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Prepared for:

Southern Nuclear Operating Company
Nuclear Development
40 Inverness Center Parkway
Birmingham, AL 35242

INTERIM REPORT OF FISH IMPINGEMENT AT THE PLANT VOGTLE ELECTRIC GENERATING PLANT

WAYNESBORO, GEORGIA

Prepared by:

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A SOUTHERN COMPANY

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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 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 a separate report (GPC 2008). Study component no. 3, the impingement study, was designed as a 12-month study encompassing twice per month sampling. Impingement data reported herein are considered to be preliminary until a final study report submittal to Southern Nuclear following conclusion of the impingement sampling program (currently scheduled at end of February 2009. However, sufficient data has been gathered at this point to support certain conclusions as detailed in this interim report.

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 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 a ten-month 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 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. 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 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. 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]) each 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 twice per month, approximately once every two weeks during 10 March to present. Impingement sampling will continue at the same frequency through February 2009 to yield a year's worth of baseline impingement data.

Samples were collected with a PVC-frame mounted fabric insert net (6 ft x 6 ft x 6 ft mesh bag) that intercepts 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 represents 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. Owing to maintenance issues, all four screens were operational during 13 of the 20 sampling 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. 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 discharge chute in order to capture any screen wash water that discharges during a given 12-hr 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) which, except on a very few instances, was the case 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 equaled 63.36 MGD during the study period.

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 organism sample, any fish and shellfish were separated from organic debris such as aquatic weed fragments, leaves, twigs, relict and sometime live shells of Asian clam (*Corbicula fulminea*), etc. Sample organisms were then sorted by species and enumerated and reported in field data sheets for each collection period. Twenty (20) of the 24 scheduled impingement samples have been collected and processed to date 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 was developed based on actual daily make-up water pumping rates.

Impingement rate for each species was extrapolated using the following equation:

$$\sum E_i = R_i \times D_i \text{ where:}$$

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 ten 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 ten-month 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

As of 22 December, 2008, a total of 21 taxa representing 10 taxonomic families have been collected from the Plant Vogtle intake structure traveling screens (Table 4-1). The impingement sample to date includes 19 fish taxa and two crustaceans. This stage of the study represents 83 percent (20 of 24 sampling events) of the scheduled study period currently in progress. Impinged fish species represent eight taxonomic fish families. The Centrarchidae (sunfishes) is the most speciose family represented in the impingement data with seven species. Fourteen of the 21 species collected were represented by five or fewer individual specimens in the sample (Table C-1, Appendix C). One other species, spottail shiner (*Notropis hudsonius*), was observed in the screen wash basket prior to initiation of the 19th sampling event on 3 December 2008. Because it was not known exactly when the fish was captured nor what time of day or its condition when captured, it was not included among the ten-month estimate of impinged fishes.

The potential for State of 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 have been collected in the impingement study.

4.2 Relative Abundance and Biomass

A total of 157 organisms were collected from the impingement sample from March through December 2008 (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 found during 13 of the 40 12-hour sampling events. The most numerically dominant individual species include spotted sunfish (*Lepomis punctatus*) with 61 individuals (or 38.9 percent of the sample), hogchoker (*Trinectes maculatus*) (10.8 percent), white catfish (*Ameiurus catus*) (8.9 percent), and bluegill *(L. macrochirus*) (7.6 percent). The two crustaceans observed in impingement

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.

samples include two specimens of the common shore shrimp (*Paleomonetes pugio*) and nine specimens of brushnose crayfish (*Procambarus pubescens*).

