ensure that the lines will have as little adverse impact as practicable on bird populations (GPC 2006).

Potential operational impacts associated with the transmission line ROW maintenance include mowing close enough to an active colony to disturb the nesting effort and removing trees during side clearing or building access roads. GPC has implemented procedures that recommend identification of all active colony areas within 3.2 km (2 mi) of a transmission line ROW and to identify active “hot-spots” within 229 m (750 ft) of a ROW. GPC recommends maintenance activities around “hot-spots” be conducted during non-breeding periods (Southern 2007). Avian mortalities resulting from collisions with conductors, guy wires, and overhead ground (static) wires have not been specifically documented on the GPC system components. However, electrocution of birds is unlikely on lines with voltages greater than 69 kV because the distance between lines is too great to be spanned by birds (EPRI 1993). Therefore, it is unlikely that operational impacts would adversely affect the red-cockaded woodpecker.

In summary, based on the distance to the closest known active colony, and the fact that red-cockaded woodpeckers have not been recorded on the VEGP Site, it is unlikely that red-cockaded woodpeckers are foraging on the VEGP Site, and there is no evidence of nesting onsite. It is unlikely that red-cockaded woodpeckers would be encountered during operational activities onsite with the exception of possible transient individuals. There are no known occurrences of red-cockaded woodpeckers within the RDC; however, on-the-ground surveys have not been conducted at this time. If nest trees are removed during clearing for the proposed transmission line, red-cockaded woodpeckers could be affected. However, as previously noted, there are no known nest locations within the RDC. GPC has procedures to protect red-cockaded woodpeckers encountered during maintenance activities, and electrocution of birds is unlikely. Therefore, operation of the transmission system is not likely to adversely affect the red-cockaded woodpecker.

Based on the available information, the NRC staff has determined that operation of the proposed Units 3 and 4 and construction and operation of the proposed transmission system may affect, but are not likely to adversely affect, the red-cockaded woodpecker.

5.2 Wood Stork – Endangered

Breeding populations of the wood stork (*Mycteria americana*), which are Federally listed as endangered, currently occur or have recently occurred only in Florida, Georgia, South Carolina, and North Carolina (FWS 2007c). From 1975 to 1984, Georgia averaged three colonies and had an average total of 210 nesting pairs. Beginning in 1992, surveys in Georgia were expanded, and 1091 breeding pairs were documented at nine colonies. In 2005, 1817 breeding pairs were documented at 19 colonies. In 2006, there were 1928 breeding pairs at 21 colonies. Wood storks have nested at 43 different locations in the Georgia coastal plain, and the number of colonies averaged 14 during the years from 1997 to 2007 (FWS 2007c). No critical habitat has been designated for this species (FWS 2007d).

The wood stork is a highly colonial species, usually nesting and feeding in flocks. Its habitat includes freshwater and brackish wetlands, and it normally nests in bald cypress or red mangrove (*Rhizophora mangle*) swamps. At freshwater sites, nests are often constructed in bald cypress and swamp tupelo (*Nyssa biflora*). Wood storks in Georgia and South Carolina lay eggs from March to late May, with fledging occurring in July and August (FWS 1997).

Wood storks have a unique feeding technique (tacto-location) and typically require higher prey concentrations than other birds. They tend to rely on depressions in marshes or swamps where prey can become concentrated during low-water periods (FWS 1997). A study from a wood stork colony in east-central Georgia found the diet was mostly composed of fish, including sunfishes (*Lepomis* spp.), bowfin (*Amia calva*), redfin pickerel (*Esox americanus americanus*), and lake chubsuckers (*Erimyzon* spp.) (FWS 1997).

Although forage areas may be 60 to 70 km (37 to 43 mi) from the colony, 85 percent are within 19 km (12 mi) (Coulter and Bryan 1993). Wood storks in east-central Georgia forage in a wide variety of wetland habitats, including hardwood and cypress swamps, ponds, marshes, drainage ditches, and flooded logging roads. Typical wood stork foraging sites have reduced quantities of both submerged and emergent macrophytes. The water in the foraging areas is either still or very slowly moving, and the depth is normally between 5 and 41 cm (2 and 16 in.). It has been suggested storks may have difficultly feeding in water with a depth more than 50 cm (20 in.) (Coulter and Bryan 1993).

Differences among seasons, rainfall, and surface-water patterns often cause storks to change where and when certain habitats are used for nesting, feeding, or roosting. These hydrological changes may cause storks to shift the timing or intensity of feeding at a local wetland, or cause entire regional populations of birds to make large geographic shifts between one year and the next. Successful colonies are those that are in regions where birds have options to feed under a variety of rainfall and surface-water conditions. Maintaining a wide range of feeding site options requires that many different types of wetlands, both large and small, and relatively long and short annual hydro-periods be available for foraging (FWS 1997).

Wood storks have the potential to occur in the project area (FWS 2010b). However, no wood storks were identified in the VEGP threatened and endangered species surveys completed in 2005, and there are no known records of wood storks occurring on the VEGP Site or within the RDC (NRC 2008a; TRC 2006; GDNR 2007; GDNR 2009). The closest known wood stork colonies to the VEGP Site are located in Jenkins and Screvin Counties, Georgia, which are south of the project area. The Birdsville colony is located at Big Dukes Pond, a 570-ha (1400-ac) cypress swamp, which is 12.6 km (7.8 mi) northwest of Millen in Jenkins County, Georgia. The VEGP Site is approximately 45 km (28 mi) from the Birdsville colony. The Chew Mill Pond colony in Jenkins County is approximately 6 km (3.7 mi) southwest of the Birdsville colony. Chew Mill Pond has a history of being a wood stork foraging site and a wading bird rookery. Researchers consider it to be an overflow or satellite colony of the Birdsville colony (Wike et al. 2006). The Jacobsons Landing colony in Screven County is approximately 43 km (27 mi) southeast of the VEGP Site. In 1996, it contained an estimated 40 wood stork nests. The distance from the VEGP Site to these colonies is within the maximum radius that wood storks travel during daily feeding flights (i.e., 60 to 70 km [37 to 43 mi]) (Coulter and Bryan 1993). Foraging wood storks have been recorded throughout Burke County, Georgia (Coulter and Bryan 1993; Wike et al. 2006), and in the Savannah River Swamp on DOE’s Savannah River Site in South Carolina, which is adjacent to the VEGP Site (Wike et al. 2006).

Wood storks were reported in the vicinity of the Savannah River Site before the site was established in 1952, and before the discovery of the Birdsville colony. Storks have been followed from the Birdsville colony to the Savannah River Site. However, data from the aerial wood stork surveys of the Savannah River Swamp and the studies at the Birdsville colony suggest that the Savannah River Swamp probably is not used extensively during the breeding or pre-fledging phases of the Birdsville colony. Most of the observations of storks on the Savannah River Site occur during the late-nestling or the post-fledging period, which occurs between June and September. Some of the birds observed foraging in the Savannah River Swamp may be storks from farther south, either non-breeders or birds that already have finished breeding for the year (Wike et al. 2006).

Foraging habitats for wood storks exist on the VEGP Site and in the RDC, and wood storks have been seen within 3.2 km (2 mi) of the site in the Savannah River Swamp and on Fort Gordon, which is adjacent to a portion of the RDC. In the October 20, 2010, letter from FWS to NRC, FWS noted that there are no documented occurrences of wood stork rookeries in the project area; however, FWS stated that foraging wood storks may occur in the project streams and wetlands, and their locations should be noted (FWS 2010b). Foraging from June to September on the VEGP Site and on the RDC appears possible in wetland areas along stream drainages, ponds, drainage ditches. However, there are no records of wood stork colonies in the RDC or on the VEGP Site or within 32 km (20 mi) of the site and the proposed transmission line. This species does not likely nest in the RDC or on the VEGP Site. The wood stork is highly mobile and impacts associated with foraging during operation on the VEGP Site and construction and operation activities within the proposed transmission line ROW would be negligible.

GPC maintenance recommendations include identifying all active nesting wood stork colony rookeries that are within 1.6 km (1 mi) of a transmission line ROW. In areas within 230 m (750 ft) of an active rookery, GPC recommends mowing during the non-nesting season (Southern 2007). Therefore, activities related to the maintenance of the transmission line ROW are not expected to adversely affect the wood stork.

Based on the available information, the NRC staff has determined that operation of the proposed Units 3 and 4 and construction and operation of the proposed transmission system may affect, but are not likely to adversely affect, the wood stork.

5.3 Canby's Dropwort – Endangered

Canby's dropwort (*Oxypolis canbyi*) was listed as endangered by the FWS in 1986 (51 FR 6690). This species is native to the Coastal Plain from Delaware (historical only), Maryland, North Carolina, South Carolina, and Georgia. Historically, this plant was found in Burke, Dooly, Lee, and Sumter Counties in Georgia. There is no critical habitat designated for this species (FWS 1990).

Canby's dropwort has been found in a variety of habitats, including ponds dominated by pond cypress (*Taxodium ascendens*), grass-sedge-dominated Carolina bays, wet-pine savannahs, shallow-pineland ponds, and cypress-pine swamps or sloughs. The largest and most vigorous populations occur in open bays or ponds, which are wet throughout most of the year and have little or no canopy cover. Sites occupied by this species generally have infrequent and shallow inundations (5 to 30 cm [2 to 12 in.]). The species water requirements are narrow, with too little or too much water being detrimental (FWS 1990). Suitable habitat is normally on a sandy loam or loam soil underlain by a clay layer, which along with the slight gradient of the areas results in the retention of water.

Canby’s dropwort has the potential to occur in the project area (FWS 2010b). However, Canby’s dropwort was not found on the VEGP Site during the 2005 threatened and endangered species surveys, and there are no historical records of it occurring onsite (NRC 2008a, TRC 2006). There are two historical records of occurrence in Burke County around Waynesboro, Georgia (51 FR 6690), and these populations are currently thought to be extirpated (FWS 1990). There are no recorded occurrences within 16 km (10 mi) of the VEGP Site (GDNR 2007, GDNR 2009). Known soil types that support populations of Canby's dropwort are Rembert loam, Portsmouth loam, McColl loam, Grady loam, Coxville fine sandy loam, and Rains sandy loam. These soil types are similar in that they have a medium-to-high organic matter content, a high water table, and are deep, poorly drained, and acidic (FWS 1990). None of these soil types occur on the VEGP Site. Soil types found on the site include soils in the Chastain-Tawcaw association; Lucy, Osier, and Bibb soils; the Tawcaw-Shellbluff association; and Fuquay, Bonifay, and Troup series soils (NRCS 2003). It is unlikely that the VEGP Site contains suitable habitat for Canby's dropwort. Because of the lack of suitable habitat, it is unlikely there would be adverse impacts during operational activities at the VEGP Site.

There are no known occurrences of Canby’s dropwort within the RDC. The nearest known occurrence is about 5.6 km (3.5 mi) from the RDC in Burke County (GDNR 2007). Soils known to support Canby’s dropwort occur in the RDC (USGS 2001). These soils are associated with pond or wetland areas. GPC has committed to avoiding wetlands to the extent practicable during construction. In the event that wetlands are encountered, construction would be conducted in accordance with the necessary permits to protect wetland areas (GPC 2007). Therefore, it is unlikely that Canby’s dropwort will be adversely affected during construction and operation activities along the transmission line ROW. GPC has implemented transmission line ROW maintenance procedures that include hand cutting in areas, such as wetlands, that have special environmental concerns (Southern 2008). In the October 20, 2010, letter from FWS to NRC, FWS noted that there are no documented occurrences of Canby’s dropwort in the direct project area; however, FWS recommends that Canby’s dropwort should be surveyed for, if habitat is encountered (FWS 2010b).

Based on the available information, the NRC staff has determined that operation of the proposed Units 3 and 4 and construction and operation of the proposed transmission system may affect, but are not likely to adversely affect, Canby's dropwort.

5.4 Eastern Indigo Snake – Threatened

The eastern indigo snake (*Drymarchon couperi*) was Federally listed as threatened by FWS in 1978 (FWS 1978). Historically, the eastern indigo snake occurred through Florida and in the coastal plain of Georgia, Alabama, and Mississippi (FWS 2006). Most, if not all, of the remaining viable populations of the eastern indigo snake occur in Georgia and Florida. Diemer and Speak (1983) conducted a 2-year study to survey the distribution of the eastern indigo snake and to characterize and delineate its habitat in Georgia. Results from this study indicated that the stronghold for the species was in a contiguous block of approximately 41 southeastern and south-central Georgia counties. The status and distribution in Georgia was recently reviewed by Stevenson (2006). He determined that populations of eastern indigo snakes still remain widespread in Georgia with recent records from 25 of the original 41 counties identified in the study by Deimer and Speak (1983). There are no historic or recent records for the upper Coastal Plain or Fall Line sandhill region of Georgia, including Burke, McDuffie, Jefferson, and Warren Counties (FWS 2006; Deimer and Speake 1983; Stevenson 2006). In its October 20, 2010, letter to NRC, FWS noted that there are no documented occurrences of the indigo snake in the area; however, FWS recommends that any pedestrian surveys of sandhill habitats, especially those with gopher tortoise burrows, should include cursory indigo snake surveys (FWS 2010b).

The eastern indigo snake occupies a broad range of habitats, including pine flatwoods, scrubby flatwoods, high pine, dry prairie, edges of freshwater marshes, agricultural fields, and human altered habitats (FWS 1982). In the northern parts of its range, including southeastern Georgia, eastern indigo snakes are tied to the use of gopher tortoise burrows and longleaf pine habitat (FWS 2006). The gopher tortoise burrows are used by the eastern indigo snakes not only to protect against cold in the winter and heat in the summer, but also for foraging, nesting, mating, and shelter prior to shedding (FWS 2006). Habitat use often varies seasonally between upland and wetland areas in Georgia (FWS 2006). Movement between habitat types may relate to the needs for thermal refugia, differences in habitat use by the juveniles and adults, or seasonal differences in availability of food resources. For these reasons, it is particularly vulnerable to habitat fragmentation (FWS 2006).

The eastern indigo snake is not documented in Burke County or any of the counties crossed by the proposed transmission line ROW. Suitable habitat may occur in the RDC, and gopher tortoise burrows are in the vicinity. However, the project area is outside the historic and current range of the eastern indigo snake.

Based on the available information, the NRC staff has determined that operation of the proposed Units 3 and 4 and construction and operation of the proposed transmission system may affect, but are not likely to adversely affect, the eastern indigo snake.

6.0 Cumulative Effects

Construction and operation of two new nuclear units at the VEGP Site were evaluated to determine the magnitude of their contribution to regional cumulative adverse impacts on terrestrial ecological resources. An assessment of potential impacts caused by plant construction was made for important terrestrial species (animal and plant) and habitats (as defined in the publication *Standard Review Plans for Environmental Reviews for Nuclear Power Plants* [NRC 2000]) by evaluating the impact of construction in light of other past, present, and future actions in the region. An assessment of potential impacts caused by plant operation was made for resource attributes normally affected by cooling tower operation, transmission line operation, and ROW maintenance. For this analysis, the geographic region encompassing past, present, and foreseeable future actions is the area immediately surrounding the VEGP Site, including adjoining sections of the Savannah River bottomland. GPC completed a transmission line study in 2007 to identify potential ROWs for the proposed 500-kV transmission line (GPC 2007). For the analysis of cumulative impacts related to the addition of the transmission line and its ROW, the geographic region encompassing past, present, and foreseeable future actions is the original study area identified by the GPC (GPC 2007).

6.1 VEGP Site

Approximately 353 ha (873 ac) of land would be disturbed by construction of the proposed Units 3 and 4 (NRC 2010i), including hardwood forest, planted pine plantations, open fields, and previously disturbed industrial areas. An estimated 3.7 ha (9.23 ac) of wetlands habitat on the site would be disturbed (USACE 2010). Most of the wetlands acreage involved would be in the Savannah River floodplain. The amount of wetland acreage that would be disturbed represents about 5 percent of the total 69 ha (170 ac) of wetlands currently present onsite. There are no Federally listed threatened or endangered species that would be adversely affected during construction of the proposed Units 3 and 4 (NRC 2008b; FWS 2008).

The area around the VEGP Site is rural and primarily forested and farmland. The habitats that would be disturbed at VEGP are not considered to be critical for the survival of any species, including those that are Federally protected. In addition, the percent of wetlands that would be disturbed represents only a small portion of the available wetlands in the vicinity of the site. Therefore, the staff concludes that the impact of development of the VEGP Site on the cumulative habitat loss and important species in the region associated with construction impacts would be negligible.

There are five fossil-fueled power generating stations within 145 km (90 mi) of the VEGP Site: the South Carolina Electric and Gas (SCE&G) Urquhart station, 34 km (21 mi) from the VEGP

Site; the SCE&G D area powerhouse station, 32 km (20 mi) from the VEGP Site; the GPC Plant McIntosh, 134 km (83 mi) from the VEGP Site; the GPC Port Wentworth, 124 km (77 mi) from the VEGP Site; and Plant Wilson, located on the VEGP Site. Fossil-fueled power plants release a variety of emissions to the air, including carbon dioxide, mercury, nitrous oxides, and sulfur dioxide. Nitrous oxides and sulfur dioxides can combine with water to form acid rain, which can lead to erosion and changes in soil pH levels. Mercury can deposit on soils and surface water, which may then be taken up by terrestrial plant and animal species, and poses the risk of bioaccumulation in the soil. For these reasons, these fossil-fueled power plants are likely to have current and future impacts to the environment on the VEGP Site and surrounding area (NRC 2008a).

There are three non-power generating plants that are on the Savannah River within the geographic area: the International Paper Corporation, the Savannah Industrial and Domestic Water plant, and the Beaufort-Jasper Water and Sewer authority wastewater treatment plant chemical discharges and the resulting bioaccumulation from these plants have the potential to have impacts on the surrounding area, including vegetation, wildlife, and wetlands (NRC 2008a).

DOE’s Savannah River Site could impact terrestrial habitats, including habitats used by Federally listed threatened or endangered species. The Savannah River Site facility includes non-operational nuclear reactors, a currently operational coal-fired generating plant, and a proposed facility to convert weapons-grade plutonium into nuclear reactor fuel. The Savannah River Site, when originally constructed, added runoff from additional roads and impervious surfaces, increased development on wetlands and riparian zones, and decreased forest habitat. Current operations at the Savannah River Site, through chemical discharges and water withdrawal, could also have a cumulative impact on the geographic area. Future actions, such as additional construction and maintenance of buildings and facilities could affect the VEGP Site and the surrounding area (NRC 2008a).

Because the proposed Units 3 and 4 are nuclear plants, there would be little additional impact to the nearby environment from airborne releases typical of fossil fuel or other industrial facilities. Therefore, even when combined with emissions from the facilities described above, the operation of Units 3 and 4 would not result in unacceptable deposition rates of airborne pollutants. Furthermore, terrestrial habitat loss or alteration for the proposed action would be confined primarily to the VEGP Site. This loss or alteration of habitat, even in combination with chemical discharges and habitat modification associated with the other facilities in the region as discussed above, would not destabilize terrestrial resources, including Federally listed threatened or endangered species.

No other past, present, or future actions in the region were identified that could significantly affect Federally listed threatened or endangered species and critical habitat in ways similar to those associated with the proposed Units 3 and 4 site cooling tower operation (cooling tower noise, drift from cooling towers, and bird collisions with cooling towers). The impacts associated with cooling tower operation were considered to be negligible for the VEGP Site; the cumulative adverse impact of these types of activities in the region also would be considered to be minor. Consequently, the NRC staff concludes that contributions of VEGP Site cooling tower operation to cumulative impacts on Federally listed threatened or endangered species and critical habitat in the region would be minimal.

6.2 Transmission Line ROW

The exact extent and type of wildlife habitat within the proposed new transmission line ROW is not known at this time because Southern and the GPC are evaluating ROW alternatives within the RDC. It is anticipated that the transmission line would cross Burke, Jefferson, McDuffie, and Warren Counties and would be 45 m (150 ft) wide and 97 km (60 mi) long (NRC 2008a). There are no U.S. Forest Service Wilderness Areas, Wild/Scenic Rivers or Wildlife Refuges, or State or National Parks within the RDC (GPC 2007). If possible, wetland areas would be avoided in the routing (GPC 2007).

A hypothetical transmission line ROW that represents what the GPC believes is a feasible route within the RDC was identified as part of a 2007 study (GPC 2007). Based on the GPC analysis, habitats within the ROW could include approximately 60 ha (148 ac) of forested habitat, 37 ha (91.5 ac) of forested wetlands, 133 ha (329 ac) of planted pine, 2.6 ha (6.4 ac) of open water, and 64 ha (158 ac) of open land (GPC 2007). Other land-use categories identified as potentially being impacted, such as mine/quarry, utility, transportation, and row crops, provide little value as wildlife habitat. In the region surrounding the proposed transmission line ROW, there are approximately 18,085 ha (44,688 ac) of forest, 16,956 ha (41,898 ac) of forested wetlands, 1354 ha (3346 ac) of open water, and 17,262 ha (42,656 ac) of open land (GPC 2007). Assuming the actual routing would be similar to the hypothetical route, the number of acres of forested habitat, forested wetlands, open water, open land, and planted pine forest that would be affected represent a very small portion of the available habitat. If the actual route would be similar to the hypothetical route, impacts on wildlife habitat in the region would be negligible. However, if the actual route differs from the hypothetical route, wildlife habitat impacts could either be greater or smaller.

There are no known occurrences of Federally listed threatened and endangered species within the RDC. However, suitable habitat for the red-cockaded woodpecker (*Picoides borealis)*, wood stork (*Mycteria americana*), Canby's dropwort (*Oxypolis canbyi*), and the eastern indigo snake (*Drymarchon couperi*) could exist within the RDC. The GPC would site the transmission line in accordance with Georgia Code Title 22, Section 22-3-161. Part of the GPC procedures for implementing this regulation include consultation with FWS and GDNR and an evaluation of impacts to special habitats and threatened and endangered species. In addition, the GPC has guidelines for transmission line maintenance practices for nests and rookeries in Georgia (Southern 2007), has developed an APP that provides guidance for minimizing impacts to bird species when siting new transmission lines (GPC 2006), would use good engineering and construction practices, and would comply with all applicable laws, regulations, and permit requirements (Southern 2008). Based on this review, cumulative impacts on important species and habitat loss in the region associated with construction of the transmission line ROW would be negligible.

No other past, present, or future actions in the region were identified that could significantly affect Federally listed threatened or endangered species and critical habitat in ways similar to those associated with transmission line operation and ROW maintenance (i.e., bird collisions with transmission lines, flora and fauna affected by EMFs and ROW maintenance, and floodplains and wetlands affected by ROW maintenance). Therefore, because these impacts were considered negligible for the VEGP Site transmission line operation and ROW maintenance, the cumulative adverse impacts of these types of activities in the region also would be minor. Consequently, the staff concludes that the contribution of transmission line operation and the maintenance of transmission line ROWs to cumulative impacts on wildlife and wildlife habitat in the region would be minimal.

6.3 Summary

The cumulative terrestrial resource impacts of the proposed action, including to Federally listed threatened or endangered species, may be detectable, but they are expected to be minor and not destabilizing to the resource. Therefore, the NRC staff concludes that cumulative impacts to terrestrial resources resulting from construction and operation of the proposed Units 3 and 4, including consideration of impacts from transmission line ROW construction and operation, would be minor.

7.0 Conclusions

The potential impacts to the protected species listed in Table 1 from operating the proposed Units 3 and 4 at the VEGP Site, considered cumulatively with the potential impacts of construction and operation of the offsite transmission line, are shown in Table 2. The known distributions and records of these species, in combination with the potential ecological impacts of the proposed action on the species, their habitat, and their prey, have been considered in making the impact determinations in this BA.

Table 2. Federally Listed Species Potentially Affected by Operation of the Proposed Units 3 and 4 at the VEGP Site and Construction and Operation of the Proposed Transmission Line Right of Way

Scientific Name	Common Name	Federal Status	Determination
Birds			
Mycteria americana	wood stork	E	May affect, not likely to adversely affect
Picoides borealis	red-cockaded woodpecker	E	May affect, not likely to adversely affect
Reptile			
Drymarchon couperi	Eastern Indigo Snake	T	May affect, not likely to adversely affect
Vascular Plant			
Oxypolis canbyi	Canby's dropwort	E	May affect, not likely to adversely affect

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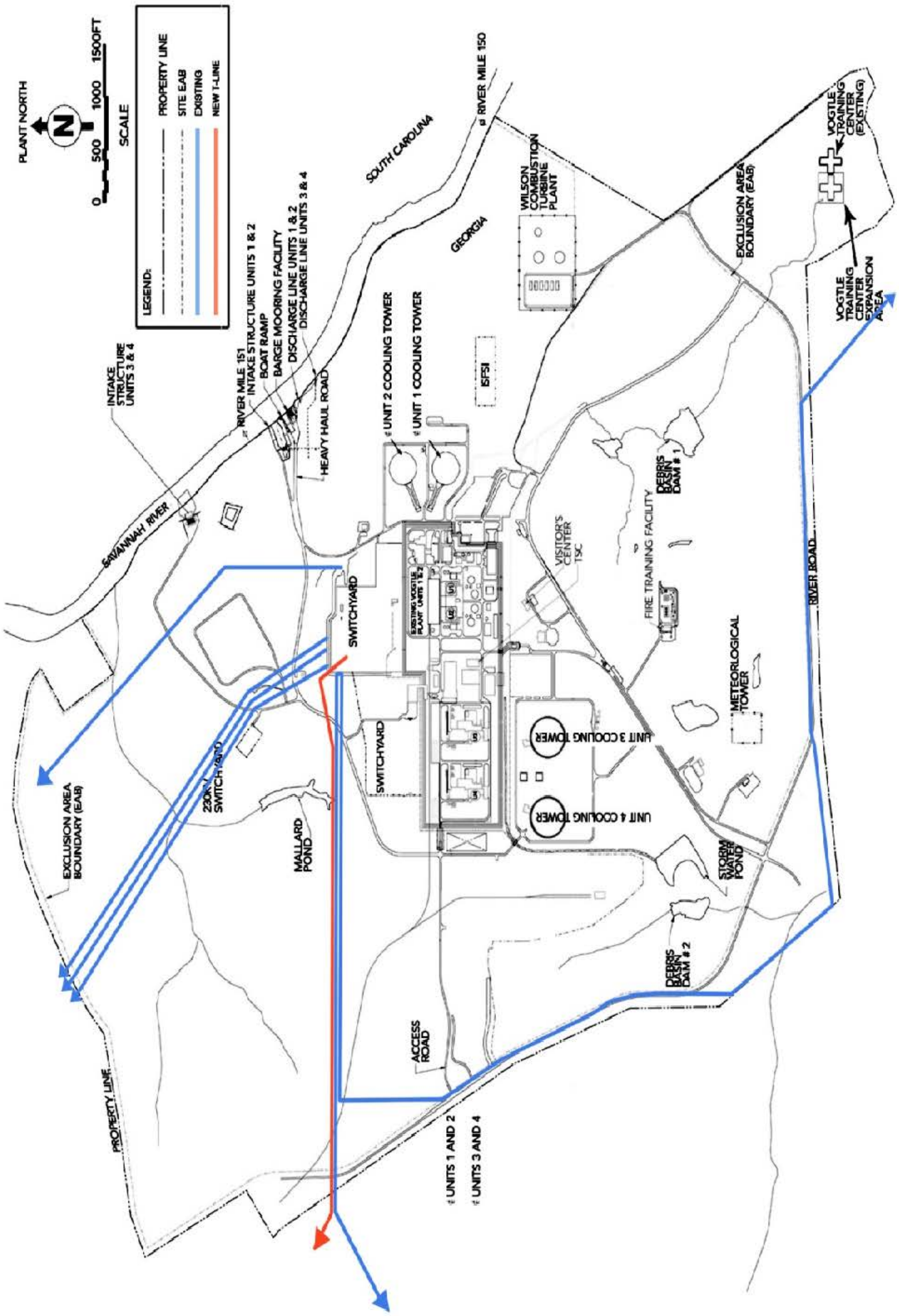

Figure 1. Proposed VEGP Site Footprint

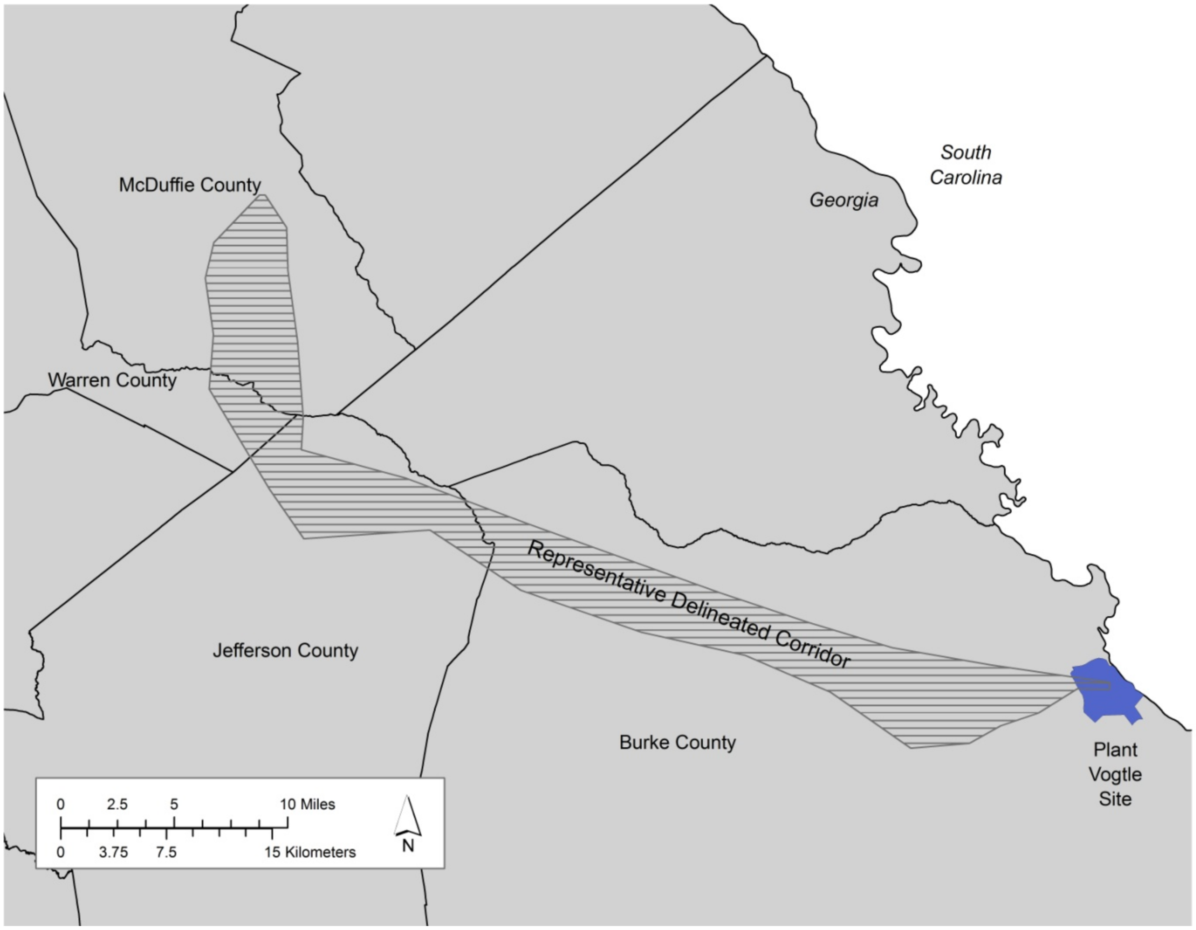

Figure 2. Representative Delineated Corridor

Attachment 9

Section 7 Consultations – Letters of Concurrence from National Marine Fisheries Service and US Fish and Wildlife Service

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701-5505
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AUG 11 2008

F/SER31:AM

Mr. William Burton
Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: A Biological Assessment for the Shortnose Sturgeon for the Vogtle Electric Generating Plant Early Site Permit Application

Dear Mr. Burton:

This responds to your letter dated January 25, 2008, and January 2008 biological assessment (BA) requesting National Marine Fisheries Service's (NMFS) concurrence with your determinations pursuant to section 7 of the Endangered Species Act (ESA) for the Nuclear Regulatory Commission's (NRC) Early Site Permit (ESP) application for the Vogtle Electric Generating Plant (VEGP) in Burke County, Georgia. You determined the project will have no effect on six species of whales, five species of marine turtles, and smalltooth sawfish, and may affect but is not likely to adversely affect shortnose sturgeon. We have also reviewed the September 2007 Draft Environmental Impact Statement (DEIS) prepared by NRC for this ESP. NMFS' determinations regarding the effects of the proposed action are based on the description of the action in this informal consultation. You are reminded that any changes to the proposed action may negate the findings of the present consultation and may require reinitiation of consultation with NMFS.

The project is located at latitude 33.1414°N, longitude 81.7667°W (NAD83), in Burke County, Georgia, adjacent to the Savannah River between river kilometers 241 and 244, approximately 24 km east-northeast of Waynesboro, Georgia, and 42 km southeast of Augusta, Georgia. The applicant proposes to clear, grade, and construct non-safety-related facilities entirely within the confines of the existing VEGP site. The purpose of the proposed permit is preparation for the construction and operation of two new nuclear power units at VEGP. Construction and operation of the units will require additional licensing by the NRC; therefore, the NRC considers this permit a separate action from the filing of an application for a construction permit or combined license for one or more nuclear power facilities. The ultimate construction and operation of the units, however, are the purpose of the ESP, and the ESP has no independent utility except to support construction and operation. Your DEIS for the ESP did analyze potential construction and operation effects on the environment, including shortnose sturgeon. Therefore, this consultation considers potential effects from the ESP as well as the units' construction and operation.

Proposed work under the ESP includes construction of the intake and discharge structures for the new nuclear units and a barge slip to support construction of the new units. All other work, such as clearing and grading, will take place in the uplands; the applicant has committed to instituting best management practices to mitigate erosion, sedimentation, and dust-generating activities. Approximately 22.5 acres of wetland would be impacted by the construction of the intake and discharge structures and barge slip modifications. It is also estimated that 510 ft of shoreline would be disturbed by the intake and discharge structures and the barge facility. Benthic habitat consists of "brown, poorly graded gravel with sand" to "poorly graded gravel." A tethered, floating silt curtain will be installed for all aspects of the project.

The intake canal would be approximately 240-ft long by 170-ft wide, with an earthen bottom at an elevation of 70 ft above mean sea level (MSL) and vertical sheet piles extending to an elevation of 98 ft MSL. Construction will take place in the summer, fall, and early winter to minimize flooding and impacts to anadromous species that enter the river during the high water conditions of February through April. Permanent and temporary sheet piles will be driven for the intake canal using a vibratory or impact hammer. Piling installation will be conducted from the uplands and the intake area cofferdam will be excavated to an elevation of 70 ft. Installation of the inner serrated weir wall and the outer serrated wall and guide vanes at the mouth of the intake would be accomplished from a barge in the Savannah River. According to the DEIS, construction will take place in the summer, fall, and early winter to minimize the impacts to fish and other aquatic organisms that move into the floodplain with the high water conditions of February, March, and April.

The existing barge slip is located between the existing VEGP Units 1 and 2 intake canal and the ring crane foundation. The downstream sheet-pile wall would be removed and the slope excavated to extend the barge slip 90 ft along the shoreline; the downstream sheet pile would be reconstructed and the shoreline stabilized. Approximately 300 cy of sediment would be dredged to a depth of 67 ft MSL from the Savannah River at the east end of the barge slip. In addition, the construction of the barge slip would require approximately 2,600 cy of stone fill within the barge basin, most of which is not in the Savannah River, to provide a stable foundation for grounding the loaded barges. Some fill would be placed in the area that is currently part of the river. A bathymetry study indicated that there will not be a need to dredge from the end of the barge slip to the federal navigation channel.

The proposed discharge structure will be placed near the southwest bank of the Savannah River, extending about 50 ft into the river. The discharge pipe will be approximately 3.5 ft in diameter, narrowing to 2 ft before the discharge point. The pipe is expected to be elevated 3 ft above the river bottom. Construction would involve the installation of a temporary sheet-pile cofferdam, which would be installed using a vibratory or impact hammer, and a dewatering system, either a well-point or local pumps. The interior of the cofferdam would be excavated so that the pipe could be installed approximately 3 ft below the invert elevation of the discharge piping and then contoured up the river bank. H-piles used for piping supports would be driven to an elevation of 50 ft MSL. After the pipe is laid, the dewatering system would be removed and the piping would be backfilled and graded to the required river bank slope contours. The cofferdam would be removed and riprap material would be installed to stabilize the riverbed and shoreline in the vicinity of the discharge point.

The DEIS states that the plant will use a closed-cycle wet cooling tower system, which reduces water use by 96 to 98 percent, and thereby reduces the likelihood of sturgeon impingement. Units 3 and 4 would have a design through-screen velocity of less than 15 cm/sec (0.5 ft/sec) at a minimum water level of 23.8 m (78 ft) above MSL; the units would withdraw between 0.9 and 1.4 percent of the river flow during normal conditions and between 1.4 and 3.4 percent of the total flow at maximum withdrawal. All four units (1-4) will be operating simultaneously beginning between 2015 and 2017. The DEIS states that the combined surface-water-use impacts would be minor due to the following: "1) the total VEGP site withdrawals are expected to be less than 5 percent of the total river discharge, 2) the total VEGP site consumptive use is expected to be less than 3.5 percent of the total river discharge, 3) other nearby surface-water users consume less water than the VEGP site would with the proposed two new units, and 4) the reduction in the river stage near the VEGP site caused by its withdrawals is expected to be less than 5 cm (2 in.)." The intake canal will be situated perpendicular to the river flow and a canal weir will be located 15 m (50 ft) inside the canal, with a serrated weir wall to reduce entrainment mortality. The installation of the weir wall would also reduce the potential of sturgeon larvae entrainment, since their larvae are demersal, tending to stay near the river bottom.

Chemicals, including biocides, would be added to the cooling tower basins for Units 3 and 4. Biofouling would be controlled using chlorination and/or other treatment methods. Operation of the cooling towers would be based on four cycles of concentration; thus, the levels of solids and organics in the cooling tower blowdown would be approximately four times higher than the ambient or upstream concentrations. Blowdown from the cooling towers would be discharged to a common blowdown sump to provide retention time for settling of solids or to be treated, if required to remove biocide residuals before the water is discharged to the river. Calculations give an estimated in-river dilution factor of 60 to 120 during periods of average Savannah River discharge, depending on the time of year and river flow rate.

In regards to water temperature, the following information comes directly from the DEIS for the ESP: 1) The discharge from the discharge structure would enter the Savannah River at 123.1 meters (404 ft) downstream through a single submerged port, 2) water quality standards for temperature are not to exceed 32.2°C (90°F), and at no time is the temperature of the receiving waters to be increased more than 2.8°C (5°F). The effluent from new Units 3 and 4 would discharge directly into the Savannah River; the maximum downsteam distance of the 2.8°C (5°F) above ambient isotherm was estimated to be 29.6 m (97 ft) from the outfall pipe.

Shortnose sturgeon, protected by the ESA, can be found in or near the action area and may be affected by the project. There is no designated critical habitat in or near the project area.

NMFS has identified the following potential effects to shortnose sturgeon and concluded that they are not likely to be adversely affected by the proposed ESP. Possible effects include the risk of injury from construction activities. Due to the species' mobility and the implementation of best management practices, such as the timing of the project (i.e., outside of the spawning season), risk of injury effects will be discountable. Turbidity curtains will be used during all phases of work and will remain in place until the proposed project is complete, and will then be removed. Effects on the species caused by exclusion from and temporary loss of spawning habitat due to construction activities are expected to be insignificant; neither the water depths, substrate bottom type, time of year for construction, nor the shape of the river at this location are conducive to shortnose sturgeon spawning. Shortnose sturgeon generally do not inhabit this section of the Savannah River at this time of year; sturgeon are generally found upstream from the site during the proposed construction months and no spawning studies have observed them in the river adjacent to the Vogtle site.

Other concerns that NMFS has regarding the effects to shortnose sturgeon include the future use of the intake and discharge structures proposed at the site. The potential effect from thermal discharge will be insignificant as it is expected that fish and other organisms would avoid the elevated temperatures, as they can move through this part of the river unencumbered by any structures or physical features that would retain them in the plume; this also reduces the likelihood of cold shock when moving outside of the plume.

The risk of sturgeon impingement within the intake structures will be discountable due to the very small chance of sturgeon being trapped, as detailed above.

Potential effects from chemical effluents will be insignificant due to the fact that "no impacts to the aquatic ecology of the Savannah River from these chemicals [i.e., biocides] have been observed" from operating Units 1 and 2. Discharge from Units 3 and 4 will be similar and thus expected to have insignificant effects on shortnose sturgeon.

Based on the above information, NFMS concludes that this proposed action is not likely to adversely affect shortnose sturgeon; therefore, this concludes your consultation responsibilities under the ESA for species under NMFS' purview. Consultation must be reinitiated if a take occurs or new information reveals effects of the action not previously considered, or the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action.

We have enclosed additional information on other statutory requirements that may apply to this action, and on NMFS' Public Consultation Tracking System to allow you to track the status of ESA consultations. If you have any questions, please contact Ms. Alexis Meyer at (727) 824-5312 or by e-mail at Alex.Meyer@noaa.gov. Thank you for your continued cooperation in the conservation of listed species.

Sincerely,

James E. Weaver

for Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

File: 1514-22.F.1.FL
Ref: I/SER/2008/00705

Additional Considerations for ESA Section 7 Consultations (Revised 01-18-2008)

Marine Mammal Protection Act (MMPA) Recommendations: The Endangered Species Act (ESA) section 7 process does not authorize incidental takes of listed or non-listed marine mammals. If such takes may occur an incidental take authorization under MMPA section 101 (a)(5) is necessary. Contact Ken Hollingshead of our NMFS Headquarters' Protected Resources staff at (301) 713-2323 for more information on MMPA permitting procedures.

Essential Fish Habitat (EFH) Recommendations: In addition to its protected species/critical habitat consultation requirements with NMFS' Protected Resources Division (PRD) pursuant to section 7 of the ESA, prior to proceeding with the proposed action the action agency must also consult with NMFS' Habitat Conservation Division (HCD) pursuant to the Magnuson-Stevens Fishery Conservation and Management Act's (MSA) requirements for essential fish habitat (EFH) consultation (16 U.S.C. 1855 (b)(2) and 50 CFR 600.905-.930, subpart K). The action agency should also ensure that the applicant understands the ESA and EFH processes; that ESA and EFH consultations are separate, distinct, and guided by different statutes, goals, and time lines for responding to the action agency; and that the action agency will (and the applicant may) receive separate consultation correspondence on NMFS letterhead from HCD regarding their concerns and/or finalizing EFH consultation.

Public Consultation Tracking System (PCTS) Guidance: PCTS is an online query system allowing federal agencies and U.S. Army Corps of Engineers' (COE) permit applicants to track the status of NMFS consultations under ESA section 7 and under MSA sections 305(b)2 and 305(b)(4): Essential Fish Habitat. Access PCTS via: www.nmfs.noaa.gov/pcts. Federal agencies are required to enter an agency-specific username and password to query the Federal Agency Site. The Corps Permit Site allows COE permit applicants the ability to check on the current status of Clean Water Act section 404 permit actions for which NMFS has conducted an ESA section 7 consultation with the COE since the beginning of the 2001 fiscal year (no password needed).

For COE-permitted projects, click on "Enter Corps Permit Site." From the "Choose Agency Subdivision (Required)" list, pick the appropriate COE district. At "Enter Agency Permit Number" type in the COE district identifier, hyphen, year, hyphen, number. The COE is in the processing of converting its permit application database to PCTS-compatible "ORM." An example permit number is: SAJ-2005-000001234-IPS-1. For the Jacksonville District, which has already converted to ORM, permit application numbers should be entered as SAJ (hyphen), followed by 4-digit year (hyphen), followed by permit application numeric identifier with no preceding zeros. E.g., SAJ-2005-123, SAJ-2005-1234, SAJ-2005-12345.

For inquiries regarding applications processed by Corps districts that have not yet made the conversion to ORM (e.g., Mobile District), enter the 9-digit numeric identifier, or convert the existing COE-assigned application number to 9 numeric digits by deleting all letters, hyphens, and commas; converting the year to 4-digit format (e.g., -04 to 2004); and adding additional zeros in front of the numeric identifier to make a total of 9 numeric digits. E.g., AL05-982-F converts to 200500982; MS05-04401-A converts to 200504401. PCTS questions should be directed to Eric Hawk at Eric.Hawk@noaa.gov. Requests for username and password should be directed to PCTS.Usersupport@noaa.gov.

United States Department of the Interior

Fish and Wildlife Service

105 West Park Drive, Suite D
Athens, Georgia 30606

West Georgia Sub Office
P.O. Box 52560
Ft. Benning, Georgia 31995-2560

Coastal Sub Office
4270 Norwich Street
Brunswick, Georgia 31520

SEP 19 2008

Mr. Mark Notich, Project Manager
Nuclear Regulatory Commission (NRC)
11555 Rockville Pike, M/S 010H2
Rockville, Maryland 20852

Re: USFWS Log # 08-FA-0473

Dear Mr. Notich:

The U. S. Fish and Wildlife Service (Service) has reviewed the Biological Assessment (BA) for U. S. Fish and Wildlife Species, Vogtle Electric Generating Plant (VEGP), Early Site Permit Application. The existing Vogtle Plant is located on the Savannah River near Waynesboro, Georgia in Burke County, approximately 42 km (26 miles) south of Augusta, Georgia. The purpose of this BA is "to provide information to the U. S. Fish and Wildlife Service (FWS) concerning potential impacts of limited site-preparation activities at the VEGP site on threatened and endangered species and designated critical habitat pursuant to Section 7(a)(2) of the Endangered Species Act." This BA addresses only limited site-preparation activities at the Vogtle site.

These comments, pertaining only to the Georgia portion of the Vogtle project, are provided in accordance with the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*) and the Migratory Bird Treaty Act (16 U.S.C. 703 *et seq.*).

Based on the information provided in this BA and all available information, we believe that species under the jurisdiction of the Service have been adequately addressed for limited site-preparation activities at the Vogtle site. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner which was not previously considered in this assessment; or (3) a new species is listed or critical habitat determined that may be affected by the identified action.

Should you have further questions, please call our Coastal Georgia Sub-office supervisor, Strant Colwell, at (912) 265-9336.

Sincerely,

Strant Colwell

Sandra S. Tucker
Field Supervisor

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5511
(727) 824-5317; FAX (727) 824-5300
http://sero.nmfs.noaa.gov/

March 4, 2010 F/SER4:PB/pw

(Sent via Electronic Mail)

Col. Edward J. Kertis
U.S. Army Corps of Engineers, Savannah District
100 W. Oglethorpe Avenue
Savannah, Georgia 31401-3640

Attention: Shaun L. Blocker

Dear Colonel Kertis:

NOAA's National Marine Fisheries Service (NMFS) reviewed the public notice, dated February 2, 2010, for a Department of the Army Permit (Public Notice No. SAS-2007-01837) regarding proposed expansion of the Vogtle Electric Generating Plant (VGEP), located adjacent to the Savannah River near Waynesboro, Burke County, Georgia. The applicant, Southern Nuclear Operating Company, Inc., proposes to construct two additional nuclear reactors (Units 3 and 4) with a new cooling water intake system and excavated canal to the Savannah River. The following comments are provided in accordance with the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

The applicant proposes impacts to wetlands and aquatic habitats through land clearing, excavation, and permanent fill in 9.23 acres of jurisdictional wetland, 1.42 acres of open-water habitat in the Savannah River, and 0.07 acres of an ephemeral tributary stream. As compensatory mitigation, the applicant proposes to purchase 77.9 wetland mitigation credits from the Phinizy Swamp Mitigation Bank, located adjacent to the Savannah River near the City of Augusta, Georgia.

Fishery Resources Potentially Affected

The Savannah River within the area of project influence provides important spawning and maturation habitats for migratory diadromous fish species, including American shad, blueback herring, Atlantic and shortnose sturgeon, American eel, and striped bass. Riparian wetlands to be impacted by project construction provide important ecological functions for maintenance of habitat quality for fishery and aquatic resources.

Comments and Recommendations

Mitigation of Wetland Impacts

Based on review of the application, the wetland mitigation plan incorporates adequate avoidance, minimization, and compensatory mitigation through utilization of credits from the Phinizy Swamp Mitigation Bank.

Fish Protection at the Cooling Water Intakes

NMFS participated in the Nuclear Regulatory Commission (NRC) relicensing of the existing VEGP facilities and Early Site Permit proceedings for the proposed expansion. During this coordination, NMFS indicated concerns about the potential impingement and entrainment eggs, larvae, and juveniles of diadromous fish at the proposed intake for the new cooling water system on the Savannah River, and we discussed with the NRC and applicant the need for adequate measures to reduce impingement and entrainment at the intake structures. The fish protection system included in the NRC's *Final Early Site Permit Environmental Impact Statement* (Section 5.4.2) includes design features expected to provide adequate reduction of impingement and entrainment impacts.

Essential Fish Habitat (EFH) Consultation

Section 305(b) (4) (A) of the Magnuson-Stevens Act requires NMFS to provide conservation recommendations when an activity is expected to adversely impact EFH. Designated EFH for federally managed fish species is present in estuarine waters and tidal freshwater wetlands in the lower Savannah River Basin, approximately 130 river miles downstream from the VEGP facilities.

The public notice does not include an EFH Assessment, presumably because the Savannah District believes VEGP is too far upstream to affect EFH in the Savannah River Estuary. One function of EFH within the Savannah River Estuary is to provide foraging grounds for federally managed fish, and abundance of prey is one factor affecting the level of function provided. Diadromous fish are among the prey of federally managed species. Impingement or entrainment of eggs, larvae, and juveniles of diadromous fish species at the proposed at the proposed intake for the new cooling water system could reduce the abundance of prey and the level of service provided by EFH within the estuary. As noted above, NMFS worked with the NRC and the applicant to develop a fish protection system expected to provide adequate reduction of impingement and entrainment impacts. Accordingly, NMFS concludes the project is not likely to adversely affect EFH.

Endangered Species Act (ESA) Consultation

During August 2008, NMFS responded to the NRC's ESA consultation Biological Assessment and concluded that the proposed action is not likely to adversely affect the endangered shortnose sturgeon.

Thank you for the opportunity to provide comments. Related correspondence should be directed to the attention of Prescott Brownell at our Atlantic Branch office, 219 Fort Johnson Road, Charleston, South Carolina, 29412. He may be reached by telephone at (843) 953-7204, or by e-mail: Prescott.Brownell@noaa.gov.

Sincerely,

Pace Wilber

/ for

Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc:

CESAS, Shaun.L.Blocker@usace.army.mil
GADNR-EPD, Keith_Parsons@dnr.state.ga.us
SCDNR, PerryB@dnr.sc.gov
EPA, Lord.Bob@epamail.epa.gov
F/SER4

United States Department of the Interior

Fish and Wildlife Service
105 West Park Drive, Suite D
Athens, Georgia 30606
Phone: (706) 613-9493
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West Georgia Sub-Office
Post Office Box 52560
Fort Benning, Georgia 31995-2560
Phone: (706) 544-6428
Fax: (706) 544-6419

Coastal Sub-Office
4980 Wildlife Drive
Townsend, Georgia 31331
Phone: (912) 832-8739
Fax: (912) 832-8744

March 24, 2011

Gregory P. Hatchett, Chief
United States Nuclear Regulatory Commission
Environmental Projects Branch 1
Washington, DC 20426

Re: USFWS File Number 2010-1254

Dear Mr. Hatchett:

The U. S. Fish and Wildlife Service (Service) has reviewed your correspondence dated February 24, 2011, and the attached Biological Assessment for Threatened and Endangered Species and Designated Critical Habitat for the Vogtle Electric Generating Plant, Units 3 and 4 Combined Licenses Application. The proposed action for this project is the Nuclear Regulatory Commission's (NRC) issuance of a combined license for two new nuclear power reactor units at the Vogtle Electric Generating Plant (VEGP) Site near Waynesboro, Georgia. Your correspondence stated that the Biological Assessment (BA) evaluated the effects of the proposed action on four federally listed threatened or endangered species identified by the Service's comments in an October 20, 2010, letter that may occur on or in the vicinity of the VEGP site and/or in habitats crossed by the proposed transmission line. Service comments are provided in accordance with the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 *et seq.*), and the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d).

Using information gathered via actions such as: communication with the Service, electronic files, and the lack of habitat and sightings for federally listed species, the NRC has determined that this project may affect but is not likely to adversely affect the following: the red-cockaded woodpecker (*Picoides borealis*), the wood stork (*Mycteria americana*), the Eastern indigo snake (*Drymarchon couperi*), and Canby's dropwort (Oxypolis canbyi).

Based on the information provided within the BA, and the measures addressed therein, we concur with your determination that this project may affect, but is not likely to adversely affect the four species listed above. In view of this, we believe that the requirements of section 7 of the Endangered Species Act have been satisfied. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner which was not previously considered in this assessment; or (3) a new species is listed or critical habitat determined that may be affected by the identified action.

This informal consultation is between the NRC and the Service. However, we will continue to work with other governmental agencies as permits are required and with Georgia Power Company as they reduce the macro-corridor to a more defined power line right of way.

Thank you for the opportunity to comment on the proposed project. We will continue to coordinate with your agency as needed and welcome questions or comments at any time. Please direct any questions or concerns you may have to the Coastal Georgia Sub Office supervisor, Strant Colwell, at 912-832-8739.

Sincerely,

Strant Colwell

Sandra S. Tucker for
Field Supervisor

cc: U.S. Nuclear Regulatory Commission, Ms. Mallecia Sutton
USFWS, Townsend, Georgia

Attachment 10

Nuclear Regulatory Commission Analysis Regarding Potential Impacts on Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

And

Letter of Concurrence from National Marine Fisheries Service

March 2, 2011

Mr. David Bernhart
Assistant Regional Administrator
for Protected Resources
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SUBJECT: CONFERENCE CONSULTATION FOR THE ATLANTIC STURGEON FOR THE VOGTLE ELECTRIC GENERATING PLANT, UNITS 3 AND 4 COMBINED LICENSES APPLICATION

Dear Mr. Bernhart:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application, submitted on March 31, 2008, from Southern Nuclear Operating Company, Inc (Southern) and its four co-applicants for combined licenses (COLs) to construct and operate two Westinghouse AP1000 pressurized water reactors at the Vogtle Electric Generating Plant (VEGP) site in Burke County, GA. The COL application referenced an early site permit (ESP) for the VEGP site that was issued to Southern and its co-applicants in 2009. As part of the ESP process, the NRC staff developed a draft and final environmental impact statement.

As part of the NRC's responsibilities under Section 7 of the Endangered Species Act (ESA), the NRC staff prepared a biological assessment (BA) in connection with the VEGP ESP review documenting potential impacts on the shortnose sturgeon (*Acipenser brevirostrum*) as a result of preconstruction site-development activities of the two new units at the VEGP site. That BA, which was submitted to your office on January 25, 2008, concluded that the proposed action is not likely to adversely affect the shortnose sturgeon. The National Marine Fisheries Service (NMFS) concurred with that determination in a letter dated August 11, 2008. In a letter dated September 3, 2010, the NRC confirmed with your office that the ESP-stage consultation encompassed the proposed actions included in the COL application.

The shortnose sturgeon was the only applicable listed or proposed species under the purview of the NMFS during the NRC staff's ESP-stage consultation. On October 6, 2010, NMFS, published in the Federal Register (75 FR 61904), a proposed rule for listing the Carolina and South Atlantic distinct population segments of the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) as endangered under the ESA. To address this development, the NRC has prepared the enclosed document which describes the potential effects of the construction and operation of two new nuclear units at the VEGP site on the Atlantic sturgeon and serves as our conference consultation under Title 50 of the Code of Federal Regulations (CFR) Part 402, subpart B, Section 402.10 (50 CFR 402). This document is limited to consultation on the Atlantic sturgeon and does not affect the prior NRC or NMFS assessment regarding the shortnose sturgeon. The NRC is requesting NMFS concurrence with the NRC staff's determination that the proposed action is unlikely to adversely affect the Atlantic sturgeon.

If you have any questions regarding this consultation letter or the staff's request, please contact Ms. Mallecia Sutton, NRC Environmental Project Manager via telephone at 301-415-0673 or via e-mail to Mallecia.Sutton@nrc.gov.

Sincerely,

/RA/

Gregory Hatchett, Chief
Environmental Projects Branch 1
Division of Site and Environmental Reviews
Office of New Reactors

Docket Nos.: 52-025
52-026

Enclosure:
As stated

cc w/o encl: See next page

Analysis Regarding Potential Impacts on Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

Background

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application from Southern Nuclear Operating Company, Inc. (Southern), acting on behalf of itself and co-applicants (Georgia Power Company [GPC], Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and the City of Dalton, Georgia). The application is for combined licenses (COLs) to construct and operate two Westinghouse Electric Company, LLC (Westinghouse) Advanced Passive 1000 (AP1000) pressurized water reactors (i.e., Units 3 and 4) on the site of the Vogtle Electric Generating Plant (VEGP) in Burke County, Georgia. The COL application (Southern 2009) referenced an early site permit (ESP) for the VEGP site that was issued to Southern and the same co-applicants in 2009 (NRC 2009a). As part of the ESP process the NRC staff developed a draft and final environmental impact statement (EIS) (NRC 2007 and 2008a).

As part of the NRC's responsibilities under Section 7 of the Endangered Species Act (ESA), the NRC staff prepared a biological assessment (BA) in connection with the VEGP ESP review. The BA, which documented potential impacts on the shortnose sturgeon (*Acipenser brevirostrum*) as a result of preconstruction site-development activities of two new units at the VEGP site, was submitted to the National Marine Fisheries Service (NMFS) on January 25, 2008, (NRC 2008b). In the BA, the staff concluded that the overall impact of preconstruction-related activities (including constructing the intake and discharge systems and modifying the barge slip) would be temporary and unlikely to adversely impact shortnose sturgeon in the Savannah River. In its draft and final EIS (NRC 2007, 2008a) supporting the review of the ESP application, the NRC staff also analyzed the impacts of operation of two new nuclear units at the VEGP site and concluded that operation is unlikely to adversely impact shortnose sturgeon.

NMFS reviewed the BA and the September 2007 draft ESP EIS (NRC 2007) and, in a letter dated August 11, 2008, (NMFS 2008), concluded that "… effects on the species caused by exclusion from and temporary loss of spawning habitat due to construction activities are expected to be insignificant…" NMFS's basis for this conclusion was that, "… neither the water depths, substrate bottom type, time of year for construction [i.e., outside of the spawning season], nor the shape of the river at this location are conducive to shortnose sturgeon spawning. Shortnose sturgeon generally do not inhabit this section of the Savannah River at this time of year [i.e., outside of the spawning season]; sturgeon are generally found upstream from the site during the proposed construction months and no spawning studies have observed them in the river adjacent to the Vogtle Site." Further, based on its review of the draft ESP EIS, NMFS indicated that, "… the potential effect from thermal discharge will be insignificant as it is expected that fish and other organisms would avoid the elevated temperatures, as they can move through this part of the river unencumbered by any structures or physical features that would retain them in the plume; this also reduces the likelihood of cold shock when moving outside of the plume." NMFS concluded that, "… the risk of sturgeon impingement within the intake structures will be discountable due to the very small chance of sturgeon being trapped." Finally, NMFS concluded "… potential effects from chemical effluents will be insignificant." In summary, after considering impacts of both construction and operation of two new units at the VEGP site, NMFS concluded that the proposed action is not likely to adversely affect shortnose sturgeon.

The shortnose sturgeon was the only applicable listed or proposed species under the purview of the NMFS during the NRC staff's ESP-stage consultation. On October 6, 2010, NMFS published in the Federal Register (75 FR 61904) a proposed rule for listing the Carolina and South Atlantic distinct population segments of the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) as endangered under the ESA. To address this development, this document describes the potential effects of the construction and operation of two new nuclear units at the VEGP site on the Atlantic sturgeon, and serves as our conference consultation under Title 50 of the Code of Federal Regulations (CFR) Part 402, subpart B, Section 402.10 (50 CFR 402). This document is limited to consultation on the Atlantic sturgeon and does not affect the prior NRC or NMFS assessment regarding the shortnose sturgeon. In a letter dated September 3, 2010 (NRC 2010a), NRC notified NMFS of the issuance and request for comments for the Vogtle draft supplemental EIS (SEIS) for the COL application. The letter further stated that no relevant information had changed regarding the project since the earlier BA was submitted. The NRC staff has incorporated by reference the ESP-stage consultation with respect to the shortnose sturgeon, pursuant to 50 CFR 402.12(g). However, because of the similarities between the Atlantic sturgeon and the shortnose sturgeon, material supporting the previous consultation is referenced or included here as appropriate.

Description of the Action

NRC is reviewing an application, submitted on March 31, 2008, from Southern and the aforementioned co-applicants for COLs to construct and operate two Westinghouse AP1000 pressurized water reactors at the VEGP site in Burke County, Georgia. The VEGP site and existing facilities are owned and operated by GPC, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and the City of Dalton, Georgia. Southern is the licensee and operator of the existing VEGP, Units 1 and 2 and has been authorized by the VEGP co-owners to apply for COLs for the new Units 3 and 4.

On August 26, 2009, NRC approved issuance to Southern and co-applicants of an ESP and a Limited Work Authorization (LWA) for two additional nuclear units at the VEGP site (NRC 2009a). This approval was supported by information contained in NUREG-1872, Final Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site (ESP EIS) (NRC 2008a) and errata. The ESP EIS considered the environmental issues and impacts of constructing and operating two new nuclear units at the VEGP site. Issuance of the ESP allowed Southern to “bank” the VEGP ESP site for up to 20 years. The LWA authorized Southern to conduct certain limited construction activities at the site in accordance with 10 CFR 50.10 and 52.24(c). As permitted by NRC regulations, Southern’s COL application references the ESP.

Southern has performed, or plans to initiate, the following site-preparation activities for the two new Units 3 and 4 at the VEGP site which were considered in the BA prepared for the shortnose sturgeon and in the ESP EIS:

- Prepare the site for construction of the facilities (including such activities as clearing, grading, constructing temporary access roads, and preparing borrow areas),
- Install temporary construction support facilities (including items such as warehouses, shop facilities, utilities, concrete mixing plants, docking and unloading facilities, and construction-support buildings),
- Excavate for facility structures,

- Construct service facilities (including items such as roadways, paving, railroad spurs, fencing, exterior utility and lighting systems, transmission lines, and sanitary sewage treatment facilities), and

- Construct structures, systems, and components that do not prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public. These structures, systems, and components include, but are not limited to the following:
  - Cooling towers
  - Intake and discharge structures
  - Circulating water lines
  - Fire protection equipment
  - Switchyard and onsite interconnections.

The ESP BA concerning the shortnose sturgeon also described modification of a barge slip (NRC 2008b). Since then, Southern has decided not to modify the barge slip because large components will be delivered by rail (Southern 2010a) thus precluding the need to modify the barge slip.

Under 10 CFR Part 52, which contains NRC's reactor licensing regulations and in accordance with the applicable provisions of 10 CFR Part 51, which are the NRC regulations implementing the National Environmental Policy Act of 1969 (NEPA), the NRC is required to prepare a SEIS (NRC 2010b) as part of its review of a COL application referencing an ESP. As required by 10 CFR 51.26, the NRC published a notice of availability of the draft SEIS for public comment in the *Federal Register* (FR) on September 3, 2010, (75 FR 54145). The SEIS, together with the ESP EIS (NRC 2008a), the ESP hearing proceedings, and specifically the NRC staff's prefiled testimony (NRC 2009b), and environmental assessments for three ESP license amendments concerning onsite backfill activities authorized by the LWA, (NRC 2010c, NRC 2010d, NRC 2010e) provide the NRC staff's evaluation of the environmental effects of constructing and operating two AP1000 reactors at the VEGP site.

VEGP Site Description

The VEGP site is located in Burke County, Georgia, adjacent to the Savannah River between river kilometers (RKM) 241 and 244 (river miles [RM] 150 and 152). The site is approximately 24 km (15 mi) east-northeast of Waynesboro, Georgia and 42 km (26 mi) southeast of Augusta, Georgia (see Figure 1). The proposed COL site is completely within the confines of the existing VEGP site with the new units to be constructed and operated adjacent to the existing Units 1 and 2 (Figure 2). A more detailed site description was provided in the ESP BA (NRC 2008b).

Figure 1. VEGP Site and the Vicinity within an 80-km (50-mi) Radius (Southern 2007)

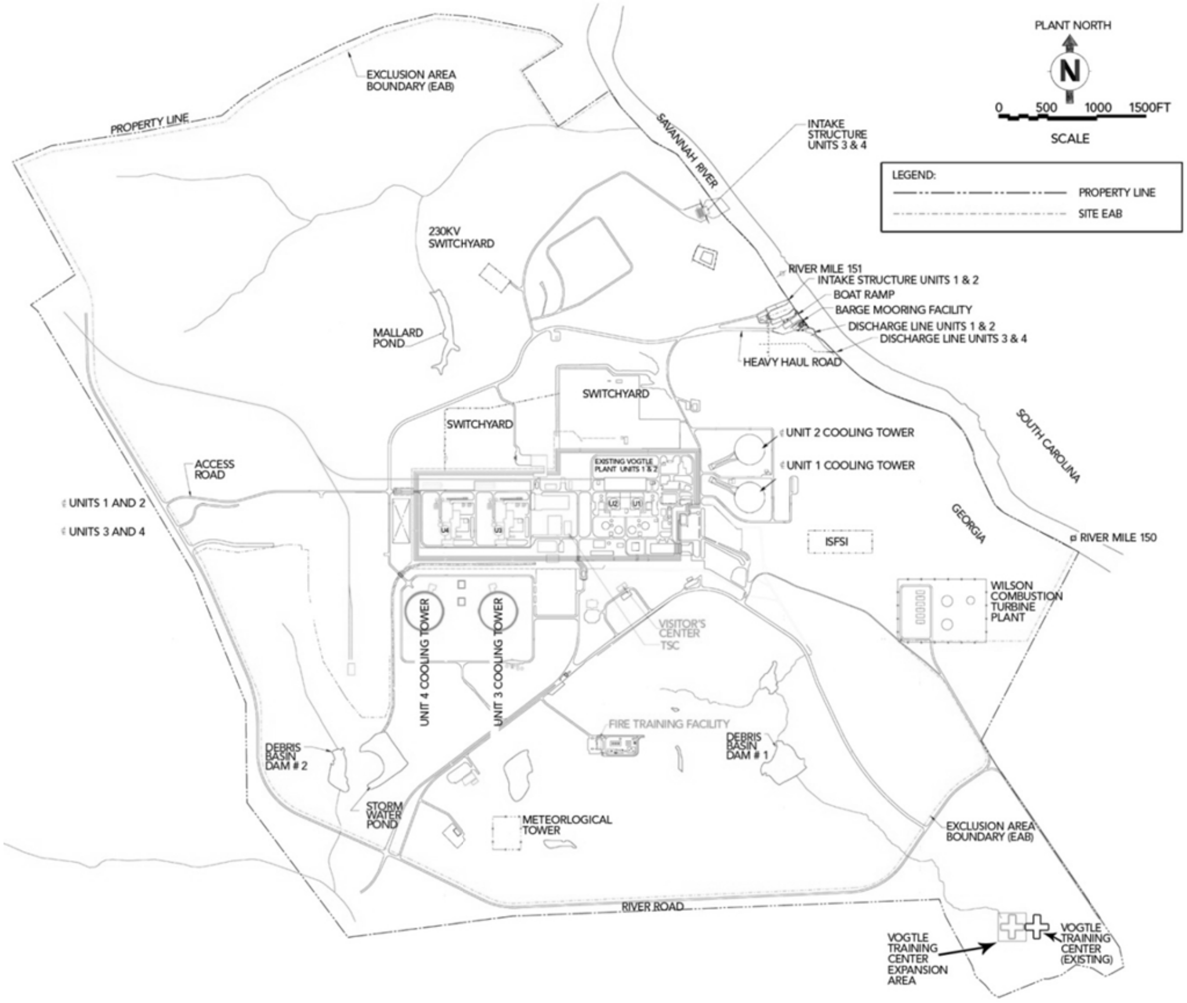

Figure 2. VEGP Site Footprint with the Existing and Proposed Nuclear Units (Southern 2010b)

Potential Environmental Impacts from Preconstruction Site-Preparation Activities

The activities that could potentially affect the habitat for the Atlantic sturgeon during construction of the intake and discharge structures are the same as those described in the ESP BA (NRC 2008b), with the exception of the construction of a barge slip, dredging from the barge slip to the Savannah River Navigation Channel, and maintenance dredging of the Savannah River Navigation Channel, which are no longer planned to occur (Southern 2010a).

