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SCE&G®
A SCANA COMPANY

November 20, 2009

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

Subject: South Carolina Electric & Gas Company
Saluda Hydroelectric Project
FERC Project No. 516-459
Response to Clarification of Additional Information Request Letter Dated October 21, 2009

Dear Secretary Bose:

South Carolina Electric & Gas Company ("SCE&G" or "Company"), Licensee of the Saluda Hydroelectric Project (FERC Project No. 516-459), hereby files an electronic copy of our responses to Mr. Mark Pawlowski's letter dated October 21, 2009 requesting clarification to the Company's responses provided on February 24, 2009 to the Commission's original Additional Information Request (AIR) issued on November 24, 2008 and responses provided by the Company on July 30, 2009 to the Commission's additional information letter dated June 11, 2009 in support of our Final License Application.

If you have any questions about this filing, please contact Mr. William Argentieri at (803) 217-9162 or by email at bargentieri@scana.com.

Very truly yours,

James M. Landreth

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Response to Mr. Mark Pawlowski's letter dated October 21, 2009 requesting clarification of responses to the Commission's follow-up letter concerning the Additional Information Request issued on November 24, 2008

RESPONSE TO THE OCTOBER 21, 2009
CLARIFICATION OF RESPONSES TO ADDITIONAL INFORMATION REQUEST
ISSUED ON NOVEMBER 24, 2008

SALUDA HYDROELECTRIC PROJECT
FERC PROJECT No. 516

1. **Floodplain Riparian Vegetation Along the Congaree National Park**.

FERC Request – In our AIR we had indicated that we would need information about the project to assess the environmental effects and costs of any proposed measures to protect or enhance floodplain vegetation along the Lower Saluda River. Your response was that you were awaiting the results of the settlement pending at that time and for recommendations from the National Park Service that were expected by September 2008. You now have a settlement for the project and the National Park Service has filed its recommendations for the project. The conditions in the settlement now become your proposed measures for the project. In Appendices A-11 (Saluda Hydroelectric Flow Release Program) and A-13 (Saluda Hydroelectric Project Maintenance, Emergency, and Low Inflow Protocol) of the settlement, you describe the agreed-upon flow releases into the Lower Saluda River for the project. However, you have not described the analysis of the effects of these changes, if any, on vegetation along the Lower Saluda River and within the Congaree National Park. For us to be able to assess the potential project effects on floodplain riparian vegetation in the Lower Saluda River and in the Congaree National Park, you need to describe the effects of these proposed flows on the riparian vegetation at these sites. Please also describe any costs associated with your proposed enhancement measures related to riparian vegetation resulting from your new proposed flows.

SCE&G Response: See Appendix A to this response titled "Floodplain Riparian Vegetation Along the Lower Saluda River and in the Congaree National Park and Potential Effects of Proposed Minimum and Enhancement Flows from the Saluda Hydroelectric Project."

2. **Recreation Plan**

FERC Request – You have adequately responded to 8 of the 10 items we requested as part of the recreation plan described in our November 24, 2008, AIR. However, your responses are incomplete for sub-item 6 (recreation facilities that are inside and/or outside of the project boundary) and for sub-item (9) (location of commercial and private recreation sites).

In our AIR number 18, sub-item 6, we requested information regarding a description of whether the existing and proposed facilities are within or outside of the project boundary, including a map denoting the location of all the proposed measures along with the existing project boundary. However, while the Recreation Plan in section 3.1, page 3-1, provides a general discussion of the recreation sites within the project boundary, there is no specific description for each of the recreation sites relative to whether they are located either entirely or partially within or outside of the project boundary. Also, the Recreation Plan provides figures of the recreation sites; however the project boundary is not denoted on all of the figures probably because of the scale.

Therefore, please provide a description of whether the recreation sites are entirely or partially within or outside of the existing project boundary for each of the existing recreation sites, for the proposed additions to these sites, and for the proposed future recreation sites. If portions of any recreation site are both within and outside of the project boundary, please provide a description of what portions are within and outside. Also, please provide revised figures at a scale that denote the location of the project boundary on all of the recreation site figures. In the event that the project boundary is not within the area surrounding the recreation sites, please provide a description of whether the site is located completely within or outside of the project boundary. Finally, for any areas where you propose to add lands associated with the recreation sites into the project boundary, please describe the location of these lands and provide a summary of the additional acreage to be added to the project boundary for each individual site.

In response to sub-item 9, we requested information pertaining to the location of the commercial and private recreation sites. Figure A-4 of your Recreation Plan provides this information, however, because of the scale and clarity of the figure, the names and associated designation of the sites is not legible. Therefore, please provide a revised map, which can be broken into smaller sub-set maps or clarify, so that the site names are legible.

SCE&G Response: See Appendix B to this response titled “Saluda Hydroelectric Project (FERC Project 516) Recreation Site Property Designation” which provides a description of what portions of each recreation site are within and outside of the project boundary.

Enclosed is a revised Exhibit F of our Recreation Plan filed on July 31, 2009 as part of the Comprehensive Relicensing Settlement Agreement (CRSA) which includes 38 maps of the existing and proposed recreation sites that have been modified to denote or clarify the location of the project boundary of each recreation site.

The areas where we propose to add lands associated with the recreation sites into the project boundary are shown on Figure D-1, titled “Lake Murray Proposed Future Recreation Sites” which was filed as part of the CRSA on July 31, 2009 and Revision 1 dated November 20, 2009 to Figure D-2, titled “Lower Saluda Proposed Recreation Sites” which is enclosed with this filing. These two figures provide the location of the lands we propose to bring into the project boundary along Lake Murray and the lower Saluda River after issuance of the new license. A summary of the additional acreage to be added to the project boundary for each individual site is shown on the attached Appendix B.

Attached is Revision 1 dated November 20, 2009 to Figure A-4 of the Recreation Plan which was modified to make the site names and associated designation of the sites legible.

3. **Statement of Project Costs and Financing**

FERC Request – In section 8.0 of the Revised Exhibit D filed on July 31, 2009, you present the on-peak and off-peak power rates for the project, but do not provide the breakdown of on-peak and off-peak generation for application of those rates. Sections 9.1 through 9.6 of the same document present the gain or loss in annual generation, as well as any shifts from on-peak to off-peak generation (or vice versa), associated with proposed operational changes. For us to adequately use the information you provided, we need the annual on-peak and off-peak generation values for the baseline condition before the proposed operational changes are implemented. For the baseline annual generation of 180,069 megawatthours, as cited in section 9.0, please provide the amount of on-peak and off-peak generation.

SCE&G Response: For the average annual baseline generation of 180,069 MWH given in Exhibit B-1 of the Final License Application, average annual generation during peak periods (defined as weekday hours 8 – 23) was 107,409 MWH. Average annual off peak generation (defined as all other hours) was 72,660 MWH. This information has been provided in Revision 1 dated November 20, 2009 to Exhibit B-1.

As noted in the revised Exhibit B-1, peak and off-peak generation for 1988 and 1990 was estimated based on hourly generation data for January through November; December hourly generation data was not available for these two years. Annual gross generation for these years is correct and is based on monthly total generation for all 12 months.

APPENDIX A

Floodplain Riparian Vegetation Along the Lower Saluda River and in the Congaree National Park and Potential Effects of Proposed Minimum and Enhancement Flows from the Saluda Hydroelectric Project

The lower Saluda River (LSR) and the Congaree National Park (CNP) are two important features of the South Carolina midlands, serving significant biological functions and supporting notably diverse ecological communities. The fishery community in the LSR enjoys the distinction of providing fishing opportunities for both resident warm-water species, as well as stocked coldwater species made possible by releases from the Saluda Hydroelectric Project (Saluda Hydro). The CNP contains the largest contiguous tract of old-growth bottomland hardwood forest in the United States. Inundation of CNP floodplains by the Congaree River, and the diverse habitats of the Park, supports a variety of terrestrial wildlife habitats. As part of the relicensing of Saluda Hydroelectric Project, the South Carolina Coastal Conservation League, American Rivers, South Carolina Department of Natural Resources and Lower Saluda Scenic River Advisory Council requested that South Carolina Electric & Gas Company (SCE&G) provide information on riparian vegetation along the LST and or the CNP and the effects of flows in the LSR on these resources. In response to the requests, SCE&G conducted a literature search to address the questions. The results of the search are addressed below.