Total impinged biomass was 865.2 grams (g) (1.9 pounds (lbs)). Sample biomass was dominated by the Centrarchidae (sunfish family) accounting for 47.5 percent of the impingement sample biomass. The single largest biomass contribution comes from two black crappies (*Pomoxis nigromaculatus*) which included a single large specimen that was severely bodily damaged and missing tissue (implying morbidity prior to impingement) that accounted for 32.5 percent of the entire impingement sample biomass. The one gizzard shad (*Dorosoma cepedianum*), a member of the herring family, represented the second single largest biomass contribution representing 19.0 percent (164.0 g) of the sample (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 average length of all impinged organisms combined was 51.7 mm TL. 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 mid-March , July, and December (Table C-2, Appendix C). No organisms were impinged during 13 (33 percent) of the 40 individual sampling events.

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 (37) of impinged organisms were collected during nighttime periods (Table C-2; Appendix C). 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 Impingement Rate

As shown in Table C-4, Appendix C, 157 organisms were impinged during the study period to date. Per the calculated mean half-monthly impingement rate, the resultant estimated ten-month impingement rate is 2,421 fish. When considering the 95-percent upper confidence limit (UCL) (accounting for natural variation and standard deviation), the upper estimated ten-month impingement rate is 3,882 organisms. Spotted sunfish represent the most dominant component comprising up to 38.9 percent of estimated impingement. Hogchoker represents the second most dominant component at 10.8 percent.

Table C-5, Appendix C similarly summarizes actual vs. calculated ten-month biomass impingement. Actual biomass of impinged organisms during the study to date was 865.2 g (1.9 lbs). The estimated ten-month biomass impingement is 13,096 g (30.1 lbs). At the 95-percent upper confidence limit (UCL), the estimated ten-month rate of biomass impingement is 19,563 g (~44.9 lbs). Five species including black crappie, hogchoker, gizzard shad, spotted sunfish and threadfin shad account for 82.1 percent of impinged biomass. A single large specimen each of black crappie and gizzard shad accounts for 51.6 percent of the impingement biomass. The principal investigator noted that both of those specimens were in states of relatively advanced decay indicating they most likely deceased 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, it is assumed that the biomass estimate is skewed higher by as much as 48 percent and therefore overly conservative based on the accounting of all specimens in the sample (95 % UCL of 10,172 g [~22.4 lbs] vs. 19,563 g [~44.9 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 for 312 days of pumping during the ten month study period 63.0 mgd (or 238.48 m^3).

Due to maintenance needs, all four traveling screens were operational during 13 of the 20 impingement sampling events. Three screens were in service on six of the 20 events and two screens were in service during one event (25 March 2008).

5.2 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 12.5 to 29.1°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 daily minimum air temperature ranged from 8.8 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 flow of 4,646 cfs (or 11,467,311.5 m3). 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 air temperature, water temperature, precipitation, or river stage.

6. SUMMARY AND DISCUSSION

Ten months of the year-long impingement study of Plant Vogtle's make-up water intake structure was conducted by GPC environmental field services staff during March through December of 2008.

Although 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 result possibly indicates increased vulnerability of fishes to impingement during periods of increased mobility along shoreline habitats.

A total of 157 aquatic organisms were impinged during ten months of impingement sampling. The sample was comprised of 21 taxa including 19 fish taxa and two decapod crustaceans. Sunfishes were the most abundant group impinged. No organisms were impinged in 13 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 stage were impinged at Plant Vogtle. Spotted sunfish and hogchoker were the most abundant individual species impinged.

Impinged organisms weighed a total of 865.2 g (1.9 lbs) and were dominated by the sunfishes (47.5 percent of the total biomass). A single large specimen of black crappie and gizzard shad accounted for the majority of impingement biomass. The principal investigator noted that both specimens were in states of relatively advanced decay indicating they most likely deceased before becoming impinged unlike the vast majority of other specimens collected during the study.