On September 29, 2010, the Department of the Army issued an individual Section 10/404 permit (Permit Number SAS-2007-01837) to Southern authorizing impacts to 9.23 acres of jurisdictional wetland, 734 linear feet of stream (only the Georgia side of the Savannah River, equivalent of 1.42 acres of open water), and 0.07 acre of ephemeral stream in the southeast corner of the site near the debris basins (USACE 2010a). Southern also received a Section 401 Water Quality Certification from the Georgia Department of Natural Resources (GDNR) dated June 1, 2010, (USACE 2010a).

The design and location of the cooling water intake structure for proposed Units 3 and 4 has changed since the original BA was sent to NMFS in January 2008. The cooling water intake structure has been repositioned upstream approximately 46 m (150 ft), which places it approximately 650 m (2130 ft) upstream of the existing intakes for Units 1 and 2 and approximately 427 m (1400 ft) downstream of the outlet to the unnamed tributary of Mallard Pond. Southern also described a change in the dimensions of the intake structure (Southern 2010b); this change will lower the intake structure floor from elevation 38.1 m to 32.0 m (125 to 105 ft). In addition, there will be a slight bend (i.e., approximately 30 degrees) about halfway down the canal to orient the mouth of the intake canal perpendicular to the river. Figure 3 illustrates the revised intake structure and the wetlands in its vicinity. The design changes (Southern 2010b) do not substantially modify the width of the intake canal or the length of the canal extending beyond the existing river bank. The new location and design modifications did not alter the basis for the NRC staff's analysis of construction impacts in the COL SEIS.

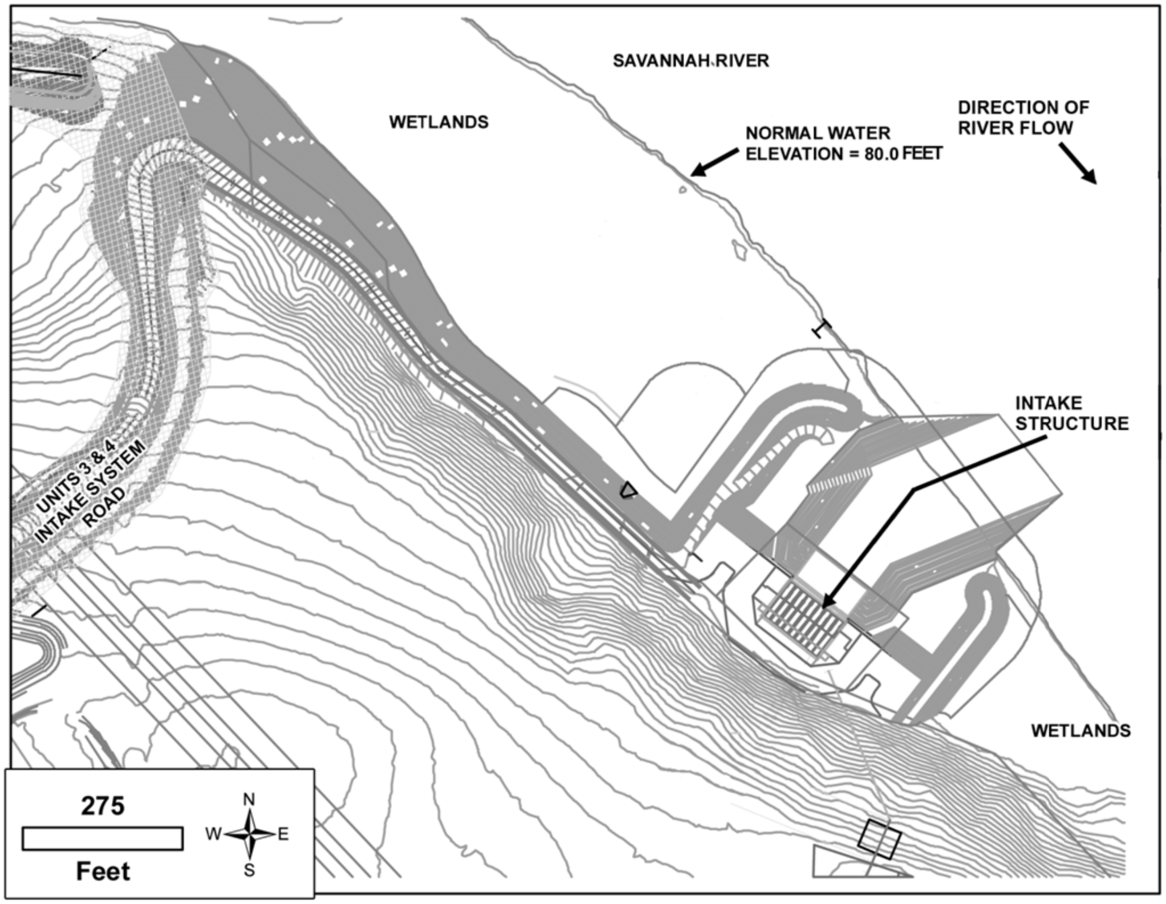

Figure 3. Revised Intake Structure and Surrounding Wetlands (Southern 2010b)

As discussed in the ESP BA (NRC 2008b), the proposed discharge structure will be placed near the southwest bank of the Savannah River, extending about 15 m (50 ft) into the river (Southern 2007). Details related to the design and placement of the discharge structure did not change.

Potential Environmental Impacts of Operational Activities

The potential impacts to the Atlantic sturgeon from the operation of the proposed Units 3 and 4 would include the loss of habitat from the consumption of water from the Savannah River, the entrainment of fish eggs or larvae, impingement against intake screens, the discharge of heated effluents, the discharge of chemicals, and the physical impact of bottom scouring from the discharge into the Savannah River.

Although the design and location of the cooling water intake structure has changed, the orientation of the mouth of the intake canal in relation to the river (perpendicular) has not changed. There is a slight bend in the intake canal (approximately 30 degrees) as shown in Figure 3; however, the orientation of the mouth of the intake canal relative to the river will not change. The new location of the intake canal is in habitat similar to that in the previous location (i.e., on a straight portion of the river and in the same floodplain.) No changes were made to the water withdrawal rates, through-screen velocities, traveling screen mesh size, or the hydraulic zone of influence, which are the main factors that would impact entrainment or impingement rates of aquatic biota during operation of the cooling water intake structure (Southern 2010b).

The staff evaluated the potential for fish, including the Atlantic sturgeon to be affected by the withdrawal of water from the Savannah River in the ESP EIS (NRC 2008a). The combined normal withdrawal rate of 2.35 m^3/s (83 cfs) for both VEGP Units 3 and 4 represents 0.9 percent of the average river discharge measured at the Augusta gauge. This is significantly less than the U.S. Environmental Protection Agency (EPA) national performance requirement of 5 percent for a cooling water intake structure located in a freshwater river or stream.

The staff also considered in the ESP EIS, the percentage of water withdrawn during normal operations for the proposed Units 3 and 4 from the Savannah River at Drought Level 3 river flow levels (108 m^3/s [3800 cfs]). At normal withdrawal rates, Units 3 and 4 would withdraw 2.2 percent of the river flow at the Drought Level 3 flow rates (NRC 2008a). Historically, these drought levels have occurred for short periods of time and this withdrawal rate is a small fraction of the water in the Savannah River at this location in the river.

As part of the evaluation process for the ESP EIS and the COL SEIS, the NRC staff considered several factors related to the operation of the discharge structure: (1) the physical and thermal characteristics of the plume in relation to the receiving water body, (2) the potential for cold shock, and (3) impacts from the discharge of chemicals from operation of the two proposed units. Regarding the physical and thermal characteristics of the plume in relation to the receiving water body, at the location of the discharge outfall and at a Drought Level 3 flow rate, the Savannah River is approximately 95-m (312-ft) wide (NRC 2008a). In its COL Environmental Report (ER), Southern (2009) indicated that there would be a 3 percent increase in the discharge flow beyond what was assessed in the ESP EIS. Using the same conservative assumptions employed in the ESP EIS analysis, this change would result in only a small increase in the size of the 2.8°C (5°F)-above-ambient isotherm, from 4.6 m (15 ft) to 5.2 m (17 ft) in width and from 29.6 m (97 ft) to 33.6 m (110 ft) in length (NRC 2010b). Because the estimated extent of the thermal plume remains small in relation to the width of the Savannah River at the VEGP site, the staff concluded the thermal plume still would not impede fish passage up and down the river. The staff concluded that consistent with the reasoning identified by the ESP EIS analysis, fish and other organisms likely would avoid the elevated temperatures and would be able to move through this part of the river unencumbered by any structures or physical features that would retain them in the plume. In addition, the staff determined that the thermal plume would not create a barrier to the upstream or downstream movement of migratory fish (NRC 2010b).

Operation of the proposed Units 3 and 4 could potentially result in cold shock, which occurs when aquatic organisms that have become acclimated to warm water such as fish in a power plant's discharge canal are exposed suddenly to a lower temperature. The staff concluded that cold shock would be less likely to occur at the VEGP site because multiple units would be operating, thus lowering the possibility of simultaneous shutdown of all the units. In addition, the volume of the discharge plume would be very small in comparison with the river flow (NRC 2008a).

Regarding the discharge of chemicals from operation of the two proposed units, the cooling water will be treated with biocides and chemicals to control scaling, corrosion, and solids deposition. Operation of the cooling towers would be based on four cycles of concentration, which means that the total dissolved solids in the make-up water would be concentrated four times before being discharged. Thus, the levels of solids and organics in the cooling tower blowdown would be approximately four times higher than ambient or upstream concentrations. Cooling water chemical treatment for the proposed Units 3 and 4 would be similar to that used for the existing units. The final plant discharge from the proposed Units 3 and 4 would be composed of circulating service water blowdown and other site wastewater streams, including sanitary waste, miscellaneous low-volume waste, and treated liquid radwaste. Blowdown from the cooling towers would be discharged to a common blowdown sump to provide retention time for settling of solids or treatment, if required to remove biocide residuals before the water is discharged to the Savannah River. Calculations performed by Southern and confirmed by the staff give an estimated in-river dilution factor of 60 to 120 during periods of average Savannah River discharge, depending on the time of the year and the river flow rate (NRC 2008a).

The use of chemicals in the existing VEGP Units 1 and 2 is regulated by the GDNR, as set forth in a National Pollutant Discharge Elimination System (NPDES) permit. The chemical concentrations at the outfall for the existing units meet the NPDES limits. The chemical concentrations from Units 3 and 4 are anticipated to be the same as those for Units 1 and 2. No impacts to the aquatic ecology of the Savannah River have been observed from the operation of Units 1 and 2 and no impacts are anticipated from operation of Units 3 and 4. Southern would be required to obtain a NPDES permit from GDNR prior to operation of Units 3 and 4. To protect the aquatic environment, the NPDES permit will specify discharge limits for the various water-treatment chemicals. The NRC staff has determined that impacts to the aquatic environment from chemical discharges to the Savannah River during operation would be minimal (NRC 2008a).

Life History of Atlantic Sturgeon

Based on information published by Marcy et al. (2005), the staff identified the Atlantic sturgeon as being present in the Middle Savannah River Basin. The Atlantic sturgeon is a member of the family Acipenseridae, which is a long-lived group of ancient anadromous and freshwater fishes. Historically, the Atlantic sturgeon was present in 38 rivers in the United States, ranging from St. Croix, Maine, to the Saint Johns River in Florida. Historical spawning populations were confirmed in 35 of the rivers. Currently, Atlantic sturgeon populations are present in 35 rivers and spawning occurs in at least 20 rivers, including the Savannah River (ASSRT 2007)

Although the life history of the Atlantic sturgeon has been studied intensely since the 1970s, important aspects of the life history are still unknown. Generally, the Atlantic sturgeon is anadromous and spends the majority of its life in marine waters, but it reproduces in a freshwater habitat. Spawning is believed to occur in flowing water between the salt wedge and the fall line of large rivers. Like the shortnose sturgeon, spawning adults generally migrate upriver during the spring (February to March) in southern rivers. A fall-spawning migration also may occur in some southern rivers (ASSRT 2007). This appears to have first been reported by Smith (1985) indicating the occurrence of a fall run of fish that are in spawning condition in the south. Smith et al. (1984) note that the fall-run fish are typically smaller than those caught in the spring. Collins et al. (2000) provided additional evidence of a fall spawning period in the Ashepoo, Combahee, and Edisto river basins in South Carolina. This finding was based on movements of two male fish that spent the summer in the lower Edisto River and then moved upriver to RKM 190 during October 1998. In addition, a female Atlantic sturgeon that had recently spawned was captured near RKM 56 of the Edisto River during the fall during this study; however, no spawning sites were confirmed.

Atlantic sturgeon eggs are highly adhesive and are deposited on the bottom substrate, usually on hard surfaces. Hatching occurs within approximately 94 to 140 hours after egg deposition at temperatures of 20°C and 18°C (68°F and 64.4°F), respectively. Embryos (age 1 to 8 days old) tend to seek cover and stay near the bottom after hatching (Kynard and Horgan 2002). When the yolk-sac larval stage is complete (after 8 to 12 days), the larvae move downstream over a 6- to 12-day period to rearing grounds. Larvae are demersal and stay near the bottom of the water column (ASSRT 2007). During the first half of their migration, movement is limited to the night and during the day, they use the bottom (e.g., a gravel matrix) as refugia. As the larvae develop further, migration occurs during both the day and the night (Kynard and Horgan 2002). Juvenile sturgeon eventually arrive in estuarine waters, where they remain for months or years. Sub-adults may move to coastal waters and may make long migrations (ASSRT 2007).

Status of Atlantic Sturgeon in the Savannah River

Atlantic sturgeon have been found in the Savannah River, with records documenting 70 individuals having been captured since 1999 (ASSRT 2007). It appears that they are spawning in the river, although specific spawning locations have not been identified. In 1997, a single running ripe male was found at the base of the dam near Augusta in the late summer (ASSRT 2007) pointing to a potential fall migration in the Savannah also.

Ichthyoplankton studies conducted during a four-year period (1982-1985) near the Savannah River Site which is across the river from the VEGP site resulted in a total of 43 sturgeon larvae being collected. The larvae were taken from the river between RM 120 and 176. Differentiating shortnose sturgeon larvae from Atlantic sturgeon larvae is difficult because of the similarity in appearance; however, a total of 31 of the 43 sturgeon larvae were identified as Atlantic sturgeon. Of the 31 larvae, four were identified as being collected from near the top of the water column. The remainder were from near the bottom. The Atlantic sturgeon larvae were collected during April. Sampling was conducted from February through July, so a fall spawning season would not have been noticed (Paller et al. 1986). In addition, Collins et al. (2000) documented an early larval *Acipenser* sp., tentatively identified as an Atlantic sturgeon located at RKM 42 (RM 26) in the Savannah River.

Cumulative Impacts

On November 15, 2010, the U.S. Army Corps of Engineers published a draft General Re-Evaluation Report (GRR) (USACE 2010b) and a Tier II EIS (USACE 2010c) related to determining the feasibility of improvements to the Federal navigation project at Savannah Harbor. The GRR and EIS assess mitigation plans for alternative channel depths from -42 to -48 ft mean lower low water. The Savannah Harbor expansion project has the potential to result in the loss of several hundred acres of habitat for fish that use the estuary. Many mitigation measures are being considered in connection with this project, including building a fish-way round the New Savannah Bluff Lock and Dam at Augusta, Georgia, which would open up an additional 32 km (20 mi) of habitat upstream of the dam (USACE 2010c). As explained previously, construction of the proposed units at the VEGP site would temporarily affect less than 0.6 ha (1.5 ac) of sturgeon migratory habitat. Water withdrawal rates during operation would be less than 1 percent of Savannah River flow during average flow conditions and the small zone of influence would have a negligible impact on pelagic spawning (NRC 2008a). Furthermore, the proposed activities associated with the VEGP expansion would not impede the mitigation measures being considered for the Savannah River expansion project. Accordingly, construction and operation of the proposed VEGP units would not have an adverse cumulative impact on important fish species when considered together with the Savannah Harbor expansion project.

Evaluation of Potential Impacts from Preconstruction Site-Preparation Activities

The construction activities previously described are expected to have minimal impacts on the aquatic ecology of the Savannah River. The extent of benthic habitat altered during construction of the intake canal would be small because most of the major construction activities would occur in the floodplain. Likewise, there would be limited disturbance of the benthic habitat during construction of the discharge structure. Disruption of silt and debris and its subsequent movement downstream during construction is expected to be minor because siltation curtains and cofferdams will be used, as discussed in the ESP BA. Noise impacts from pile-driving activities would be transient. Fish, including Atlantic sturgeon that may be inhabiting the river in the vicinity of the construction activities, would likely leave temporarily or avoid the Georgia side of the river. This temporary habitat loss would be a very small percentage of the total aquatic habitat in this area of the Savannah River.

The NRC staff has concluded that, because of the limited scope of the activities and the best management practices employed by Southern, site preparation activities addressed in this analysis would be temporary and would be unlikely to adversely affect Atlantic sturgeon.

Evaluation of Potential Impacts from Operational Activities

The operational impacts previously described are expected to have minimal impact on the aquatic ecology of the Savannah River. The anticipated volume of water to be withdrawn from the river by the closed-cycle cooling system is a small fraction (1.2 percent) of the water in the river.

The anticipated approach velocities (about 3 cm/sec [0.1 ft/sec]) in the proposed intake canal and a designed through-screen intake velocity of less than 15 cm/sec (0.5 ft/sec) are low enough that healthy Atlantic sturgeon would be able to avoid impingement. Further, the staff is not aware of any documented case of healthy Atlantic sturgeon being impinged at any nuclear power station along the Atlantic coast including stations that employ once-through cooling systems. Sturgeon that migrate both upstream and downstream in the Savannah River are accustomed to flow rates higher than 15 cm/sec (0.5 ft/sec). An impingement study undertaken from March 10, 2008 through February 26, 2009 at VEGP Units 1 and 2 which are similar in design to the proposed Units 3 and 4, resulted in a total of 168 organisms being impinged (GPC 2009). Extrapolation of the results for a full year (365 days) of cooling-water withdrawal provided an estimate of 2580 impinged organisms with a biomass of 15 kg (33.1 lbs). No sturgeon were impinged.

An entrainment study undertaken by Southern from March 10, 2008 through July 29, 2008, resulted in entrainment of a total of 910 fish eggs and larvae from 23 taxa, representing 13 taxonomic families (GPC 2008). No sturgeon eggs or larvae were collected in either the source water or the entrainment samples.

According to the Atlantic Sturgeon Status Review Team, it is believed that the inherent behavior of larval sturgeon to maintain an active migration and to seek deep water plays a role in helping them to avoid intake structures (ASSRT 2007). Thus, they would not be susceptible to entrainment or impingement.

The size of the modeled thermal plume is small in comparison to the width of the Savannah River at the VEGP site; therefore, the plume created by operations at VEGP would not create a barrier to the upstream or downstream migration of fish species, including the Atlantic sturgeon, in the Savannah River.

Chemical discharges at the outfall for the existing Units 1 and 2 meet the limits specified in the NPDES permit and the discharge from the proposed Units 3 and 4 will be similar. No impacts to the aquatic ecology of the Savannah River have been observed from the operation of Units 1 and 2, and no impact from chemical discharges from Units 3 and 4 would be expected for Atlantic sturgeon.

Conclusion

Based on its review of the proposed action and the biology of the Atlantic sturgeon, the staff concludes that the overall impact of the VEGP Units 3 and 4 construction- and operation-related activities would be unlikely to adversely affect Atlantic sturgeon in the Savannah River.

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MAY 19 2011 F/SER31:NB

Mr. Gregory Hatchett
Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Conference Consultation for the Atlantic Sturgeon for the Vogtle Electric Generating Plant, Units 3 and 4 Combined Licenses Application

Dear Mr. Hatchett:

This responds to your letter and biological assessment for the Atlantic Sturgeon (BA) dated March 2, 2011, requesting National Marine Fisheries Service's (NMFS) concurrence with your determinations pursuant to Section 7 of the Endangered Species Act (ESA) for the Nuclear Regulatory Commission's (NRC) Early Site Permit (ESP) application for the Vogtle Electric Generating Plant (VEGP) in Burke County, Georgia. Southern Nuclear Operating Company, Inc (Southern) is applying for a combined licence (COL) to construct new nuclear power reactors on the site of the VEGP. NMFS provided concurrence in a letter dated August 11, 2008, that the project will have no effect on six species of whales, five species of marine turtles, and smalltooth sawfish, and may affect but is not likely to adversely affect shortnose sturgeon. On October 6, 2010, NMFS published in the Federal Register (75 FR 61904) a proposed rule for listing the Carolina and South Atlantic distinct population segments of the Atlantic sturgeon as endangered under the ESA. You determined that the proposed action may affect but is not likely to adversely affect the Atlantic sturgeon. NMFS' determinations regarding the effects of the proposed action are based on the description of the action in this informal consultation. You are reminded that any changes to the proposed action may negate the findings of the present consultation and may require reinitiation of consultation with NMFS.

The project is located at latitude 33.1414°N, longitude 81.7667°W (NAD 83), in Burke County, Georgia, adjacent to the Savannah River between river kilometers 241 and 244, approximately 24 km east-northeast of Waynesboro, Georgia, and 42 km southeast of Augusta, Georgia. The applicant proposes to clear, grade, and construct non-safety-related facilities entirely within the confines of the existing VEGP site. The purpose of the proposed permit is preparation for the construction and operation of two new nuclear power units at VEGP. Construction and operation of the units will require additional licensing by the NRC; therefore, the NRC considers this permit a separate action from the filing of an application for a construction permit or combined license for one or more nuclear power facilities. The ultimate construction and operation of the units, however, are the purpose of the ESP, and the ESP has no independent utility except to support construction and operation. Therefore, this consultation considers potential effects from the ESP as well as the units' construction and operation.

Since the 2008 NMFS consultation, a few modifications have been made to the project. The intake canal design and location have been changed. None of the project modification would change the effects analysis or require reinitiation of consultation. The 2008 BA and NMFS consultation also addressed modifications to the existing barge slip. Since 2008, Southern has determined that these modifications are unnecessary as large construction components will be delivered by rail instead of by river. The only change made to the discharge methods or structures is that there would be a three percent increase in the discharge flow rate which will modestly increase the estimated extent of the thermal plume. All other work, such as clearing and grading, would take place in the uplands; the applicant has committed to instituting best management practices to mitigate erosion, sedimentation, and dust-generating activities. By eliminating the need to modify the barge slip, impacts to wetlands were reduced from approximately 22.5 acres to 9.23 acres of jurisdictional wetland. The relocation of the intake canal would extend the impacts to shoreline from 510 to 734 linear feet. Benthic habitat consists of "brown, poorly graded gravel with sand" to "poorly graded gravel." A tethered, floating silt curtain would be installed for all aspects of the project. Southern has received a Section 10/404 permit from the Army Corps of Engineers (COE) dated September 29, 2010, for impacts to wetlands and streams, as well as a Section 401 Water Quality Certification from the Georgia Department of Natural Resources dated June 1, 2010 to ensure the proposed COL does not conflict with Georgia water quality issues.

Changes to the intake canal design include: (1) the revised intake location will be 150 ft upstream of the previously proposed location, (2) the dimensions of the intake structure were modified, lowering the structure floor elevation from 125 to 105 ft, and (3) the intake pipe will have a 30 degree bend approximately half way down the canal to orient it perpendicular to the river. According to the NRC, these changes would not substantially change the intake pipe orientation within the river, the type of habitat impacts, or the length the canal will extend beyond the river bank. Construction would still take place in the summer, fall, and early winter to minimize flooding and impacts to anadromous species that enter the river during the high water conditions of February through April. The intake canal would be approximately 240 ft long by 170 ft wide, with an earthen bottom at an elevation of 70 ft above mean sea level (MSL) and vertical sheet piles extending to an elevation of 98 ft MSL. Permanent and temporary sheet piles will be driven for the intake canal using a vibratory or impact hammer. Piling installation will be conducted from the uplands and the intake area cofferdam will be excavated to an elevation of 70 ft. Installation of the inner serrated weir wall and the outer serrated wall and guide vanes at the mouth of the intake would be accomplished from a barge in the Savannah River. According to the 2007 Draft Environmental Impact Statement (DEIS), construction would take place in the summer, fall, and early winter to minimize the impacts to fish and other aquatic organisms that move into the floodplain with the high water conditions of February, March, and April.

The proposed discharge structure would still be placed near the southwest bank of the Savannah River, extending about 50 ft into the river. The discharge pipe would be approximately 3.5 ft in diameter, narrowing to 2 ft before the discharge point. The pipe is expected to be elevated 3 ft above the river bottom. Construction would involve the installation of a temporary sheet-pile cofferdam, which would be installed using a vibratory or impact hammer, and a dewatering system, either a well-point or local pumps. The interior of the cofferdam would be excavated so that the pipe could be installed approximately 3 ft below the invert elevation of the discharge piping and then contoured up the river bank. H-piles used for piping supports would be driven to an elevation of 50 ft MSL. After the pipe is laid, the dewatering system would be removed and the piping would be backfilled and graded to the required river bank slope contours. The cofferdam would be removed and riprap material would be installed to stabilize the riverbed and shoreline in the vicinity of the discharge point.

The DEIS states that the plant would use a closed-cycle wet cooling tower system, which reduces water use by 96 to 98 percent compared to a one-through cooling system, and thereby reduces the likelihood of sturgeon impingement. Units 3 and 4 would have a design through-screen velocity of less than 0.5 fps. According to the 2011 Final Supplemental Environmental Impact Statement (EIS), water withdrawal rates would be minor, totaling less than 1 percent of the Savannah River flow during average flow conditions. The intake canal will be situated perpendicular to the river flow and a canal weir will be located 15 m (50 ft 11 inches) inside the canal, with a serrated weir wall to reduce entrainment mortality. The installation of the weir wall would also reduce the potential of sturgeon larvae entrainment, since their larvae are demersal, tending to stay near the river bottom.

Chemicals, including biocides, would be added to the cooling tower basins for Units 3 and 4. Biofouling would be controlled using chlorination and/or other treatment methods. Operation of the cooling towers would be based on four cycles of concentration; thus, the levels of solids and organics in the cooling tower blowdown would be approximately four times higher than the ambient or upstream concentrations. Blowdown from the cooling towers would be discharged to a common blowdown sump to provide retention time for settling of solids or to be treated, if required, to remove biocide residuals before the water is discharged to the river. Calculations give an estimated in-river dilution factor of 60 to 120 times during periods of average Savannah River discharge, depending on the time of year and river flow rate.

In regards to water temperature, the following information comes directly from the DEIS for the ESP: (1) The discharge from the discharge structure would enter the Savannah River at previously described at 123.1 m (404 ft) downstream through a single submerged port, (2) water quality standards for temperature are not to exceed 32.2°C (90°F), and at no time is the temperature of the receiving waters to be increased more than 2.8°C (5°F). The 3 percent increase in the area of discharge anticipated since the 2008 EIS, will increase the extent of the above ambient isotherm. The effluent from new Units 3 and 4 would discharge directly into the Savannah River; the maximum downsteam distance of the 2.8°C (5°F) above the ambient isotherm will increase from 29.6 m (97 ft) to 33.6 m (110 ft) from the outfall pipe. The width will also increase from 4.6 m (15 ft) to 5.3 m (17 ft). According to the NRC March 2011 letter, the river at the discharge location is 95 m (312 ft) wide, even at a Drought Level 3 river flow.

Therefore, the increase above the ambient isotherm remains small in proportion to the width of the river.

Atlantic sturgeon, proposed for listing under the ESA, can be found in or near the action area and may be affected by the project. There is no designated critical habitat in or near the project area. NMFS has identified the following potential effects to Atlantic sturgeon and concluded that they are not likely to be adversely affected by the proposed ESP.

Possible effects include the risk of injury from construction activities. Due to the species' mobility and the implementation of best management practices, such as the timing of the project (i.e., outside of the spawning season), risk of injury effects will be discountable. Turbidity curtains will be used during all phases of work and will remain in place until the proposed project is complete, and will then be removed. Effects on the species caused by exclusion from, and temporary loss of, spawning habitat due to construction activities are expected to be insignificant; neither the water depths, substrate bottom type, time of year for construction, nor the shape of the river at this location are conducive to Atlantic sturgeon spawning. Atlantic sturgeon generally do not inhabit this section of the Savannah River at this time of year; spawning sturgeon are generally found upstream from the site. No spawning studies have detected them in the river adjacent to the Vogtle site, although presumably their spawning migrations go past the site.

NMFS believes the potential effects from the proposed water intake and discharge are not likely to adversely affect Atlantic sturgeon. Based on the water intake location within a separate canal off the river and the use of through-screen velocities of less than 0.5 fps, the risk of impingement from the water intake structures to Atlantic sturgeon would be discountable. According to NRC March 2011 letter, impingement studies were conducted at VEGP in 2008 and 2009, resulting in no sturgeon egg, larvae, or adult sturgeon impingement from the existing Units 1 and 2 water intake structures. Since the proposed water intake structures are of similar design, effects from water intake structures would be discountable. The potential effect of a heat barrier within the river from the thermal discharge will be insignificant as it is expected that fish and other organisms would avoid the elevated temperatures, as they can move through this part of the river unencumbered by any structures or physical features that would retain them in the plume; this also reduces the likelihood of cold shock when moving outside of the plume. Potential effects from chemical effluent discharge will be insignificant due to the fact that "no impacts to the aquatic ecology of the Savannah River from these chemicals [i.e., biocides] have been observed" from operating Units 1 and 2. Discharge from Units 3 and 4 will be similar and thus expected to have insignificant effects on Atlantic sturgeon.

In conclusion, NMFS concurs with your determination that the proposed action is not likely to adversely affect Atlantic sturgeon, a species proposed for listing under the ESA. Consultation must be reinitiated if a take occurs or new information reveals effects of the action not previously considered, or the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not previously considered, or if a new species is listed or critical habitat designated that may be affected by the identified action.

We have enclosed additional information on other statutory requirements that may apply to this action, as well as information on NMFS' Public Consultation Tracking System (PCTS) that allows you to track the status of ESA consultations. We look forward to further cooperation with you on other projects to ensure the conservation of our threatened and endangered marine species and designated critical habitat. If you have any questions on this consultation or PCTS, please contact Nicole Bailey, ESA Consultant, at (727) 824-5336, or by e-mail at Nicole.Bailey@noaa.gov.

Sincerely,

James E. Weaver

for Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosures (2)

File: 1514-22. F.4
Ref: I/SER/2011/00884

PCTS Access and Additional Considerations for ESA Section 7 Consultations
(Revised 7-15-2009)

Public Consultation Tracking System (PCTS) Guidance: PCTS is an online query system at **https://pcts.nmfs.noaa.gov/** that allows federal agencies and U.S. Army Corps of Engineers' (COE) permit applicants and their consultants to ascertain the status of NMFS' Endangered Species Act (ESA) and Essential Fish Habitat (EFH) consultations, conducted pursuant to ESA section 7, and Magnuson-Stevens Fishery Conservation and Management Act's (MSA) sections 305(b)2 and 305(b)(4), respectively. Federal agencies are required to enter an agency-specific username and password to query the Federal Agency Site. The COE "Permit Site" (no password needed) allows COE permit applicants and consultants to check on the current status of Clean Water Act section 404 permit actions for which NMFS has conducted, or is in the process of conducting, an ESA or EFH consultation with the COE.

For COE-permitted projects, click on "Enter Corps Permit Site." From the "Choose Agency Subdivision (Required)" list, pick the appropriate COE district. At "Enter Agency Permit Number" type in the COE district identifier, hyphen, year, hyphen, number. The COE is in the processing of converting its permit application database to PCTS-compatible "ORM." An example permit number is: SAJ-2005-000001234-IPS-1. For the Jacksonville District, which has already converted to ORM, permit application numbers should be entered as SAJ (hyphen), followed by 4-digit year (hyphen), followed by permit application numeric identifier with no preceding zeros. For example: SAJ-2005-123; SAJ-2005-1234; SAJ-2005-12345.

For inquiries regarding applications processed by COE districts that have not yet made the conversion to ORM (e.g., Mobile District), enter the 9-digit numeric identifier, or convert the existing COE-assigned application number to 9 numeric digits by deleting all letters, hyphens, and commas; converting the year to 4-digit format (e.g., -04 to 2004); and adding additional zeros in front of the numeric identifier to make a total of 9 numeric digits. For example: AL05-982-F converts to 200500982; MS05-04401-A converts to 200504401. PCTS questions should be directed to Eric Hawk at Eric.Hawk@noaa.gov. Requests for username and password should be directed to PCTS.Usersupport@noaa.gov.

EFH Recommendations: In addition to its protected species/critical habitat consultation requirements with NMFS' Protected Resources Division pursuant to section 7 of the ESA, prior to proceeding with the proposed action the action agency must also consult with NMFS' Habitat Conservation Division (HCD) pursuant to the MSA requirements for EFH consultation (16 U.S.C. 1855 (b)(2) and 50 CFR 600.905-.930, subpart K). The action agency should also ensure that the applicant understands the ESA and EFH processes; that ESA and EFH consultations are separate, distinct, and guided by different statutes, goals, and time lines for responding to the action agency; and that the action agency will (and the applicant may) receive separate consultation correspondence on NMFS letterhead from HCD regarding their concerns and/or finalizing EFH consultation.

Marine Mammal Protection Act (MMPA) Recommendations: The ESA section 7 process does not authorize incidental takes of listed or non-listed marine mammals. If such takes may occur an incidental take authorization under MMPA section 101 (a)(5) is necessary. Please contact NMFS' Permits, Conservation, and Education Division at (301) 713-2322 for more information regarding MMPA permitting procedures.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701

SEA TURTLE AND SMALLTOOTH SAWFISH CONSTRUCTION CONDITIONS

The permittee shall comply with the following protected species construction conditions:

a. The permittee shall instruct all personnel associated with the project of the potential presence of these species and the need to avoid collisions with sea turtles and smalltooth sawfish. All construction personnel are responsible for observing water-related activities for the presence of these species.

b. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing sea turtles or smalltooth sawfish, which are protected under the Endangered Species Act of 1973.

c. Siltation barriers shall be made of material in which a sea turtle or smalltooth sawfish cannot become entangled, be properly secured, and be regularly monitored to avoid protected species entrapment. Barriers may not block sea turtle or smalltooth sawfish entry to or exit from designated critical habitat without prior agreement from the National Marine Fisheries Service's Protected Resources Division, St. Petersburg, Florida.

d. All vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible.

e. If a sea turtle or smalltooth sawfish is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle or smalltooth sawfish. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or smalltooth sawfish is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition.

f. Any collision with and/or injury to a sea turtle or smalltooth sawfish shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization.

g. Any special construction conditions, required of your specific project, outside these general conditions, if applicable, will be addressed in the primary consultation.

Revised: March 23, 2006

Attachment 11

Copies of inter-agency correspondences / consultations related to aquatic resources

Included:
EPA – comments on Draft EIS
EPA – comments on FEIS
EPA – comments on Draft SEIS
EPA – comments on FSEIS
Georgia Department of Natural Resources – comments on the Draft EIS
National Marine Fisheries Service – comments on the Draft USACE Joint Individual permit
South Carolina Department of Natural Resources – comments on the Draft EIS
South Carolina Department of Natural Resources – comments on the Draft EIS (2)
South Carolina Department of Natural Resources – comments on the Draft USACE 404 permit
US Fish and Wildlife Service – comments on Draft EIS
US Fish and Wildlife Service – comments on USACE 404 permit

Attachment 11

EPA – comments on Draft EIS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

November 28, 2007

Chief, Rules, Directives and Editing Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, D.C. 20555-0001

RE: EPA Review and Comments
Draft Environmental Impact Statement (DEIS)
Vogtle Electric Generating Plant Site
Issuance of an Early Site Permit (ESP) for
Construction and Operation of a New Nuclear Power Generating Facility
NUREG-1872
CEQ No. 20070386

Dear Sir:

The U.S. Environmental Protection Agency (EPA) reviewed the subject Draft Environmental Impact Statement (DEIS) pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA), and Section 309 of the Clean Air Act. The document provides information to educate the public regarding general and project-specific environmental impacts and analysis procedures, and follows the public review and disclosure aspects of the NEPA process. This letter informs you of the results of our review.

Southern Nuclear Operating Company, Inc. (Southern) applied for an early site permit (ESP) for the Vogtle Electric Generating Plant (VEGP) site, co-located with the existing Vogtle facility. The proposed action is to approve a site within the existing Vogtle boundaries for the construction and operation of a new nuclear power generating facility consisting of two new nuclear reactors and ancillary facilities, and to issue an ESP for the proposed site. During this time, the site would be "banked" for up to 20 years, during which time a reactor type could be chosen, and a construction and operating license application submitted to the Nuclear Regulatory Commission.

The DEIS discusses the proposed action and alternatives. Alternatives include the construction and operation of two new reactors at the VEGP site or at one of three alternative sites. The DEIS states that none of the alternative sites were determined to be environmentally preferable to the VEGP site.

Based on EPA's review of the DEIS, we are assigning the document a rating of EC-1, meaning that the EPA review identified environmental impacts that if avoided, would more fully protect the environment. (A summary of EPA's rating definitions is enclosed.) In particular, EPA suggests that the Final EIS include additional information about potential surface water withdrawal impacts, as well as impacts to wetlands and minority populations and low-income populations.

In the Waste Confidence Rule (10 CFR 51.23), the Commission generically determined that the spent fuel generated by any reactor can be safely stored on-site for at least 30 years beyond the licensed operating life of the reactor. Ultimately, long-term radioactive waste disposition will require transportation of wastes to a permitted repository site. The DEIS notes that in the high-level waste and spent fuel disposal component of the fuel cycle, uncertainty exists with respect to regulatory limits for off-site releases of radionuclides for the current candidate repository site. We are aware of ongoing efforts to license a geological repository for long-term disposition within the first quarter of the 21st century.

Since appropriate on-site storage of spent fuel assemblies and other radioactive wastes is necessary to prevent environmental impacts, EPA believes the FEIS should provide a thorough consideration of impacts resulting from such storage. Given the uncertainty regarding ultimate disposal, on-site storage may continue for a longer term than currently expected.

Thank you for the opportunity to comment on this DEIS. Please contact Ramona McConney of my staff at (404) 562-9615, if you have any questions or need additional information.

Sincerely,

Heinz J. Mueller, Chief
NEPA Program Office

Enclosed: EPA Review and Comments
Summary of Rating Definitions

EPA Review and Comments on
Vogtle Electric Generating Plant Site,
Issuance of an Early Site Permit (ESP) for Construction and Operation of a New Nuclear Power Generating Facility, NUREG-1872
Draft Environmental Impact Statement (DEIS)
CEQ No. 20070386

Purpose & Need: The DEIS includes an assessment of the energy needs for the addition of two nuclear power reactors at the VEGP site (Section 8). An applicant may address the need for power in its Early Site Permit (ESP) application or defer the analysis until later in the permitting process. We note that Southern Nuclear Operating Company, Inc. included a discussion of the need for power in its ESP application. NRC's streamlined permitting process requires an energy needs analysis to include an alternatives assessment, in accordance with 10 CFR Part 50.

Radiation Concerns regarding Contingency for Storing Spent Nuclear Fuel On-site: Given the uncertainty involved with licensing the Yucca Mountain Nevada facility for the disposal of spent nuclear fuel, all utilities planning on constructing additional nuclear units on current sites should consider contingencies for long-term storage of waste on-site.

Future planning: The 20-year horizon under the proposed ESP should take into consideration population growth and additional stressors on air or water resources. Typically, an action that has not occurred within five years of an EIS warrants a re-evaluation to determine whether significant changes have occurred, and whether a supplemental EIS is required prior to the action proceeding. EPA believes the Final EIS should acknowledge the possible need for future NEPA review based on significant changes occurring.

Surface Water: Water pumped from the Savannah River would be used for some plant activities. The DEIS discusses the addition of a new surface water intake to provide water to the proposed facility. As noted in the DEIS, discharges to surface water require an NPDES permit.

The DEIS considers impacts resulting from surface water withdrawals during a Level 3 drought. Because areas in Georgia near the VEGP site are currently experiencing a Level 4 drought, which is likely to extend well into 2008, EPA recommends that the Final EIS evaluate the impacts of withdrawing water from the Savannah River given flows experienced during a Level 4 drought. The robustness of this analysis could be further enhanced through the inclusion of appropriate staff (*e.g.*, hydrologists, meteorologists, climatologists and others) in performing such analysis.

We also recommend that Chapter 5 of the EIS include a discussion of the radiological impacts of batch tritium releases from holding tanks to the river. The discussion should note the current agreement among the Southern Company, DOE Savannah River Site, South Carolina Department of Health and Environmental Control and Georgia Department of Natural Resources requiring that all parties be informed prior to releases from the facility's holding tanks.

Groundwater: The new facilities would use groundwater for some supply needs, with one system potentially supplying both Vogtle units 3 and 4. The DEIS notes the relatively shallow depth to groundwater in the vicinity. EPA recommends that the Final EIS include updated groundwater and surface water withdrawal and use data, (agricultural, public water supply, mining, hydroelectric, thermoelectric, industrial, commercial, etc) in the project area. These data should be used to determine if the estimated water needs for this project would exceed or adversely impact the anticipated needs of the community, thereby potentially reducing water quality or quantity.

Wetlands: The DEIS discusses potential impacts to wetlands, perennial streams, intermittent streams, and ephemeral streams. Approximately 22.5 acres of wetlands, mostly along the Savannah River, would be impacted. The Section 404 permit review process requires a compensatory mitigation plan for impacts that cannot be avoided or minimized. We recommend the Final EIS provide additional discussion of options for first, more fully avoiding and minimizing wetland impacts, and then for mitigating wetlands impacts that could not be avoided or minimized.

Monitoring: Section 2.5 refers to the Central Savannah River Area Radiological Environmental Monitoring Program Association (REMP). This program includes the DOE Savannah River Site, state radiation programs (South Carolina and Georgia), as well as the water intake station at Beaufort, South Carolina.

EPA Region 4 participates in an advisory role in the REMP, as described for the VEGP. This program ensures consistent analysis of water, air, biota, and other factors, data sharing among the parties, analysis of data trends, and multi-agency peer review.

Cumulative Impacts: We appreciate the DEIS's discussion and evaluation of cumulative impacts, which takes into consideration activities at the Savannah River Site and Plant Wilson, as well as other factors.

Environmental Justice: EPA understands the environmental justice (EJ) evaluation was conducted based on guidance from the NRC, Office of Nuclear Reactor Regulation. EPA appreciates the attention shown to EJ in the DEIS; however, EPA believes some aspects of the analysis could be improved.

The DEIS includes maps showing aggregate block groups of minority and low-income populations within a 50-mile (80 km) radius of the VEGP site. While mapping all potential EJ areas in a 50-mile radius of the site is helpful, EPA recommends that the Final EIS more clearly identify the areas that could face the most significant impacts. For example, provision of more detailed GIS or aerial maps of minority and low-income populations within close proximity to the VEGP site (*i.e.*, 0-5 miles) would be useful. The map(s) should indicate the distance of the closest residences to the current facility and the proposed expansion. Information regarding residential distribution and location relative to potential environmental effects is useful for community involvement and regulatory assessment.

EJ Assessment: EPA recommends that the Final EIS provide clarification regarding resource dependencies or practices, such as subsistence agriculture, hunting, or fishing, through which certain populations could be disproportionately affected. Low-income populations are likely to conduct such subsistence practices.

EJ Benefits and Burdens: While the DEIS discusses some potential risks and benefits of the project, EPA recommends the Final EIS include a more comprehensive discussion of potential benefits and impacts associated with the project, as it relates to minority and low-income populations and the population at large.

Impacts on real estate values, particularly on residential property of minority and/or low-income populations and commercial real estate within close proximity to the VEGP site, may be valuable as direct indicators of *economic* impacts from the site, and also useful as indirect indicators of how seriously the market views the human health and environmental effects of the site. If the residents within the immediate project area are low-income, they may not have the capacity to easily move away from the local community, if they consider the additional nuclear power facilities an unacceptable neighboring land use. EPA recommends the Final EIS include research on existing real estate appreciation and depreciation since the original facility was constructed and projected appreciation/depreciation of real estate values.

The Final EIS should also incorporate a matrix that outlines potential environmental and interrelated economic and social risks, burdens and benefits, and their associated magnitude.

EJ and Public Involvement: The Final EIS should provide a clearer description of the public participation process, particularly regarding minority and low-income populations residing in close proximity to the VEGP site and populations that are within the potential affected area.

The DEIS states that community leaders of the minority populations within the analytical area were interviewed, but does not discuss the relationship between those populations and the existing nuclear reactor. For example, the document does not give information regarding: the nature of the relationship between the existing facility and such minority and low-income populations that currently reside both in close proximity and within the potentially affected area; the perception of community residents as to whether the existing facility has been a good neighbor; any reported problems with the current facility which have generated public concern; the employment status and property values of residents in close proximity to the nuclear facility; and the level of support by local residents for the proposed expansion. If the residents have concerns, how are they being addressed? EPA recommends inclusion of this information in the Final EIS.

Public Health Impacts: The DEIS states that the nearest drinking water well to the VEGP site is located 4.9 miles away. The Final EIS should clarify whether activities at the site could impact drinking water quality or quantity from this well and other local wells in close proximity. In addition, the Final EIS should also identify the distance from the VEGP site to public drinking water intakes.

EPA recommends the Final EIS address the vicinity (in radius miles) that would be affected by accident scenarios in the Affected Environment and Operation Impacts sections.

EPA believes the Final EIS should also include a thorough discussion of accident scenarios, including: the types of potential accidents; the capacity of the local, state and federal entities to respond to such accidents (*e.g.,* Local Emergency Planning Committees, police and fire departments, state and federal agencies); and the record of the current facility regarding accident prevention (*e.g.,* results of chemical safety audits, emergency exercises, etc.).

SUMMARY OF RATING DEFINITIONS AND FOLLOW UP ACTION*

Environmental Impact of the Action

LO-Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC-Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impacts. EPA would like to work with the lead agency to reduce these impacts.

EO-Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU-Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS sate, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1-Adequate

The EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alterative and those of the alternatives reasonably available to the project or action. No further analysis or data collecting is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2-Insufficient Information

The draft EIS does not contain sufficient information for the EPA to fully assess the environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

Category 3-Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640 Policy and Procedures for the Review of the Federal Actions Impacting the Environment

Attachment 11

EPA – comments on FEIS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

October 20, 2008

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Chief, Rules, Directives and Editing Branch
U.S. Nuclear Regulatory Commission
Mail Stop T6-D59
Washington, D.C. 20555-0001

8/21/08
73 FR 49496
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RE: **EPA Review and Comments**
Final Environmental Impact Statement (FEIS)
Vogtle Electric Generating Plant Site
Issuance of an Early Site Permit (ESP) for
Construction and Operation of a New Nuclear Power Generating Facility
NUREG-1872
CEQ No. 20080322

Dear Sir:

The U.S. Environmental Protection Agency (EPA) reviewed the subject Final Environmental Impact Statement (FEIS) pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA), and Section 309 of the Clean Air Act. The document provides information to educate the public regarding general and project-specific environmental impacts and analysis procedures, and follows the public review and disclosure aspects of the NEPA process. The purpose of this letter is to inform you of the results of our review.

Southern Nuclear Operating Company, Inc. (Southern) applied for an early site permit (ESP) for the Vogtle Electric Generating Plant (VEGP) site, co-located with the existing Vogtle facility. The proposed action is to approve a site within the existing Vogtle boundaries for the construction and operation of a new nuclear power generating facility consisting of two new nuclear reactors and ancillary facilities, and to issue an ESP for the proposed site.

Thank you for addressing our comments regarding the DEIS. Based on EPA's review of the FEIS, a few environmental concerns remain which should be addressed in future NEPA documents. Specifically, there are concerns regarding details of radiological data references. Please see our attached comments.

Additional discussion of appropriate storage and ultimate disposition of radioactive wastes generated on-site, as well as continuing measures to limit bioentrainment and other impacts to aquatic species from surface water withdrawals and discharges should be continued to be addressed during project development. Compliance with the NPDES Permit should be addressed for the existing and new units. The NPDES permittee has operated and is currently operating in compliance with the NPDES permit requirements.

SUNSI Review Complete
Template = ADM-013

E-RIDS = ADM-03
Add = M. Notich (mdn)

Thank you for the opportunity to comment on this FEIS. Please send us a copy of the Record of Decision (ROD) for our files. If you have any questions or need additional information, please contact Ramona McConney of my staff at (404) 562-9615.

Sincerely,

Heinz J. Mueller, Chief
NEPA Program Office
Office of Policy and Management

EPA Review and Comments Regarding
Final Environmental Impact Statement (FEIS)
Vogtle Electric Generating Plant Site
Issuance of an Early Site Permit (ESP) for
Construction and Operation of a New Nuclear Power Generating Facility
NUREG-1872

Radiological data

Section 2.5, Radiological Environment, does not cite a reference to the radiological environmental monitoring plan. Section 2.5 notes that a pre-operational environmental monitoring program was conducted before 1987 to establish a baseline to observe fluctuations of radiation in the environment after startup. A reference document should be cited.

Section 3.2.1, Plant Water Use, lists sources of liquid radioactive wastes, but there is no reference to a document citing the amount of the waste.

Section 5.9, Radiological Impacts of Normal Operations, should provide a reference for receptor locations identified (i.e., schools, hospitals, residences.)

The FEIS notes that in the high-level waste and spent fuel disposal component of the fuel cycle, uncertainty exists with respect to regulatory limits for off-site releases of radionuclides for the current candidate repository site. We are aware of ongoing efforts to license a geological repository for long-term disposition within the first quarter of the 21st century.

Appropriate on-site storage of spent fuel assemblies and other radioactive waste is necessary to prevent environmental impacts. Given the uncertainty regarding ultimate disposal, on-site storage may continue for a longer term than currently expected.

In the Waste Confidence Rule (10 CFR 51.23), the Commission generically determined that the spent fuel generated by any reactor can be safely stored on-site for at least 30 years beyond the licensed operating life of the reactor. Ultimately, long-term radioactive waste disposition will require transportation of wastes to a permitted repository site.

Wetlands and streams

Wetlands and stream impacts and their mitigation, and the Section 404 permit review process, should be discussed in future NEPA documents for this project. The Section 404 permit review process requires a compensatory mitigation plan for impacts that cannot be avoided or minimized. The Cumulative Impacts section of the FEIS discusses the Limited Waste Authorization (LWA) rule. We note that pre-construction impacts will be discussed in the Cumulative Impacts sections of future EISs for this project, and that approximately 21 acres of wetlands along the Savannah River could be impacted by the project.

Attachment 11

EPA – comments on Draft SEIS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
SAM NUNN
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA GEORGIA 30303-8960

November 15, 2010

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75FR54190
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Chief, Rulemaking and Directives Branch
Office of Administration
Mail Stop: TWB-05-B01M
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: EPA Review and Comments
Draft Supplemental Environmental Impact Statement (DSEIS) for the Combined Licenses (COLs) for Vogtle Electric Generating Plant Units 3 and 4 Construction and Operation, Application for Combined Licenses (COLs), NUREG-1947
CEQ No. 20100351

Dear Sir:

The U.S. Environmental Protection Agency (EPA) has reviewed the Draft Supplemental Environmental Impact Statement (DSEIS) for the Combined Licenses (COLs) for Vogtle Electric Generating Plant Units 3 and 4, pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA), and Section 309 of the Clean Air Act. The purpose of this letter is to inform you of the results of our review, and our detailed comments are enclosed.

Southern Nuclear Operating Company, Inc. (Southern) and four co-applicants applied for combined construction permits and operating licenses (combined licenses or COLs) for Vogtle Electric Generating Plant (VEGP) Units 3 and 4. The proposed action is NRC issuance of COLs for two new nuclear power reactor units (Units 3 and 4) at the VEGP site near Waynesboro, Georgia.

EPA previously reviewed and submitted written comments regarding the Draft and Final Environmental Impact Statements (EISs) for the Early Site Permit (ESP) for the new units, and for the Joint Public Notice for the U.S. Army Corps of Engineers (USACE) Permit. Since these documents stated that there were no transmission line impacts, our comments at that time pertained to the plant site only. The USACE permit action on an Individual Permit application pursuant to Section 404 of the Clean Water Act, and Section 401 water quality certification for the Plant VEGP expansion were finalized in September 2010. The current DSEIS provides updated information and focuses on the proposed issuance of the COLs to authorize construction and operation of the new units and ancillary facilities.

The NRC issued an Early Site Permit (ESP) on August 26, 2009, approving the VEGP site as suitable for the construction of Units 3 and 4. NRC issuance of a Limited Work Authorization

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Add = M. Sutton (mah2)

(LWA) enabled specific pre-construction activities at the site to begin. The NRC is currently reviewing the Westinghouse AP1000 pressurized reactor design in a design certification process.

Radioactive waste storage and disposal are ongoing concerns with existing and proposed nuclear power plants. The NRC approved final revisions to the Waste Confidence findings and regulation (10 CFR Part 51.23) in September 2010. This update expresses confidence that commercial high-level radioactive waste and spent fuel generated by any reactor "*...can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor.*" This refers to storage in a spent fuel basin or at either onsite or offsite independent spent fuel storage installations.

Since appropriate storage of spent fuel assemblies and other radioactive wastes is necessary to prevent environmental impacts, the FSEIS should provide a thorough consideration of impacts resulting from such storage. Given the uncertainty regarding ultimate disposal at a repository, on-site storage may continue for many years.

Southern indicated that there would be an operations-related three percent increase in the thermal discharge flow in the DSEIS. The NRC determined that the thermal plume would remain small compared to the width of the Savannah River at this location, and that it would not impede fish passage in the river. The Final Supplemental Environmental Impact Statement (FSEIS) should include a graph of the plume showing the temperature profile, and a discussion of how the increase will (or will not) cause a violation of Georgia's water quality standard for temperature at the point of discharge.

In addition, the design and location of the proposed new cooling water intake structure has changed. The NRC determined that this new location would not alter conclusions presented in the previous ESP FEIS. Continuing measures to limit bioentrainment and other impacts to aquatic species from surface water withdrawals and discharges should be referenced in the FSEIS, and should continue to be addressed as the project progresses, in compliance with the NPDES Permit.

The FSEIS should include further information regarding plans to reduce Greenhouse Gases (GHGs) and other air emissions during construction of the facility. Specifically, energy efficiency and renewable energy should be a consideration in the construction and operation of facility buildings, equipment, and vehicles. We also recommend that the FSEIS explicitly reference the draft guidance from CEQ related to evaluating GHGs in Federal actions, describe the elements of the draft guidance, and to the relevant extent, provide the assessments suggested by the guidance. Based on your analysis using the CEQ NEPA Guidance, further data collection may be necessary in the future.

Based on EPA's review of the DSEIS, the document received a rating of EC-2, meaning that the EPA review identified environmental concerns. (A summary of EPA's rating definitions is enclosed.) In particular, EPA recommends that the FSEIS include updated information about radioactive waste storage and disposal, impacts of macro-right-of-way transmission lines, a consideration of GHGs using CEQ's draft guidance for GHGs, and a discussion of opportunities to reduce GHG and other air emissions during construction and operation of the facility. In addition, the FSEIS should include a status update regarding the Westinghouse AP1000 certification review.

Thank you for your continuing coordination with us. We look forward to reviewing the FSEIS. If you have any questions or need additional information, please contact Ramona McConney of my staff at (404) 562-9615.

Sincerely,

HMueller

Heinz J. Mueller, Chief
NEPA Program Office
Office of Policy and Management

Enclosures: EPA Review and Comments
Summary of Rating Definitions and Follow Up Action

EPA Review and Comments Regarding
Draft Supplemental Environmental Impact Statement (DSEIS) for the Combined Licenses (COLs) for Vogtle Electric Generating Plant Units 3 and 4 Construction and Operation, Application for Combined Licenses (COLs), NUREG-1947
CEQ No. 20100351

General

This DSEIS provides updated information (subsequent to the ESP FEIS) regarding preconstruction activities and environmental data, and focuses on the proposed issuance of COLs for the two new reactor units and ancillary facilities.

In the DSEIS, the NRC concludes that there are no new and significant data or changes to conclusions since the ESP FEIS regarding the following: land-use impacts, meteorology and air quality impacts, water quality impacts, terrestrial and aquatic ecosystems, socioeconomic impacts, historic and cultural resource impacts, environmental justice, nonradiological health impacts, radiological impacts of normal operations, environmental impacts of postulated accidents.

Alternatives

Alternatives in the DSEIS include the no-action alternative, energy source alternatives and system design alternatives. The NRC's evaluation of alternative sites is documented in the EIS for the ESP, which EPA previously reviewed and submitted comments.

Radioactive wastes

Appropriate on-site storage of spent fuel assemblies and other radioactive waste is necessary to prevent environmental impacts. Given the uncertainty regarding ultimate disposal at a repository, on-site storage may continue for a longer term than currently expected.

Yucca Mountain was formerly considered a possible final repository for spent nuclear fuel, but this plan was withdrawn by the U.S. Department of Energy by the motion of March 3, 2010. The abandonment of the plan to create a Yucca Mountain permanent geologic repository has been recently countered by NRC's Atomic Safety and Licensing Board. If another repository in the contiguous United States (other than Yucca Mountain) is ever selected, the environmental impact estimates from the transportation of spent reactor fuel to the repository should be calculated as required under 42 USC 4321 Fuel Cycle, Transportation, and Decommissioning.

In the Waste Confidence Rule (10 CFR 51.23), the Commission generically determined that the spent fuel generated by any reactor can be safely stored on-site for at least 30 years beyond the licensed operating life of the reactor. The NRC approved final revisions to the Waste Confidence findings and regulation in September 2010, extending the storage period until *"...30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor"* in its spent fuel basin or at either onsite or offsite independent spent fuel storage installations.

The FSEIS should clarify the impact of this revision on the proposed project, as this new determination finds that spent nuclear fuel can be stored safely and securely without significant environmental impacts for at least 60 years after operation at any nuclear power plant. EPA recommends that the FSEIS cite any new analyses for longer-term storage regarding scientific knowledge relating to spent fuel storage and disposal. The FSEIS should also mention any developments with the Presidential Blue Ribbon Commission on alternatives for dealing with high-level radioactive waste, if there are such updates before FSEIS publication.

We understand that shipping casks have not yet been designed for the spent fuel from advanced reactor designs such as the Westinghouse AP1000. Information in the Early Site Permit Environmental Report Sections and Supporting Documentation (INEEL 2003) indicated that advanced light water reactor (LWR) fuel designs would not be significantly different from existing LWR designs; therefore, current shipping cask designs were used for the analysis of Westinghouse AP1000 reactor spent fuel shipments. EPA recommends that when shipping casks are designed for the spent fuel for the Westinghouse AP1000, the analysis should be repeated.

EPA understands that concerns have been raised by the NRC that certain structural components of the revised AP1000 shield building may not be suitable to withstand design loads. The shield building is designed to protect the reactor's primary containment from severe weather and other events, as well as serving as a radiation barrier and also supporting an emergency cooling water tank. It is EPA's understanding that the NRC is currently reviewing the remainder of the next-generation reactor's design certification amendment application, and that Westinghouse is expected to make design modifications and conduct safety testing to ensure the shield building design can meet its safety functions.

The FSEIS should address the status of the Westinghouse AP1000 certification review and related issues, particularly the analysis of the structural integrity of the AP1000. We understand that the Safety Evaluation Report will address these issues in even more detail, and that the certification review may be completed as soon as December 2010. EPA understands that Revision 15 of the AP1000 design is codified in 10 CFR Part 52, Appendix D. EPA concurs with NRC's plan to conduct an additional environmental review if changes result in the final design being significantly different from the design considered in the DEIS.

Transmission lines

We note that the NRC considers transmission lines to be "preconstruction" activities (discussed in the EIS for the ESP), and that preconstruction activities are considered in the context of cumulative impacts. EPA is concerned about the impacts of transmission lines and supporting infrastructure for the project and, in accordance with NEPA, considers these activities as part of the project, and not a separate action.

The DSEIS (pages 3-7 and 3-8) discusses the construction of a new transmission line through a "macro-right-of-way." This term should be defined in the text, with details given regarding the proposed extent and impacts of this new transmission line. The FSEIS should also clarify whether there are plans to issue a Limited Work Authorization (LWA) for these lines pursuant to the NRC's LWA process.

Wetlands and Streams

Jurisdictional determinations for all site wetlands are complete, with the exception of the required metes and bounds survey. A joint application package was submitted for all permits under the jurisdiction of the USACE (Section 404, Section 10, and Dredge and Fill) on January 7, 2010.

EPA reviewed the impacts to wetlands and streams in response to the USACE's public notice for the Clean Water Act Section 404 permit application, and transmitted a comment letter in accordance with Section 404 coordination procedures. We note that the Dredge and Fill discharge permit was for the transmission line corridor.

NPDES Permitting

Southern indicated that there would be an operations-related three percent increase in the thermal discharge flow. The NRC determined that the thermal plume would remain small compared to the width of the Savannah River at this location, and that it would not impede fish passage in the river (Section 5.4.2). In addition, the design and location of the proposed new cooling water intake structure has changed. The NRC determined that this new location would not alter conclusions in the previous ESP FEIS. Pursuant to our review, the following areas need clarification:

- *Temperature:* The discussion of the 3% increase in the thermal discharge should include a graph of the plume showing the temperature profile, and a discussion of how the increase will (or will not) cause a violation of Georgia's water quality standard for temperature at the point of discharge.

- *Cooling Water Intake:* For clarity, the FSEIS should restate the requirements for the cooling water intake structure.

Greenhouse Gases (GHGs)

We appreciate your discussion of climate change and GHGs in the DSEIS. The DSEIS states that the majority of the potential carbon dioxide (CO_2) emissions of the proposed nuclear power plant would be the life cycle contributions associated with the uranium fuel cycle (Section 7.2). The DSEIS notes that such emissions primarily result from the operation of fossil-fueled power plants that provide the electricity needed to manufacture the nuclear fuel.

CEQ Draft Guidance on GHG Analysis within NEPA: On February 18, 2010, the Council on Environmental Quality (CEQ) proposed four steps to modernize and reinvigorate NEPA. In particular, the CEQ issued draft guidance for public comment on, among other issues, when and how Federal agencies must consider greenhouse gas emissions and climate change in their proposed actions.
(Reference: http://www.whitehouse.gov/administration/eop/ceq/initiatives/nepa)

The draft guidance explains how Federal agencies should analyze the environmental impacts of greenhouse gas emissions and climate change when they describe the environmental impacts of a proposed action under NEPA. It provides practical tools for agency reporting, including a presumptive threshold of 25,000 metric tons of carbon dioxide equivalent ($C0_2e$) emissions from the proposed action to trigger a quantitative analysis, and instructs Federal agencies regarding how to assess the effects of climate change on the proposed action and their design. The draft guidance does not apply to land and resource management actions and does not propose to regulate greenhouse gases.

While this guidance is not yet final (and thus, not required), we recommend that the FSEIS explicitly reference the draft guidance, describe the elements of the draft guidance, and to the relevant extent, provide the assessments suggested by the guidance. (Note that the discussion in Section 7.2 and referencing the Sovacool paper (see footnote 1 below) regarding the derivation of 447,000 metric tons/year of CO_2 emissions from a 1000 MW nuclear power plant is difficult to follow. For example, we could not find the "1 percent to 5 percent" citation noted as being in the Sovacool paper. It would be helpful to show a detailed derivation of the amount of direct and indirect CO_2-equivalent emissions expected specifically from this project.)

EPA also recommends a discussion of best management practices (BMPs) to reduce GHGs and other air emissions during construction and operation of the facility. Specifically, clean energy options such as energy efficiency and renewable energy should be a consideration in the use of construction and maintenance equipment and vehicles. For example, equipment and vehicles that use conventional petroleum (e.g., diesel) should incorporate clean diesel technologies and fuels to reduce emissions of GHGs and other pollutants, and should adhere to anti-idling policies to the extent possible. Alternate fuel vehicles (e.g., natural gas, electric) are also possibilities.

(1) Sovacool, BK. Valuing the Greenhouse Gas Emissions for Nuclear Power: A Critical Survey. Energy Policy 36 (2008) 2940 - 2953.

Diesel Exhaust

In addition to the EPA's concerns regarding climate change effects and GHG emissions, the National Institute for Occupational Safety and Health (NIOSH) has determined that diesel exhaust is a potential human carcinogen, based on a combination of chemical, genotoxicity, and carcinogenicity data. In addition, acute exposures to diesel exhaust have been linked to health problems such as eye and nose irritation, headaches, nausea, and asthma.

Although every construction site is unique, common actions can reduce exposure to diesel exhaust. EPA recommends that the following actions be considered for construction equipment:

- Using low-sulphur diesel fuel (less than 0.05% sulphur).
- Retrofit engines with an exhaust filtration device to capture DPM before it enters the workplace.
- Position the exhaust pipe so that diesel fumes are directed away from the operator and nearby workers, thereby reducing the fume concentration to which personnel are exposed.
- A catalytic converter reduces carbon monoxide, aldehydes, and hydrocarbons in diesel fumes. These devices must be used with low sulphur fuels.
- Ventilate wherever diesel equipment operates indoors. Roof vents, open doors and windows, roof fans, or other mechanical systems help move fresh air through work areas.