The LSR and the CNP provide differing snapshots of riparian habitat within the Santee Basin, although each area possesses plant species typical of Piedmont and Southeastern Plains ecoregions of South Carolina. Habitat along the LSR is more homogeneous than the diversified floodplain habitats of the CNP. In the areas adjacent to the lower Saluda River below the Saluda Hydro Dam, botanical resources consist of mesic hardwood forests and pine plantations of various ages. Mixed hardwood forest dominates much of the available habitat along the LSR, especially near the river's edge. Canopy species in this forest type include white oak, southern red oak, shagbark hickory, post oak, winged elm, as well as loblolly pine stands. On the north bank of the Saluda River, a small area of bottomland hardwood forest has been identified. This represents a wetland vegetation community more common to the CNP. Although, small areas of jurisdictional wetlands have been identified along the LSR, primarily in areas of river bends no federally protected wetlands have been delineated anywhere along the LSR. (SCE&G, 2008)

Geomorphologically, the lower Saluda basin is narrow and the LSR is steeply banked and channelized. After extended high flows, water may top the river bank in some low lying areas. Although such extended operations occur occasionally, the accompanying infrequent high flows appear insufficient to support a floodplain ecosystem with associated functions (water quality improvement, diverse habitats, fish and wildlife breeding areas, flood storage). Areas considered floodplain along the LSR are few in number and limited to scattered locations where the river bends. According to data published by the Federal Emergency Management Agency, the lands bordering the LSR are in a zone considered to be a 10-year floodplain, which indicates that the annual chance of flooding along the banks is 10%. However, this is possibly a significant overestimation under current and proposed operations. Flows associated with the 10-year frequency event are 32,000 cfs; however, due to South Carolina Electric & Gas Company's (SCE&G) use of flow forecasting models and the storage capacity of the reservoir, downstream flows are moderated and rarely exceed the maximum plant hydraulic capacity (approximately 18,000 cfs). The last time the ability of the Project to pass or store flood flows was exceeded occurred in 1969 and required the opening of the Project's spillway gates. With the installation of Unit 5 in 1968-1971, having a rated hydraulic capacity of 6,000 cfs, operation of the emergency spillway for flood control has not been required. (SCE&G, 2008). Increases in the current “normal” flow regimes, for the LSR proposed through the Comprehensive Relicensing Settlement Agreement (CRSA)(Appendix A-11) range from a minimum flow of 400 cfs to a potential high flow of 2,700 cfs under Striped Bass Enhancement flows. However, these increases are not anticipated to have any material effect on riparian vegetation along the LSR, or the Congaree River. As discussed above, due to the channelization of the river and rare inundation of the adjoining lands, limited or no impact to riparian vegetation along the LSR is anticipated. Costs to implement the proposed downstream flows with respect to riparian habitat are negligible; however, the costs to implement proposed downstream flows to enhance aquatic resources appear in the revision to Exhibit D filed on July 31, 2009 as part of the CRSA filing.

Unlike the habitat along the LSR, the CNP contains a wide variety of floodplain communities that have been thoroughly studied in recent years. Even high bluffs along the Congaree River are overtopped during flood events, allowing waters to descend into the park. The varied geomorphic features of the CNP include back-water swamps supporting flood-tolerant communities of old-growth cypress, water tupelo, and overcup oak. Higher elevation and bluff areas support flood-intolerant species of sweet gum and cherrybark oaks (Graf and Meitzen, 2006). The riparian vegetation along the Congaree River consists of species such as sugarberry, green ash, box elder, paw paw, silver maple and black willow. (USGS-NPS, 1998).

Evaluation of the potential effects of any proposed downstream flows on the riparian vegetation in the CNP entails an examination of the hydrology of the system of included watercourses, as well as the geomorphology. The LSR, which joins with the much larger Broad River to form the Congaree River, generally provides around 1/3 of the river flows to the Congaree under normal flow conditions. Hydrology studies have demonstrated that flows in the Congaree, in the vicinity of the CNP, are primarily influenced by the Broad River. (Graf and Meitzen, 2006; Plewa & Graf, 2005). Saluda Hydro is a reserve facility, generating in the event of major disturbances either on SCE&G’s own electric grid or grids with which SCE&G interconnects based on a coordination agreement. Other than for planned generation (lake level management, maintenance, and scheduled downstream flows), generation events at Saluda Hydro are often short in duration, providing power until the emergency event is resolved or other generation can be brought online to cover associated capacity gaps. In 2005, Plewa and Graf produced a report for the National Park Service on the hydrologic variation of the Congaree River near CNP (attached as part of this filing). Stream gage data in the LSR, Broad and Congaree rivers was studied in order to identify river flow contributions and travel times. Results indicate that 0.25 to 0.5 ft increases in water level can be seen as a result of Saluda operations at the USGS gage in the Congaree River near the CNP. This study further establishes that fluctuations in flow occurring as a result of Saluda Hydro operations have relatively little effect on flows in the Congaree River in the vicinity of the CNP, as they are attenuated by flow variations in the Broad. Consequently, the Broad River “is the major determinate of hydrologic conditions in the Congaree River at the park.” (Plewa & Graf, 2005)

Further floodplain inundation modeling of the CNP was performed by Graf and Meitzen in 2006 for the National Park Service. HEC-RAS modeling was utilized to estimate the effects of various river flows on floodplain inundation and micro-topography of CNP. Historic flood events in the Congaree River of 55,800 cubic feet per second (cfs) and 97,900 cfs were utilized to illustrate modeling results. It is noted that during both events, flows within the Congaree River are predominantly provided by the Broad River. During the 55,800 cfs flow event, flows from the Saluda River maintain the 1/3 ratio in providing waters to the Congaree River. In the case of the 97,900 cfs event, flows from the LSR do not achieve the 1/3 flow ratio (Graf and Meitzen, 2006).

Striped Bass Enhancement Flows, proposed as part of the CRSA, are designed to provide a greater amount of water to the Congaree to encourage striped bass spawning. Nevertheless, these flows will be provided in such a way that flows from the Saluda River still will not exceed a 1/3 flow ratio, making it likely to have little influence on riparian vegetation - positively or negatively. Striped Bass Enhancement flows may increase to a small degree some inundation to backwater areas, as the Striped Bass flows are provided during periods when flows in the river are expected to be generally high.

In conclusion, downstream flows proposed through the CRSA are anticipated to have some beneficial effects to the aquatic species of the LSR and upper Congaree rivers. However, as discussed above, due the geomorphology of the riverbanks along the LSR, and the attenuation of LSR flows in the Congaree, limited to no impact is anticipated on riparian vegetation in the LSR or CNP as a result of the proposed increase in flows or project operations.

References:

Aerial Information Systems. 1998. Photo Interpretation Report; USGS-NPS Vegetation and Inventory and Mapping Program; Congaree National Park. October 12, 1998.

Graf, William L., and Kimberly M. Meitzen. 2006. Congaree Floodplain Decision Support Project: Assessing the Extent of River Regulation Effects on the Resources Within and Around Congaree National Park; Part II: Floodplain Inundation Modeling Using HEC-RAS and GIS. Prepared for the National Park Service. May 15, 2006.

Kleinschmidt Associates. 2008. Saluda Hydroelectric Project Final License Application: Exhibit E. Prepared for South Carolina Electric & Gas. Columbia, SC.

Plewa, Tara M., and William L. Graf. 2005. Hydrologic Variation of the Congaree River Near Congaree National Park, South Carolina. Prepared for the National Park Service. January 29, 2005.

UNIVERSITY OF SOUTH CAROLINA

March 3, 2005

DEPARTMENT OF GEOGRAPHY

Brian Duncan
SCANA Corporation
1426 Main Street
Columbia, SC 29201

Dear Brian,

Tara Plewa, a PhD student in the Department of Geography at the University of South Carolina, and I have completed our report, "Hydrologic Variation of the Congaree River near Congaree National Park." We conducted the analysis and created the report as part of our relationship with the park, but these efforts were not part of a grant or contract arrangement. You were very kind in assisting Tara during the work we did for the report, and we are grateful for your help. We enclose for your use a paper copy and a CD containing a *.pdf file of the report.

Of interest to SCANA are our findings that the flows of the Broad River dominate the flows of the Congaree River near the park, and fluctuations in flow resulting from hydropower operations at Saluda Dam cause stage fluctuations ranging from 0.25 to 0.50 feet near the park about 15 hours after release changes at the dam. We confirmed the commonly held impression that the Saluda flow contributes about one-third of the Congaree's flow, and we found that during the draw-down period, flows below Saluda Dam were probably not run-of-river on a daily basis, but they were run-of-river when we considered time periods longer than a day.

If you have any questions about our work, please feel free to contact me at 803-777-4437 or via e-mail at **graf@sc.edu**. Again, thank you very much for your helpful input.