The 2008 study at Plant Vogtle's intake to date indicates that the rate of fish impingement is very low. The calculated impingement rate is 2,421 organisms (3,882 at the 95% UCL) weighing approximately 30.1 lbs (44.9 lbs at the 95% percent UCL). As for comparison and contrast with the nearby Savannah River Site (prior to shutdown of reactors L, K, and P), river water intake pump screens at SRS impinged an average of 7,603 fish each year in the mid-1980's (*in* Kilgo, et al. 2005). Overall, the in-progress 2008 impingement study to date indicates that impingement effect at the Plant Vogtle make-up water intake structure is minimal resulting in an insignificant effect on the fish population of the Savannah River.

The result of this study in turn implies that when combined with a second similar intake structure associated with addition and operation of Vogtle's new Units 3&4, potentially doubling the rate of impingement, the anticipated level of impact to the Savannah River's fishery resource would be minimal (at the 95% Upper Confidence Limit, 7,492 fish and 272 crustaceans weighing approximately 89.8 lbs). Based on this study to date, it is anticipated that inclusion of the final study data (Jan. – Feb.) will not show significant differences in the actual impingement rate, and impacts will remain low owing to the low impingement rate.

7. REFERENCES

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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	

Water Temperature (°C)	
Start	
Finish	

Physicochemical parameters:

D.O.		mg/L
pH		SU
Cond.		uS/cm
Turbidity		NTU

Location of Measurement: _____

Field Conditions/Other Observations

Entered by:
Date: / /

FIGURE A-2. PLANT VOGTLE IMPINGEMENT MONITORING DATA FORM

Sample Information

Collector(s): _____ **Page:___ of___**

DAY NIGHT

12-hour Period (circle)

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:_____

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 DECEMBER 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
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*	61.4
late December 2008*	61.4

Notes:

1 = MGD - million gallons per day

* = December 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 COLLECTED AT PLANT VOGTLE, MARCH 2008 - DECEMBER 2008

	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	--	--	--	--

Figure B-1
Air Temperature Recorded at the Midville, GA, Burke County, Weather Station