As buildings under construction are gradually enclosed, remember that fumes from diesel equipment operating indoors can build up to dangerous levels without adequate ventilation.

- Attach a hose to the tailpipe of a diesel vehicle running indoors and exhaust the fumes outside, where they cannot reenter the workplace. Inspect hoses regularly for defects and damage.
- Use enclosed, climate-controlled cabs pressurized and equipped with high efficiency particulate air (HEPA) filters to reduce operators' exposure to diesel fumes. Pressurization ensures that air moves from inside to outside. HEPA filters ensure that any air coming in is filtered first.
- Regular maintenance of diesel engines is essential to keep exhaust emissions low. Follow the manufacturer's recommended maintenance schedule and procedures. Smoke color can signal the need for maintenance. For example, blue/black smoke indicates that an engine requires servicing or tuning.
- Work practices and training can help reduce exposure. For example, measures such as turning off engines when vehicles are stopped for more than a few minutes; training diesel-equipment operators to perform routine inspection and maintenance of filtration devices.
- When purchasing a new vehicle, ensure that it is equipped with the most advanced emission control systems available.
- With older vehicles, use electric starting aids such as block heaters to warm the engine, avoid difficulty starting, and thereby reduce diesel emissions.
- Respirators are only an interim measure to control exposure to diesel emissions. In most cases an N95 respirator is adequate. Respirators are for interim use only, until primary controls such as ventilation can be implemented. Workers must be trained and fit-tested before they wear respirators. Personnel familiar with the selection, care, and use of respirators must perform the fit testing. Respirators must bear a National Institute of Occupational Safety and Health (NIOSH) approval number. Never use paper masks or surgical masks without NIOSH approval numbers.

Endangered and Threatened Species

The DSEIS states that a biological assessment documenting potential impact on the federally listed threatened or endangered terrestrial special as a result of operation of the proposed new units and proposed transmission line is in development. The FSEIS should provided updated information on this assessment.

Historic Preservation

We appreciate the thorough discussion of cultural and historic resources in the DSEIS. Pursuant to the location of a historic cemetery on the VEGP site, Southern entered into a Memorandum of Understanding (SHPO) with the Georgia State Historic Preservation Office (SHPO). We also note SCE&G's cultural resources awareness training and inadvertent discovery procedure training for staff working at the site. The FSEIS should include an update of coordination activities with the SHPO.

SUMMARY OF RATING DEFINITIONS AND FOLLOW UP ACTION*

Environmental Impact of the Action

LO-Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC-Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impacts. EPA would like to work with the lead agency to reduce these impacts.

EO-Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU-Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the Draft EIS sate, this proposal will be recommended for referral to the CEQ.

Adequacy of the Impact Statement

Category 1-Adequate

The EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alterative and those of the alternatives reasonably available to the project or action. No further analysis or data collecting is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2-Insufficient Information

The draft EIS does not contain sufficient information for the EPA to fully assess the environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the Draft EIS.

Category 3-Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640 Policy and Procedures for the Review of the Federal Actions Impacting the Environment

Attachment 11

EPA – comments on FSEIS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

May 6, 2011

Chief, Rulemaking and Directives Branch
Office of Administration
Mail Stop: TWB-05-B01M
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

RE: EPA Review and Comments
Final Supplemental Environmental Impact Statement (FSEIS) for the
Combined Licenses (COLs) for Vogtle Electric Generating Plant Units 3 and 4
Construction and Operation, Application for Combined Licenses (COLs), NUREG-1947
CEQ No. 20110088

Dear Sir:

The U.S. Environmental Protection Agency (EPA) reviewed the Draft Supplemental Environmental Impact Statement (DSEIS) for the Combined Licenses (COLs) for Vogtle Electric Generating Plant Units 3 and 4, pursuant to Section 102(2)(C) of the National Environmental Policy Act (NEPA), and Section 309 of the Clean Air Act. We appreciate your responses to our comments regarding the Draft Supplemental EIS (DSEIS), which were included in Appendix E of this FSEIS. The purpose of this letter is to inform you of the results of our review.

Southern Nuclear Operating Company, Inc. (Southern) and four co-applicants applied for combined construction permits and operating licenses (combined licenses or COLs) for Vogtle Electric Generating Plant (VEGP) Units 3 and 4. The proposed action is NRC issuance of a Limited Work Authorization (LWA) for specific site preparation activities and COLs for two new nuclear power reactor units (Units 3 and 4) at the VEGP site near Waynesboro, Georgia.

The NRC issued an Early Site Permit (ESP) on August 26, 2009, approving the VEGP site as suitable for the construction of Units 3 and 4. NRC issuance of a LWA enabled specific pre-construction activities at the site to begin. The NRC is currently reviewing the Westinghouse AP1000 pressurized reactor design in a design certification process. The USACE permit action on an Individual Permit application pursuant to Section 404 of the Clean Water Act, and Section 401 water quality certification for the Plant VEGP expansion were finalized in September 2010.

EPA previously reviewed and submitted written comments regarding the Draft and Final Environmental Impact Statements (EISs) for the Early Site Permit (ESP) for the new units, and for the Joint Public Notice for the U.S. Army Corps of Engineers (USACE) Permit. Since these documents stated that there were no transmission line impacts, our comments at that time pertained to the plant site only. We note that the FSEIS has been updated to clarify the definition of the transmission line Representative Delineated Corridor (RDC), and that construction of the new transmission line right-of-way would not require a LWA issuance, because the construction of new transmission facilities is not defined as a construction activity under NRC regulations, and that transmission lines are considered in the context of cumulative impacts.

The FSEIS states that the proposed new 500-kV transmission line route is anticipated to be 46 m (150 ft) wide and 97 km (60 mi) long. According the U.S. Fish and Wildlife Service's biological opinion, the new transmission line would impact over 1000 acres of land, with impacts to approximately 92 acres of forested wetlands. EPA is concerned about this level of impacts of transmission lines and supporting infrastructure for the project and, in accordance with NEPA and Section 404 of the Clean Water Act, we consider the transmission line to be an inseparable part of the project, and not having independent utility. Therefore, in our opinion the transmission line impacts should be addressed as part of the overall Section 404 permit process.

Radioactive waste storage and disposal are ongoing concerns with existing and proposed nuclear power plants. In addition, there are concerns regarding containment of radioactive materials and wastes in case of a natural disaster or other emergency. The NRC approved final revisions to the Waste Confidence findings and regulation (10 CFR Part 51.23) in September 2010. This update expresses confidence that commercial high-level radioactive waste and spent fuel generated by any reactor *"...can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor."* This refers to storage in a spent fuel basin or at either onsite or offsite independent spent fuel storage installations.

Given the uncertainty regarding ultimate disposal at a repository, on-site storage of high level waste (HLW) may continue during operation and for many years following operating license termination. Therefore, there are concerns regarding on-site waste storage and emergency preparedness related to waste storage areas, particularly until an off-site repository under federal jurisdiction is available for ultimate disposition of radioactive wastes.

Based on EPA's review of the FSEIS, there are inherent environmental concerns regarding the storage, transportation and disposal of hazardous waste and radioactive wastes, and the FSEIS notes the need for continuing radioactive and hazardous materials and waste management, environmental monitoring to prevent ecological impacts, emergency preparedness, and radiological monitoring to ensure safety for workers and the public.

In addition, continuing measures to limit bioentrainment and other impacts to aquatic species from surface water withdrawals and discharges are required, in compliance with the NPDES Permit. Also, further data collection may be necessary in the future regarding greenhouse gases (GHGs).

The FSEIS concludes that Environmental Justice (EJ) impacts from the proposed project will be small. However, EPA has been contacted by local EJ advocates and concerned citizens, who have expressed health concerns regarding potential emissions from the power plant. Therefore, we recommend that you continue coordination with the local community and address any potential health and EJ concerns that may arise as the site preparation activities and the licensing process for the two new nuclear power reactor units progresses.

Thank you for your continuing coordination with us. Please send us a copy of the Record of Decision (ROD) when it becomes available. If you have any questions or need additional information, please contact Ramona McConney of my staff at (404) 562-9615.

Sincerely,

Heinz J. Mueller, Chief
NEPA Program Office
Office of Policy and Management

Attachment 11

Georgia Department of Natural Resources – comments on the Draft EIS

Georgia Department of Natural Resources
2 Martin Luther King, Jr. Drive, S.E., Suite 1252 East, Atlanta, Georgia 30334-9000
Noel Holcomb, Commissioner
404/656-3500
Environmental Protection Division
Carol A. Couch, Ph.D., Director
404/656-4713

November 28, 2007

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Chief of Rulemaking, Directives, and Editing Branch
Division of Administrative Services
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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

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To Whom It May Concern :

Enclosed are comments by the Georgia Department of Natural Resources, Environmental Protection Division (EPD) on the *Draft Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site*, published September 2007 and noticed in the Federal Register on September 14, 2007 (72 FR 52586). These comments are based on review of the draft environment impact statement (DEIS), the presentation and material offered at the public meeting held on October 4, 2007 in Waynesboro, Georgia, and information exchanged in informal meetings and communications with officials associated with the Vogtle facility.

EPD fully supports the work of the Southern Company and it's local operating subsidiaries – Georgia Power Company and Southern Nuclear Operating Company – in providing reliable electrical power to the citizens of Georgia. However, we are keenly aware of and concerned with the impacts of energy production and use on Georgia's environment through consumption of natural resources, generation of waste, and potential degradation of ecosystems and loss of their services. We do appreciate the Southern Company for sharing these concerns and for working in partnership with us to address them.

Topics that we will work with you to address are some site-specific potential impacts, including those related to water withdrawal from the Savannah River and discharge of treated sanitary waste and tritium-contaminated liquid effluent back to the river. We therefore reserve final comment until we have received and reviewed more detailed information from Southern Nuclear's permit applications for surface water withdrawal and wastewater discharge and from NRC's draft Final Safety Evaluation Report.

EPD appreciates the opportunity to submit comment on this DEIS. We intend for them to be useful and constructive in Southern Company's continued stewardship of Georgia's environmental resources. If you have any questions or need additional information, please contact Dr. Marlin Gottschalk at (404) 657-5419.

Sincerely,

Carol A. Couch, Ph.D.
Director

CAC:mgc

Enclosure
cc w/enclosure: Noel Holcomb, Commissioner
Lauren Travis, Governor's Office

E-RIDS = ADM-03
Add = M. Notich (mdn)
C. Guerrero (CXG3)

SUNSI Review Complete
Template = ADM-013

Draft Environmental Impact Statement For an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site

September 2007

Comments by the Georgia Department of Natural Resources, Environmental Protection Division

November 28, 2007

These comments by the Georgia Department of Natural Resources, Environmental Protection Division (EPD) focus on select potential environmental impacts from the construction and operation of a new nuclear power generating facility by Southern Nuclear Operating Company, Inc. (Southern) within the existing Vogtle Electric Generating Plant site. They are listed in alphabetical order, with no inference to importance or priority. They do not cross-reference to specific text or citations within the Draft Environmental Impact Statement (DEIS).

Air Quality Impacts

The DEIS addresses impacts to air quality from both construction and operations activities at the Vogtle site. Construction-related emissions include fugitive dust from ground-clearing, grading and excavation activities and exhaust emissions from construction vehicles and equipment. While Southern has stated in its Environmental Report that it will develop a dust control plan to mitigate fugitive dust emissions, it does not propose mitigation of exhaust emissions from construction vehicles and equipment. Nor does Southern propose to mitigate exhaust emissions from emergency and standby diesel power generators used during plant operations. EPD encourages Southern to limit these exhaust emissions and protect the health of on-site workers and nearby residents by using new, retrofitted or re-powered construction equipment and power generators that meet applicable federal non-road engine emission standards, as well as adopting anti-idling measures and using "clean" diesel fuel, e.g., ultra-low sulfur diesel or biodiesel.

Radiological Health Impacts

EPD finds that the U.S. Nuclear Regulatory Commission (NRC) assessments of radiological concerns from station operation impacts at the Vogtle site are valid and consistent with known and accepted radiological protective protocols. However, we did note the following issues.

NRC indicates in the DEIS that Southern Company did not evaluate drinking water doses of radionuclides, because there is no current downstream drinking water use within 160 kilometers (100 miles) of Plant Vogtle (see page 5-54). We would note that the City of Savannah, slightly more than 100 miles downstream, withdraws approximately 30 million gallons per day from the Savannah River for drinking and industrial uses. Also, given the momentum to shift from groundwater to surface water withdrawals along the coast and the expected population and economic growth along the coast over the next few decades, we would assume that at some point during the life of the proposed two new units at Vogtle, somebody within 100 miles downstream will seek use of the Savannah River for drinking water purposes. This potential radiological health impact needs to be addressed, since the operation of new reactors at the site will increase the amount of tritium-contaminated liquid effluent discharged into the Savannah River.

The NRC's Safety Evaluation Report, that is scheduled for publication in May 2008, for the two proposed new nuclear reactors at Plant Vogtle will allow for more detailed scrutiny covering emergency preparedness. The DEIS did not conduct a thorough assessment of applicable radiological safety-related issues, since the EIS process does not lend itself to that aim. We reserve the right to make determinations of the adequacy of proposed emergency preparedness measures and comment on those issues at that time.

EPD requests that the section on radiological monitoring in the final EIS also acknowledge and describe independent environmental monitoring conducted by EPD's Environmental Radiation Program. Our efforts are an important part of the overall strategy to monitor radioactive releases from Plant Vogtle and protect the public's health..

Water-Related Impacts

EPD is currently completing a comprehensive state-wide water plan, which the Georgia General Assembly will adopt during its 2008 legislative session. The plan is expected "to improve decisions about water management, to plan for water resource quality and quantity on a regional level, and to provide flexibility for best meeting water quality and quantity goals suited to a given region of the state." The Savannah River Basin is one of those given regions. It is within the context of this water management planning effort that EPD makes the following comments on water-related impacts.

We note that the DEIS does not consider an exceptional drought scenario, i.e., Drought Level 4, which is currently impacting nearly half of Georgia and a significant portion of the southeastern United States. Until such time as Southern has submitted the required water supply/withdrawal and National Pollutant Discharge Elimination System (NPDES) permit applications for the facility and we have an opportunity to review it in the context of current water planning efforts, consumptive water losses, and any contingencies necessary to manage future droughts, we are unable to provide any final determinations on applicable environmental permitting issues. We reserve the right to make those determinations and comment on those issues at that time.

However, it is important to note that NPDES permit No. GA0026786 has been extended effective 5/21/2004. The permit was extended in response to a Total Maximum Daily Load (TMDL) for dissolved oxygen in the Savannah Harbor. The TMDL mandates that no increase in oxygen-demanding loads can be permitted between Thurmond Dam and the Savannah Harbor. In fact, the TMDL states that the assimilative capacity in the harbor is already exceeded by the current discharges and must be addressed

The proposed expansion of Plant Vogtle will ultimately result in an increased discharge of cooling tower blowdown to the Savannah River, but these waste streams are not covered under the TMDL, due to the lack of any oxygen demanding constituents. The concern at this time is the handling of sanitary wastewaters at the facility and how this will potentially contribute to an increase in effluent Biochemical Oxygen Demand (BOD). The facility needs to anticipate and plan for the additional sanitary wastewater being generated through both the construction phase, and ultimate operation of the plant. At this time, any expansion of the sanitary sewer treatment facility, or new discharge of oxygen demanding constituents, will have to be handled through a no discharge system.

As the USEPA, Georgia EPD, and South Carolina DHEC are currently discussing the Georgia dissolved oxygen standard and the applicable November 2006 TMDL, EPD suggests that the parties to this ESP application communicate with EPD regarding any developments with these issues. Communications relating to the current water and wastewater permits, or the TMDL, should be directed to Jeff Larson at (404) 675-6236.

Attachment 11

National Marine Fisheries Service – comments on the Draft USACE Joint Individual permit

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5511
(727) 824-5317; FAX (727) 824-5300
http://sero.nmfs.noaa.gov/

March 4, 2010 F/SER4:PB/pw

(Sent via Electronic Mail)

Col. Edward J. Kertis
U.S. Army Corps of Engineers, Savannah District
100 W. Oglethorpe Avenue
Savannah, Georgia 31401-3640

Attention: Shaun L. Blocker

Dear Colonel Kertis:

NOAA's National Marine Fisheries Service (NMFS) reviewed the public notice, dated February 2, 2010, for a Department of the Army Permit (Public Notice No. SAS-2007-01837) regarding proposed expansion of the Vogtle Electric Generating Plant (VGEP), located adjacent to the Savannah River near Waynesboro, Burke County, Georgia. The applicant, Southern Nuclear Operating Company, Inc., proposes to construct two additional nuclear reactors (Units 3 and 4) with a new cooling water intake system and excavated canal to the Savannah River. The following comments are provided in accordance with the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

The applicant proposes impacts to wetlands and aquatic habitats through land clearing, excavation, and permanent fill in 9.23 acres of jurisdictional wetland, 1.42 acres of open-water habitat in the Savannah River, and 0.07 acres of an ephemeral tributary stream. As compensatory mitigation, the applicant proposes to purchase 77.9 wetland mitigation credits from the Phinizy Swamp Mitigation Bank, located adjacent to the Savannah River near the City of Augusta, Georgia.

Fishery Resources Potentially Affected

The Savannah River within the area of project influence provides important spawning and maturation habitats for migratory diadromous fish species, including American shad, blueback herring, Atlantic and shortnose sturgeon, American eel, and striped bass. Riparian wetlands to be impacted by project construction provide important ecological functions for maintenance of habitat quality for fishery and aquatic resources.

Comments and Recommendations

Mitigation of Wetland Impacts

Based on review of the application, the wetland mitigation plan incorporates adequate avoidance, minimization, and compensatory mitigation through utilization of credits from the Phinizy Swamp Mitigation Bank.

Fish Protection at the Cooling Water Intakes

NMFS participated in the Nuclear Regulatory Commission (NRC) relicensing of the existing VEGP facilities and Early Site Permit proceedings for the proposed expansion. During this coordination, NMFS indicated concerns about the potential impingement and entrainment eggs, larvae, and juveniles of diadromous fish at the proposed intake for the new cooling water system on the Savannah River, and we discussed with the NRC and applicant the need for adequate measures to reduce impingement and entrainment at the intake structures. The fish protection system included in the NRC's *Final Early Site Permit Environmental Impact Statement* (Section 5.4.2) includes design features expected to provide adequate reduction of impingement and entrainment impacts.

Essential Fish Habitat (EFH) Consultation
Section 305(b) (4) (A) of the Magnuson-Stevens Act requires NMFS to provide conservation recommendations when an activity is expected to adversely impact EFH. Designated EFH for federally managed fish species is present in estuarine waters and tidal freshwater wetlands in the lower Savannah River Basin, approximately 130 river miles downstream from the VEGP facilities.

The public notice does not include an EFH Assessment, presumably because the Savannah District believes VEGP is too far upstream to affect EFH in the Savannah River Estuary. One function of EFH within the Savannah River Estuary is to provide foraging grounds for federally managed fish, and abundance of prey is one factor affecting the level of function provided. Diadromous fish are among the prey of federally managed species. Impingement or entrainment of eggs, larvae, and juveniles of diadromous fish species at the proposed at the proposed intake for the new cooling water system could reduce the abundance of prey and the level of service provided by EFH within the estuary. As noted above, NMFS worked with the NRC and the applicant to develop a fish protection system expected to provide adequate reduction of impingement and entrainment impacts. Accordingly, NMFS concludes the project is not likely to adversely affect EFH.

Endangered Species Act (ESA) Consultation
During August 2008, NMFS responded to the NRC's ESA consultation Biological Assessment and concluded that the proposed action is not likely to adversely affect the endangered shortnose sturgeon.

Thank you for the opportunity to provide comments. Related correspondence should be directed to the attention of Prescott Brownell at our Atlantic Branch office, 219 Fort Johnson Road, Charleston, South Carolina, 29412. He may be reached by telephone at (843) 953-7204, or by e-mail: Prescott.Brownell@noaa.gov.

Sincerely,

Pace Wilber

/ for

Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc:

CESAS, Shaun.L.Blocker@usace.army.mil
GADNR-EPD, Keith_Parsons@dnr.state.ga.us
SCDNR, PerryB@dnr.sc.gov
EPA, Lord.Bob@epamail.epa.gov
F/SER4

Attachment 11

South Carolina Department of Natural Resources – comments on the Draft EIS

South Carolina Department of
Natural Resources

Robert D. Perry
Certified Wildlife Biologist, Special Projects Manager
Office of Environmental Programs
1000 Assembly Street Room 310A
PO Box 167
Columbia, SC 29202
perryb@dnr.sc.gov

John E. Frampton
Director

November 28, 2007

REFERENCE: NURWG-1872

Chief, Rules, Directives and Editing Branch
US Nuclear Regulatory Commission
Mail Stop T-6-D59
Washington, DC 20555-0001

Dear Sir or Madame,

The Draft Environmental Impact Statement (DEIS) for an Early Site Permit for the Vogtle Electric Generating Plant Site came to our attention today by way of incidental contact.

Staff of the South Carolina Department of Natural Resources (SCDNR) have reviewed a very small portion of the extensive DEIS. It is noted comments on the DEIS are due today.

Our review of the DEIS has been limited in time and scope as a result of failure of the project sponsor and preparers of the DEIS to coordinate with SCDNR as defined by the Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. 661-667e; the Act of March 10, 1934; Ch. 55; 48 Stat. 401), as amended by the Act of June 24, 1936, Ch. 764, 49 Stat. 913; the Act of August 14, 1946, Ch. 965, 60 Stat. 1080; the Act of August 5, 1947, Ch. 489, 61 Stat. 770; the Act of May 19, 1948, Ch. 310, 62 Stat. 240; P.L. 325, October 6, 1949, 63 Stat. 708; P.L. 85-624, August 12, 1958, 72 Stat. 563; and P.L. 89-72, 79 Stat. 216, July 9, 1965; and the National Environmental Policy Act (NEPA), the Environmental Quality Improvement Act of 1970, as amended (42 U.S.C. 4371 et seq.), sec. 309 of the Clean Air Act, as amended (42 U.S.C. 7609), and E.O. 11514 (Mar. 5, 1970, as amended by E.O. 11991, May 24, 1977.

The Vogtle Electric Generating Plant Site including planned additions of Units 3 and 4 are located in the state of Georgia on the Savannah River. The Savannah River is the border for most of the length of the boundary between Georgia and South Carolina. The Savannah River is a shared river, in boundary, as well as with respect to fish and wildlife and other natural resources, and as such SCDNR submits NEPA and FWCA require full consultation and coordination with resource agencies in South Carolina. A review of the Appendices of the DEIS clearly indicates such consultation and coordination with SCDNR has not occurred.

SCDNR has a number of concerns regarding natural resource impacts of the planned facility expansion to include at least the following:

1. Water use and consumptive loss in a heavily impacted surface water body, the Savannah River. This river currently is under low flow conditions to include flows lower than presently approved Stage 3 flow release protocols from the J. Strom Thurmond Dam. While projected water use and loss is small it must be considered in the cumulative context requiring careful examination of further use and loss.
2. Potential impacts to ground water reserves and aquifers.
3. Further potential water quality impacts associated with thermal pollution, and consumptive water loss.
4. Water quality impacts associated with construction activities including planned dredging of the Savannah River at the plant site as well as potential dredging of the navigation channel.
5. Undetermined fish and wildlife impacts over the length of the Savannah River from the plant site to the Savannah Harbor and Savannah River estuary.

SCDNR must stress our review of the DEIS is incomplete and not the fault of this agency. In view of the lack of consultation and coordination with SCDNR by the project sponsor and DEIS preparers, I am requesting an extension of the comment period to specifically allow appropriate review of the document by SCDNR staff in order to properly evaluate potential impacts and provide comments to the Nuclear Regulatory Commission. The project sponsor and DEIS preparers are required under NEPA and FWCA to coordinate and consult with appropriate natural resource agencies and, as of today, have not.

SCDNR respectfully requests an extension until December 31, 2007 for the purposes of having time for an appropriate review of the DEIS and submission of comments.

Please contact me if you have any questions regarding this matter. Thank you in advance.

Sincerely,

Robert D. Perry

Robert D. Perry
Special Projects Manager
Office of Environmental Programs

c: Hank Stallworth
Ed Duncan
Steve DeKozlowski
Bud Badr
Greg Mixon
Breck Carmichael
Val Nash
Dick Christie

Attachment 11

South Carolina Department of Natural Resources – comments on the Draft EIS (2)

South Carolina Department of
Natural Resources

Bob Perry
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1000 Assembly Street Room 310A
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John E. Frampton
Director
Robert D. Perry
Assistant Director,
Office of
Environmental Programs

December 28, 2007

REFERENCE: NURWG-1872

Chief, Rules, Directives and Editing Branch
US Nuclear Regulatory Commission
Mail Stop T-6-D59
Washington, DC 20555-0001

Dear Sir or Madame,

Reference is made to the Draft Environmental Impact Statement (DEIS) for an Early Site Permit for the Vogtle Electric Generating Plant Site. Staff of the South Carolina Department of Natural Resources (SCDNR) have reviewed the extensive DEIS. This correspondence includes comments on the DEIS, respectfully submitted.

The Vogtle Electric Generating Plant Site including planned additions of Units 3 and 4 are located in the state of Georgia on the Savannah River. The Savannah River is the border for most of the length of the boundary between Georgia and South Carolina. The Savannah River is a shared river, in boundary, as well as with respect to fish and wildlife and other natural resources.

SCDNR has a number of concerns regarding natural resource impacts of the planned facility expansion to include at least the following:

1. ***Water use and consumptive loss*** – We have justified concerns over water use and consumptive loss in a heavily impacted surface water body, the Savannah River. This river currently is under low flow conditions to include flows lower than presently approved Stage 3 flow release protocols from the J. Strom Thurmond Dam. While projected water use and loss from a potential plant expansion is small it must be considered in both the cumulative and also the drought contexts requiring careful examination of further use and loss. SCDNR recently has requested the US

Army Corps of Engineers to initiate an environmental assessment for further flow reductions of the Savannah River from the Thurmond Dam due to the deepening of the drought of record during 2007. Currently net inflow to Lake Thurmond is approximately 500 cfs and releases are approximately 3600 cfs. If the current drought persists Lake Thurmond outflow will be reduced to 500 cfs. Operation of the proposed reactor units 3 and 4 would result in an unprecedented percentage withdrawal of water from the Savannah River for the Vogtle facility during such flows. This level of withdrawal would result in catastrophic natural resource and human impacts. Additional withdrawal should not be permitted under low and very low flow protocols, and other sources of water will have to supplement water withdrawn from the Savannah River. The project sponsors should develop a contingency plan to describe where additional water for the Vogtle plant will come from should such a scenario occur.

2. ***Potential impacts to ground water reserves and aquifers*** – We do not believe the DEIS adequately describes potential impacts to groundwater reserves and aquifers during low and very low flow Savannah River conditions. The contingency plan recommended above should address potential impacts to groundwater reserves and aquifers.

3. ***Water quality impacts*** – The DEIS describes some potential water quality impacts associated with thermal pollution, and consumptive water loss including water quality impacts associated with construction activities related to planned dredging of the Savannah River at the plant site as well as potential dredging of the navigation channel. SCDNR is concerned the DEIS minimizes potential water quality impacts associated with these activities; supplementary information on potential water quality impacts, particularly during low and very low flow conditions is needed to adequately assess potential water quality impacts to the Savannah River.

4. ***Fish and Wildlife Impacts*** – There will be a host of undetermined fish and wildlife impacts over the length of the Savannah River from the plant site to the Savannah Harbor and Savannah River estuary related to construction activities as described in the DEIS. We do not believe the DEIS adequately describes the range of fish and wildlife impacts, and we recommend development of supplementary information in consultation with required agencies as defined by the Fish and Wildlife Coordination Act (FWCA) (16 U.S.C. 661-667e; the Act of March 10, 1934; Ch. 55; 48 Stat. 401), as amended by the Act of June 24, 1936, Ch. 764, 49 Stat. 913; the Act of August 14, 1946, Ch. 965, 60 Stat. 1080; the Act of August 5, 1947, Ch. 489, 61 Stat. 770; the Act of May 19, 1948, Ch. 310, 62 Stat. 240; P.L. 325, October 6, 1949, 63 Stat. 708; P.L. 85-624, August 12, 1958, 72 Stat. 563; and P.L. 89-72, 79 Stat. 216, July 9, 1965; and the National Environmental Policy Act (NEPA), the Environmental Quality Improvement Act of 1970, as amended (42 U.S.C. 4371 et seq.), sec. 309 of the Clean Air Act, as amended (42 U.S.C. 7609), and E.O. 11514 (Mar. 5, 1970, as amended by E.O. 11991, May 24, 1977. The project sponsor and

DEIS preparers are required under NEPA and FWCA to coordinate and consult with SCDNR and, as of today, have not.

Because of nuclear energy's relatively non-existent green-house gas emissions SCDNR generally supports opportunities to consult, review and participate in discussions involving additional reliance on nuclear power for generation of electricity. In view of the lack of consultation and coordination with SCDNR by the project sponsor and DEIS preparers, and the magnitude of potential impacts, SCDNR urges diligence and additional documentation/consultation with respect to these potential project impacts: (1) water use and loss, (2) aquifer and groundwater reserves, (3) water quality impacts, and (4) fish and wildlife impacts – particularly associated with low and very low flow conditions in the Savannah River.

Please contact me if you have any questions regarding this matter. Thank you in advance.

Sincerely,

Robert D. Perry

Robert D. Perry
Special Projects Manager
Office of Environmental Programs

c: Hank Stallworth
Steve DeKozlowski
Bud Badr
Greg Mixon
Breck Carmichael
Vivianne Vejdani

Attachment 11

South Carolina Department of Natural Resources – comments on the Draft USACE 404 permit

South Carolina Department of
Natural Resources

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Columbia, SC 29202
803.734.3766 Office
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John E. Frampton
Director
Robert D. Perry
Director, Office of
Environmental Programs

March 2, 2010

Shaun L. Blocker, Project Manager
United States Army Corps of Engineers
Savannah District
100 West Oglethorpe Avenue
Savannah, Georgia 31401-3640

REFERENCE: SAS-2007-01837 Southern Nuclear Operating Company, Inc.

Dear Mr. Blocker,

Personnel of the South Carolina Department of Natural Resources (DNR) have reviewed the public notice for the above referenced project and offer the following comments:

The proposed activity will impact 9.23 acres of jurisdictional wetland, 1.42 acres of open water (Savannah River), and 0.07 acre of ephemeral stream during the expansion of the Vogtle Electric Generating Plant (VEGP). The project will include the construction of 2 additional nuclear reactors (Units 3 and 4), power lines, building construction, water intake structures, an access road and water discharge pipes. As proposed the project would require the following impacts:

1. The permanent fill of approximately 5.50 acres of wetland to facilitate the construction of the cooling water intake system and associated access road,
2. The temporary fill of 0.26 acre of wetland for clearing, grubbing and all best management practices associated with an access road,
3. The permanent fill of 0.55 acre of the Savannah River during the construction of the cooling water intake system,
4. The excavation of 0.99 acre of wetland and 0.55 acre (12,500 cubic yards) of the Savannah River during the construction of the cooling water intake system,
5. The excavation of 1.14 acres of wetland for a temporary sedimentation basin,
6. The excavation of 0.35 acre of wetland and 0.3 acre (800 cubic yards) of the Savannah River during the construction of the discharge line,
7. The temporary clearing of 0.99 acre of wetland for construction access associated with the discharge line,
8. The permanent fill of 0.07 acre of ephemeral stream during construction of a permanent sedimentation basin, and
9. The permanent fill of 0.02 acre of the Savannah River during the placement of riprap for bank stabilization.

To mitigate for the above impacts, the applicant has proposed the purchase of 77.9 mitigation credits from Phinizy Swamp Mitigation Bank, a US Army Corps of Engineers approved mitigation bank that services the project area.

It is understood that the agencies will conduct a site visit on March 11, 2010 and that some agencies will not submit comments until after that site visit. Due to previous commitments DNR staff will not be able to participate in the site visit. DNR will defer to comments provided by the regulatory and resource agencies in Georgia regarding recommendations and conditions for permit authorization. DNR defers providing:

1. The Georgia agencies determine the proposed actions and impacts are minor and temporary in nature,
2. That any issued permits be conditioned to follow best management practices,
3. With the understanding that the temporary nature of proposed actions and impacts will not cause any injury to aquatic resources of the Savannah River, its downstream uses and users, water quality or assimilative capacity, and
4. That the March 11 site visit does not result in new information sufficient to cause the participating agencies concern that the proposed actions and impacts are not minor and temporary in nature.

DNR continues to have concerns over potential impacts of consumptive water loss in the Savannah River, particularly during drought events. The cumulative impact of proposed expansion of VEGP, growing demands on water supply, and potential for extended, severe and unprecedented drought merits thorough consideration of alternatives and development of a cooling water contingency plan for VEGP and its proposed expansion. DNR recognizes that the Nuclear Regulatory Commission (NRC) is the licensing authority and lead federal agency over nuclear power generation and that consumptive water loss is not under the purview of § 404 of the Clean Water Act.

However, DNR also recognizes the connection between permitting for the proposed intake and appurtenant structures and the eventual withdrawal of additional water from the Savannah River. DNR has expressed concerns over additional consumptive water loss associated with the proposed expansion in previous comments to the NRC. DNR will reserve the right to examine the information on water loss in the anticipated Draft Supplemental Environmental Impact Statement (DSEIS) covering expansion of VEGP and accordingly make comment and recommendations to NRC upon public notice of the DSEIS.

Previously DNR expressed concerns over preliminary plans calling for dredging the Savannah River to VEGP in order to barge construction components to the facility during the work of the proposed expansion. DNR has reviewed Southern Company's recent letter (Feb 19, 2010) to NRC regarding its *Large Component Transportation Method Decision* stating that dredging the Savannah River is no longer a consideration. DNR appreciates this avoidance strategy.

If you have any questions regarding the comments provided, pleased feel contact Vivianne Vejdani of the DNR staff at 803.734.4199 or at vejdaniv@dnr.sc.gov.

Sincerely,

Bob Perry
Director, Office of Environmental Programs

c:
- Mallecia Sutton – NRC
- Mark Notich – NRC
- Bill Bailey – Savannah District Corps of Engineers
- Bill Wikoff – FWS Brunswick
- Strant Colwell – FWS Brunswick
- Bob Lord – EPA
- Pace Wilber – NOAA Fisheries
- Keith Parsons – GA-EPD
- Jeff Larson – GA DNR
- Brad Gane – GA DNR-CRD
- Barbara Neale – SC DHEC-OCRM
- Blair Williams – SC DHEC-OCRM
- Heather Preston – SC DHEC
- Larry Turner – SC DHEC
- David Baize – SC DHEC
- Michael G. McShane – DNR Board Chairman
- John Frampton – DNR Director
- Don Winslow – DNR Chief of Staff
- Robert Boyles – DNR Deputy Director Marine Resources
- Breck Carmichael – DNR Deputy Director Wildlife & Freshwater Fisheries
- Ken Rentiers – DNR Deputy Director Land & Water Conservation

Attachment 11

US Fish and Wildlife Service – comments on Draft EIS

United States Department of the Interior

Fish and Wildlife Service

105 West Park Drive, Suite D
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West Georgia Sub Office
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Coastal Sub Office
4270 Norwich Street
Brunswick, Georgia 31520

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BRANCH
USNRC

Mr. Mark D. Notich
Chief, Rules, Directives and Editing Branch
U. S. Nuclear Regulatory Commission
M.S. T6-D59
Washington, DC 20555-0001

RE: Draft Environmental Impact Statement NUREG-1872 for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site
USFWS File # 06-FA-1890
ER 07/752

Dear Mr. Notich:

The U. S. Fish and Wildlife Service (Service) of Region IV has reviewed the Draft Environmental Impact Statement (DEIS) published in September, 2007. These comments apply to the DEIS submitted to the U. S. Nuclear Regulatory Commission (NRC) by Southern Nuclear Operating Company, Inc. (Southern) for an early site permit (ESP) to (1) approve a site within the existing Vogtle Electric Generating Plant (VEGP) boundaries as suitable for the construction and operation of a new nuclear power generating facility and (2) issue an ESP for the proposed location at the VEGP site, adjacent to the existing VEGP Units 1 and 2. The existing Plant Vogtle is located near Waynesboro, Georgia on the Savannah River. The Savannah River separates South Carolina and Georgia; therefore, these comments are provided by the Service's Ecological Services (ES) Offices in Georgia and South Carolina (Charleston ES). These comments are submitted under provisions of the Fish and Wildlife Coordination Act, (16 U.S.C. 661 *et seq.*).

Service personnel from the Georgia ES office have communicated and met with representatives from the NRC, Southern, consultants, various state and local government agencies, and interested non-governmental organizations. We attended public meetings, environmental audits, and tours of the Vogtle facilities including a boat tour of the Savannah River at this location. These comments have also been provided to the Department of Interior Office of Environmental Policy and Compliance. The DEIS is well written and addresses most of the Service's concerns and incorporates suggestions made during meetings and discussions.

SUNSI Review Complete
Template = ADM-013

E-RFDS = ADM-03
Add = M. Notich (mdn)
C. Guerrero (cxg3)

General Comments:

Channel Dredging

The document does not address dredging of the Savannah River channel that is likely needed to move required construction material up the river from Savannah Harbor to the site. The U. S. Corps of Engineers, Savannah District (USACE) has not maintained the Savannah River below Augusta, Georgia for navigation since the late 1970's. According to the USACE, previous barge shipments to Barnwell for reactor disposal required a discharge of between 10,000 cfs and 15,000 cfs in December of 2004. Vogtle construction will likely require many shipments (15-30) and it would be impossible to plan and provide that many shipment windows with releases that are incidental to flood control or pulse flow releases; therefore, it appears dredging of the federal navigation channel would be required.

The channel dredging would be a major impact of the project and, if it is necessary for construction, needs to be disclosed and thoroughly evaluated in the DEIS. Channel dredging would impact mussel beds because the beds are found in the sediment deposition areas where there is some protection from scouring flows occurring in the main channel. Habitat for fish and other aquatic organisms would also be impacted.

Dredging the river will have direct impacts on freshwater mussels by: (1) physical removal of the animals with the dredge spoil, (2) alteration of habitat, including eliminating sediment bars and removal of debris and other in-stream structures that provide refugia from scouring high-water flow, (3) alteration of habitat for fish spawning, potentially reducing numbers of host fish available for successful mussel reproduction, and (4) depending on the site selection for spoil disposal, potential degradation of backwater slough or oxbow habitat, which supports a variety of mussel species.

Specific comments:

Page 5-6. The USACE Savannah River drought plan only specifies a maximum discharge. In other words, Level 1 specifies a maximum weekly average of 4,200 cfs and Level 2 a maximum weekly average of 4,000 cfs. The only minimum discharge requirement is the daily average of 3,800 cfs, which applies in drought or non-drought. Therefore, the weekly average discharge can frequently be about 3800 cfs during levels 1 and 2, depending on hydropower needs. Furthermore, the USACE has implemented a modification to the drought plan which reduces the daily average to 3,600 cfs during severe drought and is currently considering further flow reductions. The drought plan discussion needs to be modified to clarify the flow requirements and the withdrawal percentages need to be recalculated. In addition, Drought Level 4 needs to be evaluated using information on reservoir inflow which is available at the USACE web site.

Page 4-28. The document discusses mussel fauna in the project area and states that the Atlantic pigtoe is not known to occur in the Savannah River. In 2006, the Fish and Wildlife Service conducted a freshwater mussel survey in the Savannah River to determine species composition and distribution of mussels. This study encompassed the portion of the river from the Augusta Shoals region (RM 203) near the Fall Line downstream to the tidewater region (RM 22.8) near Savannah. This survey evaluated 39 sites using both shallow water (snorkeling and grubbing) and deep water (SCUBA) survey techniques. A total of 26 freshwater mussel species were identified during the survey efforts (Table 1). With the exception of sites within the Augusta Shoals area, mussels were generally unevenly distributed in the surveyed areas, which is reflective of the distribution and quality of microhabitats within a particular river segment. In general, mussels were most abundant in the thalwag habitats at the base of the river bank, and rare to absent in the shifting sand dominated runs in the center of the channel.

Atlantic pigtoe (*Fusconia masoni*) and Savannah liliput (*Toxolasma pullus*) were both observed in the 2006 mussel survey. Both of these species are experiencing range-wide declines and are likely to be elevated to candidate status within the next two years. The population of Savannah liliput upstream of Little Hell boat landing (Allendale County, South Carolina) is probably the largest remaining population of this species and impacts to that habitat should be avoided.

The 2006 discovery of four species not previously known to occur in South Carolina demonstrates the gross lack of knowledge regarding the mussel fauna of the Savannah River. The objective of the 2006 mussel survey was to attempt to estimate species composition and distribution in the Savannah River; however, it should be noted that time and funding restrictions allowed surveyors to visit only a small portion of the available habitat in the river.

Table 1. Mussel Species Located in 2006 Savannah Mussel Survey

Species	**# of Sites Where Found in 2006 Survey**	**Conservation Status in SC State Wildlife Plan**
*Alasmidonta arcula*** (arc mussel)	1	Not previously known from SC
Alasmidonta undulata (triangle floater)	1	Highest priority
Anodonta couperiana (barrel floater)	4	Highest priority
Anodonta implicata (alewife floater)	2	High priority
Elliptio angustata (Carolina lance)	9	Moderate priority
Elliptio complanata (eastern elliptio)	27	Moderate priority
Elliptio congarea (Carolina slabshell)	33	Moderate priority
Elliptio fisheriana (northern lance)	5	High priority
Elliptio folliculata (pod lance)	10	High priority
Elliptio fraterna (brother spike)	3	Highest priority
Elliptio hopetonensis (Altamaha slabshell)	15	Not previously known from SC

Elliptio icterina (variable spike)	34	Moderate priority
Elliptio lazarus (=arctata) (delicate spike)	3	Not previously known from SC
Elliptio producta (Atlantic spike)	15	Moderate priority
Elliptio roanokensis (Roanoke slabshell)	19	High priority
Elliptio sp.*	1	n.a.
*Fusconaia masoni*** (Atlantic pigtoe)	2	Highest priority
Lampsilis cariosa (yellow lampmussel)	12	Highest priority
*Lampsilis dolabraeformis*** (Altamaha pocketbook)	1	Not previously known from SC
Lampsilis splendida (rayed pink fatmucket)	17	High priority
Leptodea ochracea (tidewater mucket)	1	High priority
Pyganodon cataracta (eastern floater)	6	Low priority
Toxolasma pullus (Savannah lilliput)	1	Highest priority
Uniomerus carolinanus (Florida pondhorn)	11	Low priority
Utterbackia imbecillis (paper pondshell)	2	Low priority
Villosa delumbis (eastern creekshell)	18	Moderate priority

* An unusual form, likely E. icterina
** Putative ID pending genetics analysis

Page 4-27. The robust redhorse is a state listed species but not federally listed. The multi-agency Robust Redhorse Conservation Committee (Georgia Power is a member) was formed in 1995 to determine why the fish had declined and to restore the species to a sustainable level without the need to be listed under the Federal Endangered Species Act. No known spawning occurs within the Vogtle project area; however, there is little doubt that the species moves through this river stretch during spawning.

Page 4-29 & 4-30. No red-cockaded woodpeckers (RCW) were located on the plant site. The closest active RCW group is located on the DOE Savannah River Site approximately ten miles from the Vogtle site. However, the DEIS mentions a Red-Cockaded Woodpecker Safe Harbor Agreement signed in June of 2007 in cooperation with the Georgia Department of Natural Resources and Georgia Power/Southern Nuclear. This agreement includes the Plant Vogtle Site and will in the future maintain and enhance habitat for the RCW at this location.

We appreciate the opportunity to review the DEIS. Should you have questions or concerns please contact Strant Colwell of the Georgia Ecological Services office at (912) 265-9336 or Ed Eudaly of the Charleston, South Carolina Ecological Services office at (843) 727-4707.

Sincerely,

Strant T. Colwell

Field Supervisor for
Sandra S. Tucker

cc: USFWS, Charleston, South Carolina, Tim Hall
USFWS, Brunswick, Georgia, Sandy Tucker

Attachment 11

US Fish and Wildlife Service – comments on USACE 404 permit

Shaun

United States Department of the Interior

Fish and Wildlife Service
105 West Park Drive, Suite D
Athens, Georgia 30606
Phone: (706) 613-9493
Fax: (706) 613-6059

West Georgia Sub-Office
Post Office Box 52560
Fort Benning, Georgia 31995-2560
Phone: (706) 544-6428
Fax: (706) 544-6419

Coastal Sub-Office
4980 Wildlife Drive
Townsend, Georgia 31331
Phone: (912) 832-8739
Fax: (912) 832-8744

FEB 19 2010

Colonel Edward J. Kertis
U. S. Army Corps of Engineers
Regulatory Division
Post Office Box 889
Savannah, Georgia 31402-0889
ATTN: Shaun H. Blocker

Re: USFWS Log Number 2010-0422

Dear Colonel Kertis:

Thank you for the opportunity to comment on the February 2, 2010, Joint Public Notice application number SAS-2007-01837 for the construction of two additional nuclear reactors (Units 3 and 4) at the existing Plant Vogtle site, along the Savannah River, near the intersection of River Road and Hancock Landing Road, near Waynesboro, in Burke County, Georgia. Impacts will include 9.23 acres of jurisdictional wetlands, 1.42 acres of open water (Savannah River), and 0.07 acre of ephemeral stream. These comments are provided in accordance with provisions of the Endangered Species Act of 1973, as amended; (16 U.S.C. 1531 *et seq*.) to further the conservation of fish and wildlife resources and their habitat, including federally listed threatened and endangered species.

The U. S. Fish and Wildlife Service Coastal Georgia Sub-Office Ecological Services has consulted with the Nuclear Regulatory Commission on this project site specific work and agreed that currently there are no known federally listed species to be impacted by the proposed work denoted in the application. If you have any additional questions, please write or call the Coastal Georgia Sub-Office supervisor, Strant Colwell, at 912-832-8739 extension 1.

Sincerely,

Strant Colwell

Sandra S. Tucker for
Field Supervisor

cc: GADNR, Brunswick, Georgia

RECEIVED
MAR - 1 2010

pab

Attachment 12

Final Report of Fish Impingement at the Vogtle Electric Generating Plant

Prepared for:

Southern Nuclear Operating Company
Nuclear Development
40 Inverness Center Parkway
Birmingham, AL 35242

FINAL REPORT OF FISH IMPINGEMENT AT THE PLANT VOGTLE ELECTRIC GENERATING PLANT

WAYNESBORO, GEORGIA

Prepared by:

GEORGIA POWER
A SOUTHERN COMPANY

March 2009

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EXECUTIVE SUMMARY AND FORWARD WITH ERRATUM

This final report follows the Interim Report of Fish Impingement at the Plant Vogtle Electric Generating Plant, GPC, Jan. 2009. The interim report provided in-progress results for 10 months of the 12-month study. At that time, study progress reported that impingement at Vogtle Units 1&2 intake was very low - potentially impacting up to 1,941 individual fish weighing approximately 23.3 lbs at the 95% upper confidence limit (UCL). The interim report estimated potential impingement impact for Units 3&4 in combination with Units 1&2 as derived by doubling the estimate described above. That result indicated that approximately 3,882 fish weighing approximately 46.6 lbs may be impinged annually (based on the 10-month study result) at the newly expanded Plant Vogtle. In transitioning from the interim to final reporting stage, a calculation error was discovered in data review that affected the 10-month impingement estimate with an increase. The corrected 10-month impingement estimate was 2,421 fish with a biomass up to 30.1 lbs (or 3,881 fish weighing up to 44.9 lbs at the 95% UCL).

The following report sections provide a final report version for the entire 12 months of study. Consistent with low impingement rate during the last two months of sampling, the final study result showed an approximate 6% increase in annual impingement rate compared to the 10-month estimate. Further, a range of potential, annual impinged biomass is suggested to allow consideration for organism mortality prior to impingement. Annual impingement at Vogtle Units 1&2, based on 12-months of impingement sampling, resulted in an impingement baseline of 3,229 organisms weighing between 18.2 to 41.2 lbs.

At the 95% UCL, the effect of operating Units 3&4 and Units 1&2 simultaneously may result in annual impingement of 6,458 fish, each measuring approximately 69 mm in length, weighing up to 82.4 lbs. The biomass estimate may range as low as 37 lbs based on the study observations that a few large-bodied fish were moribund before becoming impinged. Considering the fact that the vast majority of fish encountered at the intake structure during sampling are juveniles, the annual impingement estimated is further deemed to be conservative in that the sizes/ages of fish observed in the impingement sample would likely suffer natural mortality before reaching maturity. Based on the 12-month study, the potential net impingement effect is considered to be low and not pose a significant impact on the fishery resources of the Savannah River.

1. INTRODUCTION

In February of 2008, Georgia Power Company's (GPC) Environmental Services staff based in Smyrna, Georgia responded to Southern Nuclear's request to conduct an aquatic impingement and entrainment assessment of Plant Vogtle's make-up water intake structure. Following a site reconnaissance in early March 2008, GPC submitted a plan of study. The sampling approach included four primary components including:

1) source water ichthyoplankton sampling in the Savannah River,

2) source water/intake canal ichthyoplankton sampling,

3) impingement sampling via the traveling screen wash system, and

4) performance of work under a quality assurance/quality control plan to ensure that work was performed in high quality manner consistent with standard scientific practices, and as it pertains to sampling methodology, perform a comparison between collection gear types and data between two sampling locations upstream of the intake structure.

Following a brief period of internal review by Southern Nuclear, a sampling plan was established with authorization to proceed including implementations by Plant Vogtle to install temporary procedure modifications in order to provide GPC staff site access to aquatic impingement and entrainment sampling. Plant Vogtle Operations personnel have provided and continue to provide communications and staff resources to operate the traveling screen system for the ongoing impingement study component.

Field components of the study were initiated on 10 March 2008. Study components 1, 2, and 4 described above were completed for the entrainment portion of the study. The methods and results of those study components are described in a separate report (GPC 2008). Study component no. 3, the impingement study, was designed as a 12-month study encompassing twice per month sampling.

Under direction and support provided by Southern Nuclear, the study approach, field sampling components, and data analysis of this study have been conducted and managed by Georgia Power Company's Environmental Services Group based at 5131 Maner Road in Smyrna, GA.

Field methods used in this study are based on widely accepted, standard scientific practices and stem from Georgia Power Company staff's previous experience in performing entrainment and impingement assessment studies following applicable EPA guidance.

Planning elements for this study include:

- review of historical and recent studies characterizing the fish community in the vicinity of the site and potential fish community impacts via Plant Vogtle Operations
- a sampling approach to support development of a scientifically valid estimate of impingement rate at Plant Vogtle
- an assessment of fish communities susceptible to impingement in the vicinity of the make-up water intake structure to include:
    - taxonomic identification of fish and their life stages to the lowest practical taxon
    - description of abundance and temporal/spatial characteristics
    - characterization of annual, seasonal, and diel variations in impingement rate
    - documentation of current impingement rates of all life stages of fish and shellfish at the facility
    - identification of any Federal and/or State protected species

The following sections provide a description of the Plant Vogtle Study Area, the make-up water intake structure (Section 2), methods (Section 3), description of available environmental parameters that may aid data interpretation (Section 4), and discussion of the study results including calculation of the annual impingement rate at Plant Vogtle (Section 5).

1.1 Study Objective

The objective of the impingement assessment study is to characterize the current impingement rate at Plant Vogtle Unit 1 & 2 make-up water intake structure and use that information to infer impingement rate for the similarly designed intake structure for the proposed Vogtle Units 3 & 4.

2. STUDY AREA DESCRIPTION

2.1 Environment

The Plant Vogtle Site is located at Savannah River Mile (RM) 150.9. The plant is located approximately 26 miles south-southeast of Augusta, in Burke County, Georgia (Figure 2-1) directly across the river from the Department of Energy's Savannah River Plant (SRP) property. The Savannah River, which provides the make-up-cooling water source for Plant Vogtle's cooling tower system, is a primary river that drains the eastern and western boundaries of Georgia and South Carolina, respectively. The Savannah River originates in the mountains of North Carolina, South Carolina, and Georgia and flows approximately 505 kilometers (km) to the Atlantic Ocean. The Savannah River in the vicinity of Plant Vogtle lies in the Coastal Plain physiographic province which is characterized by sandy or sandy loam soils with rolling hills and a mixed pine-hardwood vegetative association. The Savannah River upstream from the Plant Vogtle intake structure receives wastewater discharges from municipalities and industries. The river at the site is typical of large southeastern Coastal Plain rivers except that the channel was historically dredged and maintained by the Corps of Engineers (COE) so that it is highly channelized. Studies on the Savannah River have been conducted since 1951 (GPC 1984). In a recent publication by Marcy et al. 2005, *Fishes of the Middle Savannah River Basin*, the Savannah River was characterized as being high in fish diversity and home to at least 118 native fish species. The middle Savannah River in the vicinity of Plant Vogtle is home to at least 98 species of fish - fifteen of which are species introduced mostly for fisheries management purposes. Aquatic entrainment and impingement at Plant Vogtle was initially characterized in early siting studies of the mid-1970s and reported later in GPC's 1984 Operations Environmental Report for licensing of Plant Vogtle (GPC 1984).

The 1984 report of site studies performed during January through August of 1974 suggested that prevailing biological and physical factors combined with the low intake canal velocities would result in minimal entrainment of eggs and larvae and not have a significant effect on the fish population of the Savannah River.

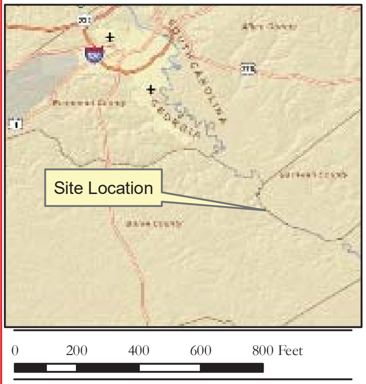
Vogtle I&E Sampling

Burke County

Figure 2-1 Sample Location Map

Legend

▭ GA Counties



Date: 09/08/2008
Scale: 1 : 4,800
Created by: B. Brinkman

2.2 Intake Canal and Structure

Among its major components, the Plant Vogtle river water intake system consists of the intake canal structure and make-up pumps. The intake canal is 356 feet (ft) long, 140 ft wide with an earthen bottom at 67 ft above mean sea level (msl), at the time it was constructed, and vertical steel sheet pile sides (canal walls) extending to 98 ft msl. The intake canal has a surface skimmer weir at about 78 ft msl with guide vanes at the river entrance. The skimmer weir consists of fixed and removable sections with the fixed sections having elevations less than 78 ft msl. A bottom canal weir is located approximately 100 ft from the mouth of the canal. Silting protection is provided by a sedimentation basin formed by the skimming weir and the canal weir. A floating trash boom is located in front of the skimmer weir to divert large floating debris (GPC 1984).

The component of river velocity parallel to the canal opening is small thus minimizing the potential for fish entering the canal. In addition, a lateral passageway is provided at the canal entrance which permits fish to escape (GPC 1984).

Flow through the intake canal is determined by plant operating conditions. Water velocities in the canal are also dependent on the river water level. Based on pre-construction engineering calculations summarized in GPC's 1984 Environmental Report, average velocity at the river intake canal was estimated as ranging from 0.01 ft/second (s) at minimum plant withdrawal rate of 13,000 gallons per minute (gpm) and a river water level of 98 msl (top of the canal sheet pilings) to a 1.05 ft/s at a maximum plant withdrawal rate (72,000 gpm) based on all four make-up water pumps running and a minimum river water level of 78.4 ft msl (allowing for a 2 ft degradation of river bed elevation) at a flow of 5,800 cubic ft/s (ft^3/s). At average plant operating conditions (42,000 gpm with two intake makeup water pumps operating) and annual water level (84 ft msl based on average river flow of 10,300 ft^3/s), the canal entrance velocity is 0.11 ft/s.

The intake structure is a 147 ft long, 72 ft wide concrete structure with four chambers, each housing one pump, a traveling water screen, a trash rack, stop logs, and screen wash discharge to a common pit with course-grated steel insert basket. The traveling screens are FMC type-45A (3/8 –inch size steel mesh of ASTM A36 structural steel shape) that currently are set to rotate one cycle every eight hours (hrs) or on a high screen differential of six inches of water at the low-setting rotation speed of five ft per minute (min). The velocities of water through the traveling screens at average annual water level (84.0 ft msl) is 0.69 ft/s and 0.82 ft/s with river level at minimum stage

(78.4 ft msl) (GPC 1984). Debris that collects on the screens is washed by water spray into the trash channel where it is sluiced into the trash basket. Screen wash water is returned via a drainage pipe from one corner of the trash pit and back into the intake structure of traveling screen unit no.1 (southernmost unit on the intake structure). The trash basket is emptied periodically and the contents are carried to a permitted offsite landfill.

2.3 Make-up Water Pumps

Four vertical pumps, each name-plate-rated at 22,000 gpm (or 15.84 million gallons per day [MGD]) are located in the river intake structure. The typical operating scenario utilizes two pumps. Total pumping rates can vary day to day based on operational needs. Pumping rates vary periodically due to make-up water needs based on cooling basin water levels. Also, periodically, cooling tower blow-down requires added dilution which requires increased pumping volumes for discharge compliance.

3. METHODS

Copies of template field data sheets used for impingement sampling are included in Appendix A.

3.1 Impingement Assessment

Screen wash from the intake structure traveling screen system was sampled for a period of one year at a rate of approximately once every two weeks during 10 March 2008 through 26 February 2009. One scheduled sampling event, 11-12 February 2009, was postponed one week due to a switch repair that affected the operation of the traveling screens.

Samples were collected with a PVC-frame mounted fabric insert net (6 ft x 6 ft x 6 ft mesh bag) that filters screen-wash water entering the screen wash pit. The collection net is constructed of ¼-inch nylon mesh netting in order to ensure collection of any organisms that would have been collected on the 3/8-in traveling screen. Each impingement sampling event represented a 24-hr collection period split into two approximately equal 12-hr samples (yielding a day vs. night sample for examination of diel attributes). The typical "day sample" was typically initiated at 0830 hrs and extended until 2030 hrs on day one and the "night sample" was started at 2030 hrs on the same day and ending the following morning at 0830 hrs.

Prior to each sampling event, all traveling screens were rotated for a complete rotational cycle as a means to purge the traveling screens before starting the actual sampling period. The screens travel at a rate of approximately 5 ft/min and the rotation speed was not changed during the study. Following the screen purge, the field crew manually installs the impingement sample insert net into the screen wash pit. The insert net is positioned, by means of tie-off ropes and the overlying safety handrail, under the screen wash discharge chute in order to capture any screen wash water during a given sample cycle. Once the actual sampling period was started, the traveling screens were allowed to rotate in the typical mode until the end of the 12-hr sample period.

Typically, two make-up water pumps operate at full capacity (22,000 gpm each) during each 24-hr impingement (and entrainment) sampling event. Twenty-four hours of pumping under the typical daily make-up water needs at Plant Vogtle during the study period equaled 63.36 MGD.

At the end of each 12-hr sample period, all operational traveling screens were rotated and washed, before retrieval of the insert sample net. The net was untied and its contents were manually lifted out of the wash pit. To collect an impingement sample, field personnel manually separated any fish and shellfish from organic debris collected in the insert net such as aquatic weed fragments, leaves, twigs, relict and sometime live shells of Asian clam (*Corbicula fulminea*). Sample organisms were then sorted by species and enumerated and reported in field data sheets for each collection period. All 24 planned impingement samples were collected and processed for inclusion in this report.

Sample processing followed a standard protocol. Once retrieved, all impinged fish were either preserved in formalin and transported to the lab for processing or were processed on site following each sample collection. During processing, impinged organisms were enumerated, weighed (grams) and total length (TL) measured to the nearest millimeter (mm). Data were recorded on field data sheets.

3.2 Calculation of Impingement Rate

Impingement rate for derived for species using the following equation:

$\sum E_i = R_i \times D_i$ where:

E_i = estimated number of fish impinged for time period i
R_i = average impingement rate per day for time period i
D_i = number of days that the sample represented

Time periods bracketed the interval between sampling events and collectively accounted for 12 months of plant operation. Time intervals used for extrapolation represented half-month sampling intervals. A 95-percent upper confidence limit was calculated and confidence intervals for individual species/taxa groups were extrapolated to yield an upper, annual impingement estimate based on the relative abundance of each species in the impingement sample.

3.3 Quality Assurance and Quality Control

Project quality assurance/quality control (QA/QC) procedures for this study followed established procedures for general field and laboratory studies conducted by Georgia Power's Environmental Laboratory (GPC, 2002). Each sampling event included senior technical involvement and preparation of trip reports summarizing field observations on the performance of the collection system including the sample collection, handling, processing, record keeping, any health and safety issues on site and communication with plant personnel.

3.4 Plant Operations and Environmental Parameters

Plant operational parameters were recorded at Plant Vogtle throughout the course of the study including intake make-up water flow rates and ambient and/or inlet water temperature. Environmental parameters such as river stage data and precipitation data were obtained from electronic sources. Appendix B contains tabular and/or graphical summaries of these supporting data.

3.4.1 Plant Operations

The frequency of power generation, and thus the frequency of make-up cooling water and pump flows at Plant Vogtle, is very stable. Although, each of the four make-up water intake pumps at Plant Vogtle are design-rated to pump 22,000 gpm (63.36 mgd or 240,000 m^3/day), actual pump flows through a given period of time can be affected by daily operational needs, periodic maintenance (outage), and to a minor degree, changes in flow head pressure due to fluctuations in river stage elevation. A summary of mean pumping rate per half-monthly sampling period is as recorded during the study period is shown in Table B-1, Appendix B.

3.4.2 Environmental Parameters

Table B-2 in Appendix B provides a summary of water quality parameters recorded during the source water study component. Water temperature data were collected through a variety of means during the study including manually recorded ambient river surface water temperatures via a multi-array Hydrolab water quality meter, and for the purpose of trend analysis electronic USGS daily water quality data records as available and applicable for the study area.

The river stage at Plant Vogtle changes constantly in response to regulated flow conditions from Corps of Engineers operations upstream and is influenced by local precipitation and/or riparian vegetation evapo-transpiration rates. Regional ambient air temperatures, river stage and discharge, and precipitation records were electronically obtained from the USGS Waynesboro gage (Station No. 021973269) and the University of Georgia weather monitoring net work (Figures B-1 through B-3; Appendix B).

4. RESULTS

4.1 Species Composition

A total of 21 taxa representing 10 taxonomic families were collected (Table 4-1). The impingement sample included 19 fish taxa and two crustaceans. Impinged fish species represented eight taxonomic fish families. The Centrarchidae (sunfishes) is the most speciose family represented in the impingement data with seven species. Twelve of the 21 species collected were represented by five or fewer individual specimens in the sample (Table C-1, Appendix C). One specimen each of three separate species including spottail shiner (*Notropis hudsonius*), chain pickerel (*Esox niger*), redbreast sunfish (*Lepomis auritus*) were observed in the screen wash basket prior to initiation of sampling events on 3 and 17 December 2008. Because it was not known exactly when those fish were impinged when captured, those fish were excluded from the annual estimate of impingement.

The potential for State or Federally-listed threatened or endangered fish species to occur in the Savannah River at Plant Vogtle was evaluated via desk top information review prior to study initiation. The U.S. Fish and Wildlife Region IV county by county database identified one fish species (shortnose sturgeon, *Acipenser brevirostrum*) as an endangered species that may occur in the region. Additionally, the State of Georgia lists three protected species of fish that may occur in the region of Plant Vogtle's intake including shortnose sturgeon, bluebarred pygmy sunfish, *Elassoma okatie*, and robust redhorse, *Moxostoma robustum.* No protected species were collected in the impingement study.

4.2 Relative Abundance and Biomass

A total of 168 organisms were collected from the impingement sample from March 2008 through February 2009 (Table C-1; Appendix C). The most abundant fish family was the Centrarchidae (sunfishes) accounting for 57.7 percent of the sample. The numerically dominant individual species was spotted sunfish (*Lepomis punctatus*) with 64 individuals (or 38.1 percent of the sample), followed in decreasing order or ranked abundance by hogchoker (*Trinectes maculatus*) (10.7 percent), white catfish (*Ameiurus catus*) (8.3 percent), and bluegill *(L. macrochirus*) (7.1 percent). The two crustaceans observed in impingement samples include three specimens of the common shore shrimp (*Paleomonetes pugio*) and 11 specimens of brushnose crayfish (*Procambarus pubescens*).

TABLE 4-1. CHECKLIST OF IMPINGED SPECIES COLLECTED AT PLANT VOGTLE, MARCH 2008 - FEBRUARY 2009

Families	Common Name*	Species	Common Name	Status
Aphredoderidae	Pirate Perch			
		Aphredodearous sayanus	pirate perch	Native
Astacidae	Crayfishes			
		Procambarus pubescens	brushnose crayfish	Native
Centrarchidae	Sunfishes			
		Enneacanthus gloriosus	bluespotted sunfish	Native
		Lepomis auritus	redbreast sunfish	Native
		Lepomis gulosus	warmouth	Native
		Lepomis macrochirus	bluegill	Native
		Lepomis marginatus	dollar sunfish	Native
		Lepomis punctatus	spotted sunfish	Native
		Pomoxis nigromaculatus	black crappie	Native
Clupeidae	Herrings			
		Dorosoma cepedianum	gizzard shad	Native
		Dorosoma petenense	threadfin shad	Native
Cyprinidae	Minnows			
		Cyprinell leedsi	bannerfin shiner	Native
		Notropis maculatus	taillight shiner	Native
Esocidae	Pikes			
		Esox niger	chain pickerel	Native
Ictaluridae	Catfishes			
		Ameiurus brunneus	snail bullhead	Native
		Ameiurus catus	white catfish	Native
		Ameiurus platycephalus	flat bullhead	Native
		Noturus leptacanthus	speckled madtom	Native
Palaemonidae	Shore Shrimps			
		Paleomonetes pugio	shore shrimp	Native
Percidae	Perches and Darters			
		Percina nigrofasciata	blackbanded darter	Native
Soleidae	Soles			
		Trinectes maculatus	hogchoker	Native

Notes:
* = Nomenclature by Page and Burr, 1991.

Total impinged biomass was 985.4 grams (g) (~2.2 pounds [lbs]). Sample biomass was dominated by the Centrarchidae (sunfish family) accounting for 42.0 percent of the impingement sample biomass. The single largest biomass contribution was attributed to black crappie (*Pomoxis nigromaculatus*) accounting for 28.7 percent of the sample. Among the crappie was a single large specimen, severely bodily damaged and missing tissue (implying morbidity prior to impingement) that accounted for 28.5 percent of the entire sample. Two gizzard shad (*Dorosoma cepedianum*), in the herring family, represented the second single largest biomass contribution representing 26.3 percent of the sample. The numerically most abundant specie, spotted sunfish accounted for 6.4 percent of the annual sample biomass. Seventeen of the 19 fish species each contributed less than 3.3 percent of the sample biomass (Table C-2; Appendix C).