Best wishes,

Will

William L. Graf
Foundation University Professor
and
Professor of Geography

Tara M. Plewa
Tara M. Plewa
PhD Graduate Student, Geography

Hydrologic Variation of the Congaree River Near Congaree National Park, South Carolina

A Report for the National Park Service

by

Tara M. Plewa and William L. Graf
Department of Geography
University of South Carolina
Columbia, South Carolina 29205

January 29, 2005

Abstract

Hydrologic investigations based on stream gage data in the Saluda, Broad, and Congaree rivers reveal the relationships between river flows near Congaree National Park and their upstream dams. The connections are important because the hardwood flood-plain forest ecosystem of the park is closely associated with the Congaree River. Streamflow data illustrate that the Broad River contributes two-thirds of the flow of Congaree River, and is the primary determinant of hydrologic conditions in the Congaree River at the park. The Saluda River contributes about one-third of the Congaree flow. Large volumes of flow in the Broad commonly wash out daily or hourly variations in the Saluda from the downstream perspective. However, operations of Saluda Dam cause fluctuations of 0.25 to 0.5 feet at the gage on the Congaree River at the park. During construction operations at Saluda Dam in the 2002-2004 period, gage data indicate that operators of the dam pursued a modified run-of-river strategy to maintain a consistent lake level. Waves or pulses of water from Parr Shoals Dam on the Broad River reach the Congaree River at the park in about a day, while travel time from the Saluda Dam on the Saluda River is about 15 hours. When stage levels in the Congaree River at the park reach about 8 feet, water from the main river substantially influences flows at the Cedar Creek stream gage, illustrating the connection between tributary flows and main river flows in the park.

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Project Overview and Purpose

Congaree National Park (previously Congaree Swamp National Monument) protects and manages the largest contiguous tract of old-growth bottomland hardwood forest in the United States (National Park Service 2004). Frequent inundation by the Congaree River on the southern border of the park is an essential component of the forest ecosystem, and is the primary driver for change. The hydrology of the park largely depends on Congaree River flows, which in turn depend on the inputs of the Saluda and Broad rivers as they respond to upstream controls by dams. Initial observations suggest that hourly and daily flows generally reflect upstream dam operations.

The Saluda River influences the hydrology of the Congaree River near the park because the Saluda contributes about one-third of the flow of the Congaree, and because of artificial controls on the Saluda. Saluda Dam, approximately 55 kilometers (34 miles) upstream from the park, impounds a reservoir, Lake Murray, with a storage capacity of 1.97 billion cubic meters (1.6 million acre feet) of water. The dam and its reservoir are large enough to alter major flood events and control daily discharges when satisfying hydropower demands.

Special characteristics of the Saluda River, Saluda Dam, and Lake Murray may be reflected in the recent hydrological history of the park downstream. The owners of the dam, South Carolina Electric & Gas Company, changed operating rules for the structure in the Fall of 2002, when they began a major construction project to reinforce and stabilize the dam to prevent earthquake damage. Between October 1, 2002 and March 31, 2004, they operated the dam to draw down the lake levels for safe construction, so that downstream flows may have been unlike previous discharges.

The Broad River influences the hydrology of the Congaree River near the park because it contributes about two-thirds of the flow of the Congaree. The Broad River is also subject to discharge artificial controls, possibly by Parr Shoals Dam. This structure, located approximately 50 miles upstream from the park, is a hydroelectric facility with a reservoir capacity of about 39.5 million cubic meters (32,000 acre feet) – substantially smaller than Lake Murray.

This report briefly examines the hydrology of the Congaree River and its primary tributaries, the Saluda and Broad rivers, by addressing the following specific questions:

1. What are the relative contributions of the Saluda and Broad Rivers to the Congaree River at the park?

2. To what degree does the operation of the Saluda Dam on the Saluda River affect the hydrology of the Congaree River at the park?

3. How have recent operations of Saluda Dam during modifications of the structure influenced flows of the Congaree River at the park?

4. How quickly does the Congaree River transmit waves or pulses of flow from the Columbia area to the park area?

5. At what stage level in the Congaree River at the park do main river flows begin to affect flows in Cedar Creek?

Data to answer these questions are available through stream gage (the hydrologic form of the term "gauge") records for the Congaree River system. These data permit the definition of basic flow parameters at various time scales, including mean annual water yield, annual peak flows, daily flows, and hourly flows. Mean annual water yield and annual peak flows illustrate the contribution of each tributary to the Congaree, and the influence that each has on overall system hydrology. Annual statistics identify patterns of flow on century and decadal timescales. Daily variation in river flows depict changes that occur over weeks or months, which would be otherwise obscured by annual averages. Hourly variation in flow highlights the effects of hydroelectric operations and the pulsing nature of their releases. Data recorded at 15-minute intervals show the waves produced by changes in releases from dams as they generate more or less hydropower; waves that would be masked by daily flow averages.

The following pages illustrate how these data provide answers to the five specific questions. The next section introduces the general setting of the Congaree River Basin and the placement of Congaree National Park within this hydrologic system. Subsequent sections of this report address each question in turn by outlining the nature of the available data, methods of analysis, and results for each question.

The Congaree River Basin as a Setting for Congaree National Park

The Congaree River

Congaree National Park lies in lower Richland County, central South Carolina, roughly 40 kilometers (25 miles) south of the City of Columbia (**Figure 1**). The Congaree River forms the southwestern and southern boundary of the park. The entire Congaree River Basin includes a drainage area of 18,137 square kilometers (7,003 square miles); slightly smaller than the state of New Jersey. Approximately 2 million persons currently reside in the watershed, withdrawing about 6 million cubic meters (4,950 acre feet; 1,650 million gallons) from the river each day for residential, industrial, and hydropower uses (U.S. Environmental Protection Agency 2005). The basin includes 801 dams of all sizes upstream from the park, providing a range of benefits: recreation, hydroelectric power, irrigation, flood control, and water supply (U.S. Army Corps of Engineers 1996).

The Congaree River Basin spans several ecoregions (**Figure 2**). The majority of the watershed lies in the Southern Outer Piedmont and Carolina Slate Belt ecoregions, while the park lies in the Southeastern Floodplains and Low Terraces Ecoregion with major river floodplains with low terraces, and containing river forms such as oxbow lakes and swamps (Griffith et al. 2002). The confluence of the Saluda and Broad Rivers creates the Congaree River, approximately 39 kilometers (24 miles) upstream from the park at the city of Columbia. The confluence occurs at "the Fall Line", or the transition zone between the Carolina Slate Belt and the Sandhills/Southeastern Floodplains Ecoregion. The Fall Line is the location of a change in geologic lithologies from the hard rock of the Piedmont to the sand units of the Coastal Plain.

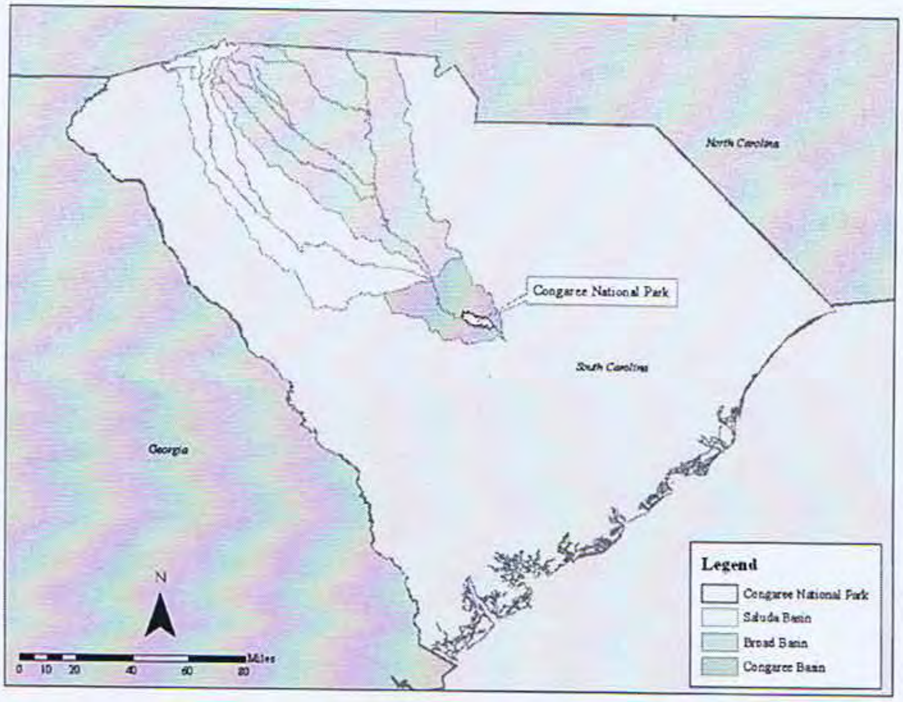

Figure 1 - Location Map, Congaree National Park with Major Watersheds
Source: Data from University of South Carolina Geographic Data Server