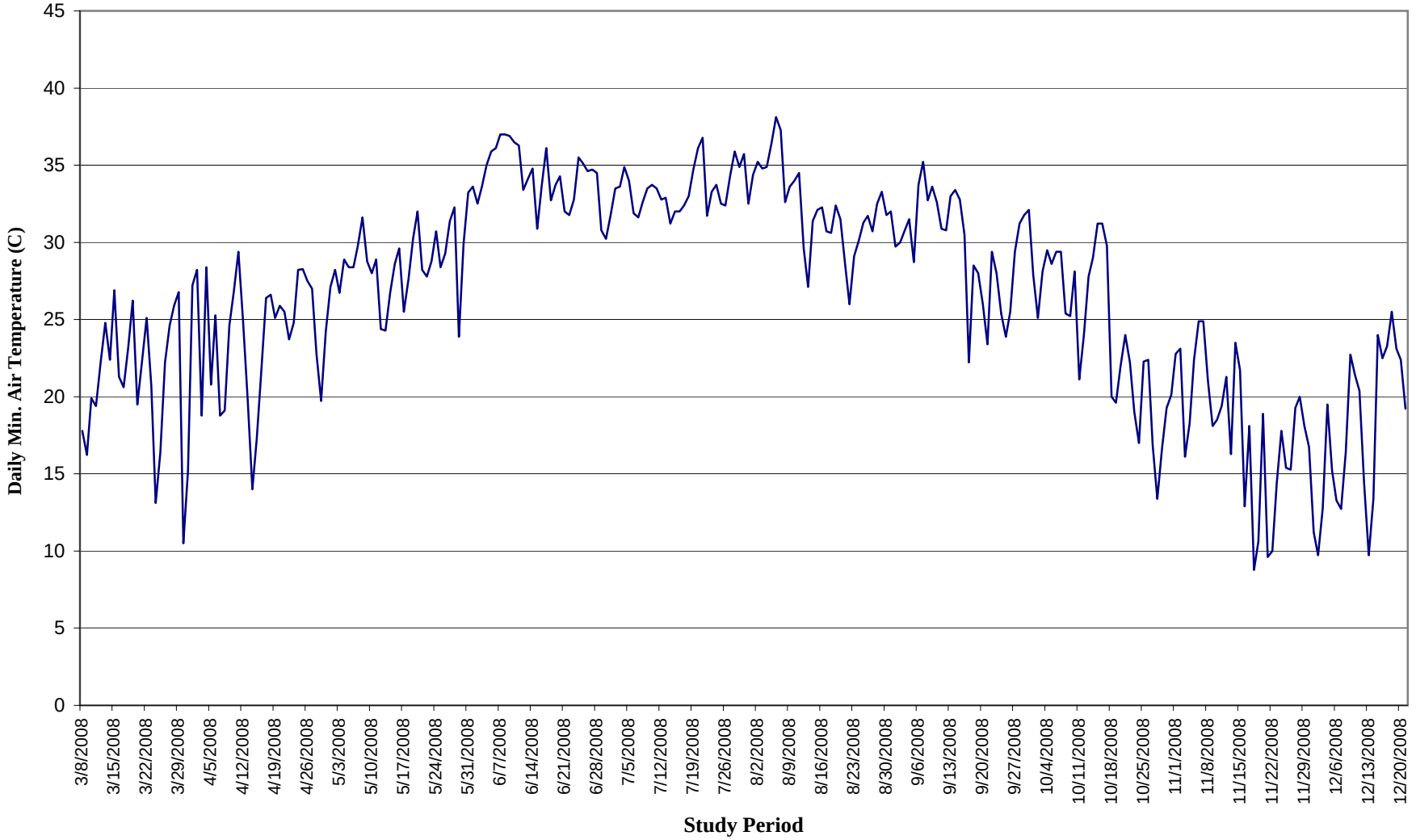
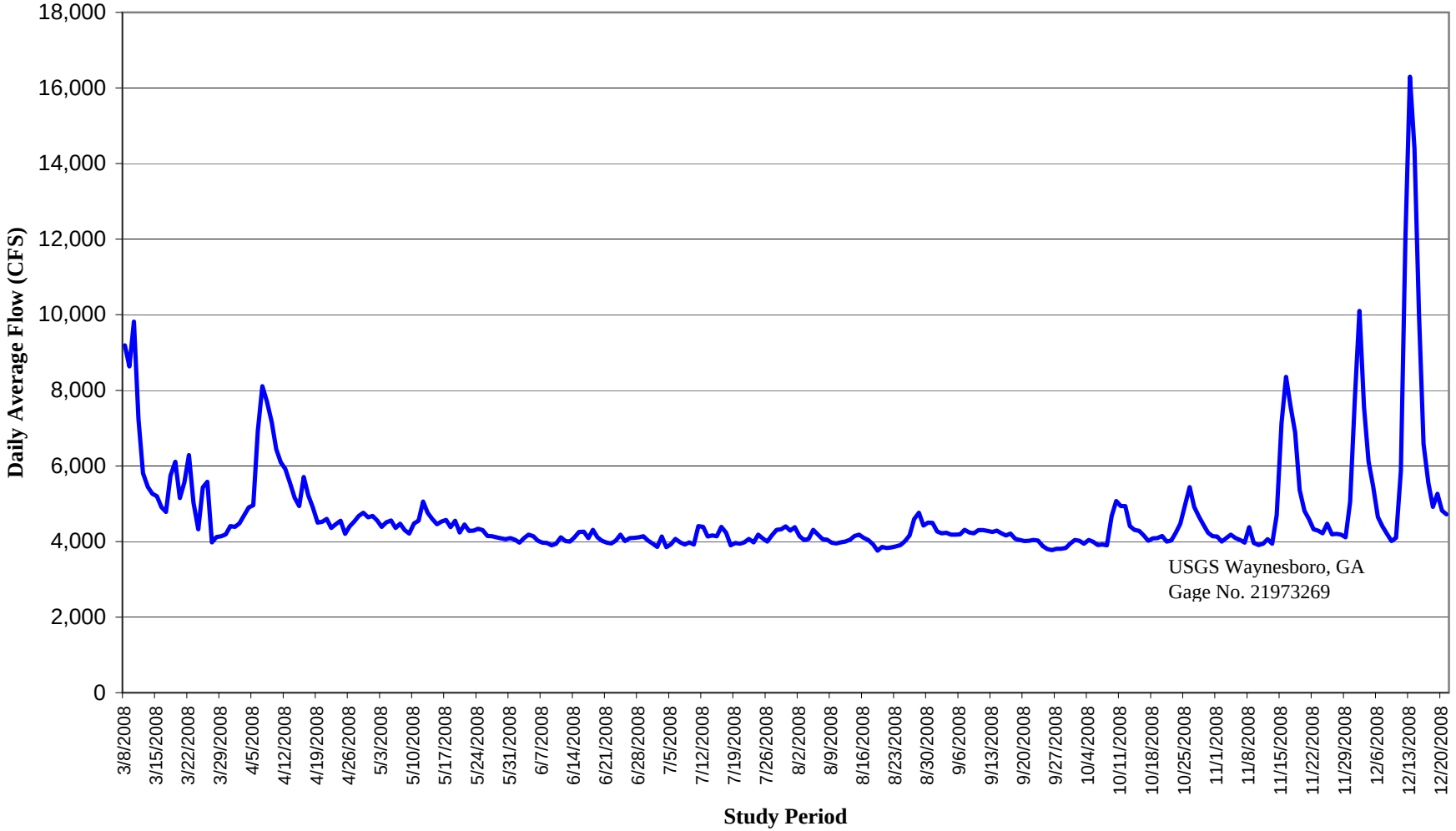