4.3 Sample Population Size Distribution

Length distribution information for each impinged species is summarized in Table C-3, Appendix C. The minimum length recorded for any impinged organism was 17 mm (total length (spotted sunfish)) and the maximum length for any single species was 303 mm TL (gizzard shad). The mean length of all impinged organisms combined was 69 mm TL. Approximately 84 and 95 percent of all impinged organisms were less than 3 and 4 inches (76.2 and 101.6 mm) in total length, respectively. Overall, the size class data indicate that, except for gizzard shad, black crappie, pirate perch, and taillight shiner, primarily young of the year and juveniles were impinged at Plant Vogtle.

4.4 Temporal and Diel Distribution

Impingement sample abundance varied periodically during the study with three empirically observable nodes of higher impingement rate including late-July and mid-December (Table C-1, Appendix C). The single sampling event with the largest number of impinged organisms (33) occurred during the night sample of 17 December 2008. No organisms were collected during 16 of the 48 individual 12-hour sampling events. When removing the single large-bodied black crappie and gizzard shad as potential outlier data points, the period of early-November through early-January represented the period with the highest rate of impinged biomass (Table C-2, Appendix C).

Diel distribution of impingement at the Plant Vogtle intake was determined through examination of approximate 12-hr daytime and nighttime samples. Overall, to date, 56.9 percent of impinged organisms were collected during nighttime periods (Table C-1; Appendix C); whereas, 68.6 percent of impinged biomass was collected at night.

Although no statistically significant relationship was found, sampling events yielding the highest impingement rate appeared to be empirically related to incidences of higher river flow. This likely indicates increased vulnerability of fish to impingement during instances of elevated river stage as fish mobility changes in response to change in stage and flow.

4.5 Sample Disposition

The disposition or condition of each specimen was recorded in field data sheets based on the field samplers observations. Specimen condition was coded at the time of impingement sample collection based on the following descriptors.

Code	Condition Description
L	alive
R	recently moribund; in visually good body, gill, and eye condition
R1	recently moribund with body, gills, and or eyes mildly necrotized
D	deceased with obvious signs of body tissue and/or gill necrosis
M	deceased with necrotic and missing tissues

Of the 168 specimens collected in the study, 60 percent were observed as recently moribund but otherwise exhibiting good body condition. This indicated that those specimens may have suffered mortality after impingement and possibly after landing in the insert net. Twenty-six percent of the sample was alive during examination of the sample in the field. R specimens showed obvious post-mortem signs and accounted for about 11 percent of the sample. Other specimens, accounting for the remaining three percent of the sample, were either coded D or R1.

4.6 Impingement Rate

As shown in Table C-4, Appendix C, based on 168 organisms collected in the impingement sample, the estimated annual impingement rate is 2,580 organisms. Fish comprised 91.6 percent (2,365) of the estimate and crustaceans comprised the remainder. At the 95-percent upper confidence limit (UCL), annual impingement may range up to 3,229 organisms. Table C-5, Appendix C presents actual vs. calculated annual biomass impingement. Actual biomass of impinged organisms during the study to date was 985.4 g (~2.2 lbs). Accounting for all impinged organisms encountered in the sample, calculated annual biomass impingement rate is 15,028 g (33.1 lbs). At the

95-percent UCL, the annual rate of biomass impingement may range up to 18,692 g (or 41.2 lbs).

Three species including black crappie, hogchoker, and gizzard shad accounted for 73.8 percent of impinged biomass. A single large specimen each of black crappie and gizzard shad accounted for 45.2 percent of the annual impingement biomass. At the time of collection, those specimens were observed in states of relatively advanced decay indicating mortality before becoming impinged unlike the vast majority of other specimens collected during the study. Accounting for the single specimens of crappie and gizzard shad that are believed to have deceased before being impinged, the biomass estimate could be conservatively overestimated as much as 45.2 percent. Assuming this observation to be reasonable, the revised annual rate of impinged biomass would be 8,271 g (~18.2 lbs). At the 95% UCL, this revised, annual biomass estimate would range up to 10,021 g or about 22.1 lbs.

In summary, the study result demonstrated that annual impingement at the Vogtle Units 1&2 intake could affect up to 3,229 organisms weighing between 18.2 to 41.2 lbs.

5. OPERATIONAL AND ENVIRONMENTAL PARAMETERS

5.1 Operational Parameters

Plant Vogtle conducted make-up water pumping through its intake structure throughout the entire study period. Copies of operational reports showing daily recorded make-up water pumping are included in Appendix B. Mean daily make-up water pumping rate during the study period was approximately 63.1 mgd (or 238.9 m^3). At the time of this report preparation, daily cooling water intake flows for February 2009 were unavailable. For the purpose of calculation, intake flows during February were assumed to be typical near 63.36 MGD.

Owing to routine maintenance issues, all four screens were operational during 15 of the 20 sampling events. At least three screens were always operational during other events. An intake pump located behind an out of service traveling screen was not operated until the traveling screen was repaired and placed back into service.

5.2 Environmental Parameters

Water quality data were recorded by the field crew during each field sampling event (Table B-2, Appendix B). Surface water temperature ranged from 12.0 to 29.1°C. The pH (standard units) varied from 6.7 to 8.4. Specific conductance ranged from

103.4 to 140.1 uS/cm with the highest measurements recorded at the end of the sampling period. Dissolved oxygen ranged from 6.7 to 9.0 mg/L consistent with inverse response to increasing water temperature. Turbidity ranged from 0 to 6.4 NTUs varying with precipitation.

Regional daily minimum air temperature ranged from -7.6 to 38.1° C based on the Midville, Georgia weather monitoring station (Figure B-1, Appendix B). River stage ranged from 5.9 to 11.7 ft (USGS Waynesboro Gage Station) with a daily mean stage of 6.8 ft. River flow ranged from 3,760 to 16,300 cfs with a daily mean of 4,728 cfs. River stage data exhibited relatively steady flow with seasonal highs in early spring and mid-winter (Figure B-2, Appendix B). Daily precipitation throughout the study period ranged from 0 to 1.9 inches with mean daily rainfall of 0.11 inches (Figure B-3, Appendix B) characteristic of severe drought conditions for the second consecutive year in the region.

Daily impingement rate was statistically regressed against these environmental variables. No significant correlation relationship was found between impingement and trends in air temperature, water temperature, precipitation, or river stage.

6. SUMMARY AND DISCUSSION

The year-long impingement study of Plant Vogtle's make-up water intake structure was conducted bi-weekly by GPC environmental field services staff during March 2008 through February 2009.

No statistically significant relationship was found between variation in rates of pumping, precipitation, diel change or temperature. Sampling events yielding the highest impingement rates appeared to be empirically related to incidences of higher river flow. This may be indicative of increased vulnerability to impingement for certain species via behavioral attributes (increased mobility) along shoreline habitats during those periods.

A total of 168 aquatic organisms were impinged during the study. The sample was comprised of 21 taxa including 19 fish taxa and two decapod crustaceans. Sunfishes were the most abundant group impinged. Spotted sunfish and hogchoker were the most abundant individual species impinged. No organisms were impinged in 16 of the 40 sampling events. Size class data for impinged species indicate that except for gizzard shad, black crappie, taillight shiner and pirate perch, primarily young of the year and juvenile life stages were impinged at Plant Vogtle.

Impinged biomass weighed 985.4 g (~2.2 lbs) and was dominated by the sunfishes with 57.7 percent of the total biomass. A single large specimen of black crappie and gizzard shad accounted for the majority of impingement biomass. Both specimens were noted as being in states of relatively advanced decay indicating those specimens were likely deceased before becoming impinged unlike the vast majority of other specimens collected during the study.

The 2008 study indicates that fish impingement rate at Plant Vogtle's intake is very low. When extrapolated to simulate 365 days of cooling-water withdrawal, annual impingement rate is estimated as 2,580 organisms with a biomass of 33.1 lbs (or 3,229 fish weighing 41.2 lbs at the 95% UCL). When doubled to estimate the potential effect of Units 3&4 in combination with Units 1&2, the annual impingement estimate would be 5,160 fish weighing up to 66.2 lbs (or 6,458 fish weighing up to 82.4 lbs the 95% UCL).

Approximately 84 percent of fish encountered at the intake structure were juvenile life stages (sub-stock size) of relatively common, non-protected species of the type mostly not sought after by anglers. As juveniles, a large portion of fish observed in the sample would otherwise be expected to likely suffer natural mortality effects before reaching maturity in the wild.

To add perspective on the numbers of estimated impingement rate, the adjacent Savannah River Plant (SRP), prior to shutdown of reactors L, K, and P, based on bi-weekly sampling, impinged an average of 2,680 fish per year including 35 species in 1977 and average of 7,603 fish per year including up to 62 species during 1983 -1985 (in Kilgo, et al. 2005; USDOE 1987). This impingement average for SRP's operations was obviously more than the estimated for Plant Vogtle's combined Units 1 through 4. The USDOE report of 1987 concluded that the reported levels of impingement did not appear to have a significant impact on the Savannah River fisheries.

As an example for understanding the level of impact of biomass impingement at Vogtle, SRP reported in its 1992 midyear health physics meeting, that the 1988 angler sport fish harvest from the Savannah River was approximately 152,000 lbs of fish. The Georgia and South Carolina commercial fish catch from the Savannah River for 1989 additionally reported of 12,081 lbs consisting primarily of carp, sturgeon, and catfish. Assuming these numbers to be reasonably representative of recreational and commercial harvest then and since then, any impact from estimated annual impingement at Plant Vogtle Units 1-4 appears at a level that poses no significant consequence to those important components of the Savannah River Fishery or overall.

The SRP report of 1992 further reported no significant changes in aquatic populations that one might reasonably attribute to a cooling water system at Vogtle had been observed in periodic biological surveys of the river by DOE contractors at the Savannah River Site, the Georgia and South Carolina departments of natural resources, other agencies or universities.

Further, the Savannah River fishery receives management attention from the Georgia Department of Natural Resources (GDNR) which results in an annually-published fishing prospects report. The angling prospects are compiled by fisheries biologists based on river sampling efforts of GDNR, *knowledge of past fishing trends,* angling experience, and information provided by anglers and marina owners. Information in the following narrative was generated from GDNR's 2009 website.

In its Savannah River 2009 fishing prospects report for the Savannah River downstream of the New Savannah Bluff Lock and Dam, GDNR indicated that bluegill and redear sunfish are abundant. Redbreast (sunfish) and other sunfishes also are present, but not as plentiful as bluegill or readear. The largemouth bass population continues to be healthy in this system. Drought conditions have contributed to slightly slower growth rates over the last few years, but good numbers of large fish are still present. Fishing should be good this spring as water temperatures rise and water levels fall. Fishing for catfish is excellent in the Savannah River. White catfish make up the majority of catfish species, but channel catfish tend to be a bit larger. Since 2005, stripers greater than 27 inches have been open to harvest with a daily limit of two per angler. The number of striped bass and the number of legal-size fish have rebounded thanks to the stocking program that began in the 1990s. Twenty-pound striped bass are common and the occasional 40- to 50-pound striper is reported (GDNR, 2009).

To capture these points of perspective in summary, the Savannah River downstream of Augusta appears to sustain among its multiple uses a healthy, desirable fishery in the face of operation of the Vogtle facility since it began operations in the mid-1980's as well as any past effects of cooling water withdrawals from SRP operations during the 1950's through 1980's. The 2008-2009 impingement study indicates that impingement effect at the Plant Vogtle make-up water intake structure is minimal and, when projected in combination with impingement effects from Units 3&4, likely poses no significant impact to the Savannah River fishery in the greater Savannah River system downstream of Augusta or the Middle Savannah Basin.

7. REFERENCES

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Kilgo, J.C, J.I. Blake, and H.R. Pulliam. 2005. Ecology and Management of a Forested Landscape: Fifty Years on the Savannah River Site. Island Press, ISBN 1597260118, 9781597260114, 479 pp.

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USDOE. 1987. Impingement and entrainment at the river water intakes of the Savannah River. U.S. Department of Energy, Savannah River Operations Office, Aiken, South Carolina.

APPENDIX A

Field Data Sheet Templates

FIGURE A-1 PLANT VOGTLE IMPINGEMENT MONITORING DATA FORM

Sample Information **Page:______ of ______**

Collector(s): ____________________________

Remarks: ____________________

12-hour Period (circle)			**DAY**	**NIGHT**		
Start Date		**Time**				
End Date		**Time**				
		Elapsed Time				

Plant and CWIS Operating Conditions

	No. Pumps	**Pump Flow (gpm)**		**No. of VTS Operating**
Start				
Finish				

	River Stage (ft.)
Start	
Finish	

Physicochemical parameters:

D.O.		mg/L
pH		SU
Cond.		uS/cm
Turbidity		NTU

Water Temperature (°C)	
Start	
Finish	

Location of Measurement: ____________________

Field Conditions/Other Observations

FIGURE A-2. PLANT VOGTLE IMPINGEMENT MONITORING DATA FORM

Sample Information

Collector(s): ______________________ **Page:**___ **of**___

12-hour Period (circle) **DAY** **NIGHT**

Start Date ☐ **Time** ☐

End Date ☐ **Time** ☐

Elapsed Time ☐

Species	TL (mm)	Weight (g)	Condition/Comment	Voucher?	Final ID

FIGURE A-3. Vogtle I & E Study Sample Chain Of Custody

Collected by:___________________________

Sample No.	Integrated Sample ID and Collection Date	Approximate Time of Collection	Preservative	Shipped to taxonomy lab	Archived at GPC Smyrna
		~0000 HRs	5% formalin or 10% formalin Wet Ice	√	√
1	ENLD1A				
2	ENLD2A				
3	ENLDCOMP				
4	ENLN1A				
5	ENLN2A				
6	ENLNCOMP				
7	IMDA				
8	IMNA				
9	SWLD1A				
10	SWLD2A				
11	SWLDCOMP				
12	SWMD1A				
13	SWMD2A				
14	SWMDCOMP				
15	SWRD1A				
16	SWRD2A				
17	SWRDCOMP				
18	SWLN1A				
19	SWLN2A				
20	SWLNCOMP				
21	SWMN1A				
22	SWMN2A				
23	SWMNCOMP				
24	SWRN1A				
25	SWRN2A				
26	SWRNCOMP				
27					
28					
29					
30					

EN = entrainment sample	D1 = first day sample	C = composited 1st and 2nd day or night samples
IM = impingement sample	N2 = second night sample	
SW = source water sample	A = archived 6-hour sample	

Relinquished by:_____________________________ Date:_____________ Time:____________

Received by:________________________________ Date: _____________ Time:___________

LAB7600

APPENDIX B

Summaries of Operational and Environmental Parameters

Figure B-1
Daily Minimum and Maximum Air Temperatures Recorded at the Midville, GA, Burke County, Weather Station

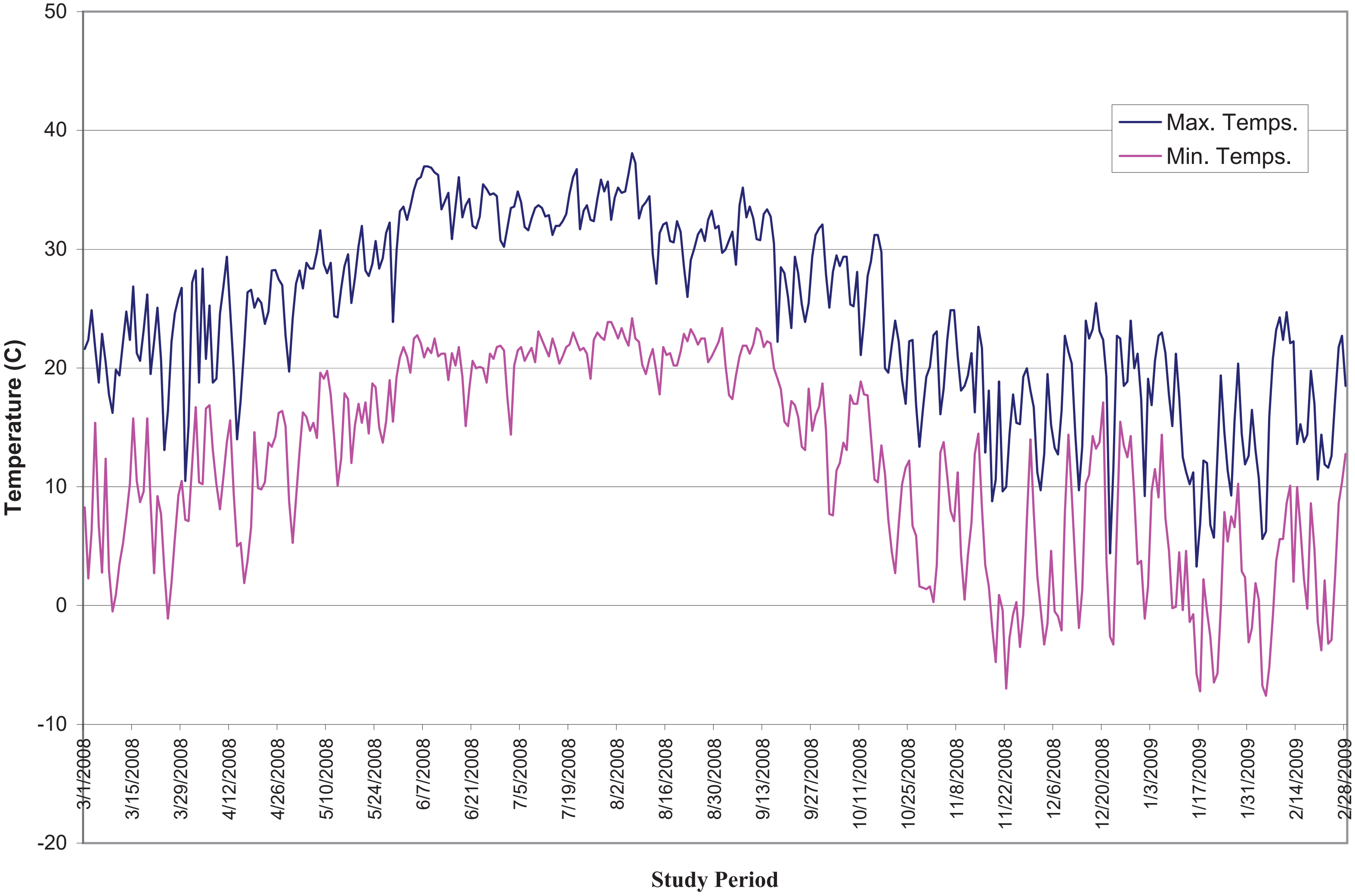

Figure B-2
Savannah River Daily Average Flow (cfs)

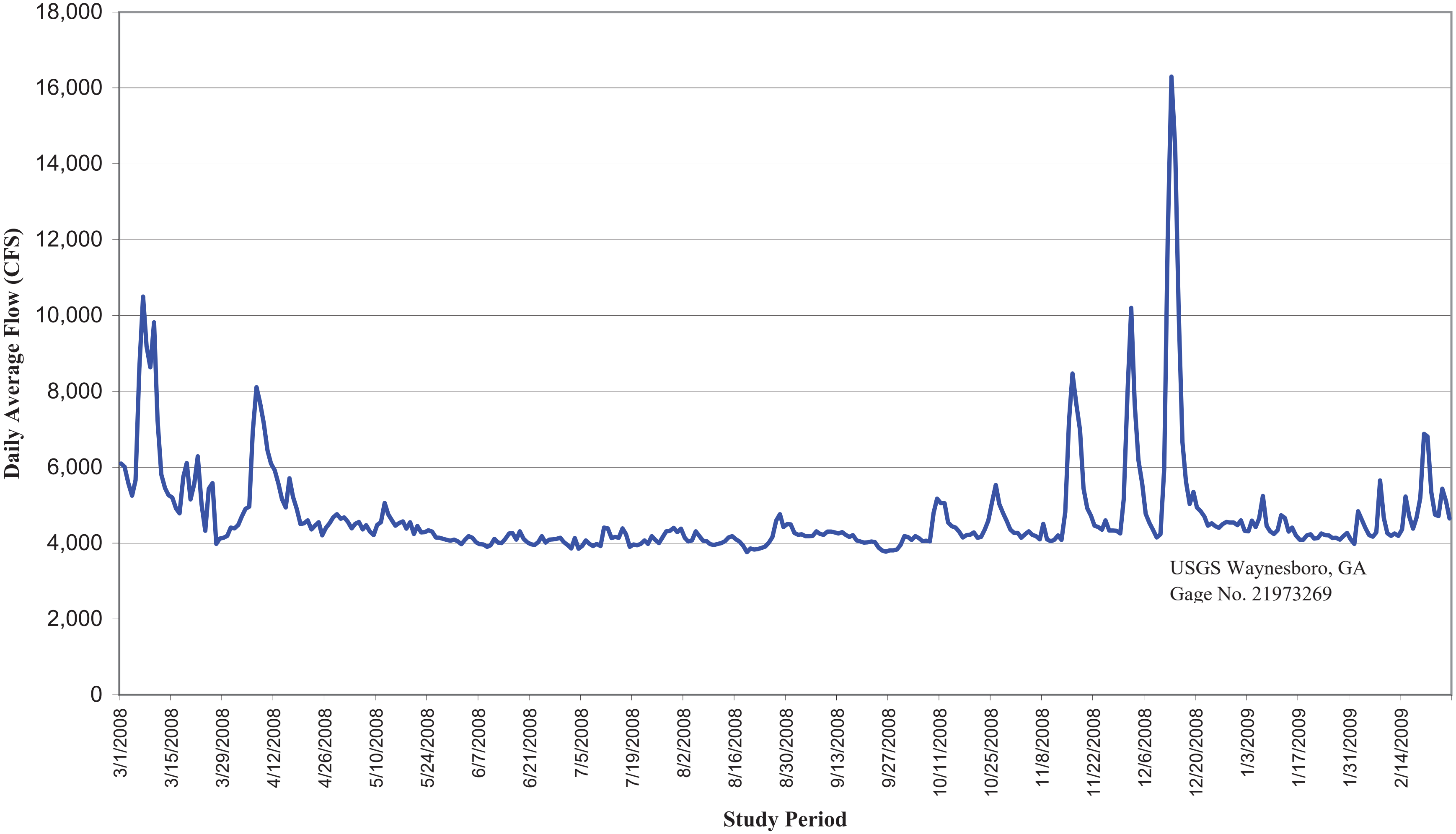

Figure B-3
Daily Precipitation, Midville, Burke County,GA

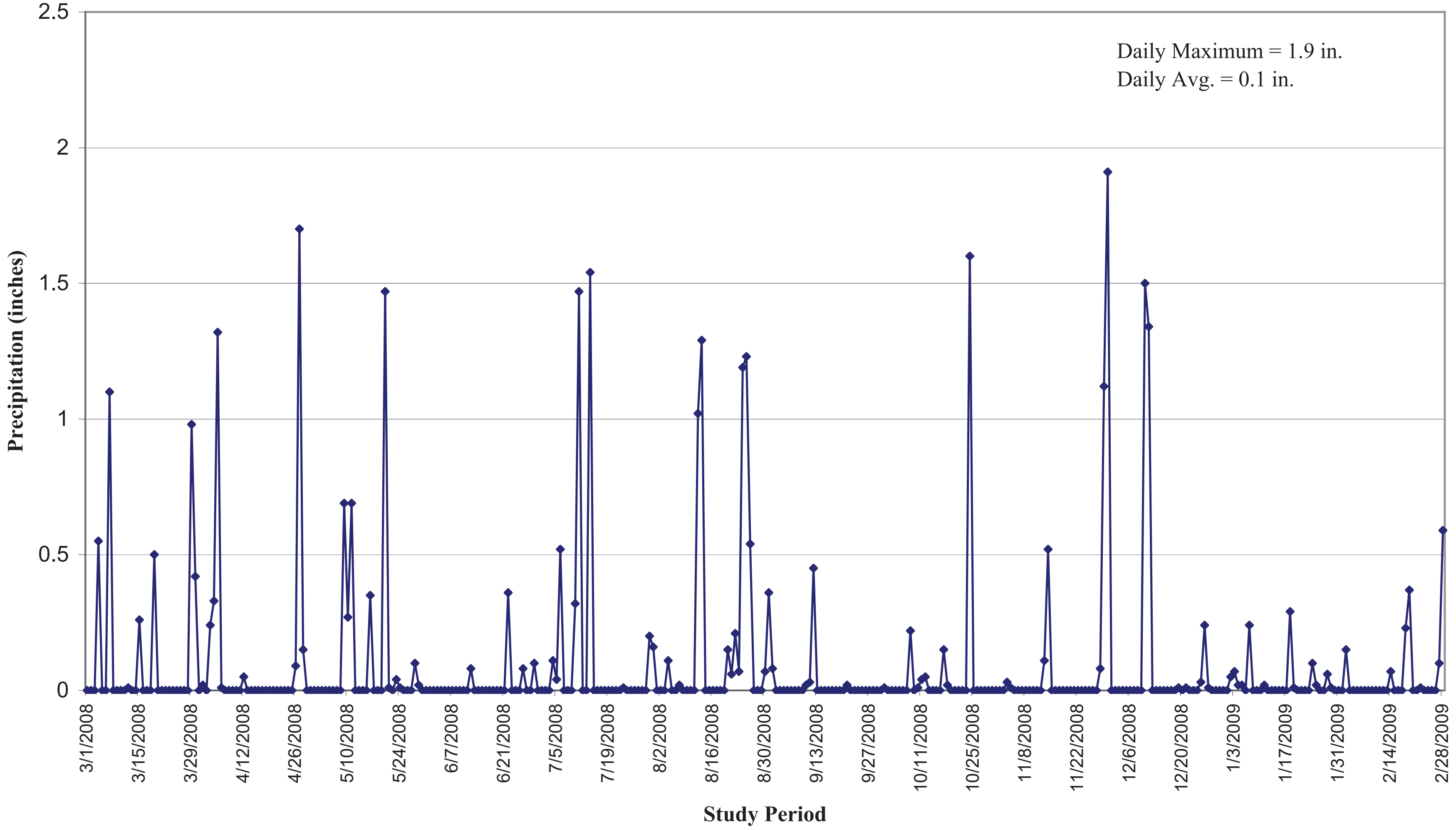

TABLE B-1. SUMMARY OF HALF-MONTHLY MAKE-UP WATER INTAKE PUMPING VOLUMES AT PLANT VOGTLE, MARCH 2008 - FEBRUARY 2009

Sample Period	Daily Average Pump Volume (MGD)[1]
early March 2008	61.1
late March 2008	61.4
early April 2008	63.4
late April 2008	63.4
early May 2008	61.9
late May 2008	62.2
early June 2008	64.3
late June 2008	63.4
early July 2008	62.8
late July 2008	70.7
early August 2008	61.4
late August 2008	61.4
early September 2008	69.3
late September 2008	63.4
early October 2008	61.3
late October 2008	61.4
early November 2008	63.4
late November 2008	64.4
early December 2008	62.0
late December 2008	62.0
early January 2009	61.8
late January 2009	60.0
early February 2009	--
late February 2009	--

Notes:

1 = MGD - million gallons per day

* = February data not available at time of report preparation. Pump Volume assumed to equal name-plate rated pumping capacity.

TABLE B-2. SUMMARY OF PHYSICOCHEMICAL WATER QUALITY MEASUREMENTS COLLECTED DURING THE IMPINGEMENT AND ENTRAINMENT STUDY AT PLANT VOGTLE, MARCH 2008 - FEBRUARY 2009

	Event	Mean Water Temperature (°c)	pH (SU)	Conductivity (uS/cm)	Disolved Oxygen (mg/L)	Turbidity (NTU)
Entrainment, Source Water and Impingement Sampling	10-12 March 2008	12.5	7.4	123.0	8.5	--
	17-19 March 2008	15.5	7.0	103.4	8.8	0.8
	8-10 April 2008	17.0	6.7	118.0	8.2	0.8
	22-24 April 2008	18.4	7.1	113.4	9.0	0.0
	6-8 May 2008	22.4	7.2	121.1	7.7	0.0
	20-22 May 2008	22.7	7.1	106.2	7.2	6.4
	10-12 June 2008	28.6	8.0	128.5	7.2	0.0
	24-25 June 2008	27.0	8.2	127.5	7.4	0.0
	15-16 July 2008	26.5	7.2	130.5	6.7	0.3
	29-30 July 2008	27.6	8.4	140.1	6.9	0.0
Impingement Sampling Only	11-12 August 2008	29.1	--	--	--	--
	25-26 August 2008	28.0	--	--	--	--
	9-11 September 2008	27.5	--	--	--	--
	24-25 September 2008	24.0	--	--	--	--
	7-8 October 2008	22.5	--	--	--	--
	22-23 October 2008	18.3	--	--	--	--
	5-6 November 2008	17.3	--	--	--	--
	19-20 November 2008	13.5	--	--	--	--
	3-4 December 20008	12.5	--	--	--	--
	17-18 December 2008	13.0	--	--	--	--
	6-7 January 2009	14.0	--	--	--	--
	21-21 January 2009	12.0	--	--	--	--
	17-18 February 2009	13.0	--	--	--	--
	25-26 February 2009	14.0	--	--	--	--

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:
	Water Source: Savannah River	Water Source:	Water Source:	Water Source:	Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	58.83				
14	63.07				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	63.36				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
31	63.36				
Total (MG)*	1959.34				
Average (MGD)**	63.20				
Max Day (MG)*	63.36				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: **March**

Year: **2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 4-2-9 Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	63.36				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	63.36				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
Total (MG)*	1900.8				
Average (MGD)**	63.36				
Max Day (MG)*	63.36				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: **April**

Year: **2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

5-2-08
Signature Date
for
Clif Buck
Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs

(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values In Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:
	Water Source: Savannah River	Water Source:	Water Source:	Water Source:	Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	71.24				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	63.36				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	76.89				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
31	63.36				
Total (MG)*	1985.57				
Average (MGD)**	64.05				
Max Day (MG)*	76.89				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: May

Year: 2008

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 6-6-08 Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	66.40				
5	73.30				
6	64.06				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	63.36				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	63.36				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
Total (MG)*	1914.48				
Average (MGD)**	63.82				
Max Day (MG)*	73.30				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: **June**

Year: **2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

7-10-08 ~~6/18~~ SAV
Signature Date

Stan Varnum for Clif Buck
Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	73.15				
12	63.36				
13	63.36				
14	75.61				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	75.35				
20	74.76				
21	70.62				
22	75.94				
23	75.31				
24	75.39				
25	71.04				
26	71.70				
27	76.47				
28	72.20				
29	76.27				
30	63.36				
31	63.36				
Total (MG)*	2104.29				
Average (MGD)**	67.88				
Max Day (MG)*	76.47				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: July

Year: 2008

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 8/5/08 Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.51				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	63.36				
8	63.36				
9	71.39				
10	63.36				
11	69.94				
12	75.24				
13	64.04				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.40				
19	63.36				
20	73.50				
21	63.47				
22	63.36				
23	63.45				
24	63.36				
25	72.71				
26	70.71				
27	63.36				
28	63.45				
29	63.36				
30	72.20				
31	63.36				
Total (MG)*	2027.49				
Average (MGD)**	65.40				
Max Day (MG)*	75.24				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: **August**

Year: **2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 9/3/08 Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs

(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:
	Water Source: Savannah River	Water Source:	Water Source:	Water Source:	Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	76.36				
4	76.80				
5	63.36				
6	72.82				
7	63.40				
8	68.60				
9	63.36				
10	75.17				
11	73.48				
12	77.04				
13	75.31				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	63.36				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
Total (MG)*	1989.54				
Average (MGD)**	66.32				
Max Day (MG)*	77.04				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #:	SIC 4911
Month:	**September**
Year:	**2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 10/8/08 Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:
	Water Source: Savannah River	Water Source:	Water Source:	Water Source:	Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	62.77				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	63.36				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	63.36				
25	63.36				
26	63.36				
27	63.38				
28	63.36				
29	63.36				
30	63.36				
31	63.36				
Total (MG)*	1963.59				
Average (MGD)**	63.34				
Max Day (MG)*	63.38				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: **October**

Year: **2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 11/5/08 Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs

(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	63.36				
14	63.36				
15	63.36				
16	63.36				
17	63.38				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	63.45				
25	63.36				
26	71.94				
27	64.33				
28	69.48				
29	63.36				
30	63.36				
Total (MG)*	1916.58				
Average (MGD)**	63.89				
Max Day (MG)*	71.94				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: **November**

Year: **2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

12/4/08
Signature Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	66.35				
13	70.25				
14	63.36				
15	63.43				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.40				
23	63.36				
24	63.36				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	73.37				
30	63.36				
31	63.36				
Total (MG)*	1984.16				
Average (MGD)**	64.01				
Max Day (MG)*	73.37				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: December

Year: 2008

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 1-7-~~08~~09 CB
Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.40				
5	63.36				
6	63.36				
7	63.36				
8	69.92				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	63.36				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.45				
20	63.36				
21	63.36				
22	63.36				
23	72.84				
24	63.36				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
31	63.36				
Total (MG)*	1980.33				
Average (MGD)**	63.88				
Max Day (MG)*	72.84				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: **January**

Year: **2009**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 2-5-09
Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

APPENDIX C

Impingement Sampling Results

TABLE C-1. SUMMARY BY SAMPLE DATE OF ORGANISMS IMPINGED AT PLANT VOGTLE, MARCH 2008 - FEBRUARY 2009

Species Name	3/11/2008 -Day	3/12/2008 - Night	3/26/2008 - Day	3/27/2008 - Night	4/9/2008 - Day	4/10/2008 - Night	4/23/2008 - Day	4/24/2008 - Night	5/7/2008 - Day	5/8/2008 - Night	5/21/2008 - Day	5/22/2008 - Night	6/11/2008 - Day	6/12/2008 - Night	6/25/2005 - Day	6/26/2005 - Night	7/15/2008 - Day	7/16/2008 - Night	7/29/2008 - Day	7/30/2008 - Night	8/11/2008 - Night	8/12/2008 - Day	8/25/2008 - Night	8/26/2008 - Day	9/10/2008 - Night	9/11/2008 - Day	9/24/2008 - Night	9/25/2008 - Day	10/7/2008 - Night	10/8/2008 - Day	10/22/08 - Night	10/23/08 - Day	11/5/2008 - Night	11/6/08 - Day	11/19/2008 - Night	11/6/08 - Day	12/3/08 - Night	12/4/08 - Day	12/17/08 - Night	12/18/08 - Day	1/6/09 - Night	1/7/09 - Day	1/21/09 - Night	1/22/09 - Night	2/17/09 - Night	2/18/09 - Day	2/25/09 - Night	2/26/09 - Day	Number	% of Total
bannerfin shiner																																						1											**1**	*0.6%*
black crappie						1																																		1									**2**	*1.2%*
blackbanded darter		1																							1														1										**3**	*1.8%*
bluegill		2			1	2																																	3	4									**12**	*7.1%*
bluespotted sunfish										1																									1														**2**	*1.2%*
chain pickerel					1																																												**1**	*0.6%*
brushnose crayfish																			2	1						2											3			1			1		1				**11**	*6.5%*
dollar sunfish					1																																												**1**	*0.6%*
flat bullhead																								1																									**1**	*0.6%*
gizzard shad												1																														1							**2**	*1.2%*
hogchoker		1				1						1		1			1												1					1	3	4			2	1		1							**18**	*10.7%*
pirate perch										1					1						1	1															1		1										**6**	*3.6%*
redbreast sunfish																																			1				10										**11**	*6.5%*
shore shrimp					1										1																																	1	**3**	*1.8%*
snail bullhead															1			1		2	1																											1	**6**	*3.6%*
speckled madtom																																					1			1									**2**	*1.2%*
spotted sunfish	1	3													1		1		3	4	1	1	1	1											1		8	1	15	19		1	2						**64**	*38.1%*
taillight shiner	1																																																**1**	*0.6%*
threadfin shad	1	1																																															**2**	*1.2%*
warmouth						1																1																		1	2								**5**	*3.0%*
white catfish	1														1		4	1		4				1							1								1										**14**	*8.3%*
TOTALS	**4**	**8**	**0**	**0**	**4**	**5**	**0**	**0**	**0**	**2**	**0**	**2**	**0**	**1**	**5**	**0**	**6**	**2**	**5**	**11**	**3**	**3**	**1**	**3**	**1**	**2**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**6**	**4**	**13**	**2**	**33**	**28**	**2**	**3**	**3**	**0**	**1**	**0**	**0**	**2**	**168**	*100.0%*

TABLE C-2. SUMMARY OF IMPINGMED BIOMASS BY SPECIES AND SAMPLE DATE, PLANT VOGTLE, MARCH 2008 - FEBRUARY 2009

SpeciesName	3/11/2008 -Day	3/12/2008 - Night	3/26/2008 - Day	3/27/2008 - Night	4/9/2008 - Day	4/10/2008 - Night	4/23/2008 - Day	4/24/2008 - Night	5/7/2008 - Day	5/8/2008 - Night	5/21/2008 - Day	5/22/2008 - Night	6/11/2008 - Day	6/12/2008 - Night	6/25/2005 - Day	6/26/2005 - Night	7/15/2008 - Day	7/16/2008 - Night	7/29/2008 - Day	7/30/2008 - Night	8/11/2008 - Night	8/12/2008 - Day	8/25/2008 - Night	8/26/2008 - Day	9/10/2008 - Night	9/11/2008 - Day	9/24/2008 - Night	9/25/2008 - Day	10/7/2008 - Night	10/8/2008 - Day	10/22/2008 - Night	10/232/08 - Day	11/5/08 - Night	11/6/08 - Day	11/19/08 - Night	11/20/08 - Day	12/3/08 - Night	12/4/08 - Day	12/17/08 - Night	12/18/08 - Day	1/6/09 - Night	1/7/09 - Day	1/21/09 - Night	1/22/09 - Day	2/17/09 - Night	2/18/09 - Day	2/25/09 - Night	2/26/09 - Day	**Number**	*% of Total*
bannerfin shiner																																						1.3											**1.3**	*0.1%*
black crappie						281.0																																		2.2									**283.2**	*28.7%*
blackbanded darter		2.0																							1.4														3.8										**7.2**	*0.7%*
bluegill		1.0			0.4	1.2																																	3.6	3.2									**9.4**	*1.0%*
bluespotted sunfish										0.4																									1.0														**1.4**	*0.1%*
chain pickerel					1.2																																												**1.2**	*0.1%*
brushnose crayfish																			4.2	1.1						3.5											18.1			0.4			1.4		3.0				**31.7**	*3.2%*
dollar sunfish					10.5																																												**10.5**	*1.1%*
flat bullhead																								0.7																									**0.7**	*0.1%*
gizzard shad												164.0																														94.7							**258.7**	*26.3%*
hogchoker		8.0				17.8						0.6		9.0			2.8												0.5					27.0	31.0	56.5			8.4	10.1		14.0							**185.7**	*18.8%*
pirate perch										0.5					0.5						1.4	1.4															5.1		3.0										**11.9**	*1.2%*
redbreast sunfish																																			1.3				24.8										**26.1**	*2.6%*
shore shrimp					0.3										0.4																																	0.1	**0.8**	*0.1%*
snail bullhead															1.2			2.6		7.8	2.8																											4.1	**18.5**	*1.9%*
speckled madtom																																					0.7			0.3									**1.0**	*0.1%*
spotted sunfish	0.5	1.5													0.6		0.6		1.1	2.5	0.1	0.9	0.1	1.0											1.0		10.3	1.0	24.0	16.9		0.3	1.2						**63.6**	*6.4%*
taillight shiner	0.5																																																**0.5**	*0.1%*
threadfin shad	18.0	11.0																																															**29.0**	*2.9%*
warmouth						1.1																7.8																		9.4	1.4								**19.7**	*2.0%*
white catfish	0.5														0.5		4.1	1.5		5.2				4.9							3.0								3.7										**23.4**	*2.4%*
TOTALS	**19.5**	**23.5**	**0.0**	**0.0**	**12.4**	**301.1**	**0.0**	**0.0**	**0.0**	**0.9**	**0.0**	**164.6**	**0.0**	**9.0**	**3.2**	**0.0**	**7.5**	**4.1**	**5.3**	**16.5**	**4.3**	**10.1**	**0.1**	**6.6**	**1.4**	**3.5**	**0.0**	**0.0**	**0.5**	**0.0**	**3.0**	**0.0**	**0.0**	**27.0**	**34.3**	**56.5**	**34.2**	**2.3**	**71.3**	**42.5**	**1.4**	**109.0**	**2.6**	**0.0**	**3.0**	**0.0**	**0.0**	**4.2**	**985.4**	*100.0%*

TABLE C-3. LENGTH CHARACTERISTICS OF ORGANISMS IMPINGED AT THE PLANT VOGTLE INTAKE, MARCH 2008 - FEBRUARY 2009

		Total Length (mm)		
Species	**Number (N)**	**Minimum**	**Average**	**Maximum**
bannerfin shiner	**1**	57	57	57
black crappie	**2**	62	136.5	211
blackbanded darter	**3**	57	65.3	77
bluegill	**12**	25	38.9	53
bluespotted sunfish	**2**	30	34	38
chain pickerel	**1**	55	55	55
brushnose crayfish	**11**	33	53.3	78
dollar sunfish	**1**	82	82	82
flat bullhead	**1**	46	46	46
gizzard shad	**2**	234	268.5	303
hogchoker	**18**	32	72.7	106
pirate perch	**6**	28	49.8	68
redbreast sunfish	**11**	31	48.9	82
shore shrimp	**3**	38	39.0	40
snail bullhead	**6**	50	63.7	80
speckled madtom	**2**	27	33	39
spotted sunfish	**64**	17	38.3	63
taillight shiner	**1**	38	38	38
threadfin shad	**2**	114	120.5	127
warmouth	**5**	30	56.4	87
white catfish	**14**	28	51.9	78
Means		**53.0**	**69.0**	**86.1**

TABLE C-4. ANNUAL IMPINGEMENT AT PLANT VOGTLE, DATA COLLECTED PLANT VOGTLE INTAKE DURING MARCH 2008 - FEBRUARY 2009

Common Name	Annual Impingement		Actual Number of Organisms Impinged, Mar 08 - Feb 09
	Cumulative Estimate	Upper Confidence Limit (1)	
bannerfin shiner	15	19	1
black crappie	31	38	2
blackbanded darter	46	58	3
bluegill	184	231	12
bluespotted sunfish	31	38	2
chain pickerel	15	19	1
brushnose crayfish	169	211	11
dollar sunfish	15	19	1
flat bullhead	15	19	1
gizzard shad	31	38	2
hogchoker	276	346	18
pirate perch	92	115	6
redbreast sunfish	169	211	11
shore shrimp	46	58	3
snail bullhead	92	115	6
speckled madtom	31	38	2
spotted sunfish	983	1,230	64
taillight shiner	15	19	1
threadfin shad	31	38	2
warmouth	77	96	5
white catfish	215	269	14
TOTAL	**2,580**	**3,229**	**168**

Notes:

1 = 95% UCL calculated based on mean bi-monthly impingment rate.

Confidence limit for each species is estimated using relative abundance percentages applied to the actual 95% UCL.

TABLE C-5. ANNUAL IMPINGEMENT BIOMASS (grams) BASED ON DATA COLLECTED AT THE PLANT VOGTLE INTAKE DURING MARCH 2008 - FEBRUARY 2009

Common Name	**Annual Biomass (g) Impingement**		**Actual Impinged Biomass (g)**	**Relative Abundance of Impinged Biomass**
	Cumulative Estimate	**Upper Confidence Limit (1)**		
bannerfin shiner	20	25	1	*0.1%*
black crappie	4,319	5,372	283	*28.7%*
blackbanded darter	110	137	7	*0.7%*
bluegill	143	178	9	*1.0%*
bluespotted sunfish	21	27	1	*0.1%*
chain pickerel	18	23	1	*0.1%*
brushnose crayfish	483	601	32	*3.2%*
dollar sunfish	160	199	11	*1.1%*
flat bullhead	11	13	1	*0.1%*
gizzard shad	3,946	4,908	259	*26.3%*
hogchoker	2,832	3,523	186	*18.8%*
pirate perch	181	226	12	*1.2%*
redbreast sunfish	398	495	26	*2.6%*
shore shrimp	11	14	1	*0.1%*
snail bullhead	282	351	19	*1.9%*
speckled madtom	15	19	1	*0.1%*
spotted sunfish	969	1,206	64	*6.4%*
taillight shiner	8	9	1	*0.1%*
threadfin shad	442	550	29	*2.9%*
warmouth	300	374	20	*2.0%*
white catfish	356	443	23	*2.4%*
TOTAL	**15,028**	**18,692**	**985.4**	

Note:

Notes:

1 = 95% UCL calculated based on bi-monthly mean impingment rate.

Confidence limit for each species estimated using relative abundance percentages applied to the 95% UCL.

Attachment 13

Entrainment Assessment and the Vogtle Electric Generating Plant

Prepared for:

Southern Nuclear Operating Company
Nuclear Development
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ENTRAINMENT ASSESSMENT AT THE PLANT VOGTLE ELECTRIC GENERATING PLANT

WAYNESBORO, GEORGIA

Prepared by:

GEORGIA POWER
A SOUTHERN COMPANY

October 2008

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1. INTRODUCTION

In February of 2008, Georgia Power Company's (GPC) Environmental Services staff based in Smyrna, Georgia responded to Southern Nuclear's request to conduct an aquatic impingement and entrainment assessment of Plant Vogtle's make-up water intake structure. Following a site reconnaissance in early March 2008, GPC submitted a plan of study The sampling approach included four primary components including:

1) source water ichthyoplankton sampling in the Savannah River,

2) source water/intake canal ichthyoplankton (entrainment) sampling,

3) impingement sampling via the traveling screen screen-wash system, and

4) performance of work under a quality assurance/quality control plan to ensure that work was performed in high quality manner consistent with standard scientific practices, and as it pertains to sampling methodology, perform a comparison between collection gear types and data between two sampling locations upstream of the intake structure.

Following a brief period of internal review by Southern Nuclear, a sampling plan was established with authorization to proceed including implementations by Plant Vogtle to install temporary procedure modifications in order to provide GPC staff site access to aquatic impingement and entrainment sampling. Plant Vogtle Operations personnel have provided and continue to provide communications and staff resources to operate the traveling screen system for the ongoing impingement study component.

Field components of the study were initiated on 10 March 2008. Study components 1, 2, and 4 described above have been completed for the entrainment portion of the study. The methods and results of those study components are described in the following section of this report. Study component 3, the impingement study, was designed as a 12-month study encompassing twice per month sampling currently scheduled to conclude in February 2009. Interim impingement data have reported in a separate report (GPC 2008).

Under direction and support provided by Southern Nuclear, the study approach, field sampling components, and data analysis of this study have been conducted and managed by Georgia Power Company's Environmental Services Group based at 5131 Maner Road in Smyrna, GA

Field methods used in this study are based on widely accepted, standard scientific practices and stem from Georgia Power Company staffs' previous experience in performing entrainment and impingement assessment studies following applicable EPA guidance.

Planning elements for this study include:

- review of historical and recent studies characterizing the fish community in the vicinity of the site and potential fish community impacts via Plant Vogtle Operations
- a sampling approach to support development of a scientifically valid estimate of entrainment rate at Plant Vogtle
- an assessment of a fish communities susceptible to entrainment in the vicinity of the make-up water intake structure to include:
- taxonomic identification of entrained fish species and their life stages to the lowest practical taxon
- description of abundance and temporal/spatial characteristics
- characterization of annual, seasonal, and diel variations in entrainment rate
- documentation of current entrainment rates of all life stages of fish and shellfish at the facility
- identification of any Federal and/or State protected species

The following sections provide a description of the Plant Vogtle Study Area and the make-up water intake structure (Section 2), methods (Section 3), description of available environmental parameters that may aid data interpretation (Section 4), and discussion of the study results including calculation of entrainment rate at Plant Vogtle (Section 5).

1.1 Study Objective

The objective of this study was to characterize the current entrainment rate at Plant Vogtle Unit 1 & 2 make-up water intake structure and use that information to infer entrainment rate for the similarly designed intake structure for the proposed Vogtle Units 3 & 4.

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2. STUDY AREA DESCRIPTION

2.1 Environment

The Plant Vogtle Site is located at Savannah River Mile (RM) 150.9. The plant is located approximately 26 miles south-southeast of Augusta, in Burke County, Georgia (Figure 2-1) directly across the river from the Department of Energy's Savannah River Site (SRS) property. The Savannah River, which provides the make-up-cooling water source for Plant Vogtle's cooling tower system, is a primary river that drains the eastern and western boundaries of Georgia and South Carolina, respectively. The Savannah River originates in the mountains of North Carolina, South Carolina, and Georgia and flows approximately 505 kilometers (km) to the Atlantic Ocean. The Savannah River in the vicinity of Plant Vogtle lies in the Coastal Plain physiographic province which is characterized by sandy or sandy loam soils with rolling hills and a mixed pine-hardwood vegetative association. The Savannah River upstream from the Plant Vogtle intake structure receives wastewater discharges from municipalities and industries. The river at the site is typical of large southeastern Coastal Plain rivers except that the channel was historically dredged and maintained by the Corps of Engineers (COE) so that it is highly channelized. Studies on the Savannah River have been conducted since 1951 (GPC. 1984b). In a recent publication by Marcy et al. 2005, *Fishes of the Middle Savannah River Basin*, the Savannah River was characterized as being high in fish diversity and home to at least 118 native fish species. The middle Savannah River in the vicinity of Plant Vogtle is home to at least 98 species of fish - fifteen of which are species introduced mostly for fisheries management purposes. Potential aquatic community entrainment at Plant Vogtle was initially characterized in early siting studies of the mid-1970s and reported later in GPC's 1984 Operations Environmental Report for licensing of Plant Vogtle (GPC 1984).

The 1984 report of site studies performed during January through August of 1974 suggested that prevailing biological and physical factors combined with the low intake canal velocities, would result in minimal entrainment of eggs and larvae and not have a significant effect on the fish population of the Savannah River.

Vogtle Entrainment and Impingement Sampling

Burke County

Figure 2-1 Sample Location Map

Legend

☐	GA Counties

0 200 400 600 800 Feet

Date: 09/08/2008
Scale: 1 : 4,800
Created by: B. Brinkman

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2.2 Intake Canal and Structure

Among its major components, the Plant Vogtle river water intake system consists of the intake canal structure and make-up pumps. The intake canal is 356 feet (ft) long, 140 ft wide with an earthen bottom at 67 ft above mean sea level (msl), at the time it was constructed, and vertical steel sheet pile sides (canal walls) extending to 98 ft msl. The intake canal has a surface skimmer weir at about 78 ft msl with guide vanes at the river entrance. The skimmer weir consists of fixed and removable sections with the fixed sections having elevations less than 78 ft msl. A bottom canal weir is located approximately 100 ft from the mouth of the canal. Silting protection is provided by a sedimentation basin formed by the skimming weir and the canal weir. A floating trash boom is located in front of the skimmer weir to divert large floating debris (GPC 1984).

The component of river velocity parallel to the canal opening is small thus minimizing the potential for fish entering the canal. In addition, a lateral passageway is provided at the canal entrance which permits fish to escape (GPC 1984).

Flow through the intake canal is determined by plant operating conditions. Water velocities in the canal are also dependent on the river water level. Average velocity at the river intake canal ranges from 0.01 ft/second (s) at minimum plant withdrawal rate of 13,000 gallons per minute (gpm) and a river water level of 98 msl (top of the canal sheet pilings) to a 1.05 ft/s at a maximum plant withdrawal rate (72,000 gpm) based on all four make-up water pumps running and a minimum river water level of 78.4 ft msl (allowing for a 2 ft degradation of river bed elevation) at a flow of 5,800 cubic ft/s (ft^3/s). At average plant operating conditions (42,000 gpm with two intake makeup water pumps operating) and annual water level (84 ft msl based on average river flow of 10,300 ft^3/s, the canal entrance velocity is 0.11 ft/s (GPC 1984).

The intake structure is a 147 ft long, 72 ft wide concrete structure with four chambers, each housing one pump, a traveling water screen, a trash rack, stop logs, and screen wash discharge to a common pit with course-grated steel insert basket. The traveling screens are FMC type-45A (3/8 –inch size steel mesh of ASTM A36 structural steel shape) that currently are set to rotate one cycle every eight hours (hrs) or on a high screen differential of six inches of water at the low-setting rotation speed of five ft per minute (min). The velocities of water through the traveling screens at average annual water level (84.0 ft msl) is 0.69 ft/s and 0.82 ft/s with river level at minimum stage (78.4 ft msl) (GPC 1984).

2.3 Make-up Water Pumps

Four vertical pumps, each name-plate-rated at 22,000 gpm (or a maximum pump flow of 15.84 million gallons per day [MGD]) are located in the river intake structure. The typical operating scenario utilizes two pumps. Total pumping rates can vary day to day based on operational needs. Pumping rates vary periodically due to make-up water needs based on cooling basin water levels. Also, periodically, cooling tower blow-down requires added dilution which requires increased pumping volumes for discharge compliance.

3. METHODS

Copies of template field data sheets used for sampling source water and entrainment are included in Appendix A.

3.1 Source Water Early Life Stage Fish Community Assessment

Ichthyoplankton (fish eggs and larva) samples were collected from the Savannah River near the Plant Vogtle make-up water intake structure as a means to characterize the component of the fish community most subject to entrainment. Field sampling began during the late winter/early spring of 2008 in order to capture a representative sample of early season migratory fish spawning. Source water community samples were collected twice per month (approximately at two-week intervals) during 10 March 2008 through 29 July 2008. The sampled period is typically representative of maximum spring and summer fish egg and larval drift – the most biologically productive season of the year for spawning resident and migratory fishes.

Each sample event consisted of an ichthyoplankton collection at approximately 6-hour (hr) intervals. Samples from each discrete station along across-sectional transect were composited - ultimately resulting in collection of samples representative of 12-hour diurnal (daytime) and 12-hr nocturnal (nighttime) periods to facilitate assessment of diel behavior in the drift community potentially subject to entrainment into the Plant Vogtle make-up water intake structure.

Ichthyoplankton samples were collected from one primary location, a cross-sectional transect, positioned approximately at RM 151.0 (at inland waterway marker No. 72) or about 300 ft upstream from the mouth of the intake canal. Additionally, samples were periodically collected from a second transect located about 0.3 miles farther upstream in a reach of the river in the vicinity of the area proposed as the new make-up water intake for Units 3&4 (Figure 2-1). Three discrete ichthyoplankton stations were positioned along transects approximately 30-ft from the left bank, at mid-channel, and approximately 30 ft from the right bank. Ichthyoplankton samples were collected at the upstream location in the same left-, mid-, and right-bank positioning manner for an examination of between-gear and between-location analysis.

Samples collected from the second location (near the proposed Unit 3&4 intake) were used for analysis and comparison between gear types and efficiencies (e.g., plankton net vs. submersible pump) and locations (Savannah River main stem vs. inside the intake canal) in the source water and entrainment sampling locations.

Ichthyoplankton samples were collected at each station with a standard double plankton net rig comprised of a towing bridle, two 500-micron sized Nitex mesh 3:1 ratio (length to diameter) nets mounted in a side by side 0.5 meter round net ring bracket. Each net captures samples with a plastic "sieve bucket" mounted at the cod end. A portion of the bucket has an opening screened with 500-micron stainless steel mesh wire to retain planktonic organisms.

The double net rig yielded a field sample and a replicate sample set aside for archival as a 1:1 fallback quality assurance measure. Field samples were submitted for laboratory taxonomic processing and the archived samples stored at Georgia Power Company's biology lab in Smyrna, GA. The net hoop/bracket was equipped with an 11 lb. wire depressor weight (Wildco Model 90-G10) to minimize tangential drag behind the boat as a result of river current/water column velocity. An additional 16 lbs of weight in the form of down-rigger "cannonball" weights" were also used to further increase slope and reduce the length of cable required to sample at desired depth intervals. A calibrated, propeller driven General Oceanics current meter (Model No. 2030R) was mounted in the mouth of one of the two nets to provide for calculation of sampled water volumes and velocity for each discrete sample.

Before deploying the plankton nets, the sample boat was positioned at a given sampling station by setting an anchor. Once anchored, the net rig was deployed into the river by means of a hoist, winch, and depth-marked-cable. Prior to deployment, the current meter start count was recorded on a field data sheet. Actual sampling depth during each event was determined prior to deployment based on maximum water depth. The sampling method was based on adequately sampling the entire water column to yield a representative community sample by capturing both floating and demersal early life stages of fish in the drift community. Based on depth sounder readings on the boat depth finder (Garmin MapSounder 168), the net rig was initially deployed to the deepest optimal sampling depth (as a means to limit substrate materials from entering the sample) then retrieved by 1-meter sampling intervals following five to ten-minute sampling effort at each depth interval. For example, if depths could be effectively sampled down to four meters based on river stage, the total sample time would be 20 minutes based on 5-minute sampling effort at all depth intervals. As river stage declined from spring into summer, sampling times were increased with each event to offset the reduced number of depth intervals and otherwise reduced sampling effort/volume. In that the goal of the study was to provide representative drift community samples by sampling at least between 100 to 150 cubic meters (m^3) of river water per net per station.

Following the sampling effort at each station, the net rig was retrieved via hoist and winch. As the nets breeched the water surface upon retrieval, the current meter end-number was read from the current meter and recorded on the station data sheet. The plankton nets, partially suspended at the water surface were manually washed down from the outside with river water to rinse down and capture any sample debris and/or organisms clinging to the upper walls of the nets. Once rinsed, the nets were brought onboard and the sample buckets removed from each net by loosening stainless steel attachment bands. Bucket screens were back-washed with river water with a hand held squirt bottle. Once rinsed, the nets were brought onboard and the sample buckets removed from each net by loosening stainless steel attachment bands. Bucket screens were back-washed with river water with a hand held squirt bottle.

Sample materials were then dispensed from each net bucket into separately labeled 1-liter wide mouth plastic jars. Contents of each jar were fixed and preserved with 5-percent formalin. Label information was placed inside the jar with the sample and included the site name, station location, date and time of collection, indication of field sample vs archive sample, and collectors' initials. The jars were temporarily stored in coolers or an open organizer tray for transport under chain of custody to Georgia Power Company's biology lab located at 5131 Maner Road in Smyrna, GA. Once retrieved and signed for acceptance at the lab, sample jars destined for the processing lab (Normandeau Associates Laboratory, 25 Nashua Road, Bedford, New Hampshire) were assigned outer stick-on labels to match an inner jar label. Jar lids were taped, and the jars each double bagged in zip-lock bags before being packed into a cooler with a completed chain-of-custody form taped into the lid of each cooler. The back page carbon copy of each completed chain of custody form was retained by the task manager before sealing the shipping containers. Additional packing material was added before each cooler was securely taped and shut and labeled for overnight shipment (FEDEX) to the processing lab.

In addition to the sampling station identifiers, sample collectors, sample depths, sample times, and current meter readings, other supporting field data collection information was recorded on field data sheets. These data included measures of physicochemical water quality including pH (standard units), surface water temperature (°C), turbidity (NTU), conductivity (microSiemens/cm), and dissolved oxygen concentration (mg/L). Additionally, any observations regarding current weather, recent precipitation, equipment malfunction, or deviations from the intended sampling method were noted on field data sheets.

Following each sample event, provisional river discharge data corresponding to the days and nights of sampling dates was electronically retrieved from the USGS real-time data website for the Waynesboro, GA gage Station No. 021973269 (located at Plant Vogtle) and stored on Georgia Power Company's network computer system.

Samples received by the taxonomic processing laboratory were rinsed and sorted to remove any preserved fish eggs and larvae from detritus or other sample debris. Each egg and larva were identified to the lowest practical taxon and enumerated before a final quality assurance check and data entry. Lab results were submitted to Georgia Power in electronic form once the samples were fully processed. The lab data were further managed at Georgia Power in electronic spreadsheets for synthesis into this report.

3.1.1 Calculation of Source Water Sample Egg and Larval Densities

Densities were calculated by dividing the total number of eggs and larvae for a given sample period by the total volume of river water filtered through the plankton net. The densities were further examined by performing the same calculation separately for eggs and larvae.

3.2 Entrainment Assessment

The first of nine of entrainment sampling events was conducted 26 March 2008. This sample was collected in the mouth of the intake canal by means of a boat-mounted 425 gallons per minute (gpm) centrifugal pump. This event provided an opportunity to evaluate and validate pumping as a collection method for entrainment sampling. The boat-mounted pump collected entrainment samples by moving water through the pump through a 500 *u* mesh ichthyoplankton net mounted at the boat railing. During the same sampling event, source water samples were collected with the same net gear in the stationary, boat drift net sampling method described above. Both pumped- and netted samples yielded at least two life stages of fish larvae from multiple species in densities per species ranging from 0.004 to 0.03 fish per m^3 for pumped samples and 0.001 to 0.05 fish per m^3 for net samples thus validating the use of pumping as a method for collection of entrainment/canal samples. Samples were confirmed by the taxonomic laboratory as being captured and preserved in good condition. This evaluation, and ultimately, change in sampling gear was made after the first event following investigator observations that sampling from the inner canal location and in the relatively uniform and quiescent hydraulic characteristics inside the canal would yield a more representative sample of the entrained community. Also, due to the canal configuration with two tiers of sheet piling, it was not feasible to sample further inside the canal with the boat mounted pump. Instead, the more portable dual submersible pump system was chosen for use at a deployment/sampling point located inside the canal closer to the intake screens. The submersible pump system was shore-based, powered by a portable electric generator, and positioned on the top of the south canal bulkhead about 150 ft upstream from the intake screens (Figure 2-1). The following eight entrainment sampling events were conducted using the submersible pump system.

Entrainment samples were collected twice per month (approximately at the same two-week intervals as riverine source water community samples) beginning on 26 March 2008 and ending on 29 July 2008. Each sample event consisted of approximately 6-hr sample collection time intervals which were ultimately composited to be representative of 12-hr diurnal and 12-hr nocturnal periods. This sample schedule provided a means to perform a direct comparison to the riverine drift community beyond the mouth of the canal.

The entrainment pump system consisted of two Tsurumi Model LB3-750 submersible pumps each with name plate capacity at level head of 73 gpm. This type of pump is capable of pushing water vertically through a two-inch hose as high a 37 ft. The height of the canal wall from water surface to top of the wire rope hand railing during the survey ranged from approximately 23 to 24 ft. The distance from the water to the head of each net mouth was monitored during the study in order to calculate entrainment sample volume based on manufacturer curve rated head loss from maximum rated pump capacity at height. Canal water (entrainment samples) delivered by pump ultimately emptied through horizontal sections of hose into the same type of standard double plankton net rig mounted inside two side by side 55-gallon (gal) plastic drums located at the top of the canal wall. Each drum discharged sieved sample water through a two-inch diameter PVC drain fittings (45 degree elbows) which in turn emptied into a four-inch corrugated plastic storm drain hose ultimate carrying sieved water back into the canal at a location positioned about 20 ft downstream of the submersible pumps. The sampling goal was to collect between 50 to 100 m^3 of sample per net. Sample volume was calculated by multiplying head-rated pump capacity times the time (minutes) pumped then converted from units of gpm to m^3. Just as with the source water sampling, the double net rig was used to yield simultaneous field and replicate samples for archival during each event as a fallback quality assurance measure, if needed. Entrainment samples were collected from sieve buckets then handled and shipped in the same manner as the riverine source sampling. Any observations regarding equipment malfunction or deviations from the intended sampling method were noted on field data sheets.

3.2.1 Calculation of Entrainment Sample Densities

Community (fish eggs and larvae) densities were calculated by dividing the total number of eggs and larvae for a given sample period by the total volume of river water filtered through the plankton net and the result reported in number of organisms per 1000-m^3 (1000 cubic meters)

3.2.2 Calculation of Entrainment Rate

The entrainment rate was developed based on actual daily make-up water intake pumping. In that diminished occurrence of source water fish eggs and larvae at the end of July clearly bracketed the end of the drift season, the five-month entrainment study result represents the annual entrainment estimate. To calculate the annual estimate, daily entrainment rate (number of organisms/1000-m3) was established based on the result of each half-monthly entrainment sampling event result. Daily entrainment rates based on entrainment sample volumes were scaled-up by the appropriate multiplier to reflect actual daily make up water intake volumes. These adjusted daily entrainment rates were then summed to yield half-monthly entrainment rates. Half-monthly entrainment rates were summed to yield an unadjusted annual rate.

Additionally, for perspective and to account for expected natural and operational variability, a half monthly mean entrainment rate was calculated for all sampling events and statistically treated with the 95-percent confident interval. The upper limit was applied to the half-monthly mean entrainment rate which was in turn multiplied out by a factor of five in order to yield an upper estimate of “annual” entrainment for Plant Vogtle based on the upper 95% confidence limit.

3.3 Quality Assurance and Quality Control

Project quality assurance/quality control (QA/QC) procedures for this study followed established procedures for general field and laboratory studies conducted by Georgia Power’s Environmental Laboratory (GPC, 2002). Each sampling event included senior technical involvement and preparation of trip reports summarizing field observations on the performance of the collection system including the sample collection, handling, processing, record keeping, any health and safety issues on site and communication with plant personnel.

3.4 Plant Operations and Environmental Parameters

Plant operational parameters were recorded at Plant Vogtle throughout the course of the study including intake make-up water flow rates and ambient and/or inlet water temperature. Environmental parameters such as river stage data and precipitation data were obtained from electronic sources. Appendix B contains tabular and/or graphical summaries of these supporting data.

3.4.1 Plant Operations

The frequency of power generation, thus make-up cooling water, pump flows, at Plant Vogtle is very stable. Although, each of the four make-up water intake pumps at Plant Vogtle are design-rated to pump 22,000 gpm (63.36 mgd or 240,000 m^3/day), actual pump flows through a given period of time can be affected by daily operational needs, periodic maintenance (outage), and to a minor degree, changes inflow head pressure due to fluctuations in river stage elevation. A summary of mean pumping rate per half monthly sampling period is as recorded during the study period is shown in Table B-1, Appendix B.

3.4.2 Environmental Parameters

Table B-2 in Appendix B provides a summary of water quality parameters recorded during the source water study component. Water temperature data were collected through a variety of means during the study including manually recorded ambient river surface water temperatures via a multi-array Hydrolab water quality meter, and for the purpose of trend analysis electronic USGS daily water quality data records as available and applicable for the study area.

The river stage at Plant Vogtle change constantly in response to regulated flow conditions from Corps of Engineers operations upstream and influenced by local precipitation and/or riparian vegetation evapo-transpiration rates. Regional ambient air temperatures, river stage and discharge, and precipitation records were electronically obtained from the USGS Waynesboro gage (Station No. 021973269) and the University of Georgia weather monitoring net work (Figures B-1 through B-3; Appendix B).