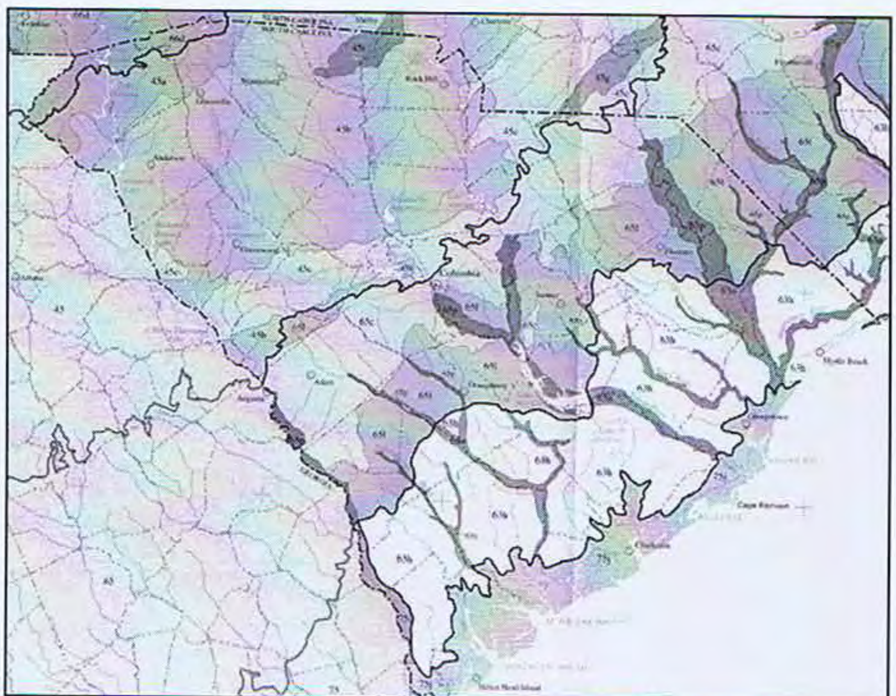

Figure 2 – Ecoregions of South Carolina
Source: Griffith, et al. 2002.

The Saluda River

The Saluda River Basin is in central and northwestern South Carolina, and is approximately 6,527 square kilometers (2,520 square miles) in area. The Saluda River flows predominantly through Piedmont ecoregions, and has several dams along its course. The two largest impoundments are Lake Greenwood at Buzzard's Roost Dam built in 1940, and Lake Murray at Saluda Dam built in 1930. Both structures are hydroelectric facilities that also provide recreation and flood control.

Saluda Dam, approximately 55 kilometers (34 miles) upstream from the park, is the largest dam in the Congaree River watershed (**Figure 3**). South Carolina Electric & Gas Company (SCE&G), a subsidiary of SCANA, owns and operates the structure. The 213-foot high, earthen gravity dam impounds a 1.97 billion cubic meter (1.6 million acre-foot) reservoir forming a lake 41 miles long, 14 miles wide, covering more than 80 square miles (Bayne 1999). Normal lake levels vary between 350 and 358 feet in elevation above sea level, with minimal daily fluctuations (FERC 2002). Saluda Dam has the capacity to continually produce 206 megawatts of electricity, and is SCE&G's second largest hydroelectric station (SCE&G 2003). Saluda Dam is "primarily used for load-following and peaking, normally generating electricity between 8:00 a.m. and 10:00 p.m." (FERC 2002: 7). The downstream hydrologic regime of the Saluda River is significantly different from the pre- dam regime and from the regime of the river upstream from the dam and lake. The dam limits large downstream floods and eliminates seasonal variation in total flow volumes (Koman 2003). Daily power generation also results in diurnal fluctuations in discharge that appear as waves or pulses of water moving downstream.

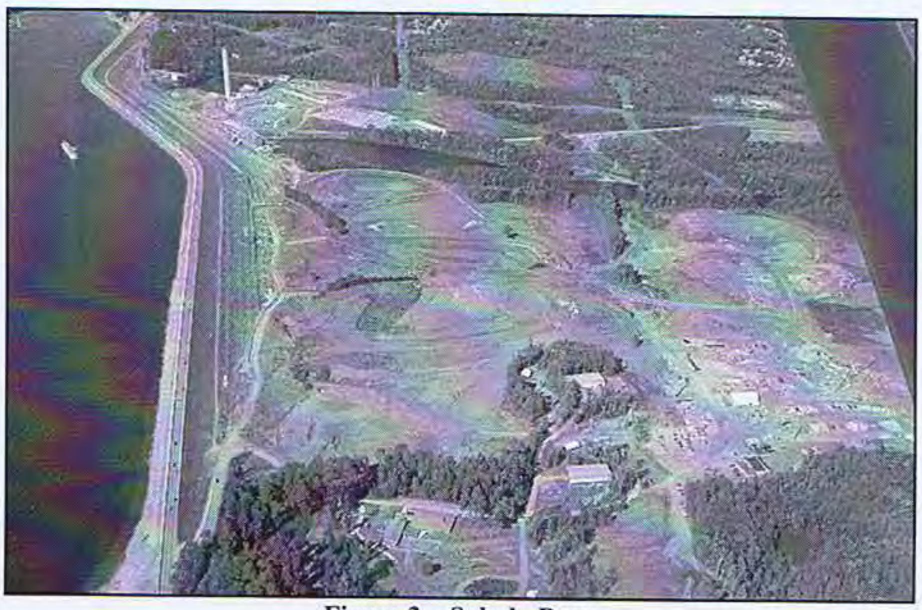

Figure 3 – Saluda Dam
Source: School of the Environment, University of South Carolina

Because Lake Murray traps and stores incoming sediment and because release water is from the deep portions of the lake, flows in the Saluda River downstream from the dam are cold (below 20 degrees Celsius), have variable dissolved oxygen levels depending on turbine venting and seasonality (averaging between 5.0 and 9.0 milligrams per liter), and are devoid of sediment (U.S. Geological Survey 2005; FERC 2002). These conditions support stocked non-native brown and rainbow trout species in this river reach, but they also limit normal geomorphic changes and curtail the ecological health of native flora and fauna.

Buzzard's Roost Dam at Lake Greenwood is upstream from Lake Murray (**Figure 4**). Greenwood County owns Buzzard's Roost Dam, and Duke Energy operates the structure to generate electricity. The powerhouse contains three turbines which have the ability to generate 15 megawatts of electricity for the surrounding area (City of Greenwood 2003). The hydrologic regime of the Saluda River below Lake Greenwood is significantly different from its pre- dam regime (Koman 2003). The primary change is that the dam releases more water during the winter months than previously flowed through the site. Other substantial differences in median flow occur in the months of October, December, January, May, and September. In these months, median flow increases and is less variable than under pre-dam conditions.

The Broad River

Most of the length of the Broad River is in the Piedmont province of central South Carolina. With a watershed size of 9,818 square kilometers (3,791 square miles), the Broad River drains most of central South Carolina, with its tributary headwaters reaching into the Blue Ridge province of North Carolina (**Figure 2**). Parr Shoals Dam, located approximately 78 kilometers (48 miles) upstream from the park, is a 14 foot-high run-of-river, gravity structure also owned and operated by SCE&G (**Figure 5**). The dam was completed in 1914 by J.G. White Engineering Corporation for the Parr Shoals Power Company, a subsidiary of Columbia Railway, Gas & Electric Company (SCANA 2005). This structure has the capacity to generate 15 megawatts of electricity, and is one of SCE&G's smallest structures. Monticello Reservoir, located nearby, is a pumped storage, off stream facility that does not directly affect flows in the main river.