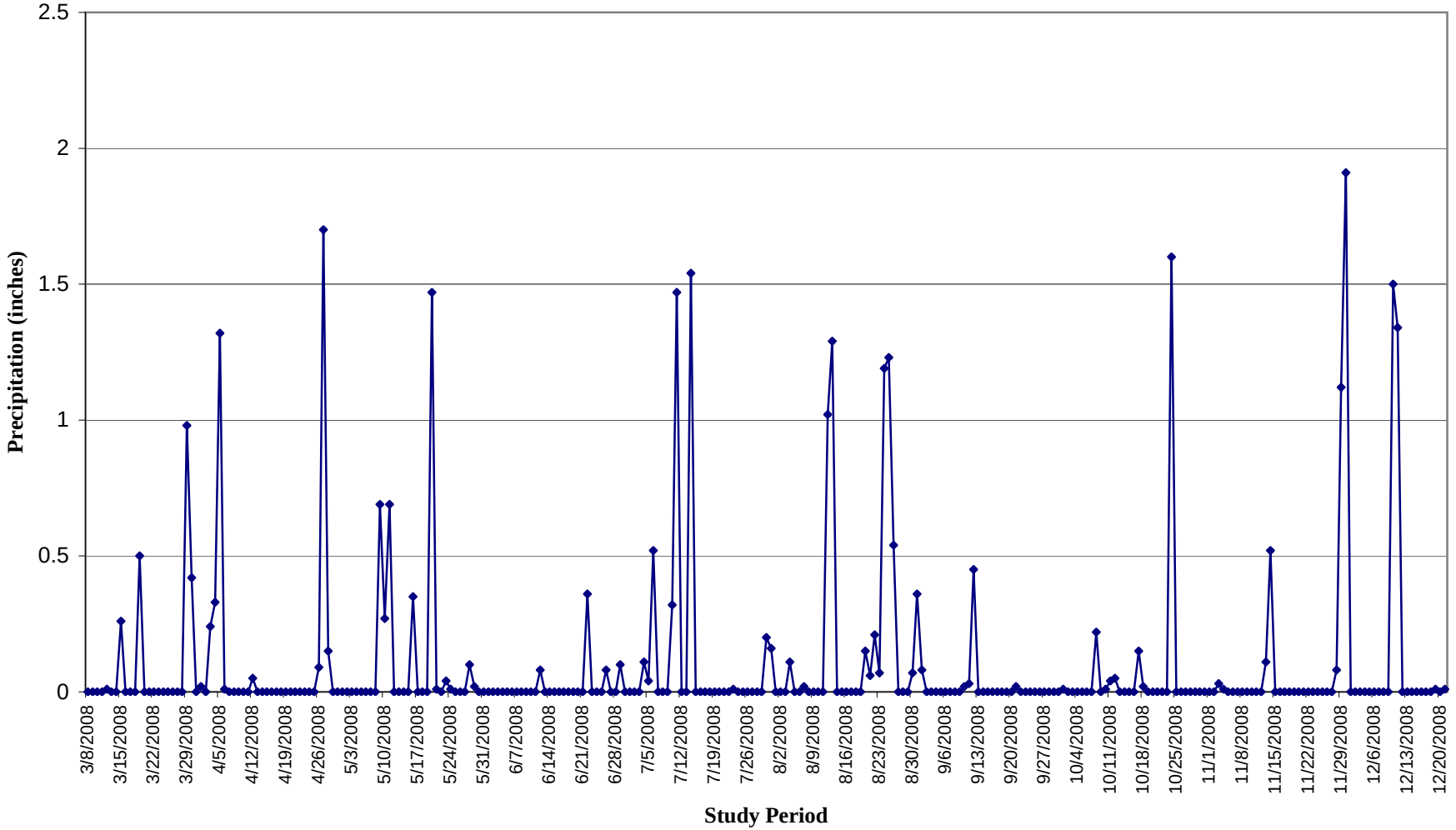