4. RESULTS

4.1 Source Water (Savannah River) Early Life Stage Fish Community

A total of 67 source water ichthyoplankton samples were collected from the Savannah River during the study period. Sixty (89.5 percent) of those samples were collected from the three sampling stations positioned along the primary sampling transect located upstream from the intake structure at its confluence with the Savannah River. The seven (11.7 percent) remaining samples, used as a measure of between-gear and between-location analyses, were collected along the second transect located near the proposed location of the Units 3&4 intake structure (Figure 2-1).

4.1.1 Species Composition and Relative Abundance

Table 4-1 provides a list of taxa and taxa groups (fish eggs and larvae identifiable in the lab to the lowest practical taxon) collected from the source water community. Sixteen species were identified among 23 taxa groups representing 13 taxonomic families (Table 4-1). Among the seven remaining taxa groups, four were identifiable to Family-level, two groups to Genus-level, and one to Class-level. No protected species were collected from source water. All species or taxa groups except for yellow perch (*Perca flavescens*), an introduced species, and carp (*Cyprinus carpio*), an exotic species, are considered native to the drainage.

A total of 910 fish eggs and larvae were collected from source water samples (Table C-1; Appendix C). The single numerically most dominant taxa group was Unidentified Cyprinidae (minnows) with 184 specimens accounting for 20.2 percent of the total sample followed in decreasing order by American shad (*Alosa sapidisimma*) with 166 individual specimens (18.2 percent) and Unidentified Clupeidae (herrings) (165 specimens or 18.1 percent).

Among the total source water sample, at least nine species represented by 18 specimens in three life stages (eggs, yolk-sac and post-yolk-sac larvae) were collected in a total of four daytime samples (~1.9 percent of the total source water sample) collected near the proposed location for Units 3&4. Species or taxa groups represented there included brook silverside, carp, northern hogsucker, spotted sucker, yellow perch, and unidentified members of Clupeidae, Cyprinidae, Unidentified darters, and the Class Osteichthyes. Unidentified darter was the most abundant taxon (Table C-2, Appendix C).

TABLE 4-1. CHECKLIST OF SPECIES COLLECTED IN THE PLANT VOGTLE SOURCE WATER AND ENTRAINMENT SAMPLING, MARCH - JULY 2008

Families	Common Name*	Species	Common Name	Status	SW[1]	ENT[2]
Aphredoderidae	Pirate Perch					
		Aphredodearous sayanus	pirate perch	Native	√	√
Atherinidae	Silversides					
		Labidesthes sicculus	brook silverside	Native	√	
Catostomidae	Suckers					
		Hypentilium nigricans	northern hogsucker	Native	√	
		Minytrema melanops	spotted sucker	Native	√	
		unidentidified Catostomidae	--	--	√	√
Centrarchidae	Sunfishes					
		Lepomis macrochirus	bluegill	Native	√	
		unidentified Lepomis	--	--	√	√
Clupeidae	Herrings					
		Alosa sapidissima	American shad	Native	√	
		Dorosoma cepedianum	gizzard shad	Native	√	
		Unidentified clupeidae	--	--	√	
Cyprinidae	Minnows					
		Cyprinus carpio	carp	Exotic	√	
		Unidentified cyprinidae	--	--	√	√
Cyprinodontidae	Pupfishes					
		Unidentified cyprinodontidae	--	--	√	
Engraulidae	Anchovies					
		Anchoa mitchilli	bay anchovy	Native	√	
Ictaluridae	Catfishes					
		Ameiurus natalis	yellow bullhead	Native	√	√
		Ictalurus punctatus	channel catfish	Native	√	
Lepisosteidae	Gars					
		Lepisoteus osseus	longnose gar	Native	√	
Moronidae	Temperate Basses					
		Morone saxatilis	striped bass	Native	√	
		Morone americana	white perch	Native	√	
Osteichthyes	Bony Fishes					
		Unidentified Osteichthyes	--	--	√	√
Percidae	Perches and Darters					
		Perca flavescens	yellow perch	Introduced	√	√
		Unidentified darter	--	--	√	
Soleidae	Soles					
		Trinectes maculatus	hogchoker	Native	√	

Notes:
* = Nomenclature by Page and Burr, 1991.
1 = SW - species/taxa groups collected via source water sampling
2 = ENT - species/taxa groups collected via entrainment sampling

4.1.2 Temporal and Diel Distribution

The relative variation in egg and larval sample abundance during the five months of survey varied from about two percent (early March and both July sample events) to almost 19 percent (late April into early May)(Table C-1, Appendix C). Peak organism abundance was observed from 23 April to 8 May 2008. Peak fish egg and larval abundance in riverine drift was marked primarily by relatively high numbers of egg, yolk-sac and post-yolk-sac life stages of Unidentified Cyprinidae, American shad, and Unidentified Clupeidae. The number of individual specimens per sampling event ranged from 0 to 170 with an average of 46 organisms per sampling event.

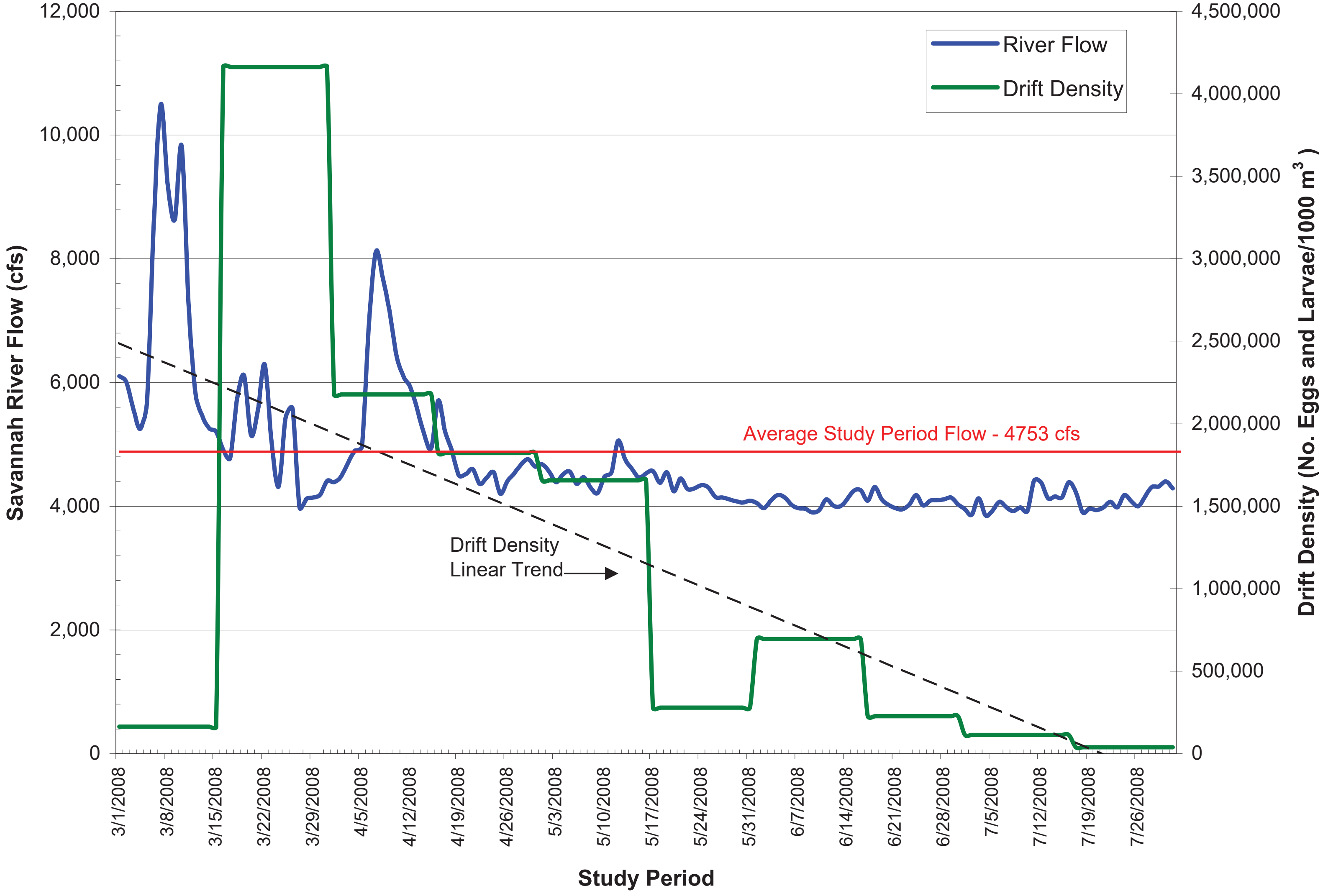
As shown in Figure 4-1, egg and larval drift abundance during the study period declined with elevated springtime river flows ranging upward near 13,000 cfs to a late-through summer low-flow average near 4,100 cfs. A sharp decline in egg and larval density was observed in mid-May which continued to an end-of-season bracket by mid July. Thus the opportunity for intake entrainment at Plant Vogtle is reduced with declining seasonal river flows. This trend is typical of southeastern, seasonal drift patterns in Piedmont and upper Coastal Plain systems.

As for diel effect, approximately 61.6 percent of all organisms collected were found in nighttime samples. The number of organisms was higher in night samples in 9 of 10 sample events. Night samples averaged 56.1 organisms per sample event whereas day samples averaged 34.9 organisms per sample event.

4.1.3 Life Stages

As shown in Table C-3, Appendix C, peak drift in the Savannah River occurred in early May and with this peak node of egg and larval abundance bracketed between early April and mid-May. The most abundant life stage collected in source water samples was fish eggs which comprised 562 (61.8 percent) of the total 910 specimens collected. Peak drift for eggs occurred during late April through early May 2008. Yolk-sac larvae and post-yolk-sac larvae comprised 16.4 and 16.2 percent of the source water community sample, respectively. Peak drift of yolk-sac larvae and post-yolk-sac larvae occurred during late April and early may, respectively. Yearling or older life stages in the samples were few in number comprising 4.4 percent of the sample (Table C-3, Appendix C). Peak abundance for yearling or older life stages occurred during early June through mid-July.

Figure 4-1
Savannah River/Source Water Flow vs. Egg and Larval Drift Density



Note: Savannah River egg and larval densities are presented as half-monthly steps as calculated from actual sampling events during the study period.

The most abundant taxa group, Unidentified Cyprinidae (minnows), exhibited four life stages in source water samples with the most abundant life stage occurring as yolk-sac larvae observable in peak proportions during late April and again in the month of June (Table C-5, Appendix C). This peak of yolk-sac larvae were followed by an earlier pulse of eggs in the drift in late April.

American shad, a migratory (anadromous) species, was the second most abundant drift organism collected from the Savannah River. American shad was encountered in two life stage forms including egg (165 specimens) and yolk-sac larvae (one specimen). The bulk of egg and larval drift for American shad occurred primarily during mid-April through May with peak abundance noted in early May (Table C-5, Appendix D).

Unidentified Clupeidae, the third most abundant taxa group collected from source water was observed in three life stages including egg, yolk-sac larvae, and post-yolk-sac larvae. Egg life stage was the most abundant with peak occurrence in the drift between early April and mid-May (Table C-5, Appendix C).

4.1.4 Source Water Community Density

Table C-4, Appendix C shows a summary of egg and larval density as collected in the riverine source ichthyoplankton samples. The summary provides density as number of specimens per 1000 m^3.by sampling date and by day and night sampling periods. Average daytime egg and larval density per sampling event varied from 7.8 organisms/1000 m^3 (late July) to approximately 659.1 organisms/1000 m^3 (late April) with an overall daytime mean of 19.2 organisms/1000 $m^{3.}$ Nighttime densities varied from 21 organisms/1000 m^3 (early March) to approximately 1999.7 organisms/1000 m^3 (early May) with an overall mean per sampling event mean of 33.5 organisms/1000 m^3. For the entire study period, mean, per-event egg and larval density was 403.6 organisms/1000 m^3.

The Unidentified Cyprinidae yielded the highest day-time density for a single taxa group at 289.4 organisms/1000 $m^{3.}$ American shad were observed in the highest density for nighttime samples as well as overall for any single species or event throughout the study period.

For the sake of comparison, source water samples were collected during the daytime near the proposed location of Units 3&4 during the two sampling dates of late May and early June resulting in a mean fish egg and larva density of 52.9 organisms/1000 m^3. Unidentified darters yielded the highest density (17.7

organisms/1000 m^3) among samples collected at the upstream location. During the same time as those sampling events, daytime egg and larval densities sampled at the primary transect were very comparable ranging from 29.5 to 52.8 organisms per 1000-m^3 (Table C-4, Appendix C). No one species was unique to the proposed intake location of Units 3&4.

Based on the USGS gage data, mean daily river flow during the five-month study period (156 bracketed days), was 11,403,000 m^3 (~11.4 million cubic meters) Source water organism density was 403.6 organisms per 1000-m^3 (Table C-4, Appendix C).

4.2 Entrainment

A total of 36 ichthyoplankton samples collected inside the intake canal (Figure 2-1) during the study period. Due to the apparent uniform and quiescent hydraulic conditions inside the intake canal, it was assumed that single point mid-depth location provided representative samples of the entrained community. Once composited into 12-hr day and 12-hr night samples, following 6-hour sample collection intervals during each period, the 18 samples were processed for taxa identification and enumeration.

4.2.1 Species Composition and Relative Abundance

As shown in Table 4-1 and Table D-1, Appendix D, a total of 25 individual specimens comprised of three fish species and four taxonomic families/groups were collected via pumped entrainment samples during March through July 2008. No protected species were collected.

Among the three species, yellow perch (*Perca flavescens*) was the most abundant (40 percent) followed in decreasing order of ranked abundance by yellow bullhead (*Ameiurus natalis*) and pirate perch (*Aphredoderus sayanus*), each accounting for four percent of the sample catch. As for the unidentified taxa, members of the Catostomidae (suckers) were thee most dominant (20 percent) followed by the Centrarchidae (sunfishes) with 16 percent of the sample (Table D-1, Appendix D).

4.2.2 Temporal and Diel Distribution

As shown in Table D-1, Appendix D, relative change in sample abundance was quite variable (0 to 52 percent) during the 5-month study. Fifty-two percent of the entrainment sample organisms were collected in the month of March, 20 percent in April and 16 percent in the month of July.

The majority of entrainment sample organisms were collected at night (72 percent) vs. day (28 percent) (Table D-1, Appendix D).

4.2.3 Life Stages

Table D-2, Appendix D provides a breakdown of life stage occurrence by sample dates for taxa collected in entrainment samples. The few egg and larval specimens collected in entrainment samples occurred between mid-March and late-July with peak abundance (52 percent of samples) observed in mid-March. The most relatively abundant life stage component of entrainment samples was post-yolk-sac larvae representing 68 percent of the samples. Yolk-sac larvae was the second most abundant life stage group represented in entrainment samples accounting for 24 percent of the total. No eggs were encountered in entrainment samples indicating their potential absence in entrained water due to early settling out of the water column between the mouth of the canal and the head of the intake structure.

The most abundant entrainment sample species was yellow perch which was encountered as being equally represented in two life stages (yolk-sac and post-yolk-sac larvae)(Table D-3; Appendix D). Yellow perch were collected from mid-march to late April in entrainment samples.

Five unidentified, individual specimens of Catostomidae (suckers) were the second most abundant group represented in entrainment samples. Catostomids were encountered only in post-yolk-sac larval form and from mid-March to late April

Unidentified Lepomids (sunfishes), the third most abundant taxa group collected in entrainment samples, were represented by four specimens distributed in two life stages including yolk-sac and post-yolk-sac larvae. Unidentified Lepomids were collected from mid-June through late-July (Table D-3, Appendix D).

4.2.4 Entrainment Rate

Table D-4, Appendix D shows a tabular summary of egg and larval density as collected in the entrainment sampling program. The summary provides density as number of specimens by 1000 m^3.by sampling date and by day and night sampling periods. Per sampling-event daytime egg and larval density varied from 0 (zero) organisms/1000 m^3 to approximately 18.1 organisms/1000 m^3 (late March). Nighttime density varied from 0.01 to 29 organisms/1000 $m^{3.}$ For the entire study period, mean per-event density was approximately 11.3 organisms/1000 m^3.

Table D-5, Appendix D, provides a summary of actual sample entrainment compared to the annual estimate and the annual estimate derived by applying the 95% upper confidence limit (UCL) to the half-monthly mean. The actual number of organisms enumerated in entrainment samples is 25. The annual estimate based on the sum of half monthly totals is 448,803. No organisms were collected in two of nine entrainment sampling events resulting a half-monthly mean entrainment rate of 49,867. Source water samples did not reveal a correlating trend at the time (May samples). When applying the 95% UCL, the statistical effect on the mean half monthly entrainment value results in a lower annual entrainment rate (568,154 organisms including the calculated confidence level of 13,261 organisms).

Plant Vogtle's mean daily make-up water intake pumping flow (241,000 m^3) represents approximately 2.1 percent of the mean daily flow (11,402,000 m^3) in the Savannah River (at Plant Vogtle based on study period flow records). Estimated daily entrainment rate is 1,230 organisms [eggs and larvae]) whereas the estimated daily source water drift abundance is 312,039 organisms (Table D-5, Appendix D).

4.3 Operational and Environmental Parameters

4.4.1 Operational Parameters

Plant Vogtle conducted make-up water pumping through its intake structure throughout the entire study period. Copies of operational reports showing daily recorded make-up water pumping are included in Appendix B. Mean daily make-up water pumping rate for the entire 156-day study period was 64.3 mgd (or 243.400 m^3). Compared to the mean daily discharge for the Savannah River of 11,402,000 $m^{3,}$ make-up water up pumping at Plant Vogtle represents approximately 2.1 percent of the available Savannah River flow based on measurements recorded during March 2008 – August 2008.

4.4.2 Environmental Parameters

Water quality data were recorded by the field crew during each field sampling events (March 2009 – August 2008)(Table B-2, Appendix B). Surface water temperature ranged from 12.3 to 28.6°C). The pH (standard units) varied from 6.7 to

8.4. Specific conductance ranged from 103.4 to 140.1 *u*S/cm with the highest measurements recorded at the end of the sampling period. Dissolved oxygen ranged from 6.7 to 9.0 mg/L consistent with inverse response to increasing water temperature. Turbidity ranged from 0 to 6.4 NTUs varying with precipitation.

Regional air temperature ranged from 1.0 to 38.1 °C based on the Midville, Georgia weather monitoring station (Figure B-1, Appendix B). River stage ranged from 5.9 to 11.7 ft (USGS Waynesboro Gage Station) with a daily mean stage of 6.8 ft. River flow ranged from 3,760 to 10,500 cfs with a daily mean flow of 4,646 cfs (or 11,367,000 m3). River stage exhibited decline consistent with seasonal trend from early spring to late summer (Figure B-2, Appendix B). Daily precipitation throughout the study period ranged from 0 to 2.0 inches with mean daily rainfall of 0.09 inches (Figure B-3, Appendix B) which is characteristic of severe drought conditions for the second consecutive year in the region.

Daily entrainment rates were statistically compared through regression analysis with daily data for these environmental variables. No significant correlation relationship was found between air temperature, water temperature, precipitation, or river stage for entrainment rate.

5. SUMMARY AND DISCUSSION

An entrainment study of Plant Vogtle's make-up water intake structure was conducted by GPC environmental field services staff during March through July of 2008. The study included two primary tasks including:

- source water (riverine) sampling for fish eggs and larvae from the Savannah River upstream of the Plant Vogtle intake canal, and
- entrainment sampling for fish eggs and larvae from the Plant Vogtle intake canal for fish eggs and larvae.

Results of the source water and entrained community descriptions are based on five months of "half-monthly" sampling during March through July 2008.

Entrainment sampling yielded seven species or taxa groups (29.2 percent) out of the 24 taxa groups represented in source water samples. Entrained taxa were also represented in the list of source water taxa. No protected fish species were encountered in source water or entrainment samples.

Peak organism abundance in the Savannah River occurred from 23 April to 8 May 2008 and was marked by relatively high numbers of egg, yolk-sac and post-yolk-sac life stages of Unidentified Cyprinidae and American shad. Source water samples yielded at least 23 species representing 13 taxonomic families. Most (~61.6 percent) of the eggs and larvae were present in nighttime samples. Eggs were the most abundant life stage collected overall accounting for 61.8 percent of the total sample. The density of source water organisms was calculated at 403.6 organisms per 1000 m^3. Extrapolation of sample data results in a calculated source water drift rate of approximately 312,039 organisms per day.

Total entrainment sampling effort yielded 25 individual specimens representing at least seven species indicating a paucity of organisms present in canal intake waters. Most (72 percent) life stage forms in entrainment samples were post-yolk-sac larvae. No eggs were encountered in entrainment samples an indication that eggs may have settled out of the water column as water velocities substantially diminish at the mouth of the canal. Most organisms were collected at night. The density of entrained organisms was calculated as 11.3 organisms per 1000 m^3 based on sample results. Annualized extrapolation of sample data resulted in an entrainment rate of 1,230 organisms (eggs and larvae)/day.

Plant Vogtle's mean daily make-up water intake pumping flow of 241,000 m^3 represents approximately 2.1 percent of the mean daily flow 11,402,000 m^3 in the Savannah River based on study period flow records. No statistically significant relationship was found between entrainment rate and trends of air temperature, water temperature, or river discharge. Empirical observations of river flow and riverine egg and larval drift during the study period (Figure 4-1) clearly demonstrated abrupt decline in drift abundance following the end of elevated springtime flows and the beginning of early summer flow norm.

Fish eggs and larvae source water samples were approximately 36.4 times more numerous than entrainment samples collected during the same period. The three most abundant source water taxa were not ranked the same as found in entrainment samples. The numerically most dominant source water taxa were Unidentified Cyprinidae (20.2 percent), American shad (18.2 percent), and Unidentified Clupeidae (18.1 percent); whereas, the most abundant entrainment sample taxa were yellow perch (40 percent), Unidentified Catostomidae (20 percent), and Unidentified Lepomis (16 percent). By comparison, yellow perch accounted for 1.8 percent of source water samples, Unidentified Catostomidae (8.2 percent), and Unidentified Lepomis (2.3 percent) of the source water sample.

Pirate perch was the only species common to source water and entrainment samples. Although not the most common species among either source water or entrainment samples, pirate perch is known to be common in the study area and is well suited for habitation and spawning in a variety of habitat types including the intake canal. Pirate perch is known both as an egg broadcaster over a variety of substrates as well as being a cavity nester (Marcy et al. 2005).

Six other species or taxa groups were represented both in source water and canal entrainment samples (Table 4-1) in at least one life stage. They included yellow bullhead, yellow perch, Unidentified Catostomids, Unidentified Lepomids, and unidentifiable fish eggs (Class Osteichthyes). Although a common species in the region and in entrainment samples, yellow perch is not native to the middle Savannah River. Its historical occurrence is more northern in range and it has been widely introduced elsewhere including the Savannah Basin (Marcy et al. 2005).

Table 5-1 provides a numerical comparison between species common to both source and entrainment sampling by sample type and life stage. No eggs were encountered in entrainment samples for any of the seven common species nor for any other species encountered during the source water study. Yolk-sac larvae were observed in both entrainment and source water samples for only one taxa group (Unidentified Lepomis). Post-yolk-sac larvae were encountered in both entrainment and source water samples in five of the seven common taxa/groups. The only species common to both source water and entrainment samples as a young-of-the-year life stage was yellow bullhead. Post-yolk-sac larvae represented 68 percent of the entrainment samples; whereas, eggs were the most abundant life stage collected from source water.

Although few samples were collected there, no single species was unique to the proposed intake location of Units 3&4 as compared to the primary transect sampling location. Source water samples were collected near the proposed location of Units 3&4 intake on two dates including late-May and early-June resulting in a mean fish egg and larva density of 52.9 organisms/1000 m^3. During the same time as those sampling events, daytime egg and larval densities sampled from the primary transect were very comparable ranging from 29.5 to 52.8 organisms per 1000-m^3.

The siting study entrainment assessment performed in GPC's 1974 studies of Plant Vogtle Units 1&2 relied on then-recent studies at the adjacent Savannah River Site

TABLE 5-1. SUMMARY OF LIFE STAGES FOR SPECIES OR TAXA GROUPS COMMON TO SOURCE WATER AND ENTRAINMENT SAMPLES, PLANT VOGTLE, MARCH 2008 THROUGH JULY 2008

	Number of Specimens by Life Stage and Sample Type							
Common Name	**Egg**		**Yolk-Sac Larvae**		**Post-Yolk-Sac Larvae**		**Young-of-the-Year**	
	SW	**EN**	**SW**	**EN**	**SW**	**EN**	**SW**	**EN**
pirate perch	--	--	--	--	2	1	--	--
unidentified Catostomidae	--	--	13	--	62	5	--	--
unidentified Cyprinidae	51	--	82	--	41	3	1	--
unidentified Lepomis	2	--	2	1	17	3	--	--
unidentified Osteichthyes	28	--	--	--	--	--	--	--
yellow bullhead	--	--	--	--	--	--	20	1
yellow perch	--	--	10	5	6	5	--	--

Note:
SW = source water sample; EN = canal entrainment sample
Table does not include ten specimens unidentifiable to life stage.

(SRS) where intensive field studies demonstrated that fish eggs were rarely found in canal plankton samples. It was concluded then that eggs and larvae settled to the bottom of the intake canal before becoming entrained owing to substantially decreased water column velocities inside the canal as compared to the Savannah River (source water) where swifter current keep eggs and larvae in suspension in the drift. The indication was that eggs and larvae which entered the intake canal were not necessarily entrained further validated by the fact that sunfish, minnows, and silversides persisted in the SRS intake canal. Per the SRS studies, sunfish in particular were known to spawn in the intake canals and were the dominant species there year round. The early Plant Vogtle studies concluded that the Vogtle intake structure would be constructed in a similar manner as SRS intake structures and minimal entrainment would likewise result.

For perspective in evaluating the 2008 study results, findings from GPC's 1974 source water study and entrainment assessment were reviewed for comparison. The 1974 source-water study at Plant Vogtle utilized six sampling stations on the Savannah River (two net collection stations along three transects) and used 1-meter nets constructed of 760 *u* mesh. Egg and larval samples were collected during January through May and July through August with and average sample time per station of 15 minutes. A total of 89 day samples and 88 night samples were collected. The sampling resulted in collected of 1,423 eggs and 2,177 larvae with at least 34 species of fish represented. Overall, a greater number of eggs and larvae were collected at night. Peak drift abundance occurred during April and May with a sharp increase detected in July. Crappie larvae were the largest contributor to the drift community accounting for 29.3 percent of the sample by American shad eggs (23.6 percent) and spotted sucker larvae (15.7 percent). The highest densities, per 1000 m^3, were reported for Clupeidae, Catostomidae, and Centrarchidae.

For comparison, entrainment at the Savannah River Plant pump-house intakes, located a short distance upstream for Pant Vogtle, was estimated in 1982, 1983, 1984, and 1985. Several taxa especially gizzard shad in 1982 and 1983, crappie in 1983 and 1984, and spotted sucker in 1985 occurred in unusually high densities suggesting they were spawned in the canals. Species that spawned in the canals tended to exhibit increased entrainment. Entrainment losses averaged 10 x 10^6 eggs and 18.8 x 10^6 larvae annually (vs ~3.1 x 10^5 total eggs and larvae at Plant Vogtle). Entrainment loses were primarily American shad and other herring species (clupeids). Entrainment was greatest during periods of high intake water usage which coincided with low river flow during the spawning season (*in* Kilgo et al. 2005).

Many aspects of the 2008 source water study at Plant Vogtle were comparable to the 1974 study. The 2008 study used a total of three sampling stations aligned along one of the same upstream river cross-sections used in the 1974 study. Additionally, three stations were sampled along a single cross-section near the proposed location of Units 3&4 on one occasion and again at one of those three stations on one other occasion. Samples were collected during longer periods (average time per station of 18.6 minutes) with nets using a smaller net opening and mesh size as compared to the 1974 study (15 minutes). Samples in 2008 were collected during March through July whish directly overlapped the 1974 sampling period. . Sixty-four day samples and 60 night samples were collected in 208 vs. 89 and 88 day and night samples in the 1974 study. More organisms were collected at night in 2008 just as observed in the 1974 study. Peak drift abundance in 1974 and 2008 occurred in April, May, with a sharp increase in July in 1974 and a pronounced peak in May in the 2008 study (without consideration for long- or short-term environmental, climatologic, or hydrological trends that may have influenced results during either study). Cyprinidae, in contrast to crappies (29.3 percent were the single largest contributor to the drift population in 2008 accounting for 20.0 percent of the total. In 1974, American shad eggs accounted for 23.6 percent of the source water sample compared to 18.2 percent of the sample in 2008. In 2008, members of the Cyprinidae and Clupeidae were the largest contributors of yolk-sac and post-yolk-sac larvae in source water samples. The highest organism density recorded during the day in the 2008 study was exhibited by Unidentified Cyprinidae at 289.4 organisms/1000 $m^{3.}$ American shad exhibited the highest density for nighttime samples as well throughout the study for a single species or event. Highest organism densities in the 1974 study were observed in families of Clupeidae, Catostomidae, and Centrarchidae.

The 2008 source water study conducted at Plant Vogtle revealed the presence of egg and early larval forms through yearling life stage for a diversity (23) of fish species representative of recently documented fish fauna of the region. The observed trend in timing of recruitment and peak drift abundance were consistent with those documented in previous studies of the area. The 2008 entrainment study result was consistent with conclusions drawn from the 1974 siting studies in demonstrating that entrainment impact at Plant Vogtle is likely minimal owing to the relative absence of organisms in entrainment samples collected from the intake canal during period of peak riverine drift. The low numbers of entrained organisms collected samples appear to likewise be related to the substantial differential decrease in water column velocity as source water is drawn from the river, partially deflected through the stop log gate and sediment catchment sheet pilings located in the mouth of the intake canal. Many semi-buoyant or demersal eggs and larvae that enter the canal, otherwise suspended in passing riverine currents, likely quickly settle into sedimentary substrates in the proximal end of the canal. Thus, most early life stage fishes entering the canal never reach the intake screens. The most abundant species entrained included only larval stages of yellow perch, unidentified suckers, and unidentified sunfishes. Owing to the type of habitat present in the canal, particularly sunfishes may even reside and spawn in the intake canal where suitable habitats and quiescent hydraulic conditions prevail. Localized and source water occurrence larval sunfishes in addition to abundance pulses of suckers and yellow perch from source water apparently contribute to the majority of entrainment based on sample results. The early GPC studies referred to SRP studies where it was stated that fish eggs carried by riverine flows were generally closer to the bottom and upon entering the intake canal encountered a sharp decrease in velocity and has a tendency to settle to the bottom resulting in low entrainment rates. The abundance of American shad eggs in particular in source water was not detected in entrainment samples indicating further that little entrainment occurs through the Plant Vogtle intake structure.

Overall, the 2008 entrainment assessment result combined with earlier GPC and SRP findings (and the fact that less than 2.2 percent of the Savannah River flow is withdrawn by the intake) indicate that entrainment effect at Plant Vogtle is minimal resulting in an insignificant effect on the fish population of the Savannah River.

6. REFERENCES

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APPENDIX A

Field Data Sheet Templates

FIGURE A-1. Vogtle I & E Study - Source Water Community Sampling Data Sheet*

Collected by:___________________________

Date:________________________

Gear: dual 1:3 ratio 0.5 m Nitex 500 micron mesh plankton nets

Sampling Period Circle One: DAY 1 DAY 2 NIGHT 1 NIGHT 2

Location: Left Bank (facing upstream)

		Depth (m)	Time at Depth (mins)
Time start	**HRS**	1	
Current meter start count		2	
Current meter stop count		3	
Time stop	**HRS**	4	
Total time for retrieval	**MINS**	5	
Calculated sample flow volume (m^3/s)		6	

Location: Mid-Channel

Time start (HRS)	**HRS**	1	
Current meter start count		2	
Current meter stop count		3	
Time stop (HRS)	**HRS**	4	
Total time for retrieval (mins)	**MINS**	5	
Calculated sample flow volume (m^3/s)		6	

Location: Right Bank (facing upstream)

Time start (HRS)	**HRS**	1	
Current meter start count		2	
Current meter stop count		3	
Time stop (HRS)	**HRS**	4	
Total time for retrieval (mins)	**MINS**	5	
Calculated sample flow volume (m^3/s)		6	

Comments/Observations:

* 6 hour samples are archived (type A samples)

* day and night sample components are composited for laboratory analysis (type C samples)

FIGURE A-2. Vogtle I & E Study - Canal Entrainment Sampling Data Sheet*

Collected by:___________________________
Date:________________________
Canal Water Stage to top rail___________ft
Depth of Pump Deployment ________ft

Pumps: 2 electric Tsurumi LB3-750 type with 73 gpm capacity at level head

	DAY 1	DAY 2	NIGHT 1	NIGHT 2
Time start (HRS)				
Time stop (HRS)				
Total pumping time (mins)				
Calculated sample flow volume (m^3)				

Notes:

Flow volume flow based on depth and river stage and performance curve:________________ gals/min
* 6 hour samples are archived (type A samples)
* day and night sample components are composited for laboratory analysis (type C samples)

FIGURE A-3. Vogtle I & E Study Sample Chain Of Custody

Collected by:___________________________

Sample No.	Integrated Sample ID and Collection Date	Approximate Time of Collection	Preservative	Shipped to taxonomy lab	Archived at GPC Smyrna
		~0000 HRs	5% formalin or 10% formalin Wet Ice	√	√
1	ENLD1A				
2	ENLD2A				
3	ENLDCOMP				
4	ENLN1A				
5	ENLN2A				
6	ENLNCOMP				
7	IMDA				
8	IMNA				
9	SWLD1A				
10	SWLD2A				
11	SWLDCOMP				
12	SWMD1A				
13	SWMD2A				
14	SWMDCOMP				
15	SWRD1A				
16	SWRD2A				
17	SWRDCOMP				
18	SWLN1A				
19	SWLN2A				
20	SWLNCOMP				
21	SWMN1A				
22	SWMN2A				
23	SWMNCOMP				
24	SWRN1A				
25	SWRN2A				
26	SWRNCOMP				
27					
28					
29					
30					

EN = entrainment sample D1 = first day sample C = composited 1st and 2nd day or night samples
IM = impingement sample N2 = second night sample
SW = source water sample A = archived 6-hour sample

Relinquished by:_____________________________ Date:_____________ Time:____________

Received by:________________________________ Date: _____________ Time:___________

APPENDIX B

Summaries of Operational and Environmental Parameters

TABLE B-1. SUMMARY OF HALF-MONTHLY MAKE-UP WATER INTAKE PUMPING VOLUMES AT PLANT VOGTLE, MARCH 2008 THROUGH JULY 2008

Sample Period	Pump Volume (MGD)[1]
early March 2008	61.1
late March 2008	61.4
early April 2008	63.4
late April 2008	63.4
early May 2008	61.9
late May 2008	62.2
early June 2008	64.3
late June 2008	63.4
early July 2008	62.8
late July 2008	70.7

Notes:

1 =MGD - million gallons per day

TABLE B-2. SUMMARY OF PHYSICOCHEMICAL WATER QUALITY MEASUREMENTS COLLECTED DURING THE SOURCE WATER COMMUNITY STUDY AT PLANT VOGTLE, MARCH 2008 THROUGH JULY 2008

Event	Mean Water Temperature (°C)	pH (SU)	Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
10-12 March 2008	12.5	7.4	123.0	8.5	--
17-19 March 2008	15.5	7.0	103.4	8.8	0.8
8-10 April 2008	17.0	6.7	118.0	8.2	0.8
22-24 April 2008	18.4	7.1	113.4	9.0	0.0
6-8 May 2008	22.4	7.2	121.1	7.7	0.0
20-22 May 2008	22.7	7.1	106.2	7.2	6.4
10-12 June 2008	28.6	8.0	128.5	7.2	0.0
24-25 June 2008	27.0	8.2	127.5	7.4	0.0
15-16 July 2008	26.5	7.2	130.5	6.7	0.3
29-30 July 2008	27.6	8.4	140.1	6.9	0.0

Figure B-1
Air Temperature Recorded at the Midville, GA, Burke County, Weather Station

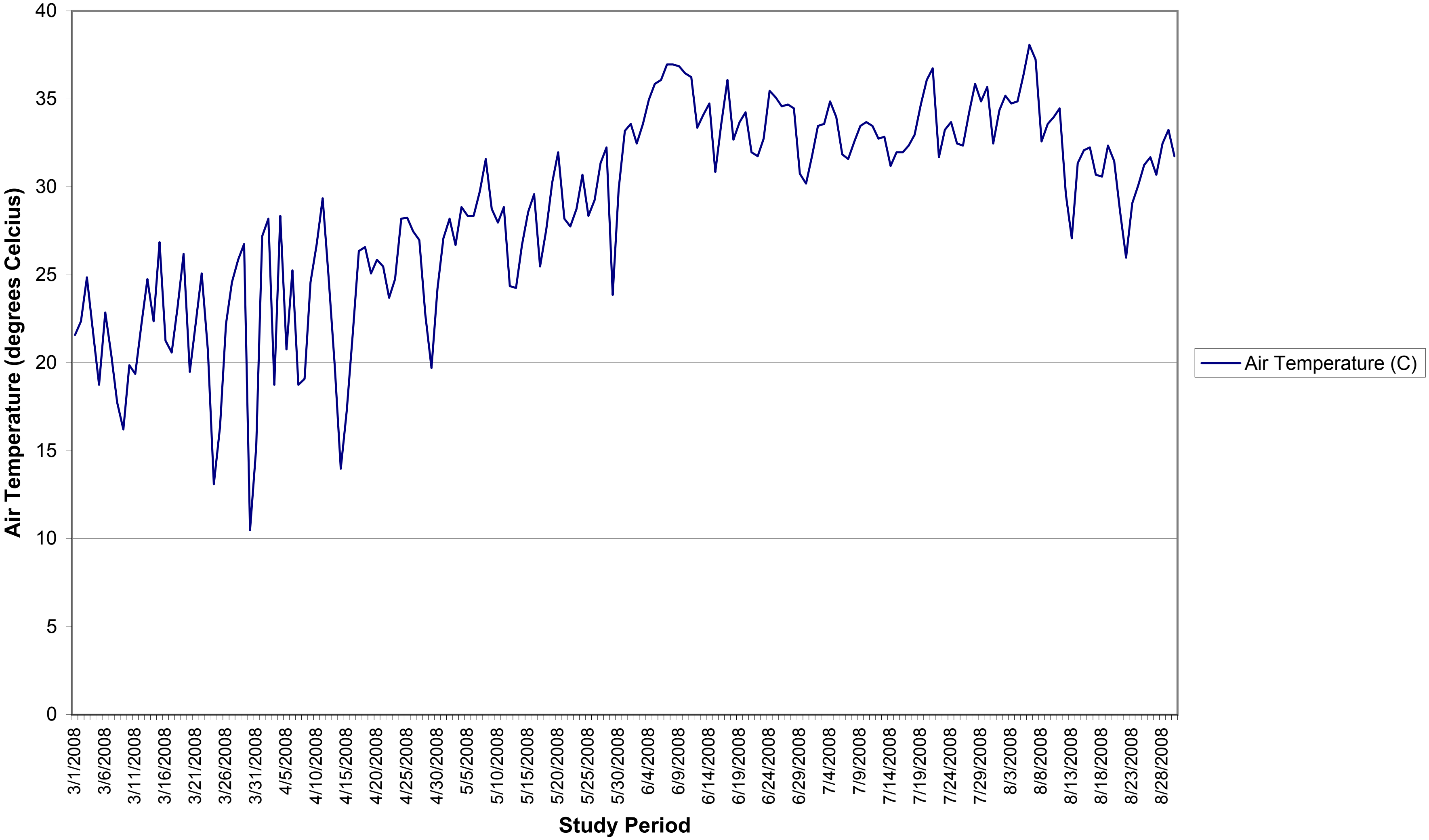


Figure B-2
Savannah River Flow (cfs) vs Gage Height (ft) msl

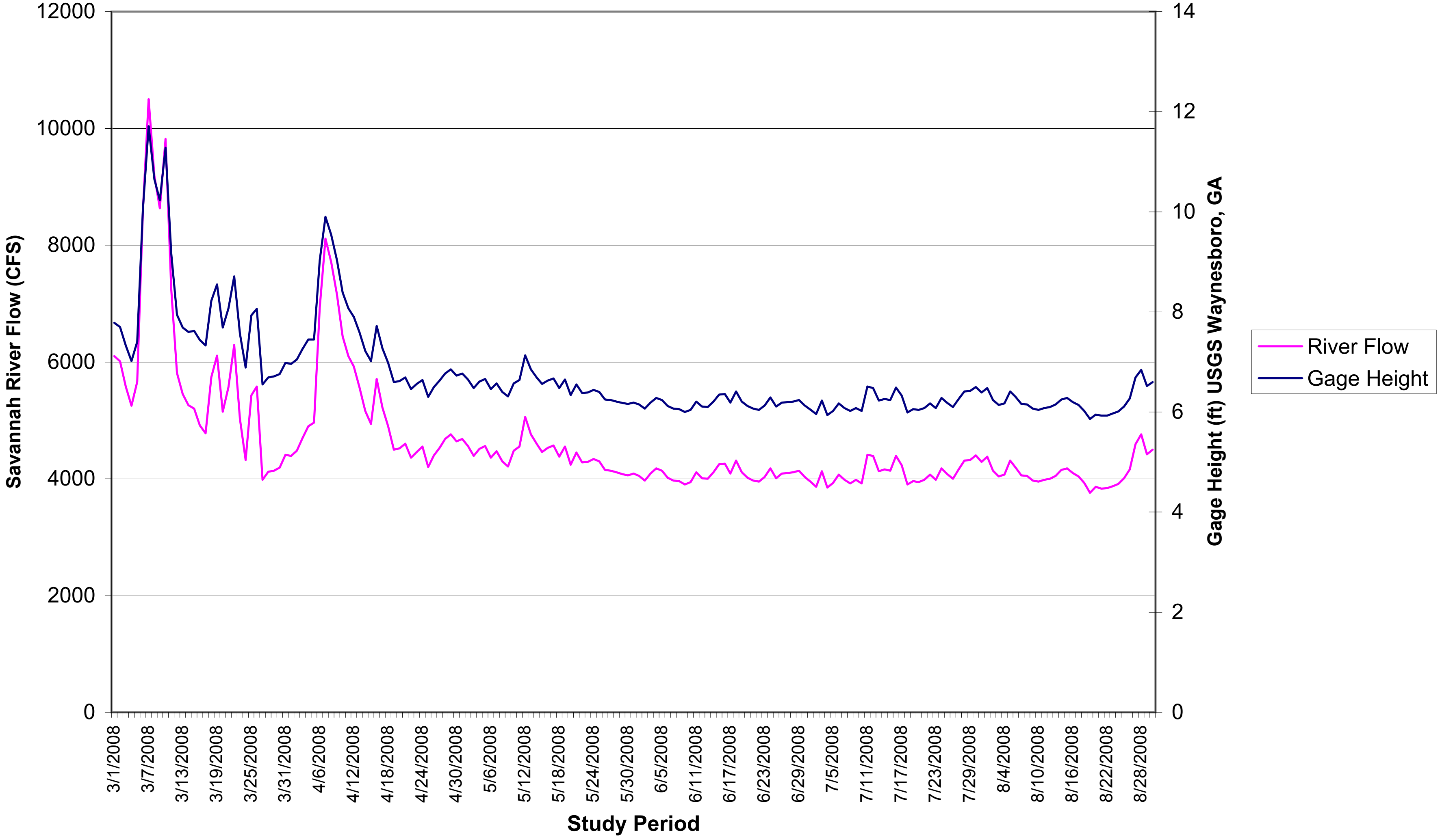
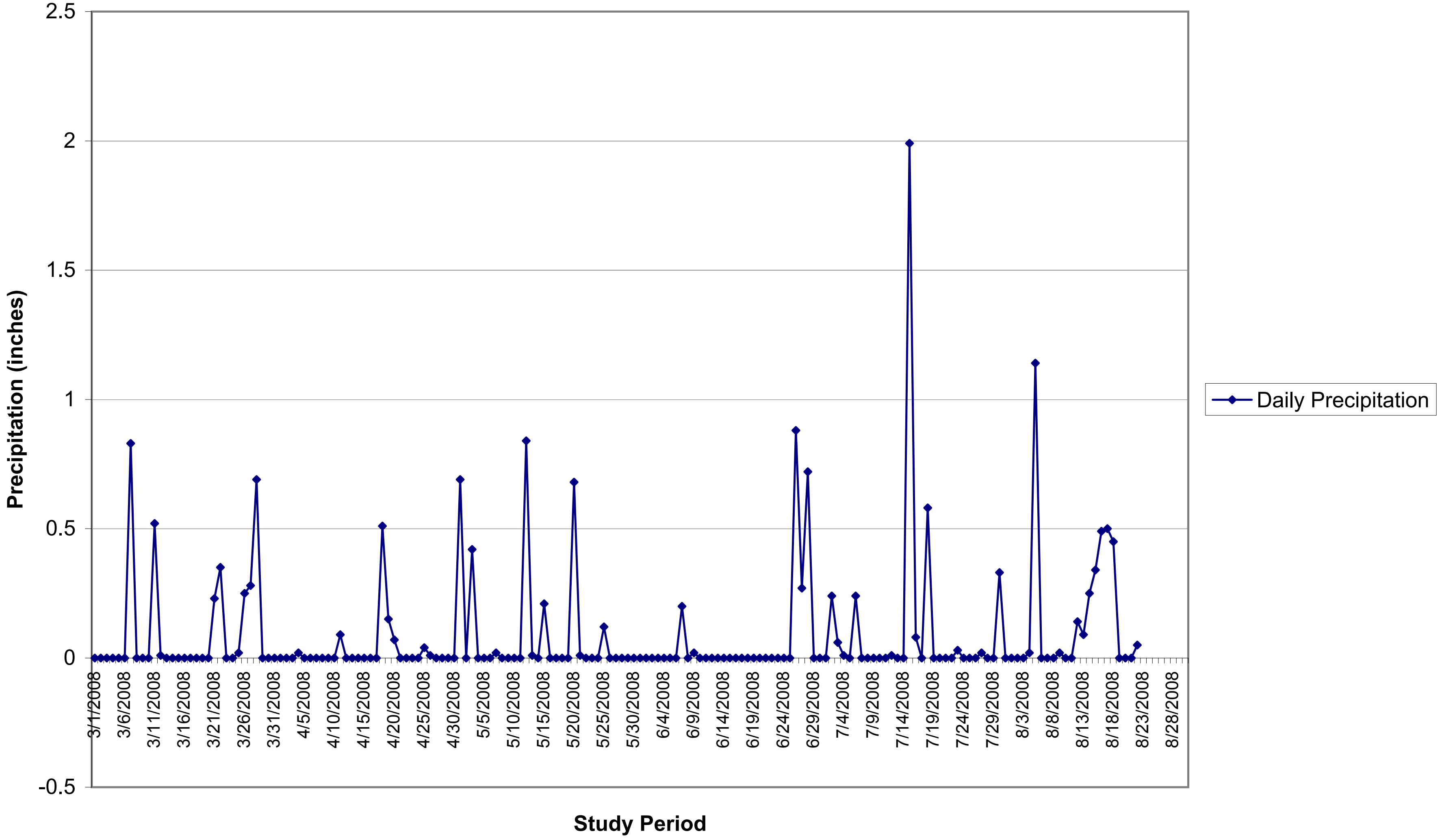


Figure B-3
Daily Precipitation, USGS Waynesboro,GA



LAB7600

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	58.83				
14	63.07				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	63.36				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
31	63.36				
Total (MG)*	1959.34				
Average (MGD)**	63.20				
Max Day (MG)*	63.36				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: **March**

Year: **2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 4-2-9 Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	63.36				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	63.36				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
Total (MG)*	1900.8				
Average (MGD)**	63.36				
Max Day (MG)*	63.36				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: **April**

Year: **2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

5-2-08
Signature Date

for Clif Buck
Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values In Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	71.24				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	63.36				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	76.89				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
31	63.36				
Total (MG)*	1985.57				
Average (MGD)**	64.05				
Max Day (MG)*	76.89				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name: Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: May

Year: 2008

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 6-6-08 Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs

(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:	Surface Water Withdrawal Permit #:
	Water Source: Savannah River	Water Source:	Water Source:	Water Source:	Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	66.40				
5	73.30				
6	64.06				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	63.36				
12	63.36				
13	63.36				
14	63.36				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	63.36				
20	63.36				
21	63.36				
22	63.36				
23	63.36				
24	63.36				
25	63.36				
26	63.36				
27	63.36				
28	63.36				
29	63.36				
30	63.36				
Total (MG)*	1914.48				
Average (MGD)**	63.82				
Max Day (MG)*	73.30				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:	Southern Nuclear Operating Company-Plant Vogtle
WSID # or SIC #:	SIC 4911
Month:	**June**
Year:	**2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Stan Varnum 7-10-08 ~~6/18~~ SAV
Signature Date

Stan Varnum for Clif Buck
Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

Monthly Surface Water Withdrawal Report (Raw Water Intake Data)

Report all Values in Millions of Gallons (Gallons/1,000,000)	Surface Water Withdrawal Permit #: 017-0191-05 Water Source: Savannah River	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:	Surface Water Withdrawal Permit #: Water Source:
Day of Month	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*	Withdrawn (MG)*
1	63.36				
2	63.36				
3	63.36				
4	63.36				
5	63.36				
6	63.36				
7	63.36				
8	63.36				
9	63.36				
10	63.36				
11	73.15				
12	63.36				
13	63.36				
14	75.61				
15	63.36				
16	63.36				
17	63.36				
18	63.36				
19	75.35				
20	74.76				
21	70.62				
22	75.94				
23	75.31				
24	75.39				
25	71.04				
26	71.70				
27	76.47				
28	72.20				
29	76.27				
30	63.36				
31	63.36				
Total (MG)*	2104.29				
Average (MGD)**	67.88				
Max Day (MG)*	76.47				

Submit data for each Surface Water Withdrawal Permit. Permits that were not used must still be reported by inputting zero's for each day.

System Name:
Southern Nuclear Operating Company-Plant Vogtle

WSID # or SIC #: SIC 4911

Month: **July**

Year: **2008**

Send to: Georgia Environmental Protection Division
Watershed Protection Branch, SW M&I Unit
4220 International Parkway
Suite 101
Atlanta, GA 30354-3902
Phone: (404) 675-1646
Fax: (404) 675-6244
E-mail: surface_water@mail.dnr.state.ga.us

I certify that all information contained on this form is correct and true to the best of my knowledge.

Signature 8/5/08 Date

Clif Buck
Print Name

Chemistry Manager
Title

contact information for SNC Env. Affairs
(205) 992 - 6387
Phone Number

(205) 992 - 6108
Fax Number

*: MG represents millions of gallons.
(MG = Gallons / 1,000,000)

**: MGD represents million gallons per day.
Average is calculated by dividing total quantity of water withdrawn by the number of days in the calendar month.
Average = (Total in MG / Days in month)

APPENDIX C

Source Water Community Sampling Results

TABLE C-1. SPECIES SUMMARY BY SAMPLE DATE OF ORGANISMS COLLECTED FROM THE SOURCE WATER COMMUNITY AT PLANT VOGTLE, MARCH 2008 - JULY 2008

Species Name	3/11/2008 -Day	3/12/2008 - Night	3/26/2008 - Day	3/27/2008 - Night	4/9/2008 - Day	4/10/2008 - Night	4/23/2008 - Day	4/24/2008 - Night	5/7/2008 - Day	5/8/2008 - Night	5/21/2008 - Day	5/22/2008 - Night	6/11/2008 - Day	6/12/2008 - Night	6/25/2005 -Day	6/26/2005 - Night	7/15/2008 - Day	7/16/2008 - Night	7/29/2008 - Day	7/30/2008 - Night	**Number**	*% of Total*
American Shad		5		11	1	49		2	2	72	3	20		1							**166**	*18.2%*
bay anchovy							3					3									**6**	*0.7%*
bluegill																1					**1**	*0.1%*
brook silverside										1			1								**2**	*0.2%*
carp									15	16	2	2	6	5	1	4					**51**	*5.6%*
channel catfish														1		1		10		5	**17**	*1.9%*
gizzard shad	1																				**1**	*0.1%*
hogchoker						1															**1**	*0.1%*
longnose gar														1							**1**	*0.1%*
northern hogsucker											4										**4**	*0.4%*
pirate perch						2															**2**	*0.2%*
spotted sucker											1										**1**	*0.1%*
striped bass							22	5		34											**61**	*6.7%*
Unidentified Catostomidae					6	8	16	11	14	17	2			1							**75**	*8.2%*
Unidentified Clupeidae		2		4	34	24	13	38	15	15	14	3	1		1					1	**165**	*18.1%*
Unidentified Cyprinidae	1		3	10	14	8	54	11	6	4	1	7	8	26	4	17		7		3	**184**	*20.2%*
Unidentified Cyprinodontidae																			1		**1**	*0.1%*
Unidentified darter	2	1	3	8	6	5	7	9	2	9	4	4	5	4	2	1					**72**	*7.9%*
Unidentified Lepomis						1			1		1	2	2	5		1		4		4	**21**	*2.3%*
Unidentified Osteichthyes			3	1	3	1	6	3	3		6	1	2	2							**31**	*3.4%*
white perch									6	1	2		2								**11**	*1.2%*
yellow bullhead														16		4					**20**	*2.2%*
yellow yerch			1		6	1	2	2		1	1		1	1							**16**	*1.8%*
TOTALS	**4**	**8**	**10**	**34**	**70**	**100**	**123**	**81**	**64**	**170**	**41**	**42**	**28**	**63**	**8**	**29**	**0**	**21**	**1**	**13**	**910**	***100%***
Day TOTALS	**4**		**10**		**70**		**123**		**64**		**41**		**28**		**8**		**0**		**1**		**349**	***38.4%***
Night TOTALS		**8**		**34**		**100**		**81**		**170**		**42**		**63**		**29**		**21**		**13**	**561**	***61.6%***

TABLE C-2. SUMMARY OF TAXA ABUNDANCE AND LIFE STAGES COLLECTED* FROM SOURCE WATER AT THE PROPOSED LOCATION OF UNITS 3&4 INTAKE, MARCH 2008 - JULY 2008

	Number of Specimens by Life Stage				
Common Name	**Egg**	**Yolk-sac larvae**	**Post yolk-sac larvae**	**Unidentified**	**Totals**
Brook Silverside	1	--	--	--	**1**
Carp	1	--	--	--	**1**
Northern Hogsucker	--	--	1	--	**1**
Spotted Sucker	--	--	1	--	**1**
Unidentified clupeidae	--	--	--	1	**1**
Unidentified cyprinidae	--	3	--	--	**3**
Unidentified darter	2	3	--	--	**5**
Unidentified osteichthyes	4	--	--	--	**4**
Yellow Perch	--	1	--	--	**1**
Totals	**8**	**7**	**2**	**1**	**18**

Note:

* = based on a total sample effor of four (4) individual samples collected during daytime only.

- - none collected

TABLE C-3. RELATIVE ABUNDANCE AND LIFE STAGE OCCURRENCE IN RIVERINE SOURCE WATER, MARCH 2008 - JULY 2008

		Total Number of Organisms Collected at Plant Vogtle during March 2008 - 30 July 2008					
		Source Water Sampling					
		Eggs	Yolk-Sac Larvae	Post Yolk-Sac Larvae	Yearling or Older	Unidentified	Totals
Event 1	10-12 March 2008	11	0	1	0	0	12
Event 2	17-19 March 2008	41	2	1	0	0	44
Event 3	8-10 April 2008	122	23	22	1	2	170
Event 4	22-24 April 2008	131	41	26	0	6	204
Event 5	6-8 May 2008	179	15	40	0	0	234
Event 6	20-22 May 2008	41	22	17	1	2	83
Event 7	10-12 June 2008	30	25	18	17	1	91
Event 8	24-25 June 2008	7	18	5	6	1	37
Event 9	15-16 July 2008	0	0	11	10	0	21
Event 10	29-30 July 2008	0	3	6	5	0	14
	Totals	**562**	**149**	**147**	**40**	**12**	**910**

TABLE C-4. DENSITIES OF EGGS AND LARVAE COMBINED FOR EACH TAXA PER 1000 CUBIC METERS OF WATER SAMPLED DURING DAY AND NIGHT PERIODS OF SOURCE WATER SAMPLNG NEAR PLANT VOGTLE, MARCH 2008 - JULY 2008

Sample Event	Species	Day	Night	USWD*	Mean Egg and Larval Density/ 1000 M3
10-12 March 2008	American Shad	0.0	13.1	(--)	
	Gizzard Shad	2.6	0.0	(--)	
	Unidentified Clupeidae	0.0	5.3	(--)	
	Unidentified Cyprinidae	2.6	0.0	(--)	
	Unidentified darter	5.3	2.6	(--)	
	Totals	**10.5**	**21.0**	(--)	**31.5**
17-19 March 2008	American Shad	0.0	36.9	(--)	
	Unidentified Clupeidae	0.0	13.4	(--)	
	Unidentified Cyprinidae	10.1	33.6	(--)	
	Unidentified darter	10.1	26.9	(--)	
	Unidentified Osteichthyes	10.1	3.4	(--)	
	Yellow Perch	3.4	0.0	(--)	
	Totals	**33.6**	**114.1**	(--)	**147.7**
8-10 April 2008	American Shad	3.1	153.3	(--)	
	Hogchoker	0.0	3.1	(--)	
	Pirate Perch	0.0	6.3	(--)	
	Unidentified Catostomidae	18.8	25.0	(--)	
	Unidentified Clupeidae	106.4	75.1	(--)	
	Unidentified Cyprinidae	43.8	25.0	(--)	
	Unidentified darter	18.8	15.6	(--)	
	Unidentified Lepomis	0.0	3.1	(--)	
	Unidentified Osteichthyes	9.4	3.1	(--)	
	Yellow Perch	18.8	3.1	(--)	
	Totals	**219.0**	**312.8**	(--)	**531.8**
22-24 April 2008	American Shad	0.0	10.7	(--)	
	Bay Anchovy	16.1	0.0	(--)	
	Striped Bass	117.9	26.8	(--)	
	Unidentified Catostomidae	85.7	58.9	(--)	
	Unidentified Clupeidae	69.7	203.6	(--)	
	Unidentified Cyprinidae	289.4	58.9	(--)	
	Unidentified darter	37.5	48.2	(--)	
	Unidentified Osteichthyes	32.2	16.1	(--)	
	Yellow Perch	10.7	10.7	(--)	
	Totals	**659.1**	**434.1**	(--)	**1093.2**

TABLE C-4 (CONT.)

Sample Event	Species	Day	Night	(--)	Mean
6-8 May 2008	American Shad	11.8	423.4	(--)	
	Brook Silverside	0.0	5.9	(--)	
	Carp	88.2	94.1	(--)	
	Striped Bass	0.0	199.9	(--)	
	Unidentified Catostomidae	82.3	100.0	(--)	
	Unidentified Clupeidae	88.2	88.2	(--)	
	Unidentified Cyprinidae	35.3	23.5	(--)	
	Unidentified darter	11.8	52.9	(--)	
	Unidentified Lepomis	5.9	0.0	(--)	
	Unidentified Osteichthyes	17.6	0.0	(--)	
	White Perch	35.3	5.9	(--)	
	Yellow Perch	0.0	5.9	(--)	
	Totals	**376.4**	**999.7**	(--)	**1376.1**
20-22 May 2008	American Shad	17.6	117.4	0.0	
	Bay Anchovy	0.0	17.6	0.0	
	Carp	11.7	11.7	0.0	
	Northern Hogsucker	17.6	0.0	5.9	
	Spotted Sucker	0.0	0.0	5.9	
	Unidentified Catostomidae	11.7	0.0	0.0	
	Unidentified Clupeidae	82.2	17.6	0.0	
	Unidentified Cyprinidae	5.9	41.1	0.0	
	Unidentified darter	11.7	23.5	11.7	
	Unidentified Lepomis	5.9	11.7	0.0	
	Unidentified Osteichthyes	23.5	5.9	11.7	
	White Perch	11.7	0.0	0.0	
	Yellow Perch	0.0	0.0	5.9	
	Totals	**52.8**	**41.1**	**41.1**	**93.9**
10-12 June 2008	American Shad	0.0	5.9	0.0	
	Brook Silverside	0.0	0.0	5.9	
	Carp	29.5	29.5	5.9	
	Channel Catfish	0.0	5.9	0.0	
	Longnose Gar	0.0	5.9	0.0	
	Unidentified Catostomidae	0.0	5.9	0.0	
	Unidentified Clupeidae	0.0	0.0	5.9	
	Unidentified Cyprinidae	29.5	153.2	17.7	
	Unidentified darter	11.8	23.6	17.7	
	Unidentified Lepomis	11.8	29.5	0.0	
	Unidentified Osteichthyes	0.0	11.8	11.8	
	White Perch	11.8	0.0	0.0	
	Yellow Bullhead	0.0	94.3	0.0	
	Yellow Perch	5.9	5.9	0.0	
	Totals	**29.5**	**141.4**	**64.8**	**170.8**

TABLE C-4 (CONT.)

Sample Event	Species	Day	Night	USWD*	Mean
24-25 June 2008	Bluegill	0.0	5.7	(--)	
	Carp	5.7	22.8	(--)	
	Channel Catfish	0.0	5.7	(--)	
	Unidentified Clupeidae	5.7	0.0	(--)	
	Unidentified Cyprinidae	22.8	97.1	(--)	
	Unidentified darter	11.4	5.7	(--)	
	Unidentified Lepomis	0.0	5.7	(--)	
	Yellow Bullhead	0.0	22.8	(--)	
	Totals	**40.0**	**131.3**	(--)	**171.3**
15-16 July 2008	Channel Catfish	0.0	55.7	(--)	
	Unidentified Cyprinidae	0.0	39.0	(--)	
	Unidentified Lepomis	0.0	22.3	(--)	
	Totals	**40.0**	**271.2**	(--)	**311.2**
29-30 July 2008	Channel Catfish	0.0	38.9	(--)	
	Unidentified Clupeidae	0.0	7.8	(--)	
	Unidentified Cyprinidae	0.0	23.3	(--)	
	Unidentified Cyprinodontidae	7.8	0.0	(--)	
	Unidentified Lepomis	0.0	31.1	(--)	
	Totals	**7.8**	**101.1**	(--)	**108.9**
Primary Transect, Mean Daytime Densities		**19.4**	**33.9**		**403.6**
	Proposed Units 3&4 Location[1]			**52.9**	

Note:

* (--) = no sample collected.

USWD includes samples collected from the Savannah River near the proposed location of the Units 3&4 intake.

a = based on mean of all individual taxa.