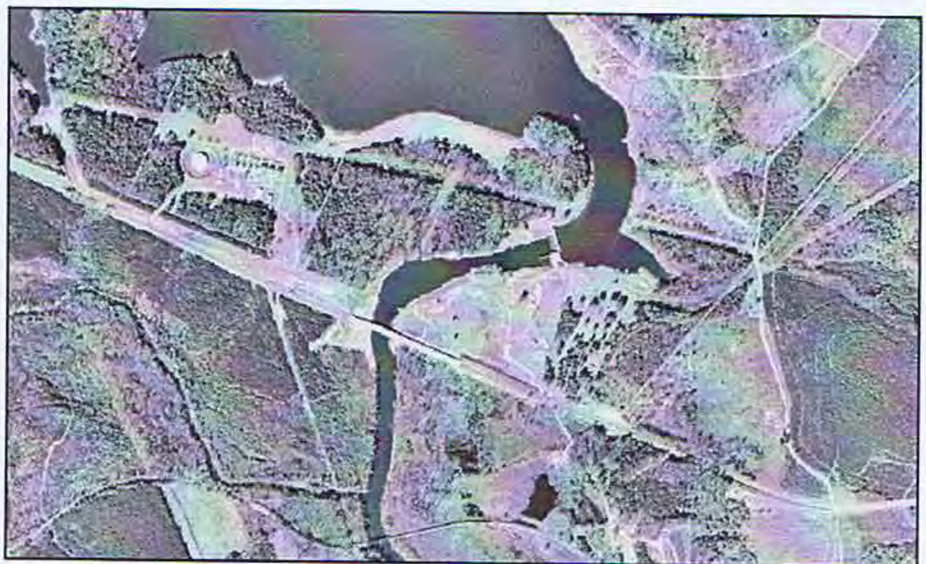

Figure 4 - Buzzard's Roost Dam at Lake Greenwood
Source: South Carolina Department of Natural Resources (1999)

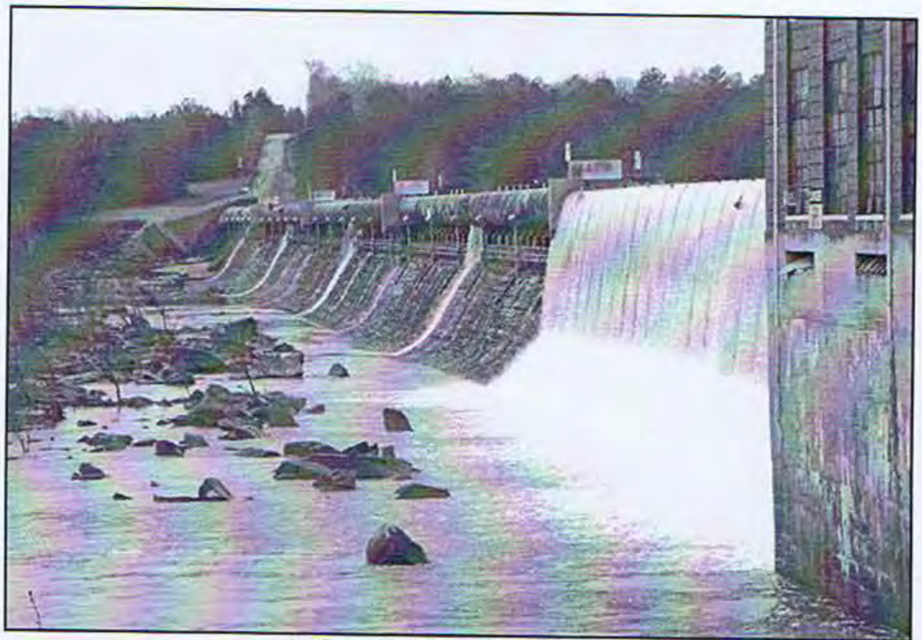

Figure 5 – Parr Shoals Dam
Source: W.L. Graf

Saluda Dam and General Congaree River Hydrology

The Role of Climate

An assessment of the general effects of Saluda Dam on the flows of the Congaree River depends on viewing river hydrology in the context of prevailing regional climate. Changes in river flows may reflect either climatic or human controls (Williams and Wolman 1984). In South Carolina and in the river basins that influence flows of the Congaree River at Congaree National Park, droughts have occurred in 1925, 1933, 1954, 1983, 1986, 1990, 1993, and 2001 (SCDHEC 2003). Since 1900, each decade has experienced three or more years of rainfall below normal totals (SCDNR 2004). In these drought years, streamflow is likely to be lower than other years simply as a result of rainfall and runoff. Climate in the study area is humid subtropical, with an average precipitation of 42 to 47 inches per year (SCDHEC 2003).

USGS Stream-Gaging Network

The primary source of streamflow data for this report is the U.S. Geological Survey network of stream gages. These gages measure stream stage or discharge at selected points along the rivers, in some cases assessing the flow once per day but in other cases providing measurements once every 15 minutes (Wahl, Thomas, and Hirsch 1995). Satellite relay systems direct the data to a central processing facility in Reston, Virigina, and it is reported on the World Wide Web within a few minutes after the measurement at www.water.usgs.gov. This report uses data from 6 gage sites to describe the flows of the main rivers influencing the park (**Table 1, Figure 6**).

Table 1 USGS Stream-Gaging Data Availability		
Station Name	**Available Dates**	**Web Site Address**
Broad River at Alston	10-1-1896 to 12-31-1907 10-1-1980 to Present	http://waterdata.usgs.gov/sc/nwis/uv?02161000
Saluda River at Chappells	10-1-1926 to Present	http://waterdata.usgs.gov/sc/nwis/uv?02167000
Saluda River near Columbia	8-14-1925 to Present	http://waterdata.usgs.gov/sc/nwis/uv?02169000
Congaree River at Columbia	10-1-1939 to Present	http://waterdata.usgs.gov/sc/nwis/uv?02169500
Lake Murray near Columbia	8-1-1929 to Present	http://waterdata.usgs.gov/sc/nwis/uv?02168500

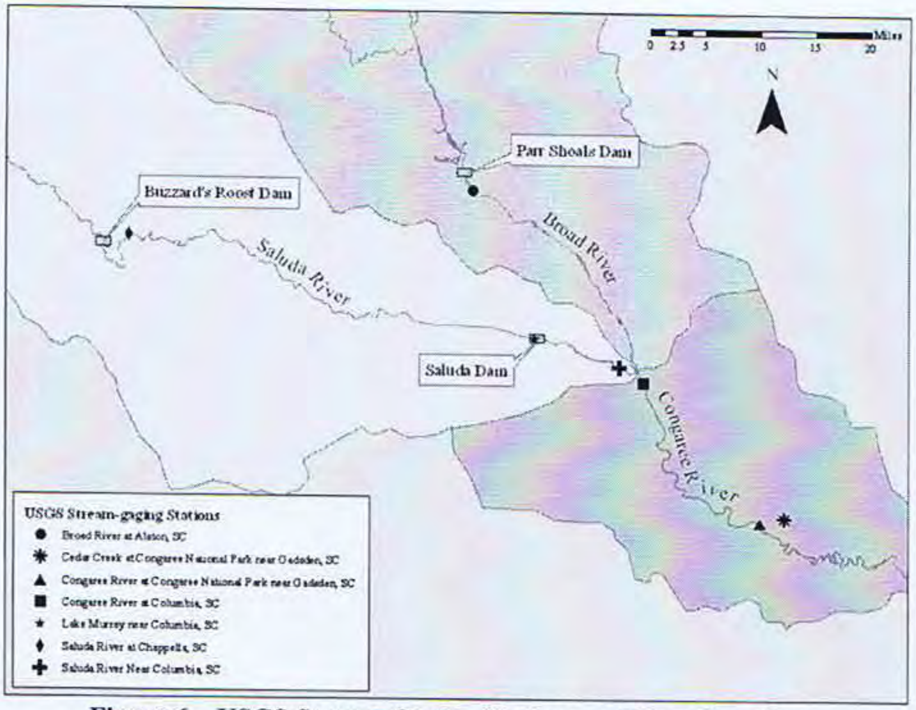

Figure 6 – USGS Stream-Gaging Stations and Dam Locations
Source: Data from Data from University of South Carolina Geographic Data Server and U.S. Geological Survey

Mean Annual Water Yield and Annual Peak Flows

Mean annual water yield (total cumulative discharge in a given year) and annual peak flows (the highest discharge in a given year) reveal the degree to which Saluda River discharges influence the Congaree River near the park. Mean annual flow on the Saluda River below Saluda Dam, is 2,777 cubic feet per second (cfs). Water year 2001 (measurements from October 1, 2000, to September 30, 2001) recorded the lowest mean discharge in the hydrologic record (984 cfs), while 1929 recorded the highest (6,332 cfs). The highest flows at this location occurred prior to Saluda Dam's installation. The dam now limits peak flows by storing floodwater for gradual releases at lower discharges. The gaging station on the Broad River at Alston, immediately downstream from Parr Shoals Dam, has a record depicting two periods, 1897-1907 and 1981-2002. The first period predates the dam while the second provides information after dam construction. The pre- dam Broad River at Alston had a mean annual flow of 7,774 cfs, while the post-dam river had a mean annual flow of 5,579 cfs, a 28 percent decrease. The highest peak flow recorded on the Broad River (130,000 cfs at the Broad River at Alston gaging-station) occurred on June 8, 1903. Since the installation of upstream dams, flows of this magnitude have not reoccurred. On October 14, 1990, flows of 106,000 cfs were recorded; the highest in the more recent hydrologic record. Despite its large volume, this flow is 18 percent less than floods occurring prior to impoundment installation. For the purpose of this analysis, the mean annual flow from all available data yields 6,310 cfs for the Broad River. The Broad River, therefore, yields twice as much water as the Saluda. The Congaree River has a mean annual flow of 8,961 cfs (~3000 cfs from the Saluda, and ~6000 cfs from the Broad). Water year 2001 also had the lowest mean discharge in the Congaree River hydrologic record (3,474 cfs), while 1964 recorded the highest (16,560 cfs). The largest flood recorded on the Congaree River occurred on October 11, 1976, with a discharge of 150,000 cfs.