Figure B-2
Savannah River Daily Average
Flow (cfs)



LAB7600

Figure B-3
Daily Precipitation, Midville,
Burke County,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 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.

Stan Varnum 7-10-08 6108 SW

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 7/5/08 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 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	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 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	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.

Signature 12/4/08 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

Impingement Sampling Results

TABLE C-1. SUMMARY BY SAMPLE DATE OF ORGANISMS IMPINGED AT PLANT VOGTLE, MARCH 2008 - DECEMBER 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	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	**Number**	*% of Total*
bannerfin shiner																																				1					**1**	*0.6%*
black crappie						1																																	1		**2**	*1.3%*
blackbanded darter		1																					1															1		**3**	*1.9%*
bluegill		2			1	2																															3	4	**12**	*7.6%*
bluespotted sunfish									1																									1						**2**	*1.3%*
chain pickerel					1																																			**1**	*0.6%*
brushnose crayfish																	2	1						2											3			1	**9**	*5.7%*
dollar sunfish					1																																			**1**	*0.6%*
flat bullhead																					1																			**1**	*0.6%*
gizzard shad											1																													**1**	*0.6%*
hogchoker		1				1					1		1			1											1						1	3	4			2	1	**17**	*10.8%*
pirate perch									1					1					1	1															1		1		**6**	*3.8%*
redbreast sunfish																																	1				10		**11**	*7.0%*
shore shrimp					1									1																									**2**	*1.3%*
snail bullhead														1			1		2	1																			**5**	*3.2%*
speckled madtom																																			1			1	**2**	*1.3%*
spotted sunfish	1	3												1		1		3	4	1	1	1	1										1		8	1	15	19	**61**	*38.9%*
taillight shiner	1																																						**1**	*0.6%*
threadfin shad	1	1																																					**2**	*1.3%*
warmouth						1														1																		1	**3**	*1.9%*
white catfish	1													1		4	1		4			1							1								1		**14**	*8.9%*
TOTALS	**4**	**8**	**0**	**0**	**4**	**5**	**0**	**0**	**0**	**2**	**0**	**2**	**0**	**1**	**5**	**0**	**6**	**2**	**5**	**11**	**3**	**3**	**3**	**1**	**1**	**2**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**1**	**6**	**4**	**13**	**2**	**33**	**28**	**157**	*100.0%*
Day TOTALS	**4**		**0**		**4**		**0**		**0**		**0**		**0**		**5**		**6**		**5**			**3**		**1**		**2**		**0**		**0**		**0**		**1**		**4**		**2**		**28**	**65**	***43.1%***
Night TOTALS		**8**		**0**		**5**		**0**		**2**		**2**		**1**		**0**		**2**		**11**	**3**		**3**		**1**		**0**		**1**		**0**		**0**		**6**		**13**		**33**		**92**	***56.9%***