TABLE C-5. SUMMARY OF LIFE STAGES REPRESENTED FOR THE THREE MOST ABUNDANT TAXA COLLECTED IN SOURCE WATER SAMPLES FROM THE SAVANNAH RIVER AT PLANT VOGTLE, MARCH 2008 - JULY 2008

Dominant Species	Sample Date	Egg	Yolk-Sac Larvae	Post-Yolk-Sac-Larvae	Young-of-the-Year	Yearling+	Subtotals
Unidentified Cyprindidae							
	10-12 March 2008	1					**1**
	17-19 March 2008	13					**13**
	8-10 April 2008	1	16	5			**22**
	22-24 April 2008	27	26	7			**60**
	6-8 May 2008	1	5	4			**10**
	20-22 May 2008	1	3	2	1		**7**
	10-12 June 2008	7	16	11			**34**
	24-25 June 2008	2	14	4			**20**
	15-16 July 2008			7			**7**
	29-30 July 2008		2	1			**3**
	Subtotals	**53**	**82**	**41**	**1**	**0**	**177**
							+7 unidentified
American shad							
	10-12 March 2008	5	0	0	0	0	**5**
	17-19 March 2008	11	0	0	0	0	**11**
	8-10 April 2008	50	0	0	0	0	**50**
	22-24 April 2008	2	0	0	0	0	**2**
	6-8 May 2008	74	0	0	0	0	**74**
	20-22 May 2008	22	1	0	0	0	**23**
	10-12 June 2008	1	0	0	0	0	**1**
	24-25 June 2008	0	0	0	0	0	**0**
	15-16 July 2008	0	0	0	0	0	**0**
	29-30 July 2008	0	0	0	0	0	**0**
	Subtotals	**165**	**1**	**0**	**0**	**0**	**166**
Unidentified Clupeidae							
	10-12 March 2008	2	0	0	0	0	**2**
	17-19 March 2008	4	0	0	0	0	**4**
	8-10 April 2008	58	0	0	0	0	**58**
	22-24 April 2008	50	0	2	0	0	**52**
	6-8 May 2008	28	0	2	0	0	**30**
	20-22 May 2008	3	8	5	0	0	**16**
	10-12 June 2008	0	0	0	0	0	**0**
	24-25 June 2008	1	0	0	0	0	**1**
	15-16 July 2008	0	0	0	0	0	**0**
	29-30 July 2008	0	0	1	0	0	**1**
	Subtotals	**146**	**8**	**10**	**0**	**0**	**164**
							+1 unidentified

APPENDIX D

Entrainment Sampling Results

TABLE D-1. SPECIES SUMMARY BY SAMPLE DATE OF ORGANISMS COLLECTED VIA ENTRAINMENT SAMPLING IN THE PLANT VOGTLE INAKE CANAL, MARCH 2008 - JULY 2008

Species Name	3/26/2008 - Day	3/27/2008 - Night	4/9/2008 - Day	4/10/2008 - Night	4/23/2008 - Day	4/24/2008 - Night	5/7/2008 - Day	5/8/2008 - Night	5/21/2008 - Day	5/22/2008 - Night	6/11/2008 - Day	6/12/2008 - Night	6/25/2005 -Day	6/26/2005 - Night	7/15/2008 - Day	7/16/2008 - Night	7/29/2008 - Day	7/30/2008 - Night	**Number**	*% of Total*
pirate perch		1																	**1**	*4.0%*
Unidentified Catostomidae	2	2				1													**5**	*20.0%*
Unidentified Cyprinidae				1												2			**3**	*12.0%*
Unidentified Lepomis													1	1	1			1	**4**	*16.0%*
Unidentified Osteichthyes						1													**1**	*4.0%*
yellow bullhead												1							**1**	*4.0%*
yellow perch	3	5				2													**10**	*40.0%*
TOTALS	**5**	**8**	**0**	**1**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**2**	**0**	**1**	**25**	***100%***
Day TOTALS	**5**		**0**		**0**		**0**		**0**		**0**		**1**		**1**		**0**		**7**	***28.0%***
Night TOTALS		**8**		**1**		**4**		**0**		**0**		**1**		**1**		**2**		**1**	**18**	***72.0%***

TABLE D-2. RELATIVE ABUNDANCE AND LIFE STAGE OCCURRENCE IN CANAL ENTRAINMENT SAMPLES, MARCH 2008 - JULY 2008

		Entrainment Sampling						
		Eggs	Yolk-Sac Larvae	Post Yolk-Sac Larvae	Yearling or Older	Unidentified	Totals	%
Event 1	10-12 March 2008	0	0	0	0	0	0	0%
Event 2	17-19 March 2008	0	5	8	0	0	13	52%
Event 3	8-10 April 2008	0	0	1	0	0	1	4%
Event 4	22-24 April 2008	0	0	3	0	1	4	16%
Event 5	6-8 May 2008	0	0	0	0	0	0	0%
Event 6	20-22 May 2008	0	0	0	0	0	0	0%
Event 7	10-12 June 2008	0	0	0	1	0	1	4%
Event 8	24-25 June 2008	0	1	1	0	0	2	8%
Event 9	15-16 July 2008	0	0	3	0	0	3	12%
Event 10	29-30 July 2008	0	0	1	0	0	1	4%
	Totals	**0**	**6**	**17**	**1**	**1**	**25**	100%

TABLE D-3. SUMMARY OF LIFE STAGES REPRESENTED FOR THE THREE MOST ABUNDANT ENTRAINED TAXA, PLANT VOGTLE INTAKE CANAL, MARCH 2008 - JULY 2008

Dominant Species	Sample Date	Egg	Yolk-Sac Larvae	Post-Yolk-Sac-Larvae	Young-of-the-Year	Yearling+	Subtotals
yellow perch							
	10-12 March 2008	0	0	0	0	0	**0**
	17-19 March 2008	0	5	3	0	0	**8**
	8-10 April 2008	0	0	0	0	0	**0**
	22-24 April 2008	0	0	2	0	0	**2**
	6-8 May 2008	0	0	0	0	0	**0**
	20-22 May 2008	0	0	0	0	0	**0**
	10-12 June 2008	0	0	0	0	0	**0**
	24-25 June 2008	0	0	0	0	0	**0**
	29-30 July 2008	0	0	0	0	0	**0**
	15-16 July 2008	0	0	0	0	0	**0**
	Subtotals	**0**	**5**	**5**	**0**	**0**	**10**
Unidentified Catostomidae							
							0
	10-12 March 2008	0	0	0	0	0	**0**
	17-19 March 2008	0	0	4	0	0	**4**
	8-10 April 2008	0	0	0	0	0	**0**
	22-24 April 2008	0	0	1	0	0	**1**
	6-8 May 2008	0	0	0	0	0	**0**
	20-22 May 2008	0	0	0	0	0	**0**
	10-12 June 2008	0	0	0	0	0	**0**
	24-25 June 2008	0	0	0	0	0	**0**
	15-16 July 2008	0	0	0	0	0	**0**
	29-30 July 2008	0	0	0	0	0	**0**
	Subtotals	**0**	**0**	**5**	**0**	**0**	**5**
Unidentified Lepomis							
	10-12 March 2008	0	0	0	0	0	**0**
	17-19 March 2008	0	0	0	0	0	**0**
	8-10 April 2008	0	0	0	0	0	**0**
	22-24 April 2008	0	0	0	0	0	**0**
	6-8 May 2008	0	0	0	0	0	**0**
	20-22 May 2008	0	0	0	0	0	**0**
	10-12 June 2008	0	0	0	0	0	**0**
	24-25 June 2008	0	1	1	0	0	**2**
	15-16 July 2008	0	0	1	0	0	**1**
	29-30 July 2008	0	0	1	0	0	**1**
	Subtotals	**0**	**1**	**3**	**0**	**0**	**4**

TABLE D-4. DENSITIES OF EGGS AND LARVAE COMBINED FOR EACH TAXA PER 1000 CUBIC METERS (No./1000 M3) OF WATER SAMPLED DURING DAY AND NIGHT PERIODS COLLECTED VIA SUBMERSIBLE PUMP FROM THE PLANT VOGTLE INTAKE CANAL DURING MARCH 2008 - JULY 2008

Sample Event	Species	Day	Night	Mean Egg and Larval Density/ 1000 M3
10-12 March 2008	None	0.0	0.0	
	Totals	**0.0**	**0.0**	**0.0**
17-19 March 2008	Pirate Perch	0.0	3.6	
	Unidentified Catostomidae	7.3	7.3	
	Yellow Perch	10.9	18.1	
	Totals	**18.1**	**29.0**	**47.2**
8-10 April 2008	Unidentified Cyprinidae	0.0	9.4	
	Totals	**0.0**	**9.4**	**9.4**
22-24 April 2008	Unidentified Catostomidae	0.0	6.8	
	Unidentified Osteichthyes	0.0	6.8	
	Yellow Perch	0.0	13.6	
	Totals	**0.0**	**27.1**	**27.1**
6-8 May 2008	None	0.0	0.0	
	Totals	**0.0**	**0.0**	**0.0**
20-22 May 2008	None	0.0	0.0	
	Totals	**0.0**	**0.0**	**0.0**
10-12 June 2008	Yellow Bullhead	0.0	5.7	
	Totals	**0.0**	**5.7**	**5.7**
24-25 June 2008	Unidentified Lepomis	0.01	0.01	
	Totals	**0.01**	**0.01**	**0.0**
15-16 July 2008	Unidentified Cyprinidae	0.0	11.6	
	Unidentified Lepomis	0.0	5.8	
	Totals	**0.0**	**17.4**	**17.4**
29-30 July 2008	Unidentified Lepomis	0.0	5.9	
	Totals	**0.0**	**5.9**	**5.9**
	Mean Density	**1.8**	**9.4**	**11.3** [a]

Notes:
a = based on per-sample event means..

TABLE D-5. ANNUAL ENTRAINMENT AT PLANT VOGTLE BASED ON DATA COLLECTED DURING MARCH 2008 - JULY 2008

Common Name	Annual Entrainment		Number of Entrained Organisms during the Five Month Study	Relative Abundance of Entrained Organisms
	Entrainment Estimate (No. Organisms)	Upper Confidence Limit (1) Based on Mean Half-Monthly Rate		
pirate perch	17,952	22,726	1	4%
unidentified Catastomidae	89,761	113,631	5	20%
unidentified Cyprinidae	53,856	68,178	3	12%
unidenified Lepomis	71,808	90,905	4	16%
unidentified Osteichthyes	17,952	22,726	1	4%
yellow bullhead	17,952	22,726	1	4%
yellow perch	179,521	227,262	10	40%
TOTAL	**448,803**	**568,154**	**25**	

Note:

(1) Confidence limit for each species is estimated using relative abundance percentages applied to the actual 95% UCL; difference between 95% UCL and annual estimate due to two events in which no organisms were entrained based actual sample data.
(2) Standard deviation of the mean half-monthly rate is 58,983 (organisms).

TABLE D-6. COMPARISON BETWEEN DAILY ENTRAINMENT RATE VS SOURCE WATER COMMUNITY DRIFT RATE DURING MARCH 2008 - JULY 2008

Location	Mean Daily Make-up Water Flow (m3) [1]	Mean Daily River Flow (m3) [1]	Estimated Number of Entrained Organisms/Day [1*]	Estimated Number of Non-Entrained Source Water Organisms/Day [2]
Plant Vogtle Intake	241,000		1,230	
Savannah River at Plant Vogtle		11,402,000		312,039

Note:

1 = Based on actual daily intake pump volumes or river discharge.

* = Daily entrainment based on the 95% UCL.

Attachment 14

5 years of annual mean flow data from USGS Gauge #021973269 (Savannah River at Waynesboro)

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National Water Information System: Web Interface

USGS Water Resources

Data Category: Surface Water

Geographic Area: Georgia

GO

News updated April, 2011

USGS Surface-Water Annual Statistics for Georgia

- All times for Georgia stations are Eastern Standard Time.
- Additional information:
  - Annual data report--2009 and earlier
  - Instantaneous Data Archive for additional intra-day data
  - Low-flow statistics for selected stations
  - Flood-frequency information for selected stations
  - USGS Water Resources of Georgia
- Sign up for Georgia Water Science Center E-mail Notices: publication releases, gage shutdown notifications, and other general USGS news
- Sign up for custom Water Alerts by text or email

The USGS operates through cooperative funding agreements where a share of the cost for funding data collection at a station is paid by a cooperating agency and the remainder of the cost is paid by the USGS. The following station is scheduled to be discontinued due to the unavailability of a cooperating agency to assist with the ongoing operation and maintenance costs:

- **02388350 Armuchee Creek at Old Dalton Road, near Rome, GA**

For more information on what is needed to keep this gage operating, please call Brian McCallum at 770-903-9127 or email at bemccall@usgs.gov.

The statistics generated from this site are based on approved daily-mean data and may not match those published by the USGS in official publications. The user is responsible for assessment and use of statistics from this site. For more details on why the statistics may not match, click here.

USGS 021973269 SAVANNAH RIVER NEAR WAYNESBORO, GA

Available data for this site Time-series: Annual statistics GO

Burke County, Georgia
Hydrologic Unit Code 03060106
Latitude 33°08'59", Longitude 81°45'18" NAD27
Drainage area 8,300 square miles
Gage datum 70 feet above NAVD88

Output formats

- HTML table of all data
- Tab-separated data
- Reselect output format

Water Year	00060, Discharge, cubic feet per second
2006	6,988
2007	5,979
2008	4,798
2009	5,308
2010	10,910

** No Incomplete data have been used for statistical calculation

---

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U.S. Department of the Interior | U.S. Geological Survey
Title: Surface Water data for Georgia: USGS Surface-Water Annual Statistics
URL: http://waterdata.usgs.gov/ga/nwis/annual?

Page Contact Information: Georgia Water Data Support Team
Page Last Modified: 2011-05-27 14:15:02 EDT
0.25 0.23 sdww01

Attachment 15

Annual mean flow data for Water Years 1952 through 2010 from USGS Gauge #02197000 (Savannah River at Augusta)

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National Water Information System: Web Interface

USGS Water Resources

Data Category: Surface Water

Geographic Area: United States

GO

News updated April, 2011

USGS Surface-Water Annual Statistics for the Nation

The statistics generated from this site are based on approved daily-mean data and may not match those published by the USGS in official publications. The user is responsible for assessment and use of statistics from this site. For more details on why the statistics may not match, click here.

USGS 02197000 SAVANNAH RIVER AT AUGUSTA, GA

Available data for this site   Time-series: Annual statistics   GO

	Output formats
Richmond County, Georgia Hydrologic Unit Code 03060106 Latitude 33°22'25", Longitude 81°56'35" NAD27 Drainage area 7,510 square miles Gage datum 95.58 feet above NGVD29	HTML table of all data Tab-separated data Reselect output format

Water Year	00060, Discharge, cubic feet per second
1952	8,596
1953	6,561
1954	7,293
1955	5,487
1956	5,398

1957	6,572
1958	11,360
1959	7,125
1960	12,450
1961	8,873
1962	9,276
1963	9,554
1964	16,580
1965	12,940
1966	9,509
1967	8,372
1968	9,043
1969	9,812
1970	7,032
1971	8,668
1972	10,240
1973	13,200
1974	9,822
1975	12,200
1976	12,100
1977	11,030
1978	10,270
1979	10,770
1980	12,550
1981	6,280
1982	6,919
1983	11,060
1984	11,450
1985	6,440
1986	6,236
1987	7,825
1988	5,344
1989	5,371

1990	11,570
1991	10,280
1992	7,656
1993	15,370
1994	8,375
1995	11,110
1996	11,800
1997	9,014
1998	14,150
1999	5,827
2000	4,754
2001	4,767
2002	4,470
2003	10,070
2004	6,505
2005	11,490
2006	6,604
2007	5,235
2008	4,194
2009	4,424
2010	11,630
** No Incomplete data have been used for statistical calculation	

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U.S. Department of the Interior | U.S. Geological Survey
Title: Surface Water data for USA: USGS Surface-Water Annual Statistics
URL: http://waterdata.usgs.gov/nwis/annual?

Page Contact Information: South Carolina Water Data Support Team
Page Last Modified: 2011-05-27 14:08:07 EDT
0.47 0.46 sdww02

Vogtle Electric Generation Plant Units 3&4 NPDES Permit GA0039420 Permit Renewal Application – Attachment (2) Source Water Physical Data

Please refer to pages 4-8 of the Attachment named: 316(b) Supporting Information

Attachment
(3) Cooling Water Intake Structure Data

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

Vogtle Electric Generation Plant Units 3&4
NPDES Permit GA0039420 Permit Renewal Application – Attachment (3) Cooling water intake structure data

Please refer to pages 9-10 of the Attachment named: 316(b) Supporting Information

Attachment
(4) Source Water Baseline Characterization Data

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

Vogtle Electric Generation Plant Units 3&4 NPDES Permit GA0039420 Permit Renewal Application – Attachment (4) Source Water Baseline Biological Characterization Data

Please refer to pages 10-22 of the Attachment named: 316(b) Supporting Information

Attachment
(5) Cooling Water System Data

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

Vogtle Electric Generation Plant Units 3&4 NPDES Permit GA0039420 Permit Renewal Application – Attachment (5) Cooling Water System Data

Please refer to pages 4 and 9 of the Attachment named: 316(b) Supporting Information

Attachment
(6) Chosen Method(s) of Compliance with Impingement Mortality Standard

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

Southern Nuclear
Operating Company, Inc.
3535 Colonnade Parkway
Birmingham, Alabama 35243

Vogtle Electric Generation Plant Units 3&4 NPDES Permit GA0039420 Permit Renewal Application – Attachment (6) Chosen Method(s) of Compliance with Impingement Mortality Standard

Refer to Page 4 of the Attachment named: 316(b) Supporting Information. The facility will employ closed cycle-cooling.

Attachment
(7) Entrainment Performance Studies

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

Vogtle Electric Generation Plant Units 3&4
NPDES Permit GA0039420 Permit Renewal Application – Attachment (7) Entrainment Performance Studies

Refer to Attachment 13 of the Attachment named: 316(b) Supporting Information for preoperational data.

The facility is under construction with scheduled in-service dates of 2021 and 2022 for Units 3 and 4, respectively.

Attachment
(8) Operational Status

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

Vogtle Electric Generation Plant Units 3&4
NPDES Permit GA0039420 Permit Renewal Application – Attachment (8) Operational Status

Refer to page 1 of the Attachment named: 316(b) Supporting Information for preoperational data.

The facility is under construction with scheduled in-service dates of 2021 and 2022 for Units 3 and 4, respectively.

Attachment
(9) Federal Agency Consultation

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

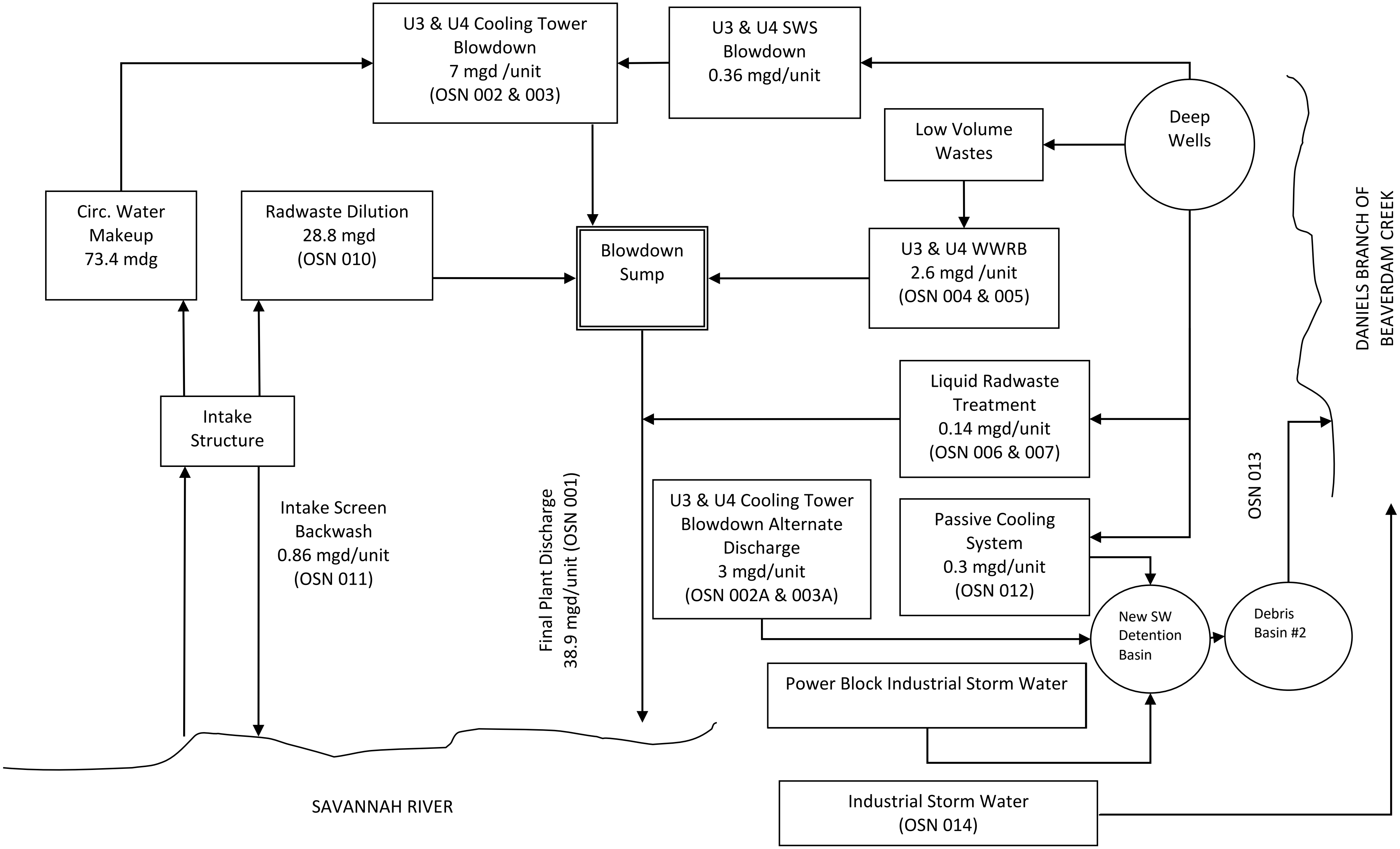
Vogtle Electric Generation Plant Units 3&4 NPDES Permit GA0039420 Permit Renewal Application – Attachment Federal Agency Communication

Refer to Attachments 6, 7, 8, 9, 10, and 11 the Attachment Named: 316(b) Supporting Information for prior communication with applicable Federal Agencies.

Attachment
Water Flow Line Drawing

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

Vogtle Electric Generating Plant Units 3 and 4 Flow Diagram
NPDES Permit No. GA0039420



Attachment
Antidegradation Report

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

National Pollutant Discharge Elimination System (NPDES)

Industrial Socioeconomic Demonstration And Alternatives Analysis

The goal of the state of Georgia is to enhance, protect, and maintain water quality in Georgia. The Antidegradation Implementation Procedures established by the Environmental Protection Division (EPD) serve to promote this goal and the implementation of the State antidegradation regulation found at 391-3-6-.03(2)(a), (b), and (c) of the Georgia Rules and Regulations for Water Quality Control. NPDES permit applications for new or expanded point sources require the applicant to conduct a socioeconomic demonstration and alternatives analysis to justify the necessity of lowering local water quality to accommodate important economic or social development in the area in which the water is located. This demonstration shall include this completed form and copies of any engineering reports, economic feasibility studies, or other supporting documentation.

I. Project Information

Facility Name: Vogtle Electric Generating Plant

NPDES Permit Number: new application

Location:7821 River Road, Waynesboro, GA 30830

County: Burke

Receiving Waters Impacted: Savannah River

Stream Classification: Fishing

II. Socioeconomic Demonstration

1. **Define the boundaries of the affected community:**
(Specify the geographic region the proposed project is expected to affect. Include the name of all cities, towns, and counties. This geographic region must include the proposed receiving water.)

See attachment

2. **The effect on employment in the affected community:**
(Compare current unemployment rates in the affected community to current state and national unemployment rates. Discuss how the proposed project will positively or negatively impact those rates, including quantifying the number of jobs created and/or continued and the quality of those jobs.)

See attachment

II. Socioeconomic Demonstration

3. The effect on median household income levels in the affected community:

(Compare current median household income levels with projected median household income levels. Discuss how the proposed project will positively or negatively impact the median household income in the affected community including the number of households expected to be impacted within the affected community.)

See attachment

4. The effect on tax revenues of the affected community:

(Compare current tax revenues of the affected community with the projected increase in tax revenues generated by the proposed project. Discuss the positive and negative social and economic impacts on the affected community by the projected increase.)

See attachment

5. The effect on existing environmental or public health in the affected community:

(Discuss how the proposed project will have a positive or negative impact on existing environmental or public health.)

See attachment

II. Socioeconomic Demonstration

6. Discuss any other economic or social benefit to the affected community:

(Discuss any positive or negative impact on the economy of the affected community including direct and or indirect benefits that could occur as a result of the project. Discuss any positive or negative impact on the social benefits to the community including direct and indirect benefits that could occur as a result of the project.)

See attachment

III. Alternative Analysis

1. Pollution prevention measures:

(Discuss the pollution prevention measures evaluated including the feasibility of those measures and the cost. Measures to be addressed include but are not limited to changes in processes, source reductions or substitution with less toxic substances. Indicate which measures are to be implemented.)

See attachment

2. The use of best management practices to minimize impacts:

(Discuss the consideration and use of best management practices that will assist in minimizing impacts to water quality from the proposed permitted activity.)

See attachment

III. Alternative Analysis

3. Recycle or reuse of wastewater, waste by-products, or production materials and fluids:

(Discuss the potential recycle or reuse opportunities evaluated including the feasibility of implementation and the costs. Indicate which of these opportunities are to be implemented)

See attachment

4. Application of water conservation methods:

(Discuss the potential water conservation opportunities evaluated including the feasibility of implementation and the costs. Indicate which of these opportunities are to be implemented)

See attachment

5. Alternative or enhanced treatment technology:

(Compare feasibility and costs of proposed treatment with the feasibility and costs of alternative or enhanced treatment technologies that may result in more complete pollutant removal. Describe each candidate technology including the efficiency and reliability in pollutant removal and the capital and operational costs to implement those candidate technologies. Justify the selection of the proposed treatment technology.)

See attachment

III. Alternative Analysis

6. Improved operation and maintenance of existing treatment systems:

(Discuss improvements in the operation and maintenance of any available existing treatment system that could accept the wastewater. Compare the feasibility and costs of improving an existing system with the feasibility and cost of the proposed treatment system.)

See attachment

7. Seasonal or controlled discharge options:

(Discuss the potential of retaining generated wastewaters for controlled releases under optimal conditions, i.e. during periods when the receiving water has greater assimilative capacity. Compare the feasibility and cost of such a management technique with the feasibility and cost of the proposed treatment system.)

See attachment

8. Land Application System

(Discuss the potential of utilizing a spray field or other land disposal system. Compare the feasibility and costs of such treatment techniques with the feasibility and costs of the proposed treatment system.)

See attachment

III. Alternative Analysis

9. Discharge to other treatment systems

(Discuss the availability of either public or private treatments systems with sufficient capacity and sophistication to treat the wastewaters generated by this project. Compare the feasibility and costs of such options with the feasibility and costs of the proposed treatment system.)

See attachment

IV Certification: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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VEGP Units 3 and 4
Attachment to NPDES Industrial Antidegradation Analysis

Southern Nuclear Operating Company (SNC) prepared two Environmental Reports and the U.S. Nuclear Regulatory Commission (NRC) prepared two Environmental Impact Statements (EIS) (one for an Early Site Permit, the other for a Combined Operating License), which assessed the impacts of the proposed construction and operation of two additional electric-generating units at the Vogtle Electric Generating Plant (VEGP) in eastern Burke County, approximately 20 miles east of Waynesboro, Georgia.

The following responses have been incorporated from the socioeconomic and alternatives analyses conducted for, and presented in, these documents, as appropriate.

Part II Socioeconomic Demonstration

1. Define the boundaries of the affected community:
(Specify the geographic region the proposed project is expected to affect. Include the name of all cities, towns, and counties. This geographic region must include the proposed receiving water.)

Response:
For socioeconomic analyses, the relevant region is (1) the county in which the proposed facility would be located and (2) that county and those surrounding counties whose community services would be affected by the in-migrating workforce.

SNC assumed that the residential distribution of the new units’ in-migrating construction/operations workforces would resemble the residential distribution of VEGP’s current workforce. Approximately 80 percent of current VEGP employees reside within three counties: Burke (20 percent), Richmond (26 percent), and Columbia (34 percent) (SNC 2008, p. 2.5-1). The remaining 20 percent are distributed across 24 other counties, with numbers ranging from 1 to 58 (0.1 to 6.7 percent of the existing VEGP workforce) employees per county (SNC 2008, p.2.5-1).

The socioeconomic effects of the project would be most evident in Burke, Richmond and Columbia Counties. These are the counties that comprise the affected community. The principal cities within these counties are Waynesboro, Augusta, and Martinez.

The receiving water is the Savannah River, which borders these counties to the east.

2. The effect on employment in the affected community:
(Compare current unemployment rates in the affected community to current state and national unemployment rates. Discuss how the proposed project will positively or negatively impact those rates, including quantifying the number of jobs created and/or continued and the quality of those jobs.)

Response:
In 2008, the NRC published a Final Environmental Impact Statement for an Early Site Permit at the Vogtle Electric Generating Plant Site (EIS) (NRC 2008). Table 2-15 of the EIS provides employment changes in Burke, Columbia, and Richmond Counties and the State of Georgia between 1995 and 2005 (see below). The number of employed workers in Burke and Richmond Counties increased between 1995 and 2005 by more than 24 percent. The number of employed workers in Columbia County increased in approximately the same proportion as the county's population growth increased. During the same time period, the unemployment rate in Burke County decreased from 13.7 percent to 7.7 percent while the unemployment rate in Richmond and Columbia Counties remained relatively unchanged.

EIS Table 2-15. Employment Changes in Burke, Columbia, and Richmond Counties (1995 to 2005).

Region	Workers Employed 1995[a]	Workers Employed 2005[b]	Percentage Change in Workers Employed 1995-2005	Percentage Unemployment Rate 2005	Percentage Unemployment Rate 2005
Burke County	7,516	9,374	24.7	13.7	7.7
Richmond County	38,567	53,098	37.7	4.1	4.4
Columbia County	75,814	84,793	5.0	7.1	7.1
County Totals	121,897	147,265	20.8		
Georgia	3,522,905	*4,384,030*	*24.4*	*4.8*	*5.2*

Source: NRC 2008[1] (p. 2-103)

(a) Employed workers includes both part-time and full-time employment

(b) Unemployed workers includes all workers without employment who are available for, and seeking employment

In September, 2009, as part of the license application process, SNC reviewed the most current U.S. Bureau of Labor statistics. Between 2005 and 2008, the labor force in the three counties increased 2.8 percent, employment increased 2.4 percent, and the number of unemployed increased 9.5 percent (BLS 2009).

Recently SNC reviewed the available employment and unemployment data. The unemployment rate (not seasonally adjusted) in the Augusta-Richmond county metropolitan area was 7.7 percent in December 2008, 9.3 percent in December 2009 (BLS 2010), and 8.9 percent in 2010 (BLS 2011).

Construction Impacts to Economy of the Affected Community

Project construction is estimated to require 7 years and would result in an in-migration over that time of approximately 2,500 construction workers, which would create new indirect jobs in the community. NRC performed an analysis of job creation in a 50-mile radius surrounding the project site. While the three counties that would be most affected by the new facility do not comprise the entire 50-mile radius, they all are within that radius, and because of commute distances and available amenities, would see most of the job increases.

For every in-migrating construction worker, an additional 0.70 indirect jobs would be created (NRC 2008,p.4-44). Therefore, the construction activities at the VEGP site could create approximately 3,400 additional (direct plus indirect) jobs in the 50-mile region during the construction phase (NRC 2008, p. 4-44). The employment of such a large workforce over a 7-year period would have positive economic impacts on the surrounding region. Even if these workers earned no more than average construction wage rates, this large pool of jobs would inject millions of dollars into the community economy, reduce unemployment and create business opportunities for housing and service-related industries. The largest economic impacts would most likely be felt in Burke County, particularly in the town of Waynesboro, Georgia, because it may house the largest percentage of construction employees.

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[1] These data are from the Bureau of Labor Statistics (BLS). The NRC queried these data in 2007 from the following web address, http://www.bls.gov/lau/home.htm. However, if the same query were performed in 2011 (for 1995 and 2005 data), the data for 2005 would differ from the data presented here and recovered from the NRC query in 2007. This is because the BLS updated the 2005 data since NRC's 2007 query. In any event, however, the updated numbers would be similar to those presented in this table.

Operations Impacts to Economy of the Affected Community

The period of project operations is 40 years and 812 workers would be required to operate the new units at VEGP. The new operations workers would create new indirect jobs in the area. For every operations worker, an additional 1.41 indirect jobs (SNC 2008, p. 5.8-4) would be created. Therefore, the operations activities at the VEGP site could create approximately 1,957 additional (direct plus indirect) jobs in the 50-mile region. Many of these jobs could be filled by the region's unemployed. In 2004, there were approximately 7,800 unemployed workers in the three counties (SNC 2008, p. 5.8-4). In December 2010, there were approximately 23,100 unemployed workers in the Augusta-Richmond County metropolitan area, which encompasses Burke, Columbia, McDuffie, and Richmond Counties in Georgia, and Aiken and Edgefield Counties in South Carolina (annual county data not available).

The affected community has a relatively diverse and stable economy, with a steady growth in the number of jobs for Burke, Columbia, and Richmond Counties in the last decade. The 812 new jobs at VEGP would represent less than 1 percent of the total current workforce in the three counties. However, in Burke County, where the plant is located, the 812 additional jobs currently represent an 8.7 percent increase in the total number of jobs. Burke County likely would be the most affected county, as it likely would have the largest workforce increase as a percentage of its base workforce, and it would also receive substantial property taxes as a result of the new facilities. Outside of Burke County, the impacts become diffuse because of the larger economic base of Columbia and Richmond Counties and the city of Augusta (NRC 2008, p. 5-47).

The operation of two new units at the VEGP site would also roughly double the workforce needed for scheduled outages. VEGP Units 1 and 2 each undergo a scheduled refueling outage every 18 months. Once the proposed VEGP Units 3 and 4 are operational, the refueling outages would occur at least annually, and sometimes semiannually, and would require as many as 1000 (maximum estimate) additional short-term (3- to 5-week) contract employees. Most of the outage workers would stay in local hotels, rent rooms in local homes, or bring travel trailers. In the town of Waynesboro, which is the closest town to the VEGP site, all available hotel rooms are filled to capacity during outages. This would now likely occur twice as often, increasing hotel and restaurant revenues, as well as those of other retail establishments that provide services to these temporary workers. Outside of Burke County, the impacts become more diffuse because of each area's larger economic base with more available hotel rooms and temporary housing (NRC 2008, p. 5-47).

3. The effect on median household income levels in the affected community: (Compare current median household income levels with projected median household income levels. Discuss how the proposed project will positively or negatively impact the median household income in the affected community including the number of households expected to be impacted within the affected community.)

Response:
The 2008 median household incomes of Burke, Columbia, and Richmond Counties were $32,311, $66,181, and $37,723, respectively (USCB 2010). The 2008 median household incomes of Georgia and the United States were $50,834 and $52,029, respectively (USCB 2010). Projected median household incomes are not available.

Construction Impacts to Median Household Income
According to the EIS, a maximum of 2,500 construction workers would likely migrate into the 50-mile region. Of these, 2,000 jobs would last two or more years and the remainder would be for less than two years. SNC assumed all workers would locate throughout the affected community in the same proportions as the current VEGP workforce. Eighty percent of the in-migrating workers would locate in

the affected community. Consequently, 500 workers would relocate to Burke County, 650 to Richmond County, and 850 to Columbia County.

In the EIS, the NRC indicated that a representative annual construction salary for the region would be approximately $64,000 per year. This salary is higher than the median household incomes of all of the counties in the affected community, the state of Georgia, and the US. Therefore, the construction worker salaries would increase the median household incomes in each of the counties in the affected community, especially Burke County.

Operations Impacts to Median Household Income
According to the EIS, a maximum of 812 operations workers would likely migrate into the 50-mile region. All of these jobs would be permanent. Again, SNC assumed all workers would locate throughout the affected community in the same proportions as the current VEGP operations workforce. Eighty percent of the in–migrating workforce would locate in the affected community. Consequently, 162 operations workers would relocate to Burke County, 211 to Richmond County, and 276 to Columbia County.

Operation workforce salaries are likely to be higher than those of the construction workforce. Therefore, like those of the construction workforce, the salaries of the operations workforce would be higher than the median household incomes in the affected community, the state, and the US, and would increase the median household incomes in the affected community.

4. The effect on tax revenues of the affected community:
(Compare current tax revenues of the affected community with the projected increase in tax revenues generated by the proposed project. Discuss the positive and negative social and economic impacts on the affected community by the projected increase.)

Response:
Georgia counties, municipalities, and boards of education may impose sales taxes in addition to the state sales tax. Burke County has its own 2 percent sales tax in addition to the Georgia state sales tax of 4 percent. Richmond and Columbia Counties assess an additional 3 percent sales and use tax (NRC 2008, p. 2-103).

Counties and municipalities are authorized by the state constitution to levy and collect a general ad valorem ("according to value") property tax. Georgia law generally requires tangible real and personal property be assessed at 40 percent of its fair market value. The tax rate is stated in terms of "mills," with 10 mills equal to 1 percent of a property's assessed value. County and city governing authorities set the property tax (millage) rate. VEGP owners pay annual property taxes to Burke County. Table 2-16 of the EIS presents information on the total property taxes VEGP pays to Burke County for the existing units, the total property taxes collected by the county, the percentage of the total property taxes that are paid by VEGP, and the portion of Burke County's tax revenues that is disbursed to the Burke County School District. For the 5 years between 2000 and 2004, VEGP paid approximately 80 percent of the property tax collected in Burke County (NRC 2008, p. 2-104).

EIS Table 2-16. Property Tax Information for Burke County (2000-2004)

Year	Total Burke County Tax Revenue ($)	Burke County Tax Revenue Disbursed to the Burke County School District ($)	Property Tax Paid by SNC ($)	Percent of Total Property Taxes
2000	30,329,024	19,119,331	24,930,927	82.2
2001	30,758,563	18,691,850	25,276,404	82.2
2002	29,713,972	18,022,492	23,699,476	79.8
2003	30,029,880	18,160,393	24,341,247	81.1
2004	29,805,738	17,838,847	24,358,042	81.7

Source: NRC 2008, p. 2-104

Tax bases differ between counties in Georgia because of differences in taxable properties. Counties that have power plants or large manufacturing plants have much greater revenue-raising potential than purely agricultural counties. In terms of revenue-generating capacity per capita (including all forms of local tax revenues), Burke County has one of the highest revenues per capita in the state. Columbia County revenues per capita are close to the state average, and Richmond County is somewhat below the average relative to other counties in the state (NRC 2008, p. 2-104).

Construction Impacts on Taxes

Several tax revenue categories would be affected by the construction of VEGP Units 3 and 4. These include taxes on wages, salaries, and corporate profits; sales and use taxes on construction-related purchases; workforce expenditures; property taxes related to the new units; and personal property taxes on owned real property.

Personal and Corporate Income Taxes

Georgia has personal and corporate income taxes. Construction workers would pay taxes to the State of Georgia on their wages and salaries if their residence is in Georgia or if they are nonresidents working in Georgia and have Georgia income that exceeds 5 percent of income from all sources. (The wages of Georgia residents who would work at the proposed site would be considered a net transfer with no net gain.) For in-migrating workers, the full value of their VEGP-based earnings would be considered as applicable to this analysis. While the exact amount of income taxes the project would generate for the State of Georgia cannot be known, assuming in-migrating workers earn a representative annual construction salary of approximately $64,000 per year, the income from in-migrating workers could generate millions of dollars of additional revenue over the 7-year construction period. However, this revenue would be paid into the general fund to the State of Georgia. Therefore, the impact of additional income tax revenues would be relatively small for the affected community. Similarly, contractors building the new units at the VEGP site would pay corporate income taxes on the net income earned from the construction activity, which would be paid to the State general fund (NRC 2008, p. 4-45).

Sales and Use Taxes

The area around the proposed site would experience an increase in sales and use taxes generated by retail expenditures (e.g., restaurants, hotels, merchant sales, food, etc.) by the construction workforce. The region would also experience an increase in the sales and use taxes collected from construction materials and supplies purchased for the project. Given its relatively small population and economic base, Burke County would probably receive the largest benefit from sales and use tax revenues. Columbia and Richmond Counties also may experience an increase in sales and use tax revenues; however, it would likely be a much smaller benefit because of the larger sales and use tax base already in these counties (NRC 2008, p. 4-45).

Property Taxes
The VEGP site's current property tax payments represent approximately 80 percent of Burke County's total county property tax revenues (see EIS Table 2-16). Although an exact property tax revenue estimate is not available, during construction the new units would be assessed at some negotiated value that would likely result in a tax revenue range of $1.2 to $2.6 million, based on expected net electrical output of 1117 MW(e). It is likely that this negotiated value would be no more than 50 percent of the invested capital each year. VEGP would pay Burke County some taxes on VEGP Units 3 and 4 during the construction period (NRC 2008, p. 4-45 and 4-46).

A second source of revenue from property taxes would be housing purchased by the long-term construction workforce. In-migrating workers may construct new housing, which would add to the counties' taxable property bases, or these workers could purchase existing houses, which could drive housing demand and housing prices up, thus slightly increasing values (and property taxes levied). The increased housing demand would have little effect on tax revenues in the more heavily populated jurisdictions (NRC 2008, p. 4-46).

Summary of Tax Impacts
The amount of income taxes collected during the construction period could be large in absolute terms, but small when compared to the total amount of taxes that Georgia collects in any given year or in a 7-year period.

In absolute terms, the amount of sales and use taxes collected over a 7-year construction period could be large, but small when compared to the total amount of taxes collected by Georgia, South Carolina, and the governmental jurisdictions within the region. However, given the smaller economic bases, sales and use tax impacts in Burke County could be moderate.

The construction site-related property taxes collected in and distributed to Burke County would likely be moderate when compared to the total amount of taxes Burke County collects in any given year over the 7-year construction term, depending on the terms of the ad valorem tax revenue payments made for VEGP Units 3 and 4. Burke, Richmond, and Columbia Counties may also benefit from small property tax revenue increases stemming from changes in house values and increased inventory from the influx of the long-term construction workforce.

Operations Impacts on Taxes

Sales, Use, Income, and Corporate Taxes
To the extent the new operations employees would move into the area, the counties within the 50-mile radius of the plant would experience an increase in sales and use tax, and income tax revenues; however, these tax payments go to general State funds, and the marginal tax revenue impact at the affected-community level would be negligible. (NRC 2008, p. 5-47)

Georgia Power Corporation also would pay the State of Georgia a corporate income tax on the profits received from the sale of electricity generated by the new units, but the tax revenue impact from increased sales, use, income, and corporate taxes would not be noticeable at the affected community level (NRC 2008, p. 5-47).

Property Taxes
Currently, SNC's tax payments represent about 80 percent of the total property taxes received by Burke County (see Table 2-16). Property taxes that would be paid by the co-owners for the two new units during operations depend on many factors, most of which are unknown at this time, including future millage rates. SNC made simplifying assumptions to develop an estimate of tax payments based on the estimated value of the reactors. Estimated payments range from a high of $29,000,000 in the early years of operations to a low of $3,500,000 in the final years of operations (NRC 2008, p. 5-48).

In addition to the property taxes paid on the value of the plant itself, Burke, Columbia, and Richmond Counties could experience an increase in property tax revenues on new homes, if the influx of workers results in new residential construction or increases in existing home prices; however, this overall impact would likely be small, since the operations workforce and their families would represent only a small percentage of the existing population in the affected community (NRC 2008, p. 5-48).

Summary of Tax Impacts
Tax revenue will increase in the affected community in the form of sales, use, income, and corporate taxes, because of the operation of the proposed VEGP Units 3 and 4 and the influx of operations workforce. This increase, however, is likely to be small in the three-county area in its entirety. However, Burke County would experience a large beneficial property tax revenue increase.

5. The effect on existing environmental or public health in the affected community: (Discuss how the proposed project will have a positive or negative impact on existing environmental or public health.)

Response:
The NRC's 2008 EIS, Sections 4.12, Summary of Construction Impacts, and 5.12, Summary of Operational Impacts, Chapter 6, Fuel Cycle, Transportation, and Decommissioning, and Chapter 7, Cumulative Impacts, provide summaries of project-related impacts to environmental and public health. Sections 4.7 and 5.7 of the EIS provide information about project-related impacts to minority and low-income populations in the affected community. Based on the NRC analysis, there are no impacts of concern to the general population and, as a result, there are no impacts of concern to minority and low-income populations. Below, are summaries of the NRC's conclusions.

Construction Impacts to the Environment (by exposure pathway)
Soil: Construction activities at the VEGP site represent the largest source of soil-related environmental impacts. However, while construction activities would disrupt large volumes of soil, the effects are primarily localized and have little migratory ability. Furthermore, best management practices at the construction site and modularization in the construction process would mitigate these effects. Because SNC plans to ship in prefabricated pieces and assemble them onsite, proposed construction activities would involve roughly a third of the peak number of workers employed during construction of VEGP Units 1 and 2. Therefore, the disruption of soils during construction would be mitigated by smaller workforces and a lower level of onsite activity, relative to historic levels. In addition, the soil disruption within those communities that would host in-migrating workers and their families would also be reduced, relative to historic levels. Community leaders in towns surrounding the proposed site believe there is a much greater state of preparedness now than at the time of the initial construction. Old problems of overcrowded trailer parks and vehicle dust have been addressed through local legislation. Given these mitigating factors, soil-related environmental impacts during the construction of Units 3 and 4 at the VEGP site would pose little or no impacts on any populations in the affected community (NRC 2008, p. 4-58).

Water: Water-related environmental impacts include erosion-related surface-water degradation and the introduction of anthropogenic substances into surface and groundwater. No impact on the Savannah River from sediments or contaminants is expected because of SNC's commitment to implementing best management practices at the construction site. Because sewer and septic systems must meet strict environmental standards, the influx of workers will not adversely affect the quality of the groundwater. Construction-related impacts on the water table aquifer would not extend to the nearest residence to the site (about 1 mile). Construction-related activities are not of sufficient magnitude to impact the deep aquifers beneath the VEGP site. Therefore, the potential negative environmental effects from impacts to water sources would be small (NRC 2008, p. 4-59).

Air: Motor vehicle exhaust and construction dust would cause minor and localized adverse impacts to air quality but would not extend as far as the site boundary. Therefore, the NRC determined the negative environmental effects from construction-related reductions in air quality would be small, localized, and short-lived for any population in the region. The additional commuting workforce would increase vehicle emissions, but the increase would not noticeably diminish the regional air quality (NRC 2008, p 4-59).

Noise: Noise levels during construction may be as high as 110 dBA within the construction site, but noise levels diminish according to the inverse square rule, which says that if you double the distance from the source, the noise level diminishes by a factor of four. Because the loudest construction noise would register 60 to 80 dBA 400 feet from the source and the VEGP site exclusion area boundary is more than a half mile from the construction site in all directions, impacts from the noise of construction activities would be small (NRC 2008, p. 4-60).

Socioeconomics: Traffic would increase beyond the capacity of the local access road during construction. However, SNC plans to mitigate any negative impacts by encouraging car pooling, providing van pools, and/or staggering work shifts. No disproportionate adverse impacts on minority and low-income populations would occur because of changes in traffic and other community services (NRC 2008, p. 4-60).

Operations Impacts to the Environment (by exposure pathway)
Soil: No operations-related environmental effects to soils at the VEGP site would affect nearby residents. Similarly, although the proposed new units would generate low-level radioactive and non-radioactive wastes, these are currently generated at the site and there are existing facilities throughout the country permitted for disposing of these materials. Consequently, the marginal impact to soils from the proposed new units would be small (NRC 2008, p. 5-55).

Water: The two proposed units at the VEGP site would create a very small thermal plume in the Savannah River and concentrations of biocides, anti-scaling compounds and dispersants would be very small and greatly diluted by the volume of flow in the Savannah River. Consequently, the slightly elevated water temperatures and concentrations of chemical additives should quickly return to near-background levels after discharge to the river. Therefore, the impact to aquatic biota would be negligible.

VEGP has three groundwater wells drawing from the Cretaceous aquifer, each of which is capable of producing 1000 to 2000 gpm, and under normal operating conditions for the two existing units and the two proposed units, the total pumping rate would be about 1482 gpm. The closest of the existing Cretaceous aquifer wells is 5,700 feet from the facility boundary. Two new wells have been installed to supply groundwater (to support construction, then operation, of Units 3 and 4). The well location closest to the facility boundary is approximately 3,500 feet inside the property. By 2045, the pumping rate would draw down the level of the Cretaceous aquifer by slightly more than 6 feet at the 5,700-foot distance and nearly 6.5 feet at the 3,500-foot distance for the two new reactors. An additional six wells completed in the Tertiary aquifer currently provide a small amount of groundwater for site support.

Given the relatively small impact on water quantity and quality in the Savannah River, and the small consumptive water use and the drawdown on the Cretaceous aquifer, operations-related environmental effects on water would be small (NRC 2008, p. 5-56).

Radioactive releases: The total liquid and gaseous effluent releases from all four units (the two existing units plus the two proposed units) would result in doses that would be well within the regulatory limits of 40 CFR 190. The potential impacts from all potential radioactive sources would be small (NRC 2008, p. 5-56).

Socioeconomics: Once the proposed new units are operational, any adverse socioeconomic impacts that are the result of the construction would either stop or significantly diminish when the construction workforce leaves the affected community. The departure of the construction workforce on the affected community's economic stability would be offset somewhat by the in-migration of a skilled and highly-compensated permanent operations workforce. While these new employees would place pressure on local infrastructure (roads, schools, hospitals, etc.), any adverse impact the in-migration might create would be more than accommodated by the positive contributions of that workforce to their new local communities through income and taxes. Local tax revenues could be used to fund additional environmental and public health services. Furthermore, by their own assessment, the affected community is highly prepared for any potential influx of temporary construction or permanent operations workers (NRC 2008, p. 5-56).

6. Discuss any other economic or social benefit to the affected community: (Discuss any positive or negative impact on the economy of the affected community including direct and or indirect benefits that could occur as a result of the project. Discuss any positive or negative impact on the social benefits to the community including direct and indirect benefits that could occur as a result of the project.)

Response:
Chapters 4 and 5 of the EIS (NRC 2008) present detailed information regarding impacts to many areas of socioeconomics. Employment, income, and tax impacts have already been summarized above. Other areas include physical impacts, aesthetics, demography, transportation, recreation, housing, public and social services and infrastructure, and education (NRC 2008).

In Chapter 10 of the EIS, the NRC summarizes the socioeconomic impacts of construction and operations of Units 3 and 4 in Tables 10-1 and 10-2. In both tables, the majority of socioeconomic impacts are small (NRC 2008). NRC defines small impacts as ones that are not detectable, or are so small that they would neither destabilize nor noticeably disrupt any attribute of the resource.

For construction, moderate impacts were found for aesthetics, demography, and transportation. For aesthetics, transmission line construction could create a moderate impact. Moderate impacts would alter the resource noticeably but would not destabilize any attribute of the resource. The moderate impacts would be temporary. For demography, population numbers would increase by a maximum of 5 percent in Burke County (the county most impacted by the project) during construction peak. This could be considered a moderate impact. However, the impact would be temporary. For transportation, Burke County could experience a moderate impact to local roadways during the peak of construction, but SNC would mitigate those impacts as described above. The NRC defines moderate impacts as ones that are sufficient to alter noticeably, but not destabilize, important attributes to the resource.

For operations, moderate impacts were found for aesthetics, only. This was due to the presence of the new transmission lines and no mitigation was suggested (NRC 2008, p. 10-5).

Part III – Alternative Analysis

1. Pollution prevention measures:
(Discuss the pollution prevention measures evaluated including the feasibility of those measures and the cost. Measures to be addressed include but are not limited to changes in processes, source reductions or substitution with less toxic substances. Indicate which measures are to be implemented.)

Response:
In 2008, the NRC published a Final Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site (EIS) (NRC 2008). As described in Section 3.2.4.1 of the EIS, water withdrawn from the Savannah River for use in the circulating water system (CWS) would be treated with both biocides and chemicals. The biocides would be used to control biofouling of the CWS, and chemicals would be added to control scaling, corrosion, and solids deposition. Depending on the intended use, groundwater would be treated with chemicals and/or biocides. A representative list of chemicals or biocides that may be used in the proposed VEGP Units 3 and 4 is provided in Table 3.6-10 of the ESP Environmental Report (SNC 2008). The chemicals used at VEGP Units 3 and 4 with be similar to those currently used at VEGP Units 1 and 2 and will include sodium hypochlorite, sodium bromide, ammonium bisulfite, tolytriazole, and polymers that control corrosion or that act as a dispersant. The National Pollutant Discharge Elimination System (NPDES) permit for the VEGP site will limit the volume and concentration of these discharges as necessary to protect water quality.

SNC will provide dechlorination of the CWS effluent prior to discharge. A dechlorination chemical such as ammonium bisulfate will be injected downstream of the CWS blowdown valve. The dechlorination reaction will occur as the blowdown travels through the pipe (approximately 3,300 feet) such that the residual chlorine content is zero when it reaches the blowdown sump.

Nonradioactive liquid effluents from laboratory drains, equipment decontamination, and chemical additives would be collected in liquid waste sumps or approved chemical storage units. Oily waste would be removed via an oil/water separator and sent to a waste storage tank prior to shipment offsite for disposal. Liquid effluent not containing oily waste would be monitored, treated, and discharged to the Savannah River (NRC 2008, p. 3-16 and 3-17).

2. The use of best management practices to minimize impacts:
(Discuss the consideration and use of best management practices that will assist in minimizing impacts to water quality from the proposed permitted activity.)

Response:
As described in Section 3.4.2.2 of the ESP Environmental Report (SNC 2008), the final plant discharge from VEGP Units 3 and 4 will consist of cooling tower blowdown and other site wastewater streams. All biocides or chemical additives in the discharge will be among those approved by the U.S. Environmental Protection Agency or the State of Georgia as safe for humans and the environment, and the volume and concentration of each constituent discharged to the environment will meet requirements established in the NPDES permit. The discharge flow to the river will be from the blowdown sump, which will collect all nonradioactive wastewater and cooling tower blowdown for Units 3 and 4.

The discharge structure will be designed to meet U.S. Army Corps of Engineers navigation and maintenance criteria and to provide an acceptable mixing zone for the thermal plume. The discharge point will be near the southwest bank of the Savannah River. The centerline elevation of the discharge pipe is 3 ft above the river bottom elevation. Riprap will be placed around the discharge point to minimize potential erosion due to discharge jet from the pipe.

As described in Section 5.3.2.1 of the ESP Environmental Report (SNC 2008), the thermal plume is expected to extend only a short distance across the Savannah River, which is approximately 300 feet wide at the VEGP site. NRC conducted an independent analysis of the thermal plume as described in Section 5.3.3.1 of the EIS (NRC 2008). Based on the modeled size of the proposed VEGP Units 3 and 4 discharge plume (see Figure 5-1 in NRC 2008), and the relatively high levels of dilution at the mixing zone boundary, the NRC staff concluded that the impacts of the effluent plume on the Savannah River would be small and localized.

3. Recycle or reuse of wastewater, waste by-products, or production materials and fluids: (Discuss the potential recycle or reuse opportunities evaluated including the feasibility of implementation and the costs. Indicate which of these opportunities are to be implemented)

Response:
Water withdrawn from the Savannah River will cool the main circulating water system. The basic design of the circulating water system involves recirculation of cooling water, with surface water added to make up the volume of water lost from the system due to evaporation, drift, and blowdown. In addition to the cooling tower blowdown, the plant effluent includes low volume wastes and effluents from the liquid radioactive waste management system.

As described in Section 3.2.4.2 of the EIS (NRC 2008), nonradioactive liquid effluents from laboratory drains, equipment decontamination, and chemical additives would be collected in liquid waste sumps or approved chemical storage units. Oily waste would be removed via an oil/water separator and sent to a waste storage tank prior to shipment offsite for disposal. Liquid effluent not containing oily waste would be monitored, treated, and discharged to the Savannah River as in accordance the NPDES permit constraints. No reuse or recycle of the low volume waste waters is anticipated.

As discussed in Section 3.2.3.1 of the EIS (NRC 2008), with two exceptions, liquid effluents processed through the liquid radioactive waste-management system are discharged to the environment. The exceptions are steam generator blowdown that is normally returned to the condensate system after processing and reactor coolant that can be degassed prior to reactor shutdown and returned to the reactor coolant system.

These systems are part of the facility design, and as such there are no implementation costs.

4. Application of water conservation methods: (Discuss the potential water conservation opportunities evaluated including the feasibility of implementation and the costs. Indicate which of these opportunities are to be implemented)

Response:
The VEGP Units 3 and 4 circulating water system has been engineered using best available technology and equipment to be as efficient as possible. The water in the circulating water system will be cycled several times before being released as blowdown. The number of cycles of river water through the CWS prior to release will be determined such that SNC can ensure minimal corrosion and scaling in order to optimize the efficiency of the cooling towers, while minimizing the amount of water withdrawn from the River. The entire circulating water system, including the cooling towers, will be cleaned and inspected on a regular basis. SNC will continue to look for opportunities to enhance system operations that contribute to water conservation. No specific water conservation activities are planned at this time.

5. Alternative or enhanced treatment technology: (Compare feasibility and costs of proposed treatment with the feasibility and costs of alternative or enhanced treatment technologies that may result in more complete pollutant removal. Describe each candidate technology including the efficiency and reliability in pollutant removal and the capital and operational costs to implement those candidate technologies. Justify the

selection of the proposed treatment technology.)

Response:
The purpose of the plant cooling system is to dissipate heat to the environment. The various cooling system options differ in how and where the heat transfer takes place and, hence, have different environmental impacts. For the natural draft wet tower cooling system proposed for both VEGP Units 3 and 4, waste heat is transferred to the atmosphere primarily through evaporation and conduction. Water would be lost from the cooling system due to evaporation, drift, and blowdown discharge, and make-up water would be supplied from the Savannah River. Approximately 50 to 75 percent of the make-up water flow would be used to replace evaporative water losses with the remaining 25 to 50 percent of the water returned to the Savannah River as cooling tower blowdown. Cooling system water losses resulting from drift are minor in comparison to evaporative losses and the blowdown discharge.

As described in Section 3.2.2 of the EIS (NRC 2008), blowdown water would be directed to a common CWS blowdown sump. Water from the blowdown sump would be retained for a brief holdup period to allow for dechlorination before the water is discharged to the Savannah River. Consistent with VEGP Units 1 and 2 operation, no significant total suspended solids impact is foreseen in cooling tower blowdown. Chlorine discharges would be consistent with limits set forth in 40 CFR Part 423 for discharges from steam electric generating facilities.

Once-through Cooling Alternative
A once-through cooling system for VEGP Units 3 and 4 would not use cooling towers; instead it would transfer waste heat to the atmosphere and aquatic environment of the Savannah River by convection, evaporation, long-wave radiation, and conduction. This type of cooling design would withdraw a larger volume of water from the Savannah River through the intakes as compared to the proposed wet tower design.

The water withdrawal requirements for a once-through cooling system are estimated at 1890 cfs per unit. If both VEGP Units 3 and 4 were operating with once-through cooling, the combined water withdrawal rate would be 3,780 cfs. The surface-water withdrawal rate for once-through cooling represents 43 percent of the average Savannah River discharge passing the site (based on NRC calculations using data from the Jackson, South Carolina, streamflow gage), and could potentially be greater than the river discharge during times of drought. As discussed on Section 2.6.1.1 of the EIS, the once-through cooling system withdrawal would also approximately equal the total discharge released from Thurmond Dam (3,800 cfs) under Drought Level 3 conditions. Based on the quantity of water that would be withdrawn from the Savannah River to cool the proposed VEGP Units 3 and 4 using once-through cooling, the NRC staff concluded that a wet tower cooling system would be preferable to a once-through cooling system (NRC 2008, 9-27).

Dry or Hybrid Wet/Dry Cooling Towers Alternative
The use of a dry cooling system design versus the proposed combination wet tower design for VEGP Units 3 and 4 would largely eliminate the impacts on aquatic biota in the Savannah River. Dry cooling towers would eliminate thermal and chemical discharges associated with the plant cooling system and any losses of aquatic organisms due to impingement or entrainment.

However, a dry cooling tower also has some disadvantages. In comparing dry cooling and wet cooling, EPA (66 FR 65256) found there are additional expenses associated with dry cooling, making this technology less cost effective. In addition, to achieve the necessary cooling, dry systems must move a large amount of air through a heat exchanger, and the fans that move the air consume a significant amount of power. This, in turn, would increase the environmental impacts of fuel use and spent fuel transport and storage relative to the net electrical power production. The fans and the large volume of air required for cooling also result in elevated noise levels. The dry cooling system would also occupy more land than a mechanical or natural draft wet-cooling tower system, affecting site land use and increasing terrestrial impacts.

Hybrid wet/dry cooling towers employ both a wet section and a dry section and reduce or eliminate the visible plumes associated with wet cooling towers. Consumptive water use for the hybrid wet/dry cooling alternative is bounded by the proposed wet cooling towers water use. Compared to the wet cooling towers, less evaporation, make-up water, and blowdown are involved in the hybrid wet/dry process, therefore reducing water-related impacts. However, the disadvantages of dry cooling still apply to the dry cooling portion of the heat dissipation process. The dry cooling process is not as efficient as the wet cooling process because it requires the movement of a large amount of air through the heat exchanger to achieve the necessary cooling. This results in a net loss of electrical power for distribution, which would increase the environmental impacts of fuel use and spent fuel transport and storage. In addition, the hybrid wet/dry cooling towers would occupy more land than a wet cooling tower system, affecting site land use and increasing terrestrial impacts (NRC 2008, 9-27).

Even with the disadvantages described above, a dry or hybrid wet/dry cooling system could be a preferred option if a wet tower system would cause significant adverse impacts to water availability, water quality, or aquatic resources. However, the NRC found that the impacts of the proposed natural draft, wet tower system on water use, water quality, and aquatic resources would be small. Therefore, the NRC concluded that neither a dry nor a hybrid wet/dry cooling system would be preferable to the proposed wet tower system for VEGP Units 3 and 4.

System design alternatives are evaluated in Section 9.3 of the EIS. Once-through cooling and dry or hybrid wet/dry cooling towers were evaluated by the NRC as alternatives to the proposed wet cooling tower design. NRC concluded that none of the alternatives would be preferable to the proposed wet cooling towers for proposed Units 3 and 4. Following additional review in the Supplemental Environmental Impact Statement (SEIS) for the Combined Operating License (COL) application (NRC 2010), NRC concluded that impacts of the proposed cooling towers remain small and that the wet cooling tower design remains preferable to the alternatives considered in the EIS.

Alternative means of heat dissipation are evaluated to determine if there is an obviously superior method in terms of environmental impacts and economic costs when compared to the proposed system. The analysis follows a two-step process. First, reasonable alternatives to the proposed system are evaluated to the extent needed to rank them, from an environmental standpoint, as preferable or inferior to the proposed system. The analysis is complete if that first step determines there are no environmentally preferable alternatives. When environmentally preferable alternatives are identified, a second step is performed to consider the economic costs of any such alternative and develop a benefit-cost comparison with the proposed heat dissipation system. Because the EIS did not identify an environmentally preferable alternative to the proposed wet cooling tower system for VEGP Units 3 and 4, the capital and operational costs to implement those candidate technologies were not considered.

6. Improved operation and maintenance of existing treatment systems: (Discuss improvements in the operation and maintenance of any available existing treatment system that could accept the wastewater. Compare the feasibility and costs of improving an existing system with the feasibility and cost of the proposed treatment system.)

Response:

The VEGP site includes two operating reactors, Units 1 and 2 with an existing sanitary wastewater treatment facility. SNC will manage the sanitary wastewater from the proposed Units 3 and 4 in a combined wastewater treatment plant sized to treat the sanitary wastes from all four units. The other wastewater treatment systems associated with Units 1 and 2 are physically separate from the proposed systems that would serve Units 3 and 4 and do not offer capacity beyond that needed to support the ongoing operations of Units 1 and 2.

7. Seasonal or controlled discharge options:
(Discuss the potential of retaining generated wastewaters for controlled releases under optimal conditions, i.e. during periods when the receiving water has greater assimilative capacity. Compare the feasibility and cost of such a management technique with the feasibility and cost of the proposed treatment system.)

Response:
Discharges from VEGP Units 3 and 4 would consist primarily of blowdown from the cooling system, along with small contributions from the liquid radioactive waste treatment system and low volume wastes. The circulating water system has been engineered using best available technology and equipment to be as efficient as possible. The water in the system would be cycled several times before being released as blowdown. The number of cycles of river water through the system prior to release will be determined such that SNC can ensure minimal corrosion and scaling in order to optimize the efficiency of the cooling towers, while minimizing the amount of water withdrawn from the Savannah River. It is possible to operate the plant cooling system over a range of cycles of concentration. However, increasing the cycles is subject to circulating water system chemistry constraints. For example, VEGP Units 1 and 2 previously operated at 4-6 cycles of concentration. After fine tuning the cooling tower chemistry, the cooling towers are now typically run at 6-8 cycles of concentration. The proposed cooling towers for Units 3 and 4 are expected to operate over a similar range.

Water quality is controlled by chemical additives as determined by the site water conditions that are monitored by plant chemistry personnel. Water quality is also maintained by blowdown, which is used to control levels of solid concentrations in the CWS. Local grab samples are used to periodically test the CWS water quality to limit the effects on the system piping and valves due to improper water chemistry.

Scaling and corrosion are concerns for cooling tower operators. Indices exist to predict the scaling or corrosion tendencies of water. Turbidity is typically the limiting factor controlling the cycles of concentration at VEGP – 200 NTU is the upper limit on turbidity and 100 NTU is ideal. The lowest cycles of concentration occur after rain events when turbidity levels increase. It is not feasible to limit releases of blowdown to specific river conditions due to the adverse effects on cooling tower performance of operating outside the ranges of acceptable cooling water chemistry.

Discharge of liquid radwaste effluent requires a dilution flow that is normally furnished by blowdown from the circulating water system. A typical liquid waste release is 1,925 gallons per day. The discharge rate is controlled to be compatible with the available dilution flow (cooling tower blowdown). Whenever CWS blowdown is not available, such as during plant shutdown, the river water system would provide the dilution flow if liquid radioactive waste effluent is being discharged to the river via the outfall. The liquid radioactive waste system for each AP1000 unit includes six 15,000-gallon holding tanks to collect processed radioactive wastewater to ensure acceptability for release prior to discharge. Hold up of liquid radioactive waste is subject to the capacity and operational limits of those tanks.

8. Land Application System
(Discuss the potential of utilizing a spray field or other land disposal system. Compare the feasibility and costs of such treatment techniques with the feasibility and costs of the proposed treatment system.)

Response:
The estimated blowdown rate for the VEGP Units 3 and 4 circulating water system is 9,700 gpm (normal). Approximately 25% of the normal makeup water withdrawal (38,825 gpm) is returned to the river as blowdown. The remainder is lost through evaporation and drift. A land application system would increase the amount of surface water consumptive use by 25%. A dilution flow is required for the discharge of effluent from the liquid radioactive waste system. A land application system would not

provide dilution flow for the liquid radioactive waste system effluent. If blowdown is not available, the radioactive waste effluent is diluted using raw water withdrawn from the river intake.

Section 9.4.1.1 of the ESP Environmental Report (SNC 2008) evaluated alternative heat dissipation systems including cooling ponds and spray ponds.

Studies supporting the construction of VEGP Units 1 and 2 included the potential use of a large (approximately 8,000 acres) cooling reservoir in a closed-cycle system. This heat dissipation option was discarded due to serious questions regarding the amount of seepage loss from the reservoir and uncertainty regarding applicability of water quality standards to the impoundment. The proposed new plant footprint for Units 3 and 4 is within the 3,169-acre VEGP site. The VEGP plant and auxiliary facilities occupy about 800 acres. A cooling pond system would require more land than is available on the VEGP site. In addition, issues regarding seepage losses and applicability of water quality standards to the reservoir would need to be addressed. These issues, coupled with the land requirements, are sufficient to preclude further consideration of cooling ponds for the new units.

Use of spray ponds is similar to cooling ponds as it involves the creation of new surface water bodies. Spray modules are included to promote evaporative cooling in the ponds, which reduces the land requirements. However, this advantage is offset by higher operating and maintenance costs for the spray modules. This alternative is considered unsuitable for the VEGP site for the same reasons as cooling ponds.

Land application would require a large parcel of property with suitable location, topography and soil characteristics. The design wastewater loading rate would be determined from site characteristics. EPD limits design wastewater loading rates (WLRD) for non-reuse systems to a maximum of 2.5 inches/week and instantaneous wastewater application rates to 0.25 inches/hour. Requests for higher loadings will be evaluated on a case-by-case basis. Assuming a normal blowdown rate of 9,700 gpm and maximum WLRD of 2.5 inches/week, an area of more than 1,440 acres would be required without considering the requirements for wastewater storage during wet or emergency conditions. A suitable area of the required size is not available on the VEGP site.

9. Discharge to other treatment systems

(Discuss the availability of either public or private treatments systems with sufficient capacity and sophistication to treat the wastewaters generated by this project. Compare the feasibility and costs of such options with the feasibility and costs of the proposed treatment system.)

Response:
Discharge to public treatment systems would be impractical. As described in Section 2.8.2.6 of the EIS (NRC 2008), local governments provide wastewater treatment and each municipality decides which treatment method to use based on its needs and the technology and funds available. Currently, municipalities in the three counties (Burke, Richmond and Columbia) can meet their current and projected wastewater treatment needs. Table 2-21 of the EIS details public wastewater treatment systems, their permitted capacities, and their average daily processed wastewater volume. The normal blowdown rate is approximately 9,700 gpm or 14 mgd. The majority of the wastewater systems in the vicinity of VEGP are small with excess capacity of 1 mgd or less each. The only large public wastewater system is the Augusta-Richmond County James B. Messerly wastewater treatment plant (WWTP) which is located near the Bush Field airport approximately 17 miles north-northwest of the VEGP site. It is a conventional activated sludge plant followed by wetlands for tertiary treatment. As indicated in EIS Table 2-21, the Augusta WWTP has a capacity of approximately 46 mgd and currently processes approximately 31 mgd. While the treatment capabilities and capacity of the Augusta WWTP might accommodate the VEGP effluent, it would be cost prohibitive to pump the effluent the distance separating the WWTP from the VEGP site. The Augusta WWTP also discharges to the Savannah River and redirecting the VEGP Units 3 and 4 effluent via the Augusta WWTP would not change the receiving water body.