Daily Variation

The Saluda Dam dictates the range of daily flows emitted downstream to the Saluda River. Diurnal fluctuations range from 500 to 5,000 cfs, on average, due to releases for electricity generation (**Figure 7**). Mean daily flow is 2,791 cfs, dependant upon SCE&G's operating rules. Although the current Federal Energy Regulatory Commission (FERC) license for Saluda Dam operation contains no minimum flow requirement, the South Carolina Department of Health and Environmental Control (SCDHEC) requests a minimum release of 180 cfs to maintain downstream habitats (FERC 2002). If Lake Murray is not at capacity, the dam may store water from flood flows for later release. The Broad River is not subject to such variable diurnal fluctuations, and changes in flow are a result of precipitation events or upstream dam releases. Parr Shoals Dam operates essentially as a "run-of-river" facility, releasing the same amount of water each day that enters its reservoir. The dam is an overflow structure, so flood discharges that exceed the capacity of the reservoir spill directly over the dam and continue downstream to the Congaree. Average daily flow on the Broad River at Alston ranges from 4,000 to 40,000 cfs, with a mean of 6,324 cfs (**Figure 8**). Congaree River average daily flows range from 5,000 to 50,000 cfs and are largely influenced by the Broad River's flow (**Figure 9**).

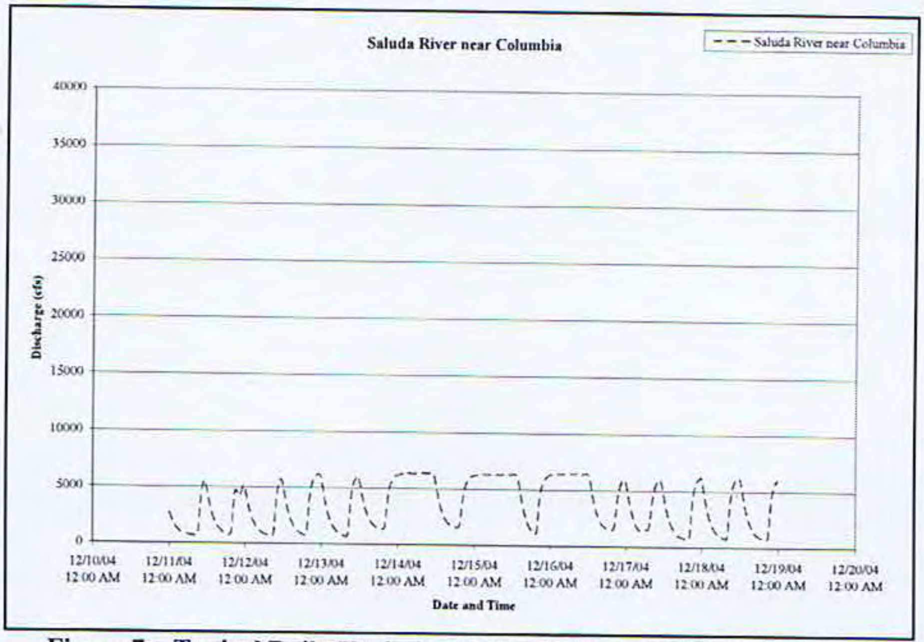

Figure 7 – Typical Daily Variation, Saluda River near Columbia Gage
Source: Data from U.S. Geological Survey

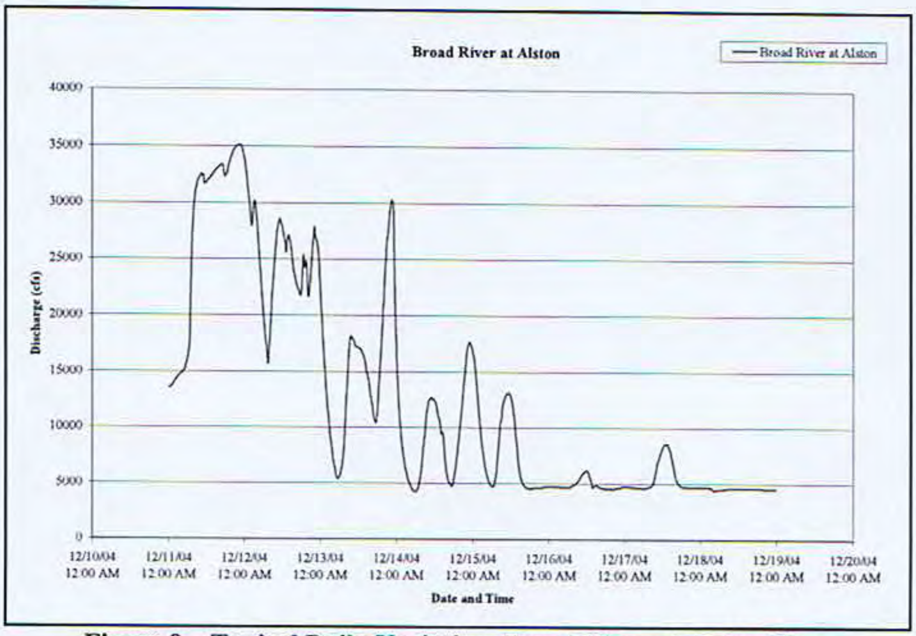

Figure 8 – Typical Daily Variation, Broad River at Alston Gage
Source: Data from U.S. Geological Survey

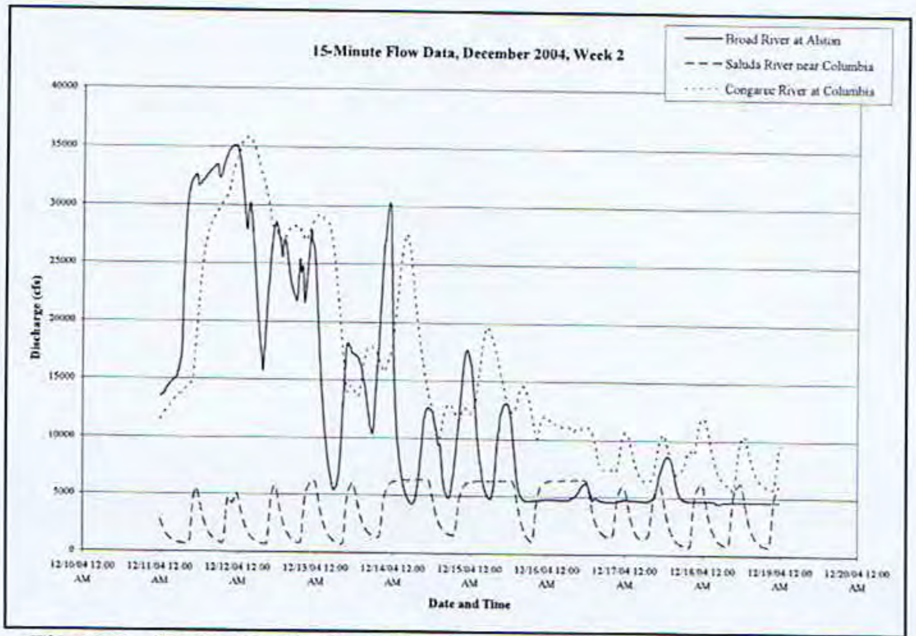

Figure 9 – Typical Daily Variation, Broad, Saluda, and Congaree Rivers
Source: Data from U.S. Geological Survey

Saluda River Flows During the Drawdown of Lake Murray

Final Environmental Assessment Summary

The Federal Energy Regulatory Commission (FERC) determined that without reinforcement, an earthquake of moderate magnitude might cause the Saluda Dam's failure, affecting over 100,000 persons downstream (FERC 2002). SCE&G, as owners and operators of the dam, undertook the construction of a large toe dam to be added to the main structure as a remedy. As mandated by the National Environmental Protection Act of 1969 (NEPA), SCE&G prepared an Environmental Assessment (EA) to evaluate potential environmental and socioeconomic impacts of the project. The Final Environmental Assessment (FEA) of the Saluda Dam seismic stabilization identifies the effects of the reservoir's lowering, and quantifies these impacts. The FEA found the following impacts would be likely as a result of construction activities: (1) short term decreases in reservoir water quality; (2) decline of the groundwater table and local well water levels; (3) temporary change in fish populations and spawning behavior; (4) loss of 4.2 acres of jurisdictional wetland; (5) decline in reservoir aesthetics; and (6) decline in recreational quality and private boat dock access.