TABLE C-2. SUMMARY OF IMPINGMED BIOMASS BY SPECIES AND SAMPLE DATE, PLANT VOGTLE, MARCH 2008 - DECEMBER 2008

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	**Number**	*% of Total*
bannerfin shiner																																					1.3			**1.3**	*0.2%*
black crappie						281.0																																		2.2	**283.2**	*32.7%*
blackbanded darter		2.0																						1.4														3.8		**7.2**	*0.8%*
bluegill		1.0			0.4	1.2																																3.6	3.2	**9.4**	*1.1%*
bluespotted sunfish										0.4																								1.0						**1.4**	*0.2%*
chain pickerel					1.2																																			**1.2**	*0.1%*
brushnose crayfish																		4.2	1.1						3.5										18.1			0.4	**27.3**	*3.2%*
dollar sunfish					10.5																																			**10.5**	*1.2%*
flat bullhead																							0.7																	**0.7**	*0.1%*
gizzard shad											164.0																													**164.0**	*19.0%*
hogchoker		8.0				17.8					0.6		9.0			2.8												0.5					27.0	31.0	56.5			8.4	10.1	**171.7**	*19.8%*
pirate perch										0.5				0.5						1.4	1.4														5.1		3.0		**11.9**	*1.4%*
redbreast sunfish																																	1.3				24.8		**26.1**	*3.0%*
shore shrimp					0.3									0.4																									**0.7**	*0.1%*
snail bullhead														1.2			2.6		7.8	2.8																			**14.4**	*1.7%*
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	**62.1**	*7.2%*
taillight shiner	0.5																																						**0.5**	*0.1%*
threadfin shad	18.0	11.0																																					**29.0**	*3.4%*
warmouth						1.1															7.8																	9.4	**18.3**	*2.1%*
white catfish	0.5													0.5		4.1	1.5		5.2				4.9							3.0							3.7		**23.4**	*2.7%*
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**	**865.2**	*100.0%*

Day TOTALS	**19.5**		**0.0**		**12.4**		**0.0**		**0.0**		**0.0**		**0.0**		**3.2**		**7.5**		**5.3**			**10.1**		**6.6**		**3.5**		**0.0**		**0.0**		**0.0**		**27.0**		**56.5**		**2.3**		**42.5**	**196.4**	***43.1%***
Night TOTALS		**23.5**		**0.0**		**301.1**		**0.0**		**0.9**		**164.6**		**9.0**		**0.0**		**4.1**		**16.5**	**4.3**		**0.1**		**1.4**		**0.0**		**0.5**		**3.0**		**0.0**		**34.3**		**34.2**		**71.3**		**668.8**	***56.9%***