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Attachment
Laboratory Results

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

Industrial Stormwater Benchmark Sample Results

The following table contains the previous five years (2015-2019) of industrial stormwater benchmark sampling results, obtained in accordance with permits GAR050000 and GA00026786 (Vogtle 1&2). This information is to support the Vogtle 3&4 NPDES permit renewal.

Year	Outfall	Oil & Grease	Copper	Nickel	Zinc
2015	013	ND	ND	ND	ND
	014	ND	ND	ND	0.025
2016	013	ND	ND	ND	0.04
	014	ND	ND	ND	0.04
2017	013	ND	ND	ND	ND
	014	ND	ND	ND	ND
2018	013	ND	ND	ND	0.029
	014	ND	ND	ND	ND
2019	013	ND	0.001	ND	0.012
	014	ND	0.002	ND	0.018

Hydrosphere research

Providing Environmental and Product Toxicity Testing Since 1986

Prepared for:

Southern Nuclear
Plant Vogtle
7821 River Rd.
Waynesboro, GA 30830

Prepared by:
Hydrosphere Research

Test Location:
11842 Research Circle
Alachua, FL 32615

Contact Information:
Craig Watts, Lab Director
(386) 462-7889
cwatts@hydrosphere.net
www.hydrosphere.net

Test Number:
SOU-VG 17264 REV 022218

Initiated:
January 30, 2018

Test Type:
7-day Chronic Definitive Bioassays

Hydrosphere Research is a NELAC/P Certified Lab (E82295)

Report of Bioassays Performed for

Southern Nuclear – Plant Vogtle

Abstract

Composite samples were collected from Southern Nuclear - Plant Vogtle, Burke County, Georgia. Using these samples, Hydrosphere Research conducted a series of 7-day chronic definitive bioassay tests.

The results are summarized in the accompanying report. This report shall not be reproduced, except in full, without the written approval of the laboratory. All test results contained herein comply with the requirements of the National Environmental Laboratory Accreditation Conference (NELAC). The results discussed in this report relate only to the samples as identified on the Chain of Custody forms in Appendix A. The Laboratory Bench Sheets and Statistical Analyses are in Appendix B, and the Standard Reference Toxicity Tests are in Appendix C.

Revisions

Initially, the test was performed without consideration to the Instream Waste Concentration (IWC) of 3.44%. As such, a more appropriate test dilution series would be Control, 0.75, 1.5, 3.44, 6 and 12% effluent. A discussion of the test results based on the IWC can be found in the Results section below.

Introduction

Composite samples were collected from the Combine Effluent Manhole at the Southern Nuclear – Plant Vogtle, Burke County, Georgia.

Using these samples, Hydrosphere Research conducted a series of 7-day chronic definitive bioassay tests using the water flea (*Ceriodaphnia dubia*) and the fathead minnow (*Pimephales promelas*).

Materials and Methods

Test Sample

Composite samples were collected from Combine Effluent Manhole at Southern Nuclear- Plant Vogtle, Burke County, Georgia, on January 29, 31, and February 2, 2018. The samples were contained in ½ gallon high density polyethylene containers, which were intact upon arrival. Hydrosphere Research received the sample in good condition.

Upon receipt, the effluent temperature of each sample met the sample acceptance criteria. The effluent water quality values fell into expected ranges for pH, conductivity, and dissolved oxygen. All other chemical characterization data for the effluent samples upon arrival in the laboratory are provided on the Sample Data Bench Sheet in Appendix B.

The Chain of Custody forms are in Appendix A. Each effluent sample tested was assigned a unique sample identification number.

Test Methods

Test methods are presented in Table 1. Test Methods. The toxicity tests were performed according to the methods listed in the table below. All tests were in compliance with NELAC standards.

Table 1. Test Methods

Test Type	Species	Dilution Series (%)	Test Method
7-day chronic static renewal definitive	*C. dubia*	0, 6.25, 12.5, 25, 50, 100	EPA-821-R-02-013, Method 1002.0
7-day chronic static renewal definitive	*P. promelas*	0, 6.25, 12.5, 25, 50, 100	EPA-821-R-02-013, Method 1000.0

Test Organisms

The *C. dubia* and *P. promelas* test organisms were cultured in-house. All organisms appeared to be in normal condition at the test initiation.

Toxicity Test Monitoring

Each test was monitored at the test initiation and daily thereafter for mortality, temperature, dissolved oxygen, pH, and conductivity. The bioassay tests were initiated on January 30, 2018.

Standard Reference Toxicity Tests

A reference toxicant test was conducted for each test species to evaluate the sensitivity of the test organisms for the chronic tests. The test conditions and dilution series were specific for each reference toxicant test conducted.

Test Location

The bioassay tests were performed at Hydrosphere Research, 11842 Research Circle, Alachua, FL 32615; telephone number (386) 462-7889. The laboratory is NELAC/P certified by the State of Florida Department of Health and Rehabilitation Services (E82295).

Statement of Quality Assurance

This report was reviewed by the Hydrosphere Research Quality Assurance Officer and the Laboratory Director to ensure the procedures outlined in the Hydrosphere Research Quality Manual were followed. Testing was conducted using generally accepted lab practices. Hydrosphere Research believes the results are true and accurate and meet all NELAC standards.

Results & Discussion

Toxicity Test Results

Initially, the test was performed without consideration to the IWC of 3.44%. As such, a more appropriate test dilution series would be Control, 0.75, 1.5, 3.44, 6 and 12% effluent. Based on the calculated IC_{25} of 13.28% effluent for the water flea (*C. dubia*). The sample was not toxic to the water flea (*C. dubia*) at 3.44% effluent. The fathead minnow (*P. promelas*) showed no toxicity at any test concentration.

Water quality values remained within acceptable limits during the test period. The results of the control exposures met the test acceptability requirements specified in the methods. The bioassay tests were initiated within 36 hours of the first sample's collection time and were acceptable tests based on controls and test conditions. Copies of the relevant laboratory raw data pertaining to the toxicity tests are provided in Appendix B.

The toxicity test results are summarized in Table 2. and the corresponding figures below:

Table 2. Chronic Test Results

Percent Effluent	***C. dubia***		***P. promelas***	
	Final Survival (%)	**Three Brood Totals (Average # of neonates / female)**	**Final Survival (%)**	**Average Dry Weight (mg/fish)**
Control	100	25.8	100	0.440
6.25	100	24.1	97.5	0.455
12.5	90	20.1	100	0.473
25	30*	8.1*	95	0.387
50	0*	0*	100	0.433
100	0*	0*	92.5	0.449
NOEC	**12.5%**	**12.5%**	**100%**	**100%**
IC_{25}	**13.28%**		**>100%**	

An "*" if present indicates a statistically significant difference between the control and the sample endpoint.

Figure 1. *C. dubia* Reproduction

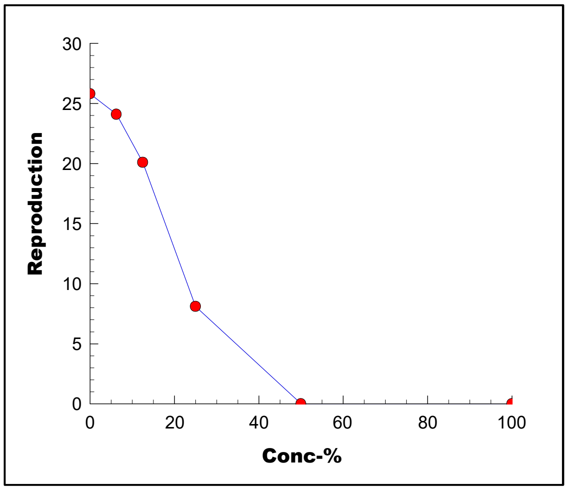
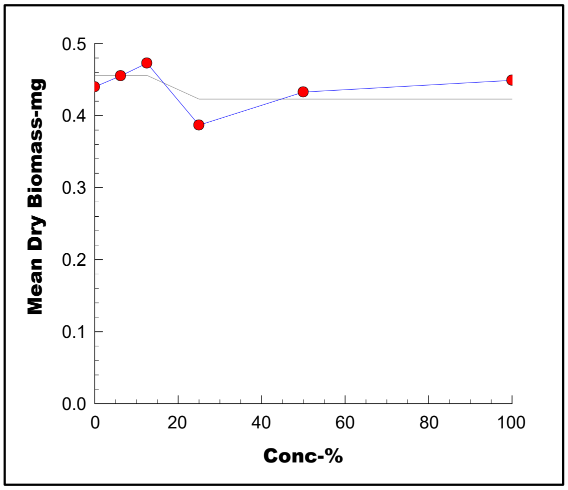


Figure 2. *P. promelas* Growth



Below is an illustration of the water flea (*C. dubia*) and fathead minnow (*P. promelas*) data including the IWC.

Figure 3 *C. dubia* Reproduction with IWC

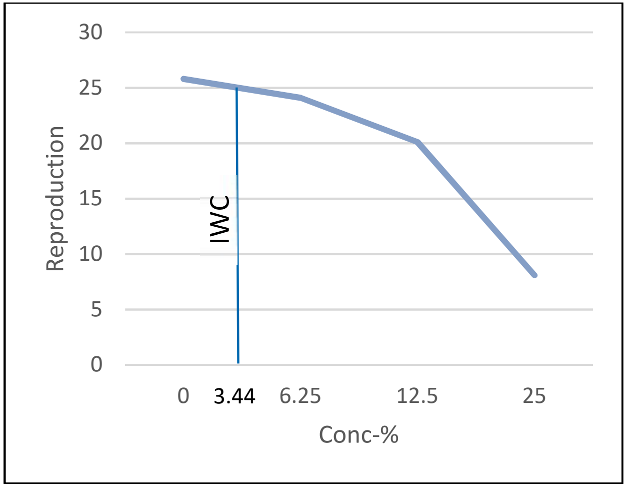
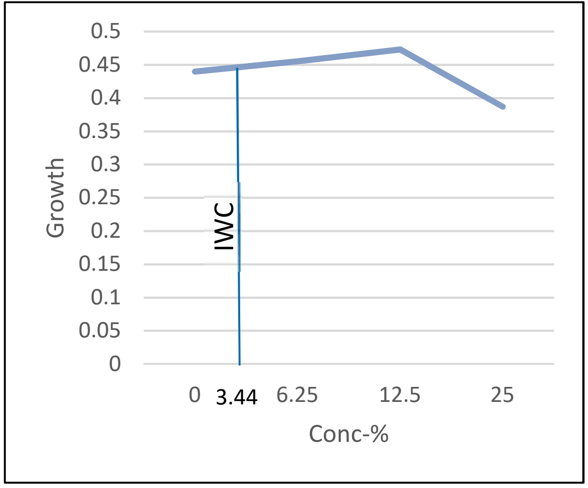


Figure 4. *P. promelas* Growth with IWC



All statistical calculations were made using CETIS® (Tidepool Scientific Software, McKinleyville, CA). The statistical results are in Appendix B.

The samples produced chronic No Observable Effect Concentration (NOEC) values of 12.5% effluent for both the waterflea (*C. dubia*) survival and reproduction endpoints. This value is greater than the IWC. The samples produced NOEC values of 100% effluent for both the fathead minnow (*P. promelas*) survival and growth endpoints. This value is greater than the IWC. The with-in test variability for water flea (*C. dubia*) reproduction and fathead minnow (*P. promelas*) growth as measured by the percent minimum significant difference and the relative difference are included in Appendix B.

Although not called for in the permit, the IC_{25} endpoint for water flea (*C. dubia*) was 13.28% effluent, and the IC_{25} for fathead minnow (*P. promelas*) was >100% effluent.

During these tests dissolved oxygen, pH, conductivity, and temperature remained within the limits established in the test methods.

As mentioned above, test was performed without consideration to the IWC of 3.44%, otherwise, there were no unusual observations or deviations from standard test protocol noted. These test results only relate to the samples described in this report and meet all requirements of NELAC.

Conclusion

Hydrosphere Research initiated a series of 7-day chronic definitive bioassay tests using the water flea (*C. dubia*) and the fathead minnow (*P. promelas)* on January 30, 2018.

The samples produced chronic No Observable Effect Concentration (NOEC) values of 12.5% effluent for both the waterflea (*C. dubia*) survival and reproduction endpoints. The samples produced NOEC values of 100% effluent for both the fathead minnow (*P. promelas*) survival and growth endpoints. All test endpoints produced an NOEC greater than the IWC of 3.44% effluent.

References

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Chemical and physical parameters reported herein were determined by methods described in *Methods for Chemical Analysis of Water and Waste*. EPA 600/4-79-020. March 1983.

NPDES Forms

Although not a compliance test, the NPDES forms on the following four pages supplement the narrative report. These forms are comprised of Table 3. NPDES Whole Effluent Toxicity Testing Report Form, Table 4. Summary of Test Conditions, Table 5. Acute Test Results, and Table 6. Chronic Test Results.

Hydrosphere research

Table 3. NPDES Whole Effluent Toxicity Testing Report Form

All blanks on this form are to be filled in.
Blanks that are not used should be filled in with "N/A" or a line drawn through the blank. Please print.

Attachments: Please attach the following items to this report form and indicate with an "x" in box.		
1.	All Chain-of-Custody Forms	X
2.	All Reference Toxicant Data for each Organism used in Test and Current Control Charts for each Organism	X
3.	All Raw Data (Bench Sheets) Pertaining to the Tests (i.e., all physical, chemical, and biological measurements)	X
4.	All Result Calculations	X
5.	Discharge Monitoring Reports (DMR) when Applicable	NA

Facility/industry/client name:	Southern Nuclear – Plant Vogtle		
Permit number:	GA0026786	County:	Burke

Consultant company name:	Hydrosphere Research	Telephone:	(386) 462-7889
Dates test(s) conducted--Begin:	01/30/18	End:	02/05/18, 02/06/18
Persons conducting test(s) (print names):	M. Curtis, A. Mahler, P. Meyers, L. Nyugen		

Authorized signature:		Date:	02/22/18

Laboratory report #/project #:	SOU-VG 17264 REV 022218	Sampler (print name):	T. Parker

DMR monitoring period end date on which this test is reported (filled out by the Permittee--mm/dd/yy):					
Routine test:	X, Non-compliance	Additional test:	NA	Failed routine test date:	NA

Samples

No.	Date & Time Collected	Lab Sample #	Grab	24-Hour Composite	Arrival Temperature (°C)	Initial Residual Chlorine	Lab Dechlorination Y/N	Lab Dechlorination Chemical Used
1.	01/29/18-1659	17264A	NA	X	0.2	0.20	N	NA
2.	01/31/18-1130	17264B	NA	X	0.2	0.10	N	NA
3.	02/02/18-1130	17264C	NA	X	0.5	0.13	N	NA
4.	NA	NA	NA	NA	NA	NA	NA	NA
5.	NA	NA	NA	NA	NA	NA	NA	NA
6.	NA	NA	NA	NA	NA	NA	NA	NA
7.	NA	NA	NA	NA	NA	NA	NA	NA
8.	NA	NA	NA	NA	NA	NA	NA	NA
9.	NA	NA	NA	NA	NA	NA	NA	NA
10.	NA	NA	NA	NA	NA	NA	NA	NA

	Wet Ice	Blue Ice	Other (describe)	Samples Aerated Yes (describe)	Samples Aerated No
Refrigerant used for sample transportation:	X	NA	NA	X, Sample 1 & 2 for 10 minutes, sample 3 for 15 minutes	X

	Bus	Hand	Common Carrier	Samples Filtered Yes (describe)	Samples Filtered No
Samples delivered by:	NA	NA	X	NA	X

Table 4. Summary of Test Conditions

Type of Test[a]	Test Concentrations[b] (% Effluent)	Test Species Used[c]	Age of Test Organism	Amount & Type of Food	How Often Fed	Test Chamber Volume	Volume of Effluent Used	Type of Chamber	# of Organisms/ Chamber	# of Replicates	Temp. Range (°C)
F	0, 4.3, 12.5, 25, 50, 100	CD	< 24 hours	0.133 ml YCT + 0.133 ml S. cap	1x/day	30 ml	20 ml	Plastic cup	1	10	25.0 ± 1.0
F	0, 4.3, 12.5, 25, 50, 100	FM	< 24 hours	0.15 ml Artemia	2x/day	1 liter	250 ml	Plastic cup	10	4	25.0 ± 1.0

G. "Other" type of test:	NA	Temperature readings:	Single	Multiple	Continuous
			NA	X	NA

Description of control water:	Moderately Hard Reconstituted	Photoperiod during test:	16 hours light / 8 hours dark

Reference Toxicant Data[d]

Name of Toxicant	Dates of Test		Species[c]	In-House or Commercially Obtained	LC_{50}/IC_{25}
	Begin	End			
KCl	01/03/18	01/09/18	CD	In-House	IC_{25} = 282 mg/L
KCl	01/03/18	01/10/18	FM	In-House	IC_{25} = 0.58 g/L

[a] Please fill the "Type of Test" box with the appropriate letter:

A. 48-Hr/Non-Renewal/Single Concentration (Screen)
B. 48-Hr/Non-Renewal/Multi-Concentration (Definitive)
C. 96-Hr/Renewed Every 48 Hrs/Single Concentration (Screen)
D. 96-Hr/Renewed Every 48 Hrs/Multi-Concentration (Definitive)
E. 7-Day Chronic/Single Concentration (Screen)/Renewed Daily
F. 7-Day Chronic/Multi-Concentration (Definitive)/Renewed Daily
G. Other (described in the "G" box)

[b] List all concentrations of effluent used (i.e., 0%, 6.25%, 12.5%, 25%, 50%, 100%).

[c] Write appropriate letters for the following species in this column:

CD - *Ceriodaphnia dubia*
FM - *Pimephales promelas* (fathead minnow)
SS - *Menidia beryllina* (inland silverside)
MS - *Americamysis bahia* (formerly *Mysidopsis bahia*, mysid shrimp)
CL - *Cyprinella leedsi* (bannerfin shiner)
Other - Please describe: ____________________

[d] Attach all reference toxicant raw data & control charts for each organism/reference toxicant used for the test.

Table 5. Acute Test Results

Test Species	Test Concentrations[b] (% Effluent)	Grab Sample[c]	Composite Sample[c]	% Mortality[d] (48 Hours)	% Mortality[d] (96 Hours)	LC_{50}[e]
Control[a]	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
Control[a]	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA

[a] List % Control Mortality in appropriate column (48 or 96 hr) for organisms (use abbreviations shown on footnote "c" of Table 4) that you list under the word "Control." Control mortality must not exceed 10% for a valid acute test.

[b] List all concentrations of effluent used (i.e., 0%, 6.25%, 12.5%, 25%, 50%, 100%).

[c] Record number that corresponds with the number of the sample in the "Date & Time Collected" column in sample section.

[d] List % Mortality for each organism and control if you are conducting a single concentration (Screen) test.

[e] If multi-concentration (Definitive) tests are conducted on grab or composite samples, record the calculated LC_{50} in this column for each sample. Enter "N/A" in all % Mortality columns and LC_{50} box at bottom of this table.

Species	LC_{50}[f]
NA	NA
NA	NA

[f] If a single concentration (screen) test is conducted and >50% mortality occurs in any one of the four grab or composite samples, record <100% in this column. If <50% mortality occurs in all four grabs or composites, record >100% in this column. Draw a line through the LC_{50} column in the above table.

Table 6. Chronic Test Results

Test Species[a]	Test Concentrations[b] (% Effluent)	NOEC		
		Survival[c]	Growth[c]	Reproduction[c]
CD	0, 4.3, 12.5, 25, 50, 100	12.5%	NA	12.5%
FM	0, 4.3, 12.5, 25, 50, 100	100%	100%	NA

[a] Use abbreviations shown on footnote "c" of Table 4.

[b] List all concentrations of effluent used (i.e., 0%, 6.25%, 12.5%, 25%, 50%, 100%).

[c] For single concentration tests (Screen), if there is a significant difference (P = 0.05) between survival, growth, reproduction, or fecundity in 100% or IWC, and control, record <100% in proper column. If there is not a significant difference between survival, growth, reproduction, or fecundity in 100% or IWC, and control, record >100% in proper column.

CD Survival in Control (≥80%)	100%
Average Number of Young per Female in CD Control (min 15 young/surviving female)	25.8

FM Survival in Control (≥80%)	100%
Average FM Dry Weight in Control (min ADW 0.25 mg/FM in surviving controls)	0.440

MS Survival in Control (≥80%)	NA
Average MS Dry Weight in Control (min ADW 0.20 mg/MS in surviving controls)	NA

SS Survival in Control (≥80%)	NA
Average SS Dry Weight in Control (min immediate ADW 0.50 mg/SS in surviving controls)	NA

Appendix A. Chain of Custody

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CHAIN OF CUSTODY

Client Name Project#
Southern Nuclear 6123-18-0730.~~XXX~~
Plant Vogtle

Client Shipping Address ~~1075 Big Shanty Rd~~ TP 1-29-18
7821 River Rd., Waynesboro, GA 30830

Sample Kit Information
Cooler 1 of 3
Container Type: 1/2 gal bottle
Number of Containers: 8
Method of Shipment:

Prepared and Shipped by Ryan Staples
Date 1-5-18

Sample Kit Received By Terrell Parker
Print Name / Signature
Date 1-8-18 Time 12:30
Condition of Seal Upon Receipt (Check One)
☑ Intact ○ Other (describe) ______

Ship Samples Priority Overnight To:
Hydrosphere Research
11842 Research Circle
Alachua, FL 32615
(386) 462-7889

✱ **Be Sure to Mark for Saturday Delivery if Appropriate**

Sampling Location Combine Effluent manhole

Permit Number

County Samples Collected In BURKE

Refrigerant Used For Shipping
☑ Wet Ice
○ Other (describe) ______

Samples must arrive at the lab ≤ 6.0 °C (never frozen). Pack cooler completely with ice before shipping.

Samples Shipped Via
☑ FedEx ○ Greyhound ○ Client
○ UPS ○ Other (describe) ______

Composite Sample Information
Samples/Hour 1 Volume/Sample 620mL
Total Hours 8 Total Volume 1.3 gal
Initiated Date 1-28-18 Reinitiated 1-29-18 Time 13:59 13:00
Ended Date 1-28-18 Ended 1-29-18 Time 16:59 16:00
Chilled During Collection ☑ Yes ○ No

Outfall Number or Client Description	Date	Time (24 Hour Format)	Sample Type		# of Containers	Sampled By		For Lab Use	
			Comp.	Grab		Print Name	Signature	Temp (°C)	Lab Sample ID
~~Plant~~ FINEFF012918	1/29/18	16:30	✓		3	Terrell Parker		0.2	17264 A
FINEFFcomp-012918									
NOTE TO LAB:			Please combine all sample bottles into 1 composite volume. The ISCO was received w/ 4x 1 gallon jars instead of 1x 4 gallon jug.						

Additional Comments (if needed) Sampler malfunctioned + collected only 4 x 620mL samples between 2:00pm + 5:00pm on 1-28-18. Restarted at 1:00pm on 1-29-18 + collected 4 more 620 mL samples for a total volume of 5,000 mL or 1.3 gallons.

Relinquished By (Print Clearly & Sign)	Date	Time	Shipped via		
James T. Parker	1-29-18	16:45	#8107 9699 8208 FEDEX Priority Overnight		
Received By (Print Clearly & Sign)	**Date**	**Time**	**Relinquished By** (Print Clearly & Sign)	**Date**	**Time**
			AM 1/30/18		
Received By Lab (Print Clearly & Sign)	**Date**	**Time**	**Shipper's Tracking Number**		
Amy Mahler Amy Mahler	1-30-18	11:25	8107 9699 8208		

See Provisions on back

PROVISIONS

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CHAIN OF CUSTODY

Client Name Amec Foster Wheeler
Southern Nuclear
Plant Vogtle

Client Shipping Address 7821 River Rd
Waynesboro, GA 30830

Sample Kit Information
Cooler 2 of 3
Container Type: 1/2 gal bottle
Number of Containers: 8
Method of Shipment: FedEx

Prepared and Shipped by Eva Staples
Date 1-5-18

Sample Kit Received By
Terrell Parker
Print Name
Signature
Date 1-8-18 Time 12:30
Condition of Seal Upon Receipt (Check One)
☑ Intact ○ Other (describe)

Ship Samples Priority Overnight To:
Hydrosphere Research
11842 Research Circle
Alachua, FL 32615
(386) 462-7889

Be Sure to Mark for Saturday Delivery if Appropriate

Sampling Location Combined Treated Effluent manhole

Permit Number

County Samples Collected In Burke

Refrigerant Used For Shipping
☑ Wet Ice
○ Other (describe)

Samples must arrive at the lab ≤ 6.0 °C (never frozen). Pack cooler completely with ice before shipping.

Samples Shipped Via
☑ FedEx ○ Greyhound ○ Client
○ UPS ○ Other (describe)

Composite Sample Information
Samples/Hour 1
Volume/Sample 620 mL
Total Hours 24
Total Volume 3.79 gal ~~4 gal.~~ JP 1-31-18
Initiated Date 1-30-18 Time 12:30
Ended Date 1-31-18 Time 11:30
24 Hours
Chilled During Collection ☑ Yes ○ No

Outfall Number or Client Description	Date	Time (24 Hour Format)	Sample Type Comp.	Sample Type Grab	# of Containers	Sampled By Print Name	Sampled By Signature	For Lab Use Temp (°C)	For Lab Use Lab Sample ID
⊛	1-31-18	12:30	✓		8	Terrell Parker		0.2	17264.B
→ FINEFFComp-013118									

Additional Comments (if needed) Please combine total volume into one composite sample. Autosampler supplier provided 4x1 gallon sample containers instead of 1x4 gallon container. Samples should be mixed for 24 hr. Composite (representative). 8th jug is only 1/3 full. AutoSampler bottle numbers written on outside of each jug in black Sharpie.

Relinquished By (Print Clearly & Sign) James T. Parker	**Date** 1/31/18	**Time** 13:30	**Shipped via** FEDEX # ~~8107 9099 8200~~ 8124 0433 4400 JP 1-31-18		
Received By (Print Clearly & Sign)	**Date**	**Time**	**Relinquished By** (Print Clearly & Sign) TR	**Date** 2.1.18	**Time**
Received By Lab (Print Clearly & Sign) T.R.	**Date** 2/1/18	**Time** 1107	**Shipper's Tracking Number** 8124 0433 4400		

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PROVISIONS

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CHAIN OF CUSTODY

Client Name AmecFosterWheeler
Southern Nuclear
Plant Vogtle

Client Shipping Address 7821 River Rd,
Waynesboro, GA 30830

Sample Kit Information
Cooler 3 of 3
Container Type: 1/2 gal bottle
Number of Containers: 8
Method of Shipment:

Prepared and Shipped by

Date 1-6-18

Sample Kit Received By Terrell Parker
Print Name Signature
Date 1-8-18 Time 12:30
Condition of Seal Upon Receipt (Check One)
● Intact ○ Other (describe)

Ship Samples Priority Overnight To:
Hydrosphere Research
11842 Research Circle
Alachua, FL 32615
(386) 462-7889

Be Sure to Mark for Saturday Delivery if Appropriate

Sampling Location Combined Treated Effluent manhole

Permit Number

County Samples Collected In Burke

Refrigerant Used For Shipping
● Wet Ice
○ Other (describe)

Samples must arrive at the lab ≤ 6.0 °C (never frozen). Pack cooler completely with ice before shipping.

Samples Shipped Via
● FedEx ○ Greyhound ○ Client
○ UPS ○ Other (describe)

Composite Sample Information
Samples/Hour 1 Volume/Sample 625mL
Total Hours 24 Total Volume 3.8gAL.
Initiated Date 2-1-18 Time 12:30
Ended Date 2-2-18 Time 11:30
Chilled During Collection ● Yes ○ No

Outfall Number or Client Description	Date	Time (24 Hour Format)	Sample Type		# of Containers	Sampled By		For Lab Use	
			Comp.	Grab		Print Name	Signature	Temp (°C)	Lab Sample ID
*	2-2-18	12:45	✓		8	Terrell Parker		0.5	17264C
→ FINEFF Comp -020218									

Additional Comments (if needed) Please combine total volume into one composite sample. Autosampler provided for 4 x 1gallon sample containers instead of 1x 4gallon container. Sample jugs should be mixed for representative 24hr. composite. Autosampler bottle #'s written on outside of each sample jug in black Sharpie.

Relinquished By (Print Clearly & Sign)	Date	Time	Shipped via		
James K Parker	2-2-18	13:30	FedEx # 8107 9699 8219		
Received By (Print Clearly & Sign)	**Date**	**Time**	**Relinquished By** (Print Clearly & Sign)	**Date**	**Time**
			AM 2-3-18		
Received By Lab (Print Clearly & Sign)	**Date**	**Time**	**Shipper's Tracking Number**		
Amy Mahler Amy Mahler	2/3/18	1020	8107 9699 8219		

See Provisions on back

PROVISIONS

Appendix B. Raw Data Sheets & Statistical Results

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Chronic Freshwater Method (EPA-821-R-02-013, Method 1002.0)

Survival & Reproduction

Client: Southern Nuclear-Plant Vogtle
Code: SOU-VG **Job #:** 17264
Species: *Ceriodaphnia dubia* **Code:** CD
ID #: 8782a **Age:** < 24-h

Note: Valid Control is
≥80% survival @ 7d ... and ...
≥15-neonates average /surviving female)

30-mL Plastic Cup

20-mLs per replicate

Initiation Date: 1/30/18 **Termination Date:** 2.5.2018

Sample Description: ———

Control — 0 Effluent, % — Control Sample Description

Live Counts (Adults ○, Number of Neonates)

REP	1 N	2 R	3 F	4 F	5 S	6 M	7 T	1st-3rd brood total
A	✓	✓	✓	✓ 4	✓ 10	✓ 12	○	26
B	✓	✓	✓	✓ 6	✓ 7	✓ 14	○	27
C	✓	●	✓	✓ 6	✓ 6	✓ 10	○	22
D	✓	✓	✓	✓ 5	✓ 10	✓ 12	○	27
E	✓	✓	✓	✓ 6	✓ 8	✓ 13	○	27
F	✓	✓	✓	✓ 6	✓ 11	✓	○	17
G	✓	●	✓	✓ 4	✓ 11	✓ 12	○	27
H	✓	✓	✓	✓ 5	✓ 12	✓ 12	○	29
I	✓	✓	✓	✓ 5	✓ 12	✓ 10	○	27
J	✓	✓	✓	✓ 4	✓ 12	✓ 13	○	29
Live Count:	10	10	10	10	10	10		258

1st dilution — 6.25 Effluent, % — Effluent Sample Description

REP	1	2	3	4	5	6	7	1st-3rd brood total
A	✓	✓	✓ ~~8~~ ②	✓ 8	✓ ③ ~~10~~ Ø	✓ 14	○	22
B	✓	✓	✓	✓ 8	✓ ~~10~~ 11	✓	○	19
C	✓	✓	✓	✓ 4	✓ 10	✓ 10	○	24
D	✓	✓	✓	✓ 4	✓ 10	✓ 13	○	27
E	✓	✓	✓	✓ 4	✓ 12	✓ 14	○	30
F	✓	✓	✓	✓ 6	✓ 10	✓ 9	○	25
G	✓	✓	✓	✓ 5	✓ 12	✓ 15	○	32
H	✓	✓	✓	✓ 6	✓ 12	✓ 11	○	29
I	✓	✓	✓	✓ 5	✓ 12	✓	○	17
J	✓	✓	✓	✓ 5	✓ 11	✓	○	16
Live Count:	10	10	10	10	10	10		241

2nd dilution — 12.5 Effluent, % — Effluent Sample Description

REP	1	2	3	4	5	6	7	1st-3rd brood total
A	✓	✓	✓	✓ 5	✓ 11	✓ 9	○	25
B	✓	⊖	⊖	⊖	⊖	⊖	⊖	~~0~~
C	✓	✓	✓	✓ 4	✓ 9	✓ 10	○	23
D	✓	✓	✓	✓ 5	✓ 11	✓	○	16
E	✓	✓	✓	✓ 6	✓ 10	✓ 9	○	25
F	✓	✓	✓	✓ 6	✓ 10	✓	○	16
G	✓	✓	✓	✓ 5	✓ 12	✓ 12	○	29
H	✓	✓	✓	✓ 8	✓ 11	✓	○	19
I	✓	✓	✓	✓ 6	✓ 13	✓	○	19
J	✓	✓	✓	✓ 6	✓ 13	✓ 10	○	29
Live Count:	10	9	9	9	9 ~~10~~ w 2-4-18	9		201

3rd dilution — 25 Effluent, % — Effluent Sample Description

REP	1	2	3	4	5	6	7	1st-3rd brood total
A	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
B	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
C	✓	✓	✓	✓ 6	✓ 11	○ 12	○	29
D	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
E	✓	✓	✓	✓ 6	✓ 9	○ 12	○	27
F	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
G	✓	●	✓	✓ 5	✓ 10	○ 10	○	25
H	⊖	⊖	⊖	⊖	⊖	⊖	⊖	~~5~~
I	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
J	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
Live Count:	3	3	~~4~~ ①	3	3	3		81

4th dilution — 50 Effluent, % — Effluent Sample Description

REP	1	2	3	4	5	6	7	1st-3rd brood total
A	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
B	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
C	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
D	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
E	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
F	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
G	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
H	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
I	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
J	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
Live Count:	0							0

5th dilution — 100 Effluent, % — Effluent Sample Description

REP	1	2	3	4	5	6	7	1st-3rd brood total
A	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
B	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
C	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
D	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
E	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
F	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
G	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
H	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
I	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
J	⊖	⊖	⊖	⊖	⊖	⊖	⊖	
Live Count:	0							0

Day	0	1	2	3	4	5	6	7
Initials	JR	MC	PR	AM	AM	W	W	
Time	16:30	17:20	14:45	12:30	17:45	18:00	16:20	
F-CD #	195	195	195	195	195	195		
F-SC #	463	463	463	463	463	463		

Notes & Comments

① 3 correction AM 2-2-18 ② Ø correction AM 2-3-18
③ correction W 2-4-18

✓ Normal Adult	○ ... Normal Adult near neonate release	⊛ ....Normal Adult with developing brood
○ .... Normal Adult w/ newly deposited brood	⦶ ... Normal Adult w/ embryos in oviducts	⊗ ... Abnormal Adult with Small Brood
⦶ ... Abnormal Adult; reproductivley inactive	Abnormal Adult; Dead ... ⊖	Abnormal Adult: Male ... ♂

Randomization Template #: 3

An "*" recorded for neonates means that dead or aborted neonates were present.

Photoperiod is 16-hours light and 8-hours dark, Illuminiation is ambient (50 to 100 ftcd)

CETIS Analytical Report

Report Date: 09 Feb-18 15:35 (p 1 of 1)
Test Code: SOU-VG 17264CDC | 06-9484-7289

Ceriodaphnia 7-d Survival and Reproduction Test

Hydrosphere Research

Analysis ID:	07-8725-9856	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.2
Analyzed:	09 Feb-18 15:34	**Analysis:**	STP 2xK Contingency Tables	**Official Results:**	Yes
Batch ID:	08-7290-2760	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	30 Jan-18 16:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	05 Feb-18 16:20	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d	**Source:**	In-House Culture	**Age:**	
Sample ID:	04-9881-1337	**Code:**	SOU-VG 17264CDC	**Client:**	Southern Nuclear-Plant Vogtle
Sample Date:	29 Jan-18 16:00	**Material:**	Final Effluent	**Project:**	WET Compliance Test
Receipt Date:	30 Jan-18 11:25	**Source:**	SOU-VG (Alabama)		
Sample Age:	25h	**Station:**	FinEffComp		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU
Untransformed	C > T	12.5	25	17.68	8

Fisher Exact/Bonferroni-Holm Test

Control vs	Group	Test Stat	P-Type	P-Value	Decision(α:5%)
Dilution Water	6.25	1.0000	Exact	1.0000	Non-Significant Effect
	12.5	0.5000	Exact	1.0000	Non-Significant Effect
	25*	0.0015	Exact	0.0046	Significant Effect
	50*	0.0000	Exact	2.7E-05	Significant Effect
	100*	0.0000	Exact	2.7E-05	Significant Effect

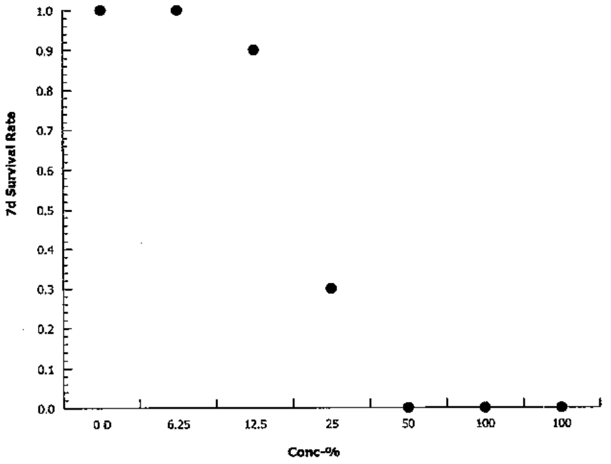
Data Summary

Conc-%	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	D	10	0	10	1	0	0.0%
6.25		10	0	10	1	0	0.0%
12.5		9	1	10	0.9	0.1	10.0%
25		3	7	10	0.3	0.7	70.0%
50		0	10	10	0	1	100.0%
100		0	10	10	0	1	100.0%

7d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5		1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25		0.0000	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000	0.0000	0.0000	0.0000
50		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Graphics



Analyst: CWJ QA: 2/9/18

CETIS Analytical Report

Report Date: 09 Feb-18 15:35 (p 1 of 2)
Test Code: SOU-VG 17264CDC | 06-9484-7289

Ceriodaphnia 7-d Survival and Reproduction Test — **Hydrosphere Research**

Analysis ID:	10-5421-3698	**Endpoint:**	Reproduction ✓	**CETIS Version:**	CETISv1.9.2
Analyzed:	09 Feb-18 15:34	**Analysis:**	Nonparametric-Control vs Treatments ✓	**Official Results:**	Yes
Batch ID:	08-7290-2760	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	30 Jan-18 16:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	05 Feb-18 16:20	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d	**Source:**	In-House Culture	**Age:**	
Sample ID:	04-9881-1337	**Code:**	SOU-VG 17264CDC	**Client:**	Southern Nuclear-Plant Vogtle
Sample Date:	29 Jan-18 16:00	**Material:**	Final Effluent	**Project:**	WET Compliance Test
Receipt Date:	30 Jan-18 11:25	**Source:**	SOU-VG (Alabama)		
Sample Age:	25h	**Station:**	FinEffComp		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	12.5	25	17.68	8	31.36%

Steel Many-One Rank Sum Test

Control	vs	Conc-%	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water		6.25	96.5	77	5	18	Asymp	0.4768	Non-Significant Effect
		12.5	81	77	2	18	Asymp	0.0852	Non-Significant Effect
		✓25*	71.5	77	3	18	Asymp	0.0154	Significant Effect ✓

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1911.68	637.225	3	8.856	1.6E-04	Significant Effect
Error	2590.3	71.9528	36			
Total	4501.98		39			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	14.29	11.34	0.0025	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9432	0.9236	0.0443	Normal Distribution

Reproduction Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	10	25.8 ✓	23.19	28.41	27	17	29	1.153	14.13%	0.00%
6.25		10	24.1 ✓	20.13	28.07	24.5	16	32	1.754	23.02%	6.59%
12.5		10	20.1 ✓	14	26.2	21	0	29	2.698	42.44%	22.09%
25		10	8.1 ✓	-1.254	17.45	0	0	29	4.135	161.44%	68.60%
50		10	0	0	0	0	0	0	0		100.00%
100		10	0	0	0	0	0	0	0		100.00%

Reproduction Detail

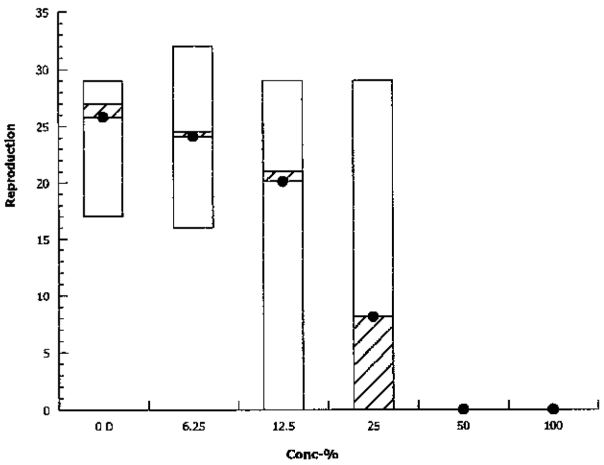
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	26	27	22	27	27	17	27	29	27	29
6.25		22	19	24	27	30	25	32	29	17	16
12.5		25	0	23	16	25	16	29	19	19	29
25		0	0	29	0	27	0	25	0	0	0
50		0	0	0	0	0	0	0	0	0	0
100		0	0	0	0	0	0	0	0	0	0

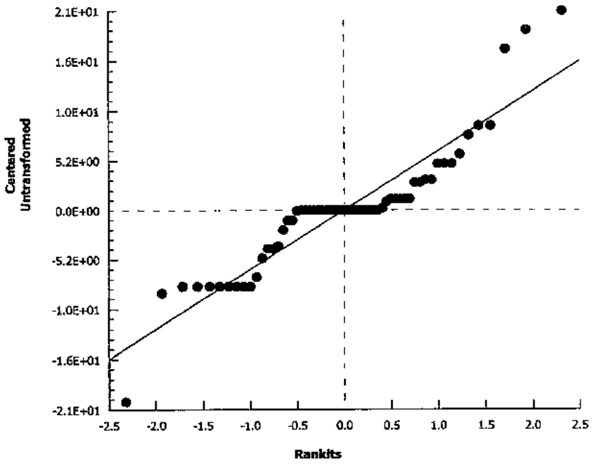
Analyst: CWf QA: 2/9/18

Ceriodaphnia 7-d Survival and Reproduction Test | **Hydrosphere Research**

Analysis ID:	10-5421-3698	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.2
Analyzed:	09 Feb-18 15:34	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Graphics





Analyst: cwj QA: 2/9/18

Hydrosphere research

Percent Minimum Signifigant Difference Calculation

Client: SOU-VG
Job Number: 17264
Sample Description: Final Effluent
Test Start Date: 1/30/2018
Test: 7 CSRD
Species (C. dubia, P. promelas, S. capricornum, M. bahia, or M. beryllina): *C. dubia*
End Point: Reproduction
Calculated PMSD (From Dunnett's): 31.36
Lower PMSD Bound: 13
Upper PMSD Bound: 47

% Sample	Toxic According to Appropriate Stats? ("Y" or "N")	Mean	Relative Difference	Lower Bound Result	Upper Bound Result
Control	NA	25.8000	NA	NA	NA
6.25	N	24.1000	7	Non Toxic	Acceptable Test
12.5	N	20.1000	22	Non Toxic	Acceptable Test
25	Y	8.1000	69	Toxic	Acceptable Test
50	Y	0.0000	100	Toxic	Acceptable Test
100	Y	0.0000	100	Toxic	Acceptable Test

Version 3.0, Revised March 2017
F:/workgroup templates/pmsd.xlt

Reviewed By: cwj 2/9/18

CETIS Analytical Report

Report Date: 09 Feb-18 15:35 (p 1 of 1)
Test Code: SOU-VG 17264CDC | 06-9484-7289

Ceriodaphnia 7-d Survival and Reproduction Test **Hydrosphere Research**

Analysis ID:	01-0677-4141	**Endpoint:**	Reproduction ✓	**CETIS Version:**	CETISv1.9.2
Analyzed:	09 Feb-18 15:35	**Analysis:**	Linear Interpolation (ICPIN) ✓	**Official Results:**	Yes

Batch ID:	08-7290-2760	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	30 Jan-18 16:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	05 Feb-18 16:20	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	6d	**Source:**	In-House Culture	**Age:**	

Sample ID:	04-9881-1337	**Code:**	SOU-VG 17264CDC	**Client:**	Southern Nuclear-Plant Vogtle
Sample Date:	29 Jan-18 16:00	**Material:**	Final Effluent	**Project:**	WET Compliance Test
Receipt Date:	30 Jan-18 11:25	**Source:**	SOU-VG (Alabama)		
Sample Age:	25h	**Station:**	FinEffComp		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
✓Linear	Linear	1812313	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	13.28	8.789	19.06	7.529	5.246	11.38

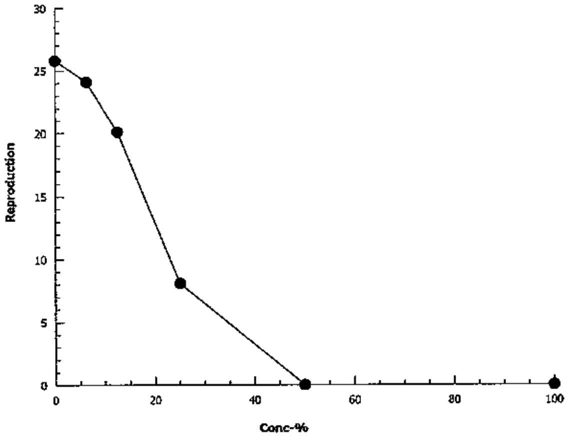
Reproduction Summary

			Calculated Variate						
Conc-%	**Code**	**Count**	**Mean**	**Min**	**Max**	**Std Err**	**Std Dev**	**CV%**	**%Effect**
0	D	10	25.8 ✓	17	29	1.153	3.645	14.13%	0.0%
6.25		10	24.1 ✓	16	32	1.754	5.547	23.02%	6.59%
12.5		10	20.1 ✓	0	29	2.698	8.53	42.44%	22.09%
25		10	8.1 ✓	0	29	4.135	13.08	161.40%	68.6%
50		10	0	0	0	0	0		100.0%
100		10	0	0	0	0	0		100.0%

Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	26	27	22	27	27	17	27	29	27	29
6.25		22	19	24	27	30	25	32	29	17	16
12.5		25	0 ✓	23	16	25	16	29	19	19	29
25		0 ✓	0 ✓	29 ✓	0 ✓	27 ✓	0 ✓	25 ✓	0 ✓	0 ✓	0 ✓
50		0	0	0	0	0	0	0	0	0	0
100		0	0	0	0	0	0	0	0	0	0

Graphics



Analyst:________ QA:________

Hydrosphere research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1002.0)

Water Quality I

Client: Southern Nuclear-Plant Vogtle
Code: SOU-VG **Job #:** 17264
Species: *Ceriodaphnia dubia*
ID #: 8782a

Initiation Date: 1/30/18 **Termination Date:** 2/5/18

Sample Description:

pH
(acceptable range for a valid test is 6 to 9)

Sample Description	% Effluent	new 0	old 1	new 1	old 2	new 2	old 3	new 3	old 4	new 4	old 5	new 5	old 6	new 6	old 7
Control	0	7.8	7.7	7.8	7.8	7.8	7.5	7.6	7.7	7.7	7.8	7.8	7.6		
Effluent	6.25	7.8	7.8	7.8	7.8	7.7	7.6	7.6	7.8	7.8	7.8	7.8	7.6		
	12.5	7.8	7.8	7.8	7.9	7.8	7.6	7.7	7.8	7.8	7.8	7.8	7.7		
	25	7.8	7.8	7.8	7.9	7.8	7.6	7.7	7.9	7.9	7.8	8.0	7.7		
	50	7.9	7.9	7.9					②						
	100	8.1	8.0	8.0											
Meter ID:		18	17	18	17	17	16	16	16	16	18	18	18		

Dissolved Oxygen (mg/L)
(acceptable minimum for a valid test is 4.0-mg/L)

Sample Description	% Effluent	new 0	old 1	new 1	old 2	new 2	old 3	new 3	old 4	new 4	old 5	new 5	old 6	new 6	old 7
Control	0	8.2	7.6	8.5	7.8	7.7	7.1	8.2	7.6	8.1	6.6	7.6	6.8		
Effluent	6.25	8.2	7.6	8.5	7.9	7.9	7.6	8.2	7.6	8.1	6.6	7.6	6.8		
	12.5	8.2	7.7	8.5	7.8	7.9	7.7	8.1	7.6	8.2	6.6	7.6	6.9		
	25	8.2	7.7	8.5	7.7	7.9	7.7	8.2	7.6	8.2	6.6	7.5	6.9		
	50	8.3	7.6	8.5					②						
	100	8.9	7.5	8.4											
Meter ID:		13	10	13	10	10	7	7	7	7	13	13	13		

Day:	0	1		2		3		4		5		6		7
Control ID:	~~4355~~	4350		4358		4358		4358		4358				
Diluent ID:	① ~~4355~~	4350		4358		4358		4358		4358				
Effluent ID:	A	A		B		B		C		C				
Initials:	LW	MC	LW	MC	MC	AM	AM	AM	AM	LW	LW	LW		
Time:	1630	1730	1225	1145	1905	1235	1120	1800	1300	1720	1140	1640		

Notes & Comments

① 4350 LW 1·31·18

② dilutions are dead -MC 2/1

Hydrosphere research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1002.0)

Water Quality II

Client: Southern Nuclear-Plant Vogtle
Code: SOU-VG **Job #:** 17264
Species: *Ceriodaphnia dubia*
ID #: 8782a

Initiation Date: 1/30/18 **Termination Date:** 2/5/18

Sample Description: —

Conductivity (µmho/cm)

(a Conductivity of 2,150-µmho/cm = a Salinity of 1‰ @ 25°C)

Measured in each new sample and control

Sample Description	% Effluent	0	1	2	3	4	5	6	7
Control	0	279	271	280	272	258	274		
Effluent	6.25	288	284	285	282	267	286		
	12.5	296	292	294	288	276	294		
	25	315	311	301	301	291	310		
	50	349	345			②			
	100	422	416						
Meter ID:		15	15	18	17	17	15		

Temperature (°C)

(acceptable range for a valid test is 25±1°C)

Measured at the end of each 24-h exposure period

Sample Description	% Effluent	0	1	2	3	4	5	6	7
Control	0		24.4	24.3	24.6	25.0	25.1	25.4	
Effluent	6.25		24.4	24.3	24.6	25.0	25.1	25.4	
	12.5		24.4	24.3	24.6	25.0	25.1	25.4	
	25		24.4	24.3	24.6	25.0	25.1	25.4	
	50		24.4			②			
	100		24.4						
Meter ID:			57	57	57	57	57	57	—

Day:	0	1	2	3	4	5	6	7
Control ID:	~~4355~~	~~4355~~	4358	4358	4358	4358		
Diluent ID:	~~4355~~ ①	4350	4358	4358	4358	4358		
Effluent ID:	A	A	B	B	C	C		
Initials:	W	W	MC	AM	AM	W	W	
Time:	1630	1225	1405	1120	1300	1145	1620	

Notes & Comments

① 4350 W 1·31·18
② dilutions are dead -MC 2/1

Version 2 (13050·DCF)

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Hydrosphere Research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1000.0)

Survival & Growth

Client: Southern Nuclear-Plant Vogtle
Code: SOU-VG **Job #:** 17264
Species: *Pimephales promelas* **Code:** FM
ID #: ~~8783~~ 8783a LW 1-30-18 **Age:** < 24-hours

—

Test Vessel: 1-L plastic cup
Test Volume: 250-mL / rep.

Initiation Date: 1/30/18 **Termination Date:** 2/6/18

Sample Description: —

Sample Description	% Effluent	REP	Live Counts (Valid Control is ≥80% survival @ 7d) T 0	W 1	R 2	F 3	Sa 4	Su 5	M 6	T 7
Control	0	A	10	10	10	10	10	10	10	10
		B	10	10	10	10	10	10	10	10
		C	10	10	10	10	10	10	10	10
		D	10	10	10	10	10	10	10	10
Effluent	6.25	A	10	10	10	10	10	10	10	10
		B	10	10	10	10	10	10	10	10
		C	10	10	9'	9	9	9	9	9
		D	10	10	10	10	10	10	10	10
	12.5	A	10	10	10	10	10	10	10	10
		B	10	10	10	10	10	10	10	10
		C	10	10	10	10	10	10	10	10
		D	10	10	10	10	10	10	10	10
	25	A	10	10	10	10	9①	9	9	9
		B	10	10	10	10	10	9'	9	9
		C	10	10	10	10	10	10	10	10
		D	10	10	10	10	10	10	10	10
	50	A	10	10	10	10	10	10	10	10
		B	10	10	10	10	10	10	10	10
		C	10	10	10	10	10	10	10	10
		D	10	10	10	10	10	10	10	10
	100	A	10	10	10	10	9'	9	9	9
		B	10	10	10	10	9①	9	9	9
		C	10	10	10	10	10	9'	9	9
		D	10	10	10	10	10	10	10	10
		Initials:	MC	W	MC	W	AM	W	W	W
		Time:	1745	1640	1500	1445	1500	1530	1600	1320

Biomass (original number, final dry weight basis. Valid Control is ≥0.25-mg/surviving fish) Pan #	Tare Weight (0.00001-gms)	Total Weight (0.00001-gms)	Net Weight (0.00001-gms)	Wt. / Fish (0.001-mgs)
1	1.13970	1.14470	0.005	0.500
2	1.14692	1.15117	0.00425	0.425
3	1.15226	1.15652	0.00426	0.426
4	1.12775	1.13183	0.00408	0.408
5	1.13187	1.13709	0.00522	0.522
6	1.12758	1.13237	0.00479	0.479
7	1.15054	1.15470	0.00416	0.416
8	1.14078	1.14482	0.00404	0.404
9	1.14524	1.14991	0.00467	0.467
10	1.13456	1.13936	0.0048	0.480
11	1.15693	1.16148	0.00455	0.455
12	1.14380	1.14869	0.00489	0.489
13	1.14142	1.14517	0.00375	~~0.375~~ ②
14	1.13049	1.13453	0.00404	0.404
15	1.12567	1.12937	0.0037	0.370
16	1.13962	1.14318	0.00356	0.356
17	1.13806	1.14254	0.00448	0.448
18	1.15508	1.15947	0.00439	0.439
19	1.15098	1.15558	0.0046	0.460
20	1.15032	1.15416	0.00384	0.384
21	1.15151	1.15595	0.00444	0.444
22	1.12755	1.13200	0.00445	~~0.445~~ ③
23	1.13767	1.14180	0.00413	0.413
24	1.16110	1.16554	0.00444	0.444

Date Tare Weights: 2/5/18 **Initials:** LS
Date Final Dry Weights: 2/7/18 **Initials:** LS

Randomization Template # 2

Feeding Type:	Artemia							
Amount:	3-drops (0.15-mLs) of a concentrated slurry / 2x / day							
Morning:	╳	915	1030	910	900	950	930	
Evening:	1800	1710	1715	1500	1645	1800	1730	
Other:								

Notes & Comments

① 1 missing AM 2-3-18
② 0.4167, CW 2/9/18
③ 0.4944, CW 2/9/18

Photoperiod is 16-hours light and 8-hours dark, Illuminiation is ambient (50 to 100 ftcd)

Version 2 (13052-DCF)

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CETIS Analytical Report

Report Date: 09 Feb-18 16:16 (p 1 of 4)
Test Code: SOU-VG 17264FMC | 04-5388-4053

Fathead Minnow 7-d Larval Survival and Growth Test **Hydrosphere Research**

Analysis ID: 15-9024-0765 **Endpoint:** 7d Survival Rate ✓ **CETIS Version:** CETISv1.9.2
Analyzed: 09 Feb-18 16:15 **Analysis:** Nonparametric-Control vs Treatments ✓ **Official Results:** Yes

Batch ID: 06-5243-8167 **Test Type:** Growth-Survival (7d) **Analyst:**
Start Date: 30 Jan-18 17:45 ✓ **Protocol:** EPA/821/R-02-013 (2002) **Diluent:** Mod-Hard Synthetic Water
Ending Date: 06 Feb-18 13:20 ✓ **Species:** Pimephales promelas ✓ **Brine:**
Duration: 6d 20h **Source:** In-House Culture **Age:**

Sample ID: 06-7104-2086 **Code:** SOU-VG 17264FMC ✓ **Client:** Southern Nuclear-Plant Vogtle ✓
Sample Date: 29 Jan-18 16:00 ✓ **Material:** Final Effluent **Project:** WET Compliance Test
Receipt Date: 30 Jan-18 11:25 ✓ **Source:** SOU-VG (Alabama) ✓
Sample Age: 26h **Station:** FinEffComp ✓

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	C > T	100	> 100	n/a	1	6.64%

Steel Many-One Rank Sum Test

Control vs	Conc-%	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water	6.25	16	10	1	6	Asymp	0.6105	Non-Significant Effect
	12.5	18	10	1	6	Asymp	0.8333	Non-Significant Effect
	25	16	10	1	6	Asymp	0.6105	Non-Significant Effect
	50	18	10	1	6	Asymp	0.8333	Non-Significant Effect
	100	14	10	1	6	Asymp	0.3451	Non-Significant Effect

✓

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.023335	0.004667	5	1.305	0.3058	Non-Significant Effect
Error	0.0643921	0.0035773	18			
Total	0.0877271		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Levene Equality of Variance Test	10.11	4.248	9.8E-05	Unequal Variances
Variances	Mod Levene Equality of Variance Test	2.042	4.248	0.1209	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.8399	0.884	0.0014	Non-Normal Distribution

7d Survival Rate Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%
6.25		4	0.9750	0.8954	1.0000	1.0000	0.9000	1.0000	0.0250	5.13%	2.50%
12.5		4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%
25		4	0.9750	0.8954	1.0000	1.0000	0.9000	1.0000	0.0250	5.13%	2.50%
50		4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%
100		4	0.9500	0.8581	1.0000	0.9500	0.9000	1.0000	0.0289	6.08%	5.00%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.00%	0.00%
6.25		4	1.371	1.242	1.501	1.412	1.249	1.412	0.04074	5.94%	2.89%
12.5		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.00%	0.00%
25		4	1.369	1.242	1.497	1.408	1.249	1.412	0.04007	5.85%	3.04%
50		4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.00%	0.00%
100		4	1.328	1.183	1.474	1.326	1.249	1.412	0.04583	6.90%	5.92%

Analyst: cwf QA: 2/9/18

Fathead Minnow 7-d Larval Survival and Growth Test **Hydrosphere Research**

Analysis ID:	15-9024-0765	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.9.2
Analyzed:	09 Feb-18 16:15	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

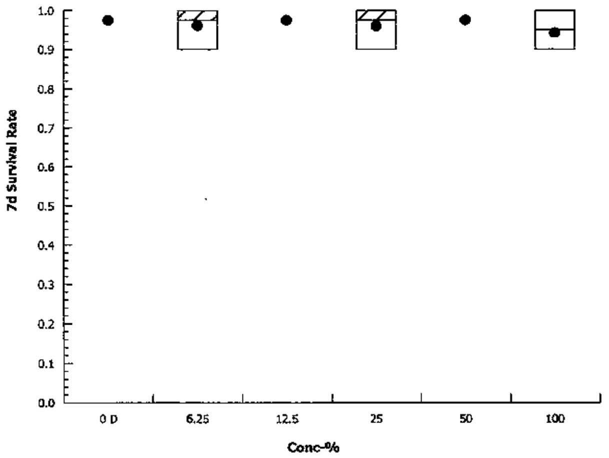
7d Survival Rate Detail

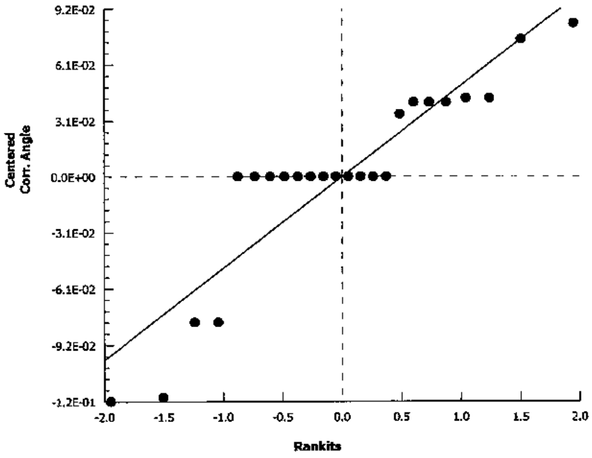
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.0000	1.0000	1.0000	1.0000
6.25		1.0000	1.0000	0.9000	1.0000
12.5		1.0000	1.0000	1.0000	1.0000
25		1.0000	0.9000	1.0000	1.0000
50		1.0000	1.0000	1.0000	1.0000
100		0.9000	1.0000	0.9000	1.0000

Angular (Corrected) Transformed Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.412	1.412	1.412	1.412
6.25		1.412	1.412	1.249	1.412
12.5		1.412	1.412	1.412	1.412
25		1.403	1.249	1.412	1.412
50		1.412	1.412	1.412	1.412
100		1.249	1.403	1.249	1.412

Graphics





Analyst: CW QA: 2/9/18

Fathead Minnow 7-d Larval Survival and Growth Test — **Hydrosphere Research**

Analysis ID:	10-1887-7173	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.9.2
Analyzed:	09 Feb-18 16:15	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes
Batch ID:	06-5243-8167	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	30 Jan-18 17:45	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	06 Feb-18 13:20	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 20h	**Source:**	In-House Culture	**Age:**	
Sample ID:	06-7104-2086	**Code:**	SOU-VG 17264FMC	**Client:**	Southern Nuclear-Plant Vogtle
Sample Date:	29 Jan-18 16:00	**Material:**	Final Effluent	**Project:**	WET Compliance Test
Receipt Date:	30 Jan-18 11:25	**Source:**	SOU-VG (Alabama)		
Sample Age:	26h	**Station:**	FinEffComp		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	100	> 100	n/a	1	14.17%

Dunnett Multiple Comparison Test

Control vs	Conc-%	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision(α:5%)
Dilution Water	6.25	-0.5988	2.407	0.062	6	CDF	0.9520	Non-Significant Effect
	12.5	-1.275	2.407	0.062	6	CDF	0.9920	Non-Significant Effect
	25	2.051	2.407	0.062	6	CDF	0.0955	Non-Significant Effect
	50	0.2705	2.407	0.062	6	CDF	0.7416	Non-Significant Effect
	100	-0.3519	2.407	0.062	6	CDF	0.9162	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0171109	0.0034222	5	2.554	0.0647	Non-Significant Effect
Error	0.0241148	0.0013397	18			
Total	0.0412256		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance Test	4.217	15.09	0.5186	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9708	0.884	0.6873	Normal Distribution

Mean Dry Biomass-mg Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.4398	0.3745	0.505	0.4255	0.408	0.5	0.0205	9.33%	0.00%
6.25		4	0.4552	0.3672	0.5433	0.4475	0.404	0.522	0.02767	12.15%	-3.52%
12.5		4	0.4727	0.4491	0.4964	0.4735	0.455	0.489	0.007442	3.15%	-7.50%
25		4	0.3867	0.3415	0.4318	0.387	0.356	0.4167	0.0142	7.34%	12.07%
50		4	0.4328	0.3793	0.4863	0.4435	0.384	0.46	0.01681	7.77%	1.59%
100		4	0.4489	0.3952	0.5025	0.444	0.413	0.4944	0.01686	7.51%	-2.07%

Mean Dry Biomass-mg Detail

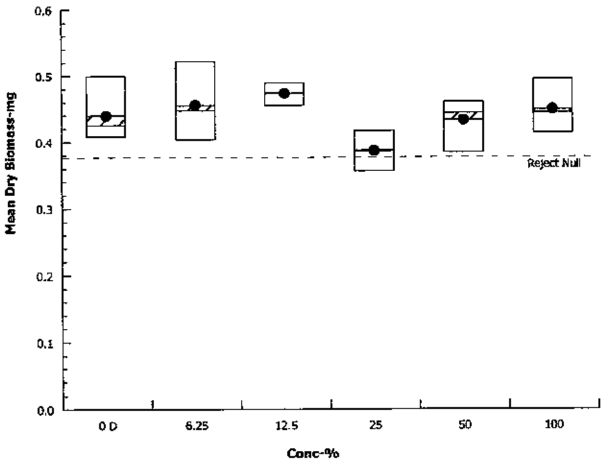
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.5	0.425	0.426	0.408
6.25		0.522	0.479	0.416	0.404
12.5		0.467	0.48	0.455	0.489
25		0.4167	0.404	0.37	0.356
50		0.448	0.439	0.46	0.384
100		0.444	0.4944	0.413	0.444

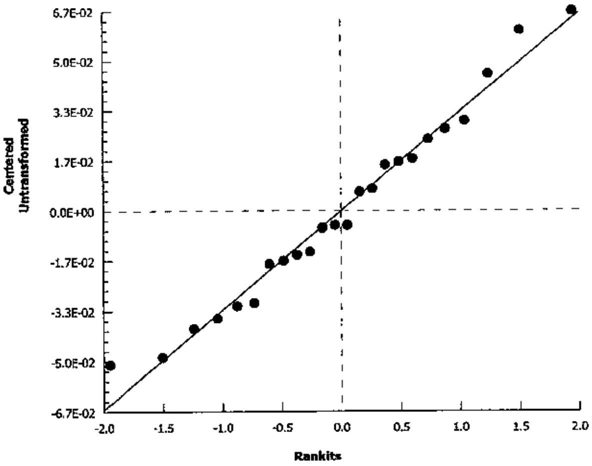
Analyst: CWJ QA: 2/9/18

Fathead Minnow 7-d Larval Survival and Growth Test **Hydrosphere Research**

Analysis ID:	10-1887-7173	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.9.2
Analyzed:	09 Feb-18 16:15	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





Analyst: CWJ QA: 2/9/18

Hydrosphere research

Percent Minimum Signifigant Difference Calculation

Client: SOU-VG
Job Number: 17264
Sample Description: Final Effluent
Test Start Date: 1/30/2018
Test: 7 CSRD
Species (C. dubia, P. promelas, S. capricornum, M. bahia, or M. beryllina): *P. promelas*
End Point: Reproduction
Calculated PMSD (From Dunnett's): 14.17
Lower PMSD Bound: 12
Upper PMSD Bound: 30

% Sample	Toxic According to Appropriate Stats? ("Y" or "N")	Mean	Relative Difference	Lower Bound Result	Upper Bound Result
Control	NA	0.4398	NA	NA	NA
6.25	N	0.4552	-4	Non Toxic	Acceptable Test
12.5	N	0.4727	-7	Non Toxic	Acceptable Test
25	N	0.3867	12	Non Toxic	Acceptable Test
50	N	0.4328	2	Non Toxic	Acceptable Test
100	N	0.4489	-2	Non Toxic	Acceptable Test

Version 3.0, Revised March 2017
F:/workgroup templates/pmsd.xlt

Reviewed By: CWJ 2/9/18

CETIS Analytical Report

Report Date: 09 Feb-18 16:16 (p 1 of 1)
Test Code: SOU-VG 17264FMC | 04-5388-4053