The FEA outlined reservoir operation in response to FERC directives, to maintain a lake level of 345 feet throughout the project. SCE&G operations in a typical year would allow the reservoir to refill during the heavy winter and spring runoff periods, compensating for summer lowering caused by natural evaporation and electricity generation (FERC 2002). In October, 2002, SCE&G operated the dam in a fashion that did not permit the ordinary winter refilling (Duncan 2004). In addition to the generally lower reservoir levels, FERC expected SCE&G to operate Saluda Dam to pass through all inflows to the reservoir in a run-of-river operation—essentially the same rule that governs the operation of Parr Shoals Dam. "The licensee proposes to maintain the lowered reservoir by operating the hydroelectric project in a run-of-river mode" (FERC 2002: 8). The FEA *did not require* a run-of-river operating scheme, but only that the reservoir remain at a stable level. By not specifying strict operating rules, the FEA allows SCE&G to compensate for inflows of runoff and upstream releases from the Buzzard's Roost Dam at Lake Greenwood by releasing larger volumes of water. During these releases, SCE&G takes advantage of the excess water, and generates electricity. **Figure 10** shows lake level fluctuations (feet above mean sea level) prior to and during the drawdown period. Lake levels hovered around 346 feet throughout the drawdown period. Reservoir levels prior to the drawdown period were seasonally predictable. During drawdown, specifically the spring and summer of 2003, lake level fluctuations occurred up to 2 feet in response to inflows from upstream (**Figure 10**). When lake levels rose, dam operators compensated by releasing "spike flows" to lower the lake to its mandated level, while generating electricity.

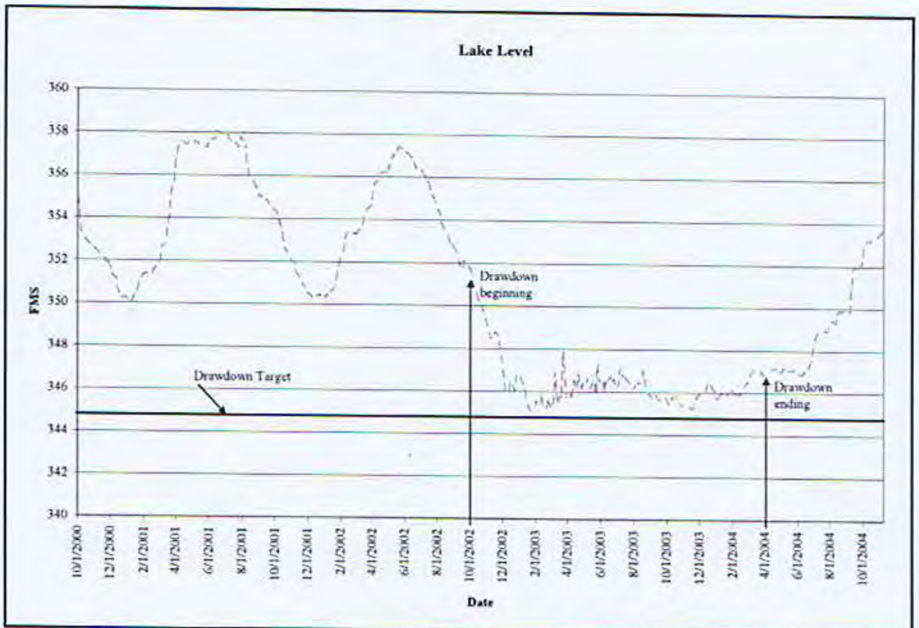

Figure 10 – Lake Murray Reservoir Level, Water Years 2001, 2002, and 2003
Source: Data from U.S. Geological Survey

Flow Comparison: Difference of Means

An analysis of mean flows in the Saluda, Broad, and Congaree rivers reveal whether or not the releases of water from Saluda Dam during the drawdown period were different in general from other similar periods of the hydrologic record. Two-year periods (using water-years) were sampled throughout the hydrosystem on a five-year recurrence interval to provide a comparison between drawdown and "normal" periods. Average flows for each period, and the sample mean and standard deviations generated from these averages are found in **Table 2**. Mean flow during water year 2003, and the drawdown period (October 1, 2002 thru March 31, 2004) provide a method for comparison. The following equation calculates the Z-score for each drawdown mean, where X is the mean discharge for a given gage site during the drawdown period, μ is the mean calculated from "normal" period flows, and δ is the standard deviation calculated from "normal" period flows:

$$Z = \frac{X - \mu}{\delta}$$

Using a 95% confidence interval, Z-score cutoffs for significance are +/- 1.96. Analysis shows that all Z-scores calculated for the drawdown period fall within this range, indicating that there is no significant difference between the mean discharge during the drawdown period and mean discharge of other periods of record. Mean discharge at each stream-gaging station in this analysis, during the drawdown period, is not statistically different from other years in the discharge record.

Table 2
Average Flow for Water Years Sampled (cfs) and Statistical Outcomes

Water Years	Broad River at Alston	Saluda River near Columbia	Congaree River at Columbia	Saluda River at Chappells
1896/1897	5914			
1901/1902	10462			
1906/1907	7211			
1926/1927		2114		1339
1931/1932		2234		1600
1936/1937		4812		2911
1941/1942		2220	6965	1404
1946/1947		2798	8882	2027
1951/1952		2225	7714	1645
1956/1957		1226	5394	1248
1961/1962		3217	10676	2131
1966/1967		2184	8009	1704
1971/1972		3510	11120	2137
1976/1977		3209	10738	2286
1981/1982	4686	1990	6978	1328
1986*/1987	5483	2175	7866	1268
1991/1992	6428	2627	9187	1672
1996/1997	6841	3069	9132	2015
2001*/2002	2323	1084	3423	786
Sample Mean	**5152.2**	**2543.4**	**8160.3**	**1718.8**
Sample Standard Deviation	**1789.6**	**903.6**	**2188.6**	**515.3**
Mean: Water year 2003	4618	2222	6883	1363
Mean: Drawdown Period 10/1/2002 – 3/31/2004	7552	3542	11300	2115
Z-score: Water year 2003	-0.29850034	-0.355647604	-0.58360682	-0.16823
Z-score: Drawdown Period 10/1/2002 – 3/31/2004	1.34096052	1.105122017	1.434537539	0.768791
* Year indicates drought period				

Run-of-River Operations During Drawdown Period

During the drawdown period, FERC expected that SCE&G would operate Saluda Dam according to run-of-river principles. That is, the expectation was that during the drawdown period, the amount of water released from the dam on a daily basis would mirror inflows to the reservoir from upstream. The Final Environmental Assessment for the Saluda Dam seismic stabilization stated "During the maintenance phase of the drawdown the licensee will operate the project in a run-of-river mode. With respect to the Saluda River below the dam this mode of operation will result in the elimination of highly variable daily flows and the greater weekday than weekend releases." (FERC 2002: 37). A comparison of daily flow records from the river above and below the dam reveal the degree to which dam operators achieved the run-of-river goal. Data for such an analysis originate from the gage on the Saluda River at Chappells for the inflow measurement and the gage from the Saluda River near Columbia for the outflow. Division of the flow values by the drainage area contributing to each gage site created normalized values of "unit discharge" and removed any influence of scale in comparing the two records (Chow 1964). The difference between the two flows, defined as the Chappells discharge minus the Columbia discharge, produced a test statistic. A positive value indicated volumes entering the reservoir were greater than those released, and a negative value indicated that operators were releasing more water from the lake than were flowing in from upstream (**Figure 11**).