TABLE C-3. LENGTH CHARACTERISTICS OF ORGANISMS IMPINGED AT THE PLANT VOGTLE INTAKE, MARCH 2008 - DECEMBER 2008

Species	Number (N)	Total Length (mm)		
		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	**9**	33	54.8	78
dollar sunfish	**1**	82	82	82
flat bullhead	**1**	46	46	46
gizzard shad	**1**	303	303	303
hogchoker	**17**	32	71.9	106
pirate perch	**6**	28	49.8	68
redbreast sunfish	**11**	31	48.9	82
shore shrimp	**2**	39	39.5	40
snail bullhead	**5**	50	60.4	76
speckled madtom	**2**	27	33	39
spotted sunfish	**61**	17	38.1	63
taillight shiner	**1**	38	38	38
threadfin shad	**2**	114	120.5	127
warmouth	**3**	43	69	87
white catfish	**14**	28	51.9	78

TABLE C-4. TEN-MONTH IMPINGEMENT AT PLANT VOGTLE BASED ON DATA COLLECTED DURING MARCH 2008 - DECEMBER 2008

Common Name	Ten-Month Impingement		Actual Number of Organisms Impinged During the Ten-Month Study Period	Relative Abundance of Impinged Organisms
	Cumulative Estimate of Daily Operation	Upper Confidence Limit (1)		
bannerfin shiner	15	25	1	0.6%
black crappie	31	49	2	1.3%
blackbanded darter	46	74	3	1.9%
bluegill	185	297	12	7.6%
bluespotted sunfish	31	49	2	1.3%
chain pickerel	15	25	1	0.6%
brushnose crayfish	139	223	9	5.7%
dollar sunfish	15	25	1	0.6%
flat bullhead	15	25	1	0.6%
gizzard shad	15	25	1	0.6%
hogchoker	262	420	17	10.8%
pirate perch	93	148	6	3.8%
redbreast sunfish	170	272	11	7.0%
shore shrimp	31	49	2	1.3%
snail bullhead	77	124	5	3.2%
speckled madtom	31	49	2	1.3%
spotted sunfish	941	1,508	61	38.9%
taillight shiner	15	25	1	0.6%
threadfin shad	31	49	2	1.3%
warmouth	46	74	3	1.9%
white catfish	216	345	14	8.9%
TOTAL	**2,421**	**3,882**	**157**	

Notes:

1 = 95% UCL calculated based on bi-monthly mean impingment rate.

Confidence limit for each species is estimated using relative abundance percentages applied to the actual 95% UCL.

TABLE C-5. TEN-MONTH IMPINGEMENT BIOMASS (grams) AT PLANT VOGTLE BASED ON DATA COLLECTED DURING MARCH 2008 - DECEMBER 2008

Common Name	Annual Biomass (g) Impingement		Actual Impinged Biomass (g)	Relative Abundance of Impinged Biomass
	Cumulative Estimate	Upper Confidence Limit (1)		
bannerfin shiner	20	29	1	*0.2%*
black crappie	4,287	6,403	283	*32.7%*
blackbanded darter	109	163	7	*0.8%*
bluegill	142	213	9	*1.1%*
bluespotted sunfish	21	32	1	*0.2%*
chain pickerel	18	27	1	*0.1%*
brushnose crayfish	413	617	27	*3.2%*
dollar sunfish	159	237	11	*1.2%*
flat bullhead	11	16	1	*0.1%*
gizzard shad	2,482	3,708	164	*19.0%*
hogchoker	2,599	3,882	172	*19.8%*
pirate perch	180	269	12	*1.4%*
redbreast sunfish	395	590	26	*3.0%*
shore shrimp	11	16	1	*0.1%*
snail bullhead	218	326	14	*1.7%*
speckled madtom	15	23	1	*0.1%*
spotted sunfish	939	1,403	62	*7.2%*
taillight shiner	8	11	1	*0.1%*
threadfin shad	439	656	29	*3.4%*
warmouth	277	414	18	*2.1%*
white catfish	353	528	23	*2.7%*
TOTAL (g)	**13,096**	**19,563**	**865.2**	
Total in pounds (lbs.)	30.1	44.9		

Notes:
1 = 95% UCL calculated based on bi-monthly mean impingment rate.
Confidence limit for each species is estimated using relative abundance percentages applied to the actual 95% UCL.