Fathead Minnow 7-d Larval Survival and Growth Test

Hydrosphere Research

Analysis ID:	11-7851-4552	**Endpoint:**	Mean Dry Biomass-mg ✓ ✓	**CETIS Version:**	CETISv1.9.2
Analyzed:	09 Feb-18 16:16	**Analysis:**	Linear Interpolation (ICPIN) ✓	**Official Results:**	Yes
Batch ID:	06-5243-8167	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	30 Jan-18 17:45	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	06 Feb-18 13:20	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 20h	**Source:**	In-House Culture	**Age:**	
Sample ID:	06-7104-2086	**Code:**	SOU-VG 17264FMC	**Client:**	Southern Nuclear-Plant Vogtle
Sample Date:	29 Jan-18 16:00	**Material:**	Final Effluent	**Project:**	WET Compliance Test
Receipt Date:	30 Jan-18 11:25	**Source:**	SOU-VG (Alabama)		
Sample Age:	26h	**Station:**	FinEffComp		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
✓Linear	Linear	1707502	200	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	>100	n/a	n/a	<1	n/a	n/a

Mean Dry Biomass-mg Summary

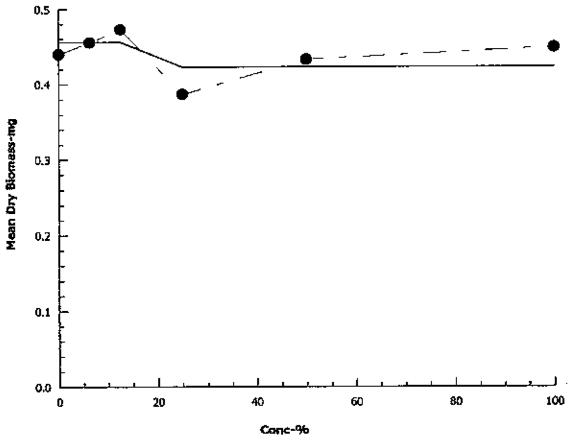
			Calculated Variate						
Conc-%	**Code**	**Count**	**Mean**	**Min**	**Max**	**Std Err**	**Std Dev**	**CV%**	**%Effect**
0	D	4	0.4398 ✓	0.408	0.5	0.0205	0.04101	9.33%	0.0%
6.25		4	0.4552 ✓	0.404	0.522	0.02767	0.05533	12.15%	-3.52%
12.5		4	0.4727 ✓	0.455	0.489	0.007442	0.01488	3.15%	-7.5%
25		4	0.3867 ✓	0.356	0.4167	0.0142	0.02839	7.34%	12.07%
50		4	0.4328 ✓	0.384	0.46	0.01681	0.03362	7.77%	1.59%
100		4	0.4489 ✓	0.413	0.4944	0.01686	0.03372	7.51%	-2.07%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.5	0.425	0.426	0.408
6.25		0.522	0.479	0.416	0.404
12.5		0.467	0.48	0.455	0.489
25		0.4167	0.404	0.37	0.356
50		0.448	0.439	0.46	0.384
100		0.444	0.4944	0.413	0.444

✓

Graphics



Analyst: CWf QA: 2/9/18

Hydrosphere research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1000.0)

Water Quality I

Client: Southern Nuclear

Code: SOU-VG **Job #:** 17264

Species: *Pimephales promelas*

ID #: 8781 a

Initiation Date: 1/30/18

Termination Date: ~~1/30~~ 2/6/18
cwj 2/9/18

Sample Description: ———

pH

(acceptable range for a valid test is 6 to 9)

Sample Description	% Effluent	new 0	old 1	new 1	old 2	new 2	old 3	new 3	old 4	new 4	old 5	new 5	old 6	new 6	old 7
Control	0	7.7	7.6	7.8	7.7	7.9	7.6	7.7	7.7	7.8	7.6	7.8	7.5	7.8	7.5
Effluent	6.25	7.7	7.6	7.8	7.7	7.9	7.6	7.7	7.7	7.8	7.6	7.9	7.5	7.9	7.5
	12.5	7.8	7.6	7.8	7.7	7.8	7.6	7.7	7.7	7.9	7.6	7.9	7.5	7.9	7.6
	25	7.8	7.7	7.8	7.7	7.9	7.7	7.7	7.7	7.9	7.6	8.0	7.5	8.0	7.6
	50	8.0	7.7	7.9	7.8	7.9	7.7	7.7	7.7	8.0	7.7	8.1	7.5	8.0	7.7
	100	8.0	7.8	8.0	7.8	8.0	7.8	7.7	7.8	8.1	7.8	8.2	7.7	8.1	7.8
Meter ID:		18	18	18	17	17	18	16	16	16	18	18	18	18	18

Dissolved Oxygen (mg/L)

(acceptable minimum for a valid test is 4.0-mg/L)

Sample Description	% Effluent	new 0	old 1	new 1	old 2	new 2	old 3	new 3	old 4	new 4	old 5	new 5	old 6	new 6	old 7
Control	0	8.1	7.4	8.5	7.3	8.4	7.3	8.4	7.1	8.4	6.7	7.8	6.6	8.1	6.9
Effluent	6.25	8.1	7.5	8.6	7.2	8.4	7.2	8.5	7.1	8.5	6.8	7.8	6.7	8.1	6.9
	12.5	8.2	7.5	8.6	7.1	8.5	7.3	8.5	7.0	8.5	6.6	7.7	6.7	8.1	6.9
	25	8.2	7.5	8.6	7.3	8.7	7.3	8.5	7.0	8.5	6.7	7.6	6.7	8.1	6.9
	50	8.2	7.4	8.5	7.3	8.7	7.4	8.5	7.0	8.4	6.7	7.4	6.8	8.1	6.9
	100	8.3	7.4	8.4	7.2	8.5	7.3	8.5	6.8	8.5	6.4	7.0	6.7	8.3	6.9
Meter ID:		13	~~18~~ ①	~~18~~	10	10	13	7	7	7	13	13	13	13	13

Day:	0	1		2		3		4		5		6		7
Control ID:	4355	4355		4355		4360		4360		4360		4360		
Dilution ID:	4355	4355		4355		4360		4360		4360		4360		
Effluent ID:	A	A		B		B		C		C		C		
Initials:	LW	LW	LW	MC	MC	LW	AM	AM	AM	LW	LW	LW	LW	LW
Time:	1630	1540	1225	1450	1430	1425	1130	1450	1310	1510	1130	1535	1125	1250

Notes & Comments

① DO Meter 13 cwj 2/13/18

Hydrosphere research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1000.0)

Water Quality II

Client: Southern Nuclear-Plant Vogtle
Code: SOU-VG **Job #:** 17264
Species: *Pimephales promelas*
ID #: 8789

Initiation Date: 1/30/18 **Termination Date:** 2/6/18

Sample Description: ———

Conductivity (µmho/cm)

(a Conductivity of 2,150-µmho/cm = a Salinity of 1‰ @ 25°C)

Measured in each new sample and control

Sample Description	% Effluent	0	1	2	3	4	5	6	7
Control	0	270	272	271	272	260	272	274	
Effluent	6.25	282	281	279	279	260	285	284	
	12.5	292	291	288	287	275	294	291	
	25	311	308	297	299	289	314	306	
	50	348	346	322	327	320	354	338	
	100	424	420	376	380	~~279~~ ①	441	399	
Meter ID:		15	15	18	17	17	15	15	

Temperature (°C)

(acceptable range for a valid test is 25±1°C)

Measured at the end of each 24-h exposure period

Sample Description	% Effluent	0	1	2	3	4	5	6	7
Control	0		24.0	24.1	24.9	24.5	25.1	24.0	24.3
Effluent	6.25		24.0	24.1	24.9	24.5	25.1	24.0	24.3
	12.5		24.0	24.1	24.9	24.5	25.1	24.0	24.3
	25		24.0	24.1	24.9	24.5	25.1	24.0	24.3
	50		24.0	24.1	24.9	24.5	25.1	24.0	24.3
	100		24.0	24.1	24.9	24.5	25.1	24.0	24.3
Meter ID:			57	57	57	57	57	57	57

Day:	0	1	2	3	4	5	6	7
Control ID:	4355	4355	4355	4360	4360	4360	4360	
Dilution ID:	4355	4355	4355	4360	4360	4360	4360	
Effluent ID:	A	A	B	B	C	C	C	
Initials:	LW	LW	MC	AM	AM	LW	LW	LW
Time:	1630	1225	1450	1130	1310	1130	1135	1250

Notes & Comments

① 379 correction AM 2-3-18

Hydrosphere research

CITY OF BRADENTON FLORIDA

Client: Southern Nuclear-Plant Vogtle

Code: SOU-VG **Job:** 17264

Sample Data

Sample Info					Dissolved Oxygen (D.O.)						Total Residual Chlorine ②			Ammonia				Conductivity			Salinity				Alkalinity/Hardness		
#	Date M/D/Y	Day	Letter Code	Description	D.O. (mg/L)	D.O. (%)	Aeration ① (min.)	Post Aeration D.O. (mg/L)	Meter #	Initials	TRC (mg/L) ①	Meter #	Initials	T-NH3 (mg/L)	pH	Meter #	Initials	Conductivity (µmho/cm)	Meter #	Initials	Salinity (ppt)	Adjusted (ppt)	Meter #	Initials	Alkalinity ① (mgCaCO3/L)	Hardness (mgCaCO3/L)	Initials
1	1 / 30 / 18	T	A	EFFLUENT	8.8	107	x	x	13	W	~~<0.04~~	147	Q	x	8.1	18	W	423	15	W	x	x	x	W	~~≥425~~	~~≥250~~	Q
2	1 / 31 / 18	W	A	"	9.4	113	10	8.3	13	W	x	x	W	x	8.2	18	W	421	15	W	x	x	x	W	x	x	W
3	2 / 1 / 18	R	B	"	7.3	92	x	x	10	MC	0.10	147	MC	x	8.1	17	MC	375	18	MC	x	x	x	MC	120	120	MC
4	2 / 2 / 18	F	B	"	10.7	136	10	8.8	7	AM	x	x	AM	x	7.8	16	AM	384	17	AM	x	x	x	AM	x	x	AM
5	2 / 3 / 18	Sa	C	"	10.5	124	15	8.8	7	AM	0.13	147	AM	x	8.1	16	AM	377	17	AM	x	x	x	AM	120	120	AM
6	2 / 4 / 18	Su	C	"	8.5	117	15	7.2	13	W	x	x	W	x	8.1	18	W	444	15	W	x	x	x	W	x	x	W
7	2 / 5 / 18	M	C		10.8	128	15	8.5	13	W	x	x	W	x	8.1	18	W	396	15	W	x	x	x	W	x	x	W
8	/ /																										
9	/ /																										
10	/ /																										
11	/ /																										
12	/ /																										
13	/ /																										
14	/ /																										
15	/ /																										
16	/ /																										

Notes & Comments

① TRC= 0.20; A= 120, H= 120 - MC 2/1

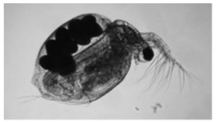
① Aeration rate is 500-mLs/min (EPA-821-R-02-012, Section 9.1.8, page 41).

② If sample is to be dechlorintaed then use 1-mL Effluent Dechlorinator (8-g/L NaThio) per 1-L Effluent Sample per 1-ppm TRC (EPA-821-R-02-012, Section 9.1.6, pg 41)

Dilution Waters		Alkalinity/Hardness		
Code	ID #	Alkalinity (mgCaCO3/L)	Hardness (mgCaCO3/L)	Initials
MHR	4355	62	88	CWJ
MHR	4360	60	88	CWJ
MHR	4350	62	88	CWJ
MHR	4358	60	80	CWJ

Appendix C. Reference Toxicant Data

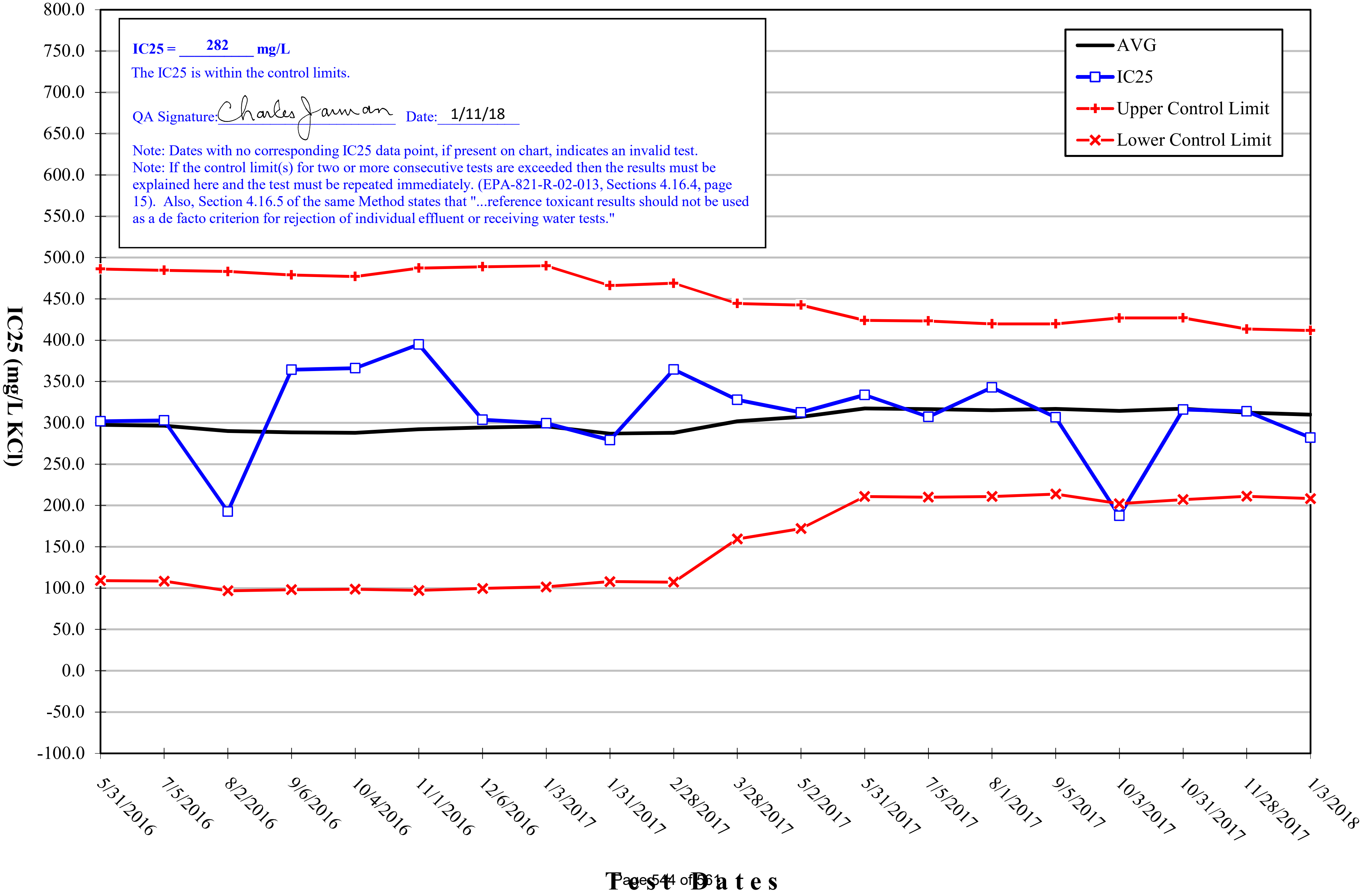
Hydrosphere research



Control Chart-I

Control Limits for Standard Reference Toxicant Tests

CHRONIC ··· *Ceriodaphnia dubia*



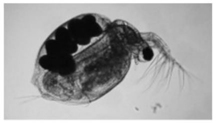
IC25 = 282 **mg/L**

The IC25 is within the control limits.

QA Signature: Charles Jarman Date: 1/11/18

Note: Dates with no corresponding IC25 data point, if present on chart, indicates an invalid test.
Note: If the control limit(s) for two or more consecutive tests are exceeded then the results must be explained here and the test must be repeated immediately. (EPA-821-R-02-013, Sections 4.16.4, page 15). Also, Section 4.16.5 of the same Method states that "...reference toxicant results should not be used as a de facto criterion for rejection of individual effluent or receiving water tests."

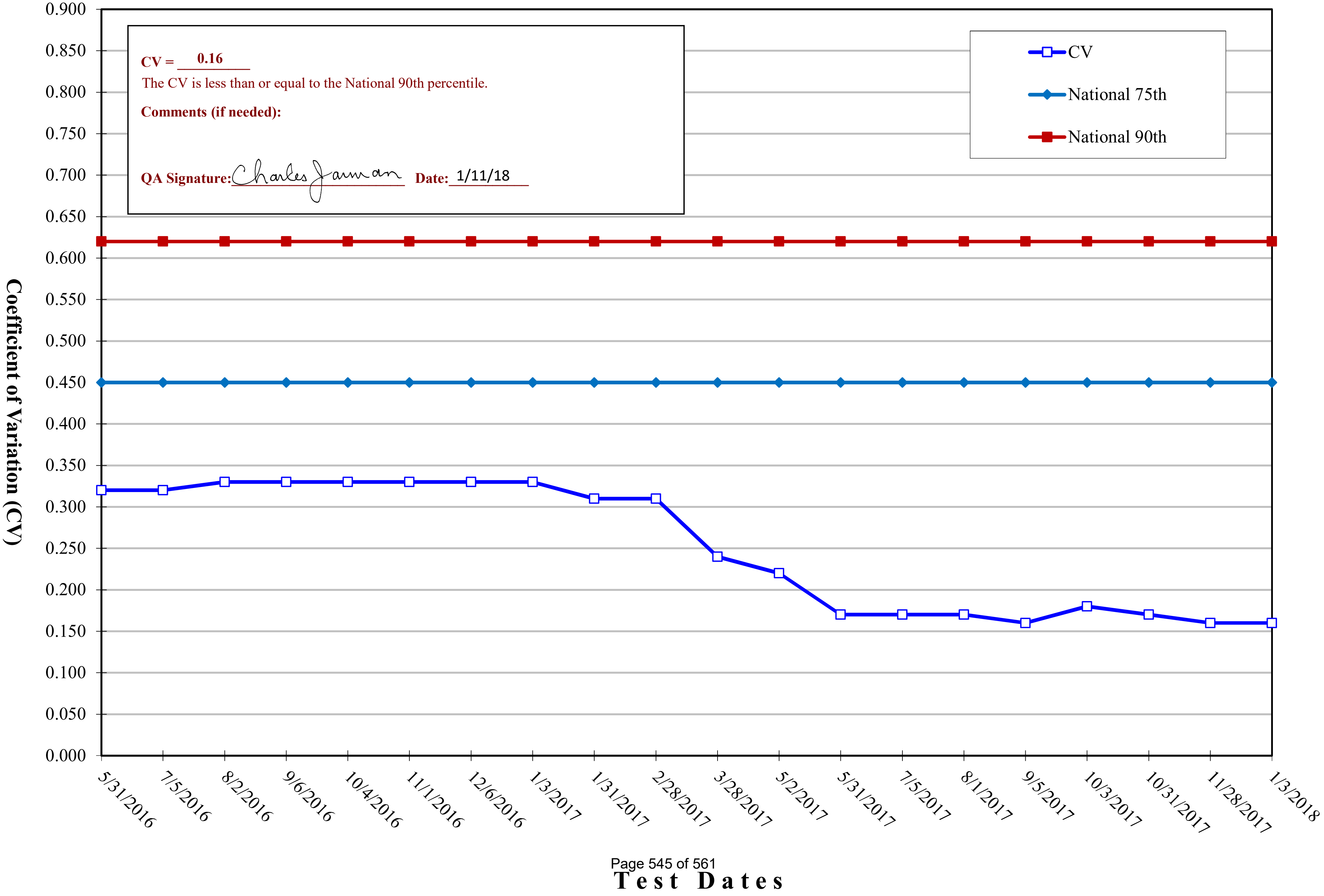
Hydrosphere research



Control Chart-II

Coefficient of Variation for Standard Reference Toxicant Tests

CHRONIC ··· *Ceriodaphnia dubia*



CV = 0.16

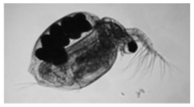
The CV is less than or equal to the National 90th percentile.

Comments (if needed):

QA Signature: Charles Jarman **Date:** 1/11/18

REFERENCE TOXICANT LOG · Last 20

Test: **7-day Chronic**
Species: *Ceriodaphnia dubia*
Toxicant: Potassium chloride (**mg** KCl / liter)



N	DATE	IC25	AVG	S.D.	2S.D.	+2 SD	-2 SD	CV	National 75th %	National 90th %	Lower Control Limit	Upper Control Limit
143	5/31/2016	302	298	94.27	188.55	486.17	109.08	0.32	0.45	0.62	109	486
144	7/5/2016	303	297	94.07	188.13	484.66	108.40	0.32	0.45	0.62	108	485
145	8/2/2016	193	290	96.61	193.21	483.18	96.76	0.33	0.45	0.62	97	483
146	9/6/2016	364	289	95.23	190.46	479.03	98.10	0.33	0.45	0.62	98	479
147	10/4/2016	366	288	94.60	189.21	477.10	98.69	0.33	0.45	0.62	99	477
148	11/1/2016	395	292	97.53	195.06	487.33	97.21	0.33	0.45	0.62	97	487
149	12/6/2016	304	294	97.31	194.63	488.92	99.66	0.33	0.45	0.62	100	489
150	1/3/2017	300	296	97.14	194.28	490.08	101.53	0.33	0.45	0.62	102	490
151	1/31/2017	279	287	89.56	179.12	466.09	107.85	0.31	0.45	0.62	108	466
152	2/28/2017	365	288	90.42	180.83	468.92	107.25	0.31	0.45	0.62	107	469
153	3/28/2017	328	302	71.23	142.45	444.43	159.52	0.24	0.45	0.62	160	444
154	5/2/2017	313	307	67.62	135.25	442.51	172.01	0.22	0.45	0.62	172	443
155	5/31/2017	334	317	53.26	106.53	424.00	210.94	0.17	0.45	0.62	211	424
156	7/5/2017	307	317	53.29	106.59	423.27	210.10	0.17	0.45	0.62	210	423
157	8/1/2017	343	315	52.23	104.46	419.82	210.90	0.17	0.45	0.62	211	420
158	9/5/2017	307	317	51.51	103.03	419.86	213.80	0.16	0.45	0.62	214	420
159	10/3/2017	188	315	56.20	112.40	426.96	202.15	0.18	0.45	0.62	202	427
160	10/31/2017	316	317	54.99	109.99	427.08	207.10	0.17	0.45	0.62	207	427
161	11/28/2017	314	312	50.56	101.12	413.46	211.22	0.16	0.45	0.62	211	413
162	1/3/2018	282	310	50.85	101.70	411.72	208.32	0.16	0.45	0.62	208	412

Hydrosphere research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1002.0)

SRT: Survival & Reproduction

SRT for the Month of (circle one):
[✓ Jan] Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Species: *Ceriodaphnia dubia*
Code: CD
ID #: 8776
Age: < 24-h

Note: Valid Control is
≥80% survival @ 7d … and …
≥15-neonates average /surviving female)

30-mL Plastic Cup
20-mLs per replicate

Initiation Date: 1/3/18W
Termination Date: 1·9·2018
Toxicant (desiccated): KCl
Stock Solution (Concentration): 100-gm KCl / Liter
Test Concentration (Units): mg KCl / Liter

Control — 0 mg/L — Control (Sample Description)

REP	Live Counts (Adults ○, Number of Neonates) 1 R	2 F	3 Sa	4 Su	5 M	6 T	7 W	1st-3rd brood total
A	✓	✓	⊛	✓ 5	✓ 10	✓ 14	○	29
B	✓	✓	⊛ 5	✓	✓ 11	✓ 16	○	32
C	✓	✓	◒ 3	✓	✓ 10	✓ 14	○	27
D	✓	✓	⊛ 3	✓	✓ 8	✓ 15	○	26
E	✓	✓	◒ 4	✓	✓ 9	✓ 14	○	27
F	✓	✓	⊛ 6	✓	✓ 10	✓ 16	○	32
G	✓	⊖3	⊖	⊖	⊖	⊖	⊖	3~~0~~ ①
H	✓	✓	◒ 3	✓	✓ 9	✓ 13	○	25
I	✓	✓	⊛ 5	✓	✓ 11	✓ 15	○	31
J	✓	✓	⊛ 5	✓	✓ 11	✓ 17	○	33
Live Count:	10	9	9	9	9	9		265

1st dilution — 31.25 mg/L — Toxicant (Sample Description)

REP	Live Counts 1	2	3	4	5	6	7	1st-3rd brood total
A	✓	✓	⊛	⦶ *	⦶ *	⦶ *	○	0
B	✓	✓	⊛ 5	✓	✓ 10	✓ 17	○	32
C	✓	✓	⊛ 3	✓	✓ 10	✓ 15	○	28
D	✓	✓	⊛ 3	✓ 11	✓	✓ 18	○	32
E	✓	✓	⊛ 4	✓	✓ 9	✓ 15	○	28
F	✓	✓	◒ 5	✓	✓ 12	✓ 17	○	34
G	✓	✓	◒ 4	✓	✓ 4	✓ 16	○	24
H	✓	✓	⊛ 4	✓	✓ 12	✓ 16	○	32
I	✓	✓	●	✓ 8	✓ 16	✓ 15	○	39
J	✓	✓	◒ 4	✓	✓ 10	✓ 16	○	30
Live Count:	10	10	10	10	10	10		279

2nd dilution — 62.5 mg/L — Toxicant (Sample Description)

REP	Live Counts 1	2	3	4	5	6	7	1st-3rd brood total
A	✓	⦶	✓	⦶ *	⦶ *	⦶ *	○	0
B	✓	✓	⊛ 5	✓	✓ 12	✓ 17	○	34
C	✓	✓	⊛ 4	✓	✓ 10	✓ 18	○	32
D	✓	✓	⊛ 5	✓ 12	✓	✓ 17	○	34
E	✓	✓	◒ 4	✓	✓ 11	✓ 17	○	32
F	✓	✓	◒ 4	✓	✓ 10	✓ 16	○	30
G	✓	✓	●	✓ 3	✓ 8	✓ 14	○	25
H	✓	✓	◒ 4	✓	✓ 12	✓ 15	○	31
I	✓	✓	◒ 3	✓	✓ 10	✓ 17	○	30
J	✓	✓	◒ 4	✓	✓ 11	✓ 15	○	30
Live Count:	10	10	10	10	10	10		278

3rd dilution — 125 mg/L — Toxicant (Sample Description)

REP	Live Counts 1	2	3	4	5	6	7	1st-3rd brood total
A	✓	⦶	⦶	⦶	⊖	⊖	⊖	0
B	✓	✓	◒ 4	✓	✓ 11	✓ 14	○	29
C	✓	✓	◒ 4	✓	✓ 12	✓ 16	○	32
D	✓	✓	⊛ 4	✓	✓ 13	✓ 17	○	34
E	✓	✓	●	✓ 4	✓ 8	✓ 13	○	25
F	✓	✓	⊛ 4	✓	✓ 9	✓ 15	○	28
G	✓	⦶	⦶	⦶	⦶ *	⦶ *	○	0
H	✓	✓	◒ 3	✓	✓ 11	✓ 14	○	28
I	✓	✓	⊛ 4	✓	✓ 11	✓ 15	○	30
J	✓	✓	⊛ 5	✓	✓ 12	✓ 18	○	35
Live Count:	10	10	10	10	9	9		241

4th dilution — 250 mg/L — Toxicant (Sample Description)

REP	Live Counts 1	2	3	4	5	6	7	1st-3rd brood total
A	✓	⊖	⊖	⊖	⊖	⊖	⊖	0
B	✓	✓	⊛ 4	✓	✓ 12	✓ 17	○	33
C	✓	✓	⊛ 2	✓	✓ 8	✓ 13	○ ②	~~25~~
D	✓	✓	⊛ 5	✓	✓ 9	✓ 15	○	29
E	✓	✓	⊛ 5	✓	✓ 11	✓ 16	○	32
F	✓	✓	⊛ 4	✓	✓ 10	✓ 14	○	28
G	✓	⦶	⦶	⦶	⊖	⊖	⊖	0
H	✓	✓	◒ 4	✓ 1	✓ 11	✓ 15	○	31
I	✓	✓	⊛ 3	✓	✓ 12	✓ 13	○	28
J	✓	✓	⊛ 5	✓	✓ 12	✓ 15	○	32
Live Count:	10	9 ~~10~~	9	9	8	8	㉓	~~238~~

5th dilution — 500 mg/L — Toxicant (Sample Description)

REP	Live Counts 1	2	3	4	5	6	7	1st-3rd brood total
A	⊖	⊖	⊖	⊖	⊖	⊖	⊖	0
B	⊖	⊖	⊖	⊖	⊖	⊖	⊖	0
C	⊖	⊖	⊖	⊖	⊖	⊖	⊖	0
D	⊖	⊖	⊖	⊖	⊖	⊖	⊖	0
E	⊖	⊖	⊖	⊖	⊖	⊖	⊖	0
F	⊖	⊖	⊖	⊖	⊖	⊖	⊖	0
G	⊖	⊖	⊖	⊖	⊖	⊖	⊖	0
H	⊖	⊖	⊖	⊖	⊖	⊖	⊖	0
I	⊖	⊖	⊖	⊖	⊖	⊖	⊖	0
J	⊖	⊖	⊖	⊖	⊖	⊖	⊖	0
Live Count:	0	0						0

Day	0	1	2	3	4	5	6	7
Initials	TPm	AM	W	KO	W	W	W	
Time	15:10	11:00	11:55	1358	14:00	14:25	14:30	
F-CD #	192	192	192	192	192	192		
F-SC #	460	461	461	461	461	462		

Notes & Comments

① 3 W 1-5-18 W 1.7.18
② 23, 236 cwf 1/11/18

An "*" recorded for neonates means that dead or aborted neonates were present.

✓ Normal Adult	● … Normal Adult near neonate release	⊛ … Normal Adult with developing brood
◒ … Normal Adult w/ newly deposited brood	⦷ … Normal Adult w/ embryos in oviducts	⊗ … Abnormal Adult with Small Brood
⦶ … Abnormal Adult: reproductivley inactive	Abnormal Adult: Dead … ⊖	Abnormal Adult: Male … ♂

Randomization Template # 2

Photoperiod is 16-hours light and 8-hours dark, Illumination is ambient (50 to 100 ftcd)

CETIS Analytical Report

Report Date: 11 Jan-18 12:09 (p 1 of 1)
Test Code: JAN18CDC | 05-8203-9810

Ceriodaphnia 7-d Survival and Reproduction Test

Hydrosphere Research

Analysis ID:	20-5576-0024	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.9.2
Analyzed:	11 Jan-18 12:08	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes
Batch ID:	21-2572-7039	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	03 Jan-18 15:10	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	09 Jan-18 14:30	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	5d 23h	**Source:**	In-House Culture	**Age:**	
Sample ID:	11-5069-7101	**Code:**	JAN18CDC	**Client:**	Internal Lab
Sample Date:	03 Jan-18	**Material:**	Potassium chloride	**Project:**	Standard Reference Toxicant Test
Receipt Date:	03 Jan-18	**Source:**	Reference Toxicant		
Sample Age:	15h	**Station:**			

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	720242	200	Yes	Two-Point Interpolation

Point Estimates

Level	mg/L	95% LCL	95% UCL
IC25	282.3	94	312.5

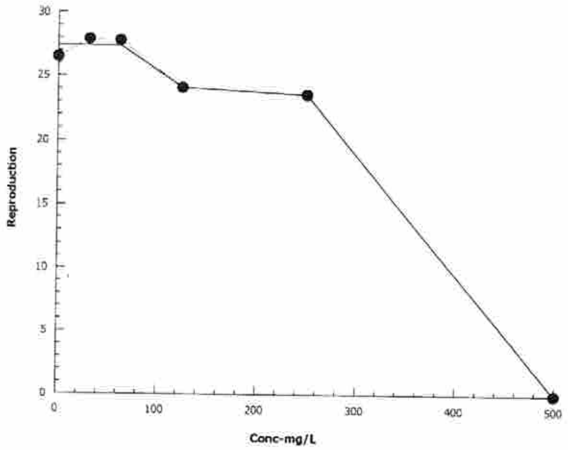
Reproduction Summary

Conc-mg/L	Code	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
			Calculated Variate						
0	D	10	26.5	3	33	2.758	8.721	32.91%	0.0%
31.25		10	27.9	0	39	3.348	10.59	37.95%	-5.28%
62.5		10	27.8	0	34	3.193	10.1	36.32%	-4.91%
125		10	24.1	0	35	4.124	13.04	54.12%	9.06%
250		10	23.6	0	33	4.037	12.76	54.09%	10.94%
500		10	0	0	0	0	0		100.0%

Reproduction Detail

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	29	32	27	26	27	32	3	25	31	33
31.25		0	32	28	32	28	34	24	32	39	30
62.5		0	34	32	34	32	30	25	31	30	30
125		0	29	32	34	25	28	0	28	30	35
250		0	33	23	29	32	28	0	31	28	32
500		0	0	0	0	0	0	0	0	0	0

Graphics



Analyst: CW QA: 1/11/18

Hydrosphere research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1002.0)

SRT: Water Quality I

SRT for the Month of (circle one):

[✓ Jan] Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Species: *Ceriodaphnia dubia*

ID #: 8776

Initiation Date: 1-3-18 W

Termination Date: 1 · 9 · 2018

Toxicant (desiccated): KCl

Stock Solution (Concentration): 100-gm KCl / L

Test Concentration (Units): mg KCl / L

pH (acceptable range for a valid test is 6 to 9)

mLs of Stock / 200-mLs	mg/L	new 0	old 1	new 1	old 2	new 2	old 3	new 3	old 4	new 4	old 5	new 5	old 6	new 6	old 7
Control	0	7.7	7.7	7.6	7.7	7.7	7.9	7.8	8.0	7.8	7.9	7.7	7.7		
62.5-µL	31.25	7.7	7.8	7.6	7.8	7.7	7.9	7.9	8.0	7.8	7.9	7.7	7.7		
125-µL	62.5	7.7	7.8	7.6	7.8	7.7	7.9	7.9	8.0	7.8	7.9	7.8	7.7		
250-µL	125	7.7	7.8	7.7	7.8	7.7	8.0	7.9	8.0	7.8	7.9	7.8	7.8		
0.5-mL	250	7.8	7.9	7.7	7.9	7.8	8.0	7.9	8.1	7.9	8.0	7.8	7.8		
1-mL	500	7.8	7.9	7.8		7.8									
Meter ID:		16	16	16	18	16	17	17	18	18	18	16	18		

Dissolved Oxygen (mg/L) (acceptable minimum for a valid test is ≥4.0-mg/L)

mLs of Stock / 200-mLs	mg/L	new 0	old 1	new 1	old 2	new 2	old 3	new 3	old 4	new 4	old 5	new 5	old 6	new 6	old 7
Control	0	8.6	7.9	8.7	7.4	8.5	7.2	8.2	7.5	8.5	7.1	8.4	7.3		
62.5-µL	31.25	8.8	7.8	8.7	7.5	8.6	7.4	8.4	7.6	8.6	7.1	8.4	7.4		
125-µL	62.5	8.8	8.0	8.7	7.5	8.6	7.5	8.5	7.7	8.7	7.1	8.4	7.5		
250-µL	125	8.8	8.0	8.7	7.5	8.6	7.6	8.6	7.7	8.7	7.1	8.4	7.6		
0.5-mL	250	8.7	8.0	8.6	7.5	8.6	7.6	8.6	7.7	8.7	7.2	8.4	7.6		
1-mL	500	8.8	8.0	8.6		8.5									
Meter ID:		7	7	7	13	7	10	10	13	13	13	7	13		

Day:	0	1	1	2	2	3	3	4	4	5	5	6	6	7
Stock Solution ID (SLN):	17356	17450		17450		17450		17450		17450				
Dilution ID:	4337	4337		4337		4337		4337		4337				
Initials:	AM	AM	AM	RSS	AM	KO	KO	w	w	w	AM	w		
Time:	11:00	1100	1030	1155	1055	1420	1057	1505	1050	1435	1240	1430		

Notes & Comments

Ⓟ w w 1-7-18

Hydrosphere research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1002.0)

SRT: Water Quality II

SRT for the Month of (circle one):

[✓ Jan] Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Species: *Ceriodaphnia dubia*

ID #: 8776

Initiation Date: 1-3-18 W

Termination Date: 1-9-2018

Toxicant (desiccated): KCl

Stock Solution (Concentration): 100-gm KCl / L

Test Concentration (Units): mg KCl / L

Conductivity (µmho/cm)
(a Conductivity of 2,150-µmho/cm = a Salinity of 1‰ @ 25°C)
Measured in each new sample and control

mLs of Stock / 200-mLs	mg/L	0	1	2	3	4	5	6	7
Control	0	254	278	274	274	276	278		
62.5-µL	31.25	290	336	329	329	332	322		
125-µL	62.5	357	391	390	445	397	386		
250-µL	125	441	498	495	508	497	494		
0.5-mL	250	644	697	698	754	658	705		
1-mL	500	1009	1111	~~1107~~					
Meter ID:		17	17	17	18	15	17		

Temperature (°C)
(acceptable range for a valid test is 25±1°C)
Measured at the end of each 24-h exposure period

mLs of Stock / 200-mLs	mg/L	0	1	2	3	4	5	6	7
Control	0		25.2	24.7	24.5	24.3	24.2	25.1	
62.5-µL	31.25		25.2	24.7	24.5	24.3	24.2	25.1	
125-µL	62.5		25.2	24.7	24.5	24.3	24.2	25.1	
250-µL	125		25.2	24.7	24.5	24.3	24.2	25.1	
0.5-mL	250		25.2	24.7	24.5	24.3	24.2	25.1	
1-mL	500		25.2	~~24.7~~					
Meter ID:			57	57	57	57	57	57	

Day:	0	1	2	3	4	5	6	7
Stock Solution ID (SLN):	17356	17450	17450	17450	17450	17450		
Dilution ID:	4337	4337	4337	4337	4337	4337		
Initials:	AM	AM	AM	KO	W	AM		
Time:	11:00	10:20	10:55	10:57	10:50	12:40	:	:

Notes & Comments

Hydrosphere research

Control Chart-I

Control Limits for Standard Reference Toxicant Tests

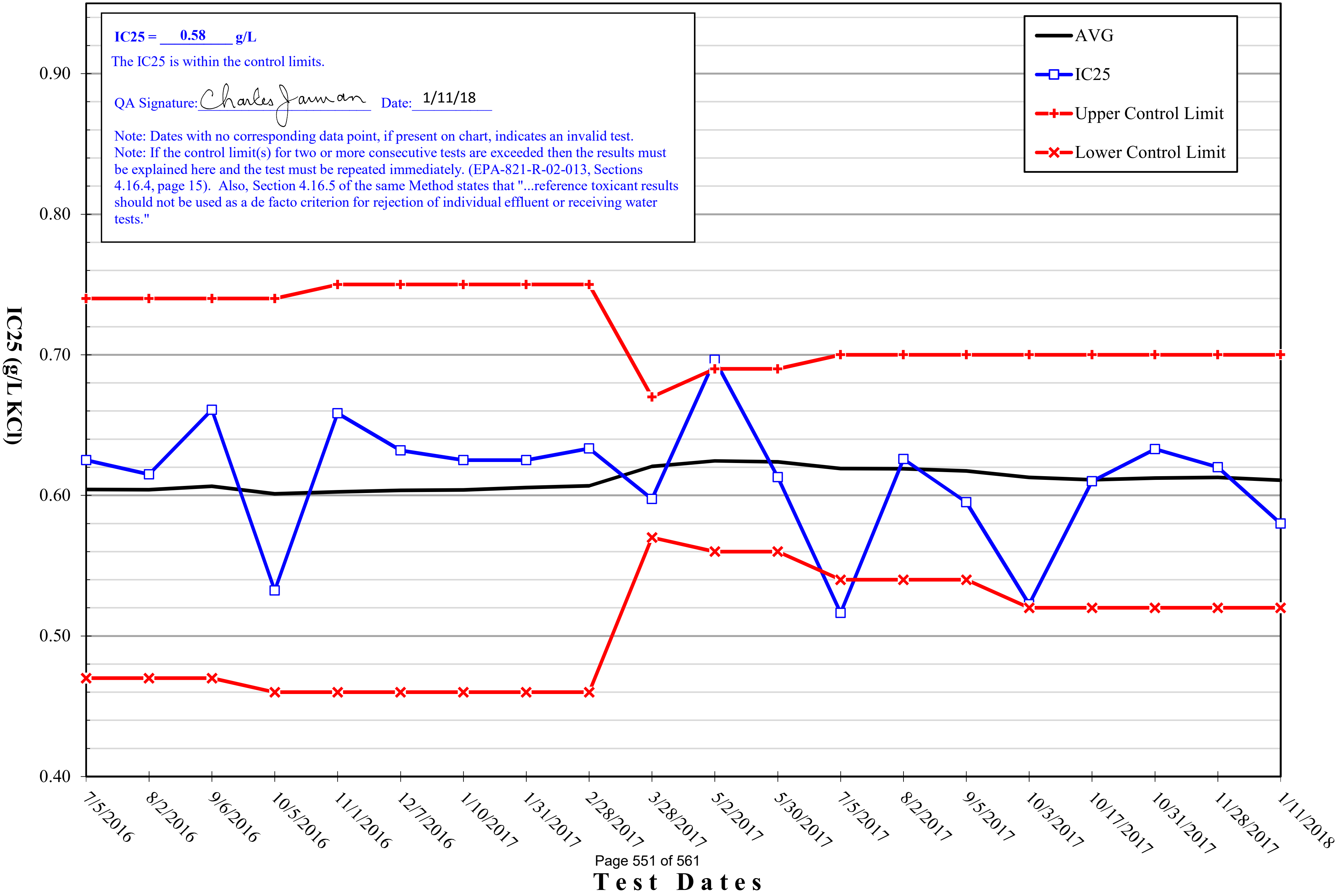
CHRONIC ··· *Pimephales promelas*

IC25 = 0.58 g/L

The IC25 is within the control limits.

QA Signature: Charles Jarman Date: 1/11/18

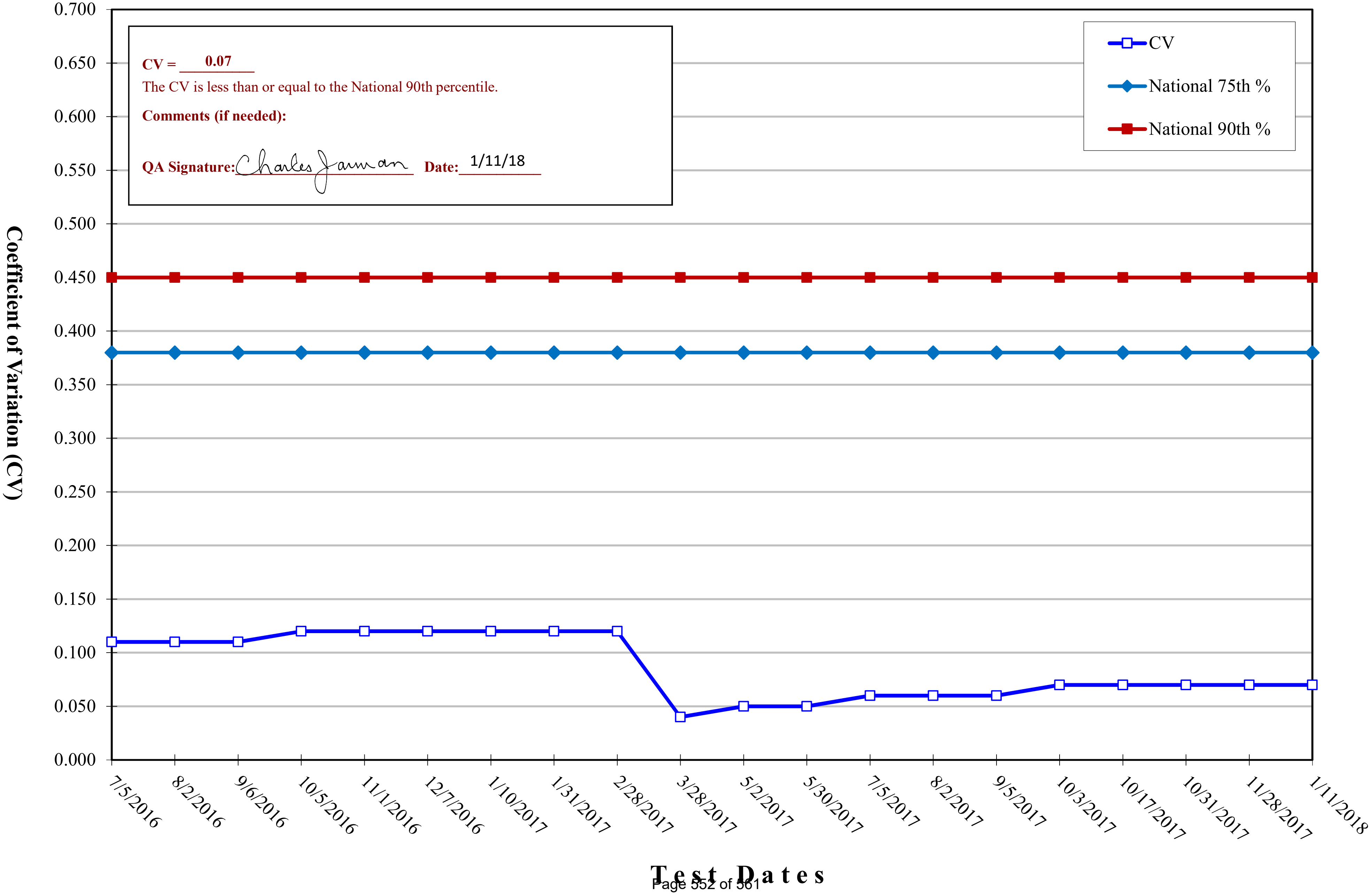
Note: Dates with no corresponding data point, if present on chart, indicates an invalid test.
Note: If the control limit(s) for two or more consecutive tests are exceeded then the results must be explained here and the test must be repeated immediately. (EPA-821-R-02-013, Sections 4.16.4, page 15). Also, Section 4.16.5 of the same Method states that "...reference toxicant results should not be used as a de facto criterion for rejection of individual effluent or receiving water tests."



Hydrosphere research

Control Chart-II

Coefficient of Variation for Standard Reference Toxicant Tests
CHRONIC ··· *Pimephales promelas*



CV = 0.07
The CV is less than or equal to the National 90th percentile.
Comments (if needed):
QA Signature: Charles Jarman **Date:** 1/11/18

REFERENCE TOXICANT LOG · Last 20

Test: **7-day Chronic**
Species: *Pimephales promelas*
Toxicant: Potassium chloride (**gm** KCl / liter)

N	DATE	IC25	AVG	S.D.	2S.D.	- 2S.D.	+2S.D.	CV	National 75th %	National 90th %	Lower Control Limit	Upper Control Limit
156	7/5/2016	0.63	0.60	0.07	0.14	0.47	0.74	0.11	0.38	0.45	0.47	0.74
157	8/2/2016	0.62	0.60	0.07	0.14	0.47	0.74	0.11	0.38	0.45	0.47	0.74
158	9/6/2016	0.66	0.61	0.07	0.14	0.47	0.74	0.11	0.38	0.45	0.47	0.74
159	10/5/2016	0.53	0.60	0.07	0.14	0.46	0.74	0.12	0.38	0.45	0.46	0.74
160	11/1/2016	0.66	0.60	0.07	0.14	0.46	0.75	0.12	0.38	0.45	0.46	0.75
161	12/7/2016	0.63	0.60	0.07	0.14	0.46	0.75	0.12	0.38	0.45	0.46	0.75
162	1/10/2017	0.63	0.60	0.07	0.14	0.46	0.75	0.12	0.38	0.45	0.46	0.75
163	1/31/2017	0.63	0.61	0.07	0.14	0.46	0.75	0.12	0.38	0.45	0.46	0.75
164	2/28/2017	0.63	0.61	0.07	0.14	0.46	0.75	0.12	0.38	0.45	0.46	0.75
165	3/28/2017	0.60	0.62	0.03	0.05	0.57	0.67	0.04	0.38	0.45	0.57	0.67
166	5/2/2017	0.70	0.62	0.03	0.06	0.56	0.69	0.05	0.38	0.45	0.56	0.69
167	5/30/2017	0.61	0.62	0.03	0.06	0.56	0.69	0.05	0.38	0.45	0.56	0.69
168	7/5/2017	0.52	0.62	0.04	0.08	0.54	0.70	0.06	0.38	0.45	0.54	0.70
169	8/2/2017	0.63	0.62	0.04	0.08	0.54	0.70	0.06	0.38	0.45	0.54	0.70
170	9/5/2017	0.60	0.62	0.04	0.08	0.54	0.70	0.06	0.38	0.45	0.54	0.70
171	10/3/2017	0.52	0.61	0.04	0.09	0.52	0.70	0.07	0.38	0.45	0.52	0.70
172	10/17/2017	0.61	0.61	0.04	0.09	0.52	0.70	0.07	0.38	0.45	0.52	0.70
173	10/31/2017	0.63	0.61	0.04	0.09	0.52	0.70	0.07	0.38	0.45	0.52	0.70
174	11/28/2017	0.62	0.61	0.04	0.09	0.52	0.70	0.07	0.38	0.45	0.52	0.70
175	1/11/2018	0.58	0.61	0.05	0.09	0.52	0.70	0.07	0.38	0.45	0.52	0.70

Hydrosphere research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1000.0)

SRT: Survival & Growth

SRT for the Month of (circle one): [✓ Jan] Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Species: *Pimephales promelas* **Code:** FM
ID #: 8774 **Age:** < 24-hours **Treatment of Eggs/Larvae** ① ☐ No, ☐ Yes, Note

Control Water: MHR
ID #: see "water quality"
Test Vessel: 1-L plastic cup
Test Volume: 250-mL / rep.

Initiation Date: 01-03-2018 W **Termination Date:** 1/10/18 W
Toxicant (desiccated): KCl
Stock Solution (Concentration): 100-gm KCl / Liter
Test Concentration (Units): gm KCl / Liter

	g/L	REP	Live Counts (Valid Control is ≥80% survival @ 7d) W 0	R 1	F 2	Sa 3	Su 4	M 5	T 6	W 7
Control	0	A	10	10	10	10	10	10	10	10
		B	10	10	10	10	10	10	10	10
		C	10	10	10	10	10	10	10	10
		D	10	10	10	10	10	10	10	10
	0.25	A	10	10	10	10	10	10	9^{1}	9
		B	10	10	10	10	10	10	10	10
		C	10	10	10	10	10	10	10	10
		D	10	10	10	10	10	10	10	9^{1}
	0.5	A	10	10	9^{1}	9	9	9	9	9
		B	10	10	9^{1}	9	9	9	9	9
		C	10	10	10	8^{2}	8	8	8	8
		D	10	10	10	10	10	10	10	10
	1	A	10	6^{4}	1^{5}	0^{1}			KO 1.6	
		B	10	10	3^{7}	1^{2}	0^{1}			
		C	10	6^{4}	0^{6}		KO 1.5			
		D	10	6^{4}	3^{3}	1^{2}	1	1	1	1
	2	A	10	0^{10}						
		B	10	0^{10}						
		C	10	0^{10}						
		D	10	0^{10}						
	4	A	10	0^{10}				KO 1/4		
		B	10	0^{10}						
		C	10	0^{10}						
		D	10	0^{10}						
		Initials:	AM	KO	KO	KO	W	AM	KO	AM
		Time:	13:15	11:44	11:40	11:58	13:10	14:10	11:04	12:50

Growth (original number, final dry weight basis. Valid Control is ≥0.25-mg/surviving fish) Pan #	Tare Weight (0.00001-gms)	Total Weight (0.00001-gms)	Net Weight (0.00001-gms)	Wt. / Fish (0.001-mgs)	Notes & Comments
1	1.12438	1.12961	0.00523	0.523	
2	1.13477	1.14078	0.00601	0.601	
3	1.13692	1.14220	0.00528	0.528	
4	1.14903	1.15516	0.00613	0.613	
5	1.12778	1.13272	0.00494	0.494	
6	1.15147	1.15719	0.00572	0.572	
7	1.13865	1.14351	0.00486	0.486	
8	1.15314	1.15855	0.00541	0.541	
9	1.15186	1.15631	0.00445	~~0.445~~	0.445 1/11
10	1.13488	1.13994	0.00506	0.506	
11	1.14368	1.14831	0.00463	0.463	
12	1.14754	1.15373	0.00619	0.619	
13	1.14397		KO 1.6		
14	1.14695				
15	1.14147		KO 1.5		
16	1.15454	1.15503	0.00049	0.049	
		AM 1-4-18			
		AM 1-4-18			

Date Tare Weights :	1/5	Initials:	LS
Date Final Dry Weights :	1/11	Initials:	LS

① Eggs may be treated with certain chemicals to control fungus. Typically methylene blue (MB) or Fungus Eliminator (FE) are used to control fungus. If used, note use under "Notes & Comments"

Randomization Template # 3

Feeding Type:	Artemia							
Amount:	3-drops (0.15-mLs) of a concentrated slurry / 2x / day							
Artemia ID#:	17095	17095	17095	17095	17095	17095	17095	(-CHM)
Morning (time):	╳	9:45	9:30	10:00	9:40	9:45	10:30	
Evening (time):	15:15	16:30	15:00	14:40	16:55	16:30	15:00	

Weigh Pan and Dry Weight Determination Information

Final							
Oven ID#:	1	Date & Time IN:	1/10. 13:18	Oven Temp:	59.1	Initials:	AM
Total Drying Time:	24	Date & Time OUT:	1/11. 1326	Oven Temp:	59.9	Initials:	LS

Drying Times & Temperatures for Final Weights:
24-hours at 60±1°C or ≥6-hours at 105±1°C

CETIS Analytical Report

Report Date: 11 Jan-18 14:39 (p 1 of 1)
Test Code: ✓JAN18FMC | 20-0804-6159

Fathead Minnow 7-d Larval Survival and Growth Test ✓ **Hydrosphere Research**

Analysis ID: 20-4375-0004 **Endpoint:** Mean Dry Biomass-mg ✓ **CETIS Version:** CETISv1.9.2
Analyzed: 11 Jan-18 14:39 **Analysis:** Linear Interpolation (ICPIN) ✓ **Official Results:** Yes

Batch ID: 08-7630-4726 ✓ **Test Type:** Growth-Survival (7d) **Analyst:**
Start Date: 03 Jan-18 13:15 ✓ **Protocol:** EPA/821/R-02-013 (2002) ✓ **Diluent:** Mod-Hard Synthetic Water
Ending Date: 10 Jan-18 12:50 ✓ **Species:** Pimephales promelas ✓ **Brine:**
Duration: 7d **Source:** In-House Culture ✓ **Age:**

Sample ID: 06-4911-5817 ✓ **Code:** JAN18FMC ✓ **Client:** Internal Lab
Sample Date: 03 Jan-18 ✓ **Material:** Potassium chloride **Project:** Standard Reference Toxicant Test
Receipt Date: 03 Jan-18 ✓ **Source:** Reference Toxicant
Sample Age: 13h **Station:**

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
✓Linear	Linear	525109	200	Yes	Two-Point Interpolation

Point Estimates 0.58 CWJ 1/11/18

Level	gm/L	95% LCL	95% UCL
IC25	0.5842	0.4778	0.6523

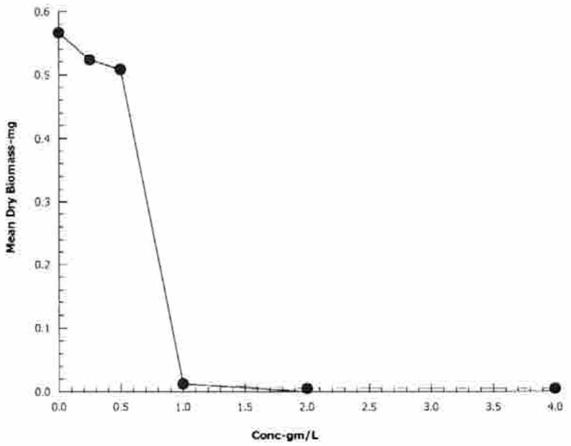
Mean Dry Biomass-mg Summary **Calculated Variate**

Conc-gm/L	Code	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.5662	0.523	0.613	0.02368	0.04735	8.36%	0.0%
0.25		4	0.5233	0.486	0.572	0.02028	0.04056	7.75%	7.59%
0.5		4	0.5083	0.445	0.619	0.03907	0.07815	15.38%	10.24%
1		4	0.01225	0	0.04901	0.01225	0.0245	200.00%	97.84%
2		4	0	0	0	0	0		100.0%
4		4	0	0	0	0	0		100.0%

Mean Dry Biomass-mg Detail

Conc-gm/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.523	0.601	0.528	0.613 ✓
0.25		0.494	0.572	0.486	0.541 ✓
0.5		0.445	0.506	0.463	0.619 ✓
1		0	0	0	0.04901 ✓
2		0	0	0	0
4		0	0	0	0

Graphics



Analyst: CWJ QA: 1/11/18

Hydrosphere research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1000.0)

SRT: Water Quality I

SRT for the Month of (circle one):
[✓ Jan] Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Species: *Pimephales promelas*
ID #: 8774

Initiation Date: 01-03-2018W
Termination Date: 1/10/18 W
Toxicant (desiccated): KCl
Stock Solution (Concentration): 100-gm KCl / L
Test Concentration (Units): gm KCl / L

pH

(acceptable range for a valid test is 6 to 9)

mLs of Stock / Liter	g/L	new 0	old 1	new 1	old 2	new 2	old 3	new 3	old 4	new 4	old 5	new 5	old 6	new 6	old 7
Control	0	7.9	7.8	7.7	7.8	7.7	7.7	7.9	7.7	7.8	7.6	7.7	7.9	7.9	7.6
2.5-mls	0.25	8.0	7.9	7.8	7.9	7.8	7.8	7.9	7.8	7.9	7.6	7.8	7.9	8.0	7.7
5-mls	0.5	8.0	7.9	7.9	8.0	7.9	7.8	8.0	7.8	8.0	7.7	7.9	7.9	8.0	7.8
10-mls	1	8.0	8.0	7.9	8.0	8.0	7.9	8.0	7.9	8.0	7.8	② 8.0	7.9	8.0	7.9
20-mls	2	8.1	8.0				AM 1-4-18								
40-mls	4	8.1	8.0				Am 1-4-18								
Meter ID:		17	17	16	17	18	17	17	18	18	16	16	17	17	16

Dissolved Oxygen (mg/L)

(acceptable minimum for a valid test is 4.0-mg/L)

mLs of Stock / Liter	g/L	new 0	old 1	new 1	old 2	new 2	old 3	new 3	old 4	new 4	old 5	new 5	old 6	new 6	old 7
Control	0	8.4	7.4	8.7	7.6	8.4	6.9	7.9	7.1	8.3	7.0	8.2	6.9	8.2	6.8
2.5-mls	0.25	8.5	7.5	8.7	7.8	8.4	7.1	8.3	7.2	8.4	7.1	8.4	7.1	8.3	6.9
5-mls	0.5	8.6	7.6	8.6	7.8	8.5	7.1	8.5	7.2	8.4	7.1	8.5	7.2	8.3	7.0
10-mls	1	8.6	7.7	8.7	7.9	8.5	7.5	8.5	7.2	8.5	7.2	8.6	7.3	8.3	7.3
20-mls	2	8.7	7.7					AM 1-4-18							
40-mls	4	8.7	7.7					AM 1-4-18							
Meter ID:		10	10	7	10	13	10	10	13	13	7	7	10	10	7

Day:	0	1		2		3		4		5		6		7
Stock Solution ID (SLN):	17356	17450		17450		17450		17450		17450		17450		
Dilution ID:	4338	~~17450~~ ①		4338		4338		4338		4338		4338		
Initials:	KO	KO	AM	KO	w	KO	KO	w	w	AM	AM	KO	KO	AM
Time:	1039	1143	1045	1138	1125	1155	1101	1300	1105	1409	1120	1101	951	1245

Notes & Comments

① 4338 correction AM 1-4-18 ② 8.0 AM 1-8-18

Hydrosphere research

Chronic Freshwater Method (EPA-821-R-02-013, Method 1000.0)

SRT: Water Quality II

SRT for the Month of (circle one):
[✓ Jan] Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Species: *Pimephales promelas*
ID #: 8774

Initiation Date: 01 03 2018 W
Termination Date: 1/10/18 W

Toxicant (desiccated): KCl
Stock Solution (Concentration): 100-gm KCl / L
Test Concentration (Units): gm KCl / L

Conductivity (µmho/cm)

(a Conductivity of 2,150-µmho/cm = a Salinity of 1‰ @ 25°C)

Measured in each new sample and control

mLs of Stock / Liter	g/L	0	1	2	3	4	5	6	7
Control	0	268	273	278	273	275	279	276	
2.5-mls	0.25	667	687	680	678	676	AM 1-8-18 ~~324~~ 702	679	
5-mls	0.5	1054	1098	1080	1079	1086	AM 1-8-18 ~~310~~ 1083	1086	
10-mls	1	1839	1915	1852	1860	1907	1889	1867	
20-mls	2	3550			AM 1-4-18				
40-mls	4	6570			AM 1-4-18				
Meter ID:		18	17	15	18	15	17	18	

Temperature (°C)

(acceptable range for a valid test is 25±1°C)

Measured at the end of each 24-h exposure period

mLs of Stock / Liter	0	1	2	3	4	5	6	7
Control		24.2	24.2	24.3	24.1	24.3	25.6	25.7
2.5-mls		24.2	24.2	24.3	24.1	24.3	25.6	25.7
5-mls		24.2	24.2	24.3	24.1	24.3	25.6	25.7
10-mls		24.2	24.2	24.3	24.1	24.3	25.6	25.7
20-mls		24.2			KO 1/4			Am 1-10-18 ~~25.7~~
40-mls		24.2						
Meter ID:		57	57	57	57	57	57	57

Day:	0	1	2	3	4	5	6	7
Stock Solution ID (SLN):	17356	17450	17450	17450	17450	17450	17450	
Dilution ID:	4338	4338	4338	4338	4338	4338	4338	
Initials:	KO	AM	W	KO	W	AM	KO	
Time:	10:41	10:45	11:25	11:02	11:05	11:20	9:53	:

Notes & Comments

Georgia EPD Online System
Submittal Receipt Documentation

Vogtle Electric Generating Plant
Units 3 and 4
NPDES No. GA 0039420

From: GovOnline@govonlinesaas.com
To: Fulton, Dale Lane; DeLano, Jim
Subject: Georgia EPD Online Application Received
Date: Tuesday, March 31, 2020 8:47:08 AM

EXTERNAL MAIL: Caution Opening Links or Files

Dear Applicant:

Thank you for your submission of Industrial NPDES Permit for New or Existing Discharges - 2C. You will be notified when your application is assigned to a permit reviewer. You may track the status of your submission review in GEOS.

Application ID: 466772
Application Name: Individual Industrial NPDES Permit for New or Existing Discharges
Submitted Date: 3/31/2020 9:45:11 AM
Thank you for using Georgia EPD GEOS System! Regards,

Georgia EPD

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

Georgia Department of Natural Resources
Online Permitting & Reporting

CONFIRMATION OF SUBMITTAL

1. Your application has been received and will be reviewed shortly.
2. Check your account, email and text message for system notification at various milestones.

Thank you for using the GEOS system.

Please click Here to print your receipt.

Print

Submittal Summary

Submittal ID:	**466772**	Submittal Name:	**Individual Industrial NPDES Permit for New or Existing Discharges**
Submitted Date:	**3/31/2020 9:45:11 AM**	Submitted by:	**Dale Fulton** **3535 Colonnade Parkway** **Birmingham AL 35243** **205-992-7536** **dlfulton@southernco.com**
Status:	**Admin Review Start**	Submission Method:	**On-line submission**
Facility / Property Name:	**SOUTHERN NUCLEAR OPERATING CO., INC. (PLANT VOGTLE UNITS 3 & 4)**		

Submittal Form List

- Form 2C_NPDES Exisiting Industrial
- Part I Application Consolidation
- Individual NPDES Permits for new or existing discharges

Attachment List

Topographic map (Required) -- Online

- NPDES_Permit_GA0039420_Renewal_App_Topo.pdf

(2) Source water physical data (Required) -- Online

- NPDES_Permit_GA0039420_Renewal_App_ Attach(2)_Cooling_Water_Intrake_Structure_Data.pdf
- NPDES_Permit_GA0039420_Renewal_App_316(b) Supporting Information.pdf

(3) Cooling water intake structure data (Required) -- Online

- NPDES_Permit_GA0039420_Renewal_App_ Attach(3)_Cooling_Water_Intrake_Structure_Data.pdf

(4) If applicable, Source water baseline biological characterization data (Required) -- Online

- NPDES_Permit_GA0039420_Renewal_App_Attach_(4)_SourceWaterBaselineBiologicalCharacterization.pdf

(5) Cooling water system data (Required) -- Online

- NPDES_Permit_GA0039420_Renewal_App_Attach_(5)_Cooling_Water_System_Data.pdf

(6) Chosen Method(s) of Compliance with Impingement Mortality Standard (Required) -- Online

- NPDES_Permit_GA0039420_Renewal_App_Attach_(6)_Method_of_Compliance_with_Impingement_Mortality_Standard.pdf

(7) Entrainment Performance Studies (Required) -- Online

- NPDES_Permit_GA0039420_Renewal_App_Attach_(7)_Entrainment_Performance_Studies.pdf

(8) Operational Status (Required) -- Online

- NPDES_Permit_GA0039420_Renewal_App_Attach_(8)_Operational_Status.pdf

All information received as a result of any communication with a Field Office of the Fish and Wildlife Service and/or Regional Office of the National Marine Fisheries Service (Required) -- Online

- NPDES_Permit_GA0039420_Renewal_App_Attach_Federal_Agency_Communication.pdf

Attach a line drawing showing the water flow through the facility. (Required) -- Online

- NPDES_Permit_GA0039420_Renewal_App_Flow Diagram.pdf

Anti-degradation report (Optional) -- Online

- NPDES_Permit_GA0039420_Antidegradation_Analysis_inital_app_submittal.pdf

Other Attachment(s) (Optional) -- Online

Print

- NPDES_Permit_GA0039420_Renewal_App_Summary_Letter_Attachment.pdf

Laboratory Results (Optional) -- Online

- NPDES_Permit_GA0039420_WET_Hydrosphere Final Report - Feb 2018.pdf
- NPDES_Permit_GA0039420_Renewal_App_Industrial SW Benchmark Results.pdf

Certification Receipt

Certification Statement:	**I hereby certify that I am the owner, or authorized agent of the owner, of the described property. Further, I consent to the work to be done as described.**
Certification Question:	**what is the name of the hospital where you were born?**
Certification Question Answer:	*******
PIN Number:	************************
Responsible Officer:	**Dale Fulton**
Sender IP Address:	**146.126.61.241**

(Last modified Time: 2019-06-27 10:19 AM PID: 12PRDWEB121)