A comparison of the differences between inflows and releases on one hand and lake levels on the other reveals the history of dam operations during the drawdown period (**Figures 11, 12**, and **13**). When lake levels began to rise, the difference measure response in most cases became a downward spike, indicative of a water release greater than that which was received upstream. The Saluda Dam therefore compensated for the lake level rise by releasing more water than the reservoir was receiving. Discharge from the dam appears to have been more variable in the spring and summer months; explained somewhat by the highly variable spring flows. Seasonal precipitation does not explain all variability, however. The importance of scale becomes evident in **Figure 13**. Widely variable flow differences appear to have occurred during time periods of lake level fluctuations. Operation of the Saluda Dam maintained a relatively constant reservoir level, but does not appear to have operated in a run-of-river mode, in the traditional sense. On a week-long timescale, the differences in flow volumes entering and exiting the reservoir may change several times, and dam operators had to adjust releases concurrently. These fluctuations indicate that the amount of water entering the reservoir is not always the same amount of water allowed to exit, resulting in a modified run-of-river scenario wherein the reservoir level remained the same. The operation of the dam may not have been run-of-river on an hourly or daily basis, but it was close to such a rule on a weekly or monthly basis.

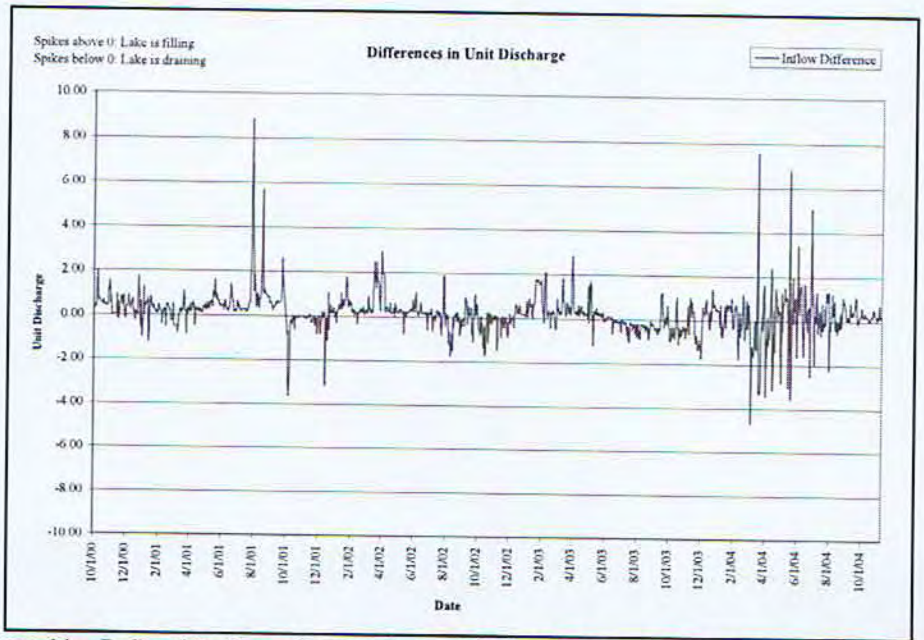

Figure 11 – Inflow/Outflow Comparison of Unit Discharge, Lake Murray Reservoir
Source: Data from U.S. Geological Survey

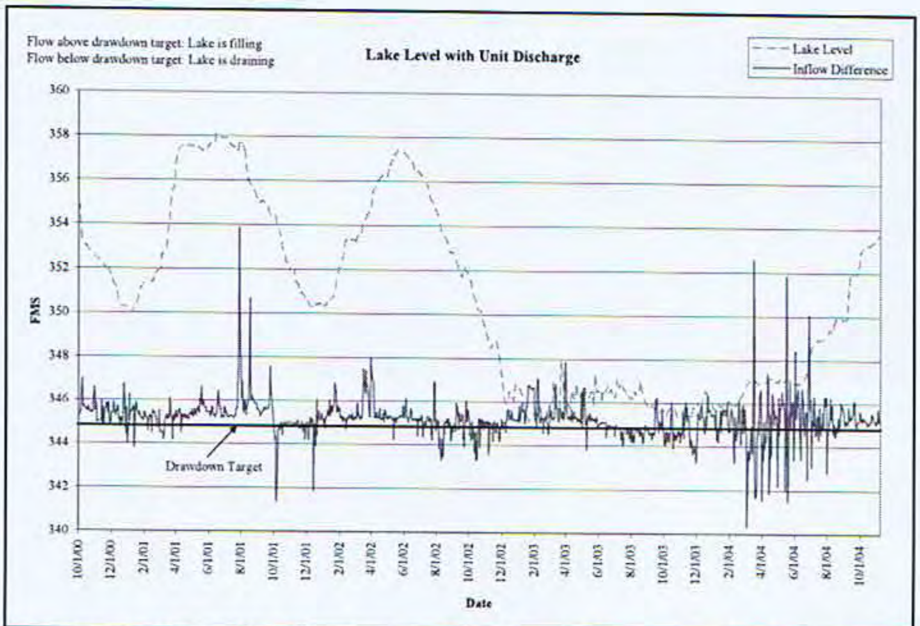

Figure 12 - Inflow/Outflow Comparison of Unit Discharge with Lake Level
Source: Data from U.S. Geological Survey

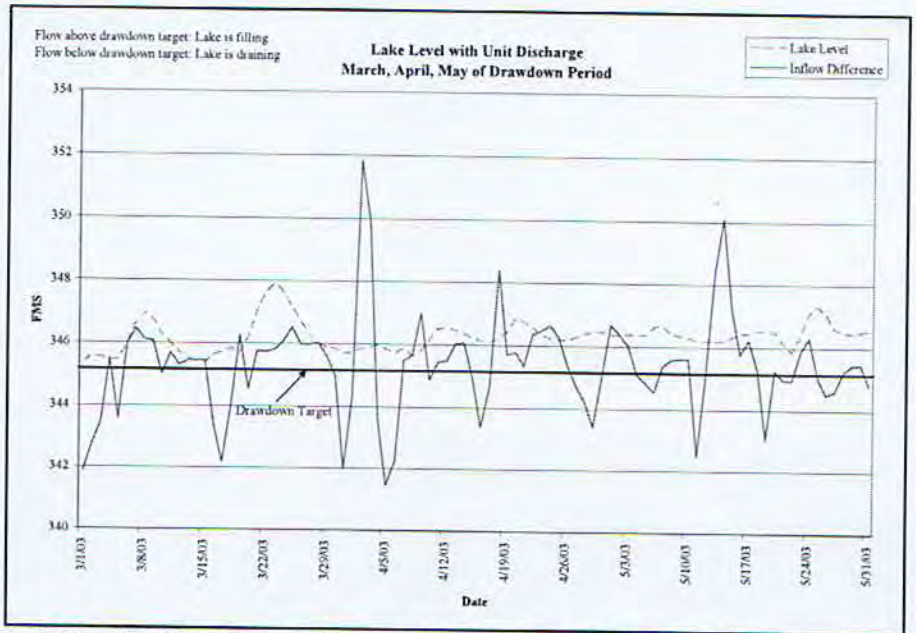

Figure 13 - Inflow/Outflow Comparison of Unit Discharge with Lake Level, Drawdown Period
Source: Data from U.S. Geological Survey

Hourly Variation and Wave Attenuation

To generate electricity, hydropower dams periodically release increased volumes of water that form downstream waves or water pulses. These waves of high water travel downstream at a velocity (v) determined by the hydraulic radius of the channel (R), bed and bank roughness (n), and reach slope or the downstream gradient (S) as in the following equation:

$$v = \frac{1.28\,(R^{2/3})(S^{1/2})}{n}$$

Hydraulic radius is the cross sectional area of the channel divided by the cross sectional wetted perimeter (Dingman 1984). The velocity calculations are approximations, because they use only mean values to represent a variable geomorphology for the river. The Congaree River between the confluence of the Saluda and Broad rivers at Columbia to the park has an average width of about 800 feet, an average depth of about 7 feet with a resulting hydraulic radius of about 6.88 feet, a slope of 0.0003, and a roughness of 0.030. Orthophotography, rectified aerial photographs, reveal the average width, and the gage record at Columbia provides the average depth. Topographic maps yield an average gradient. Channel roughness at bankfull stage (n) is an estimated value based on observation and expertise (Barnes 1967), classified by the most common bed and bank material. For the Congaree River, the value for coarse sand (0.030) is used. These values and the Manning equation generate an estimated average discharge velocity in the Congaree River of 2.67 feet per second or 1.82 miles per hour (mph).

Given the estimated travel time and the distances from gages on the Saluda and Broad rivers (**Table 3**), it is likely that a wave or pulse from Saluda Dam would travel from the gage site at Columbia to the park in about 15 hours, while a wave or pulse from the Broad River gage at Alston would require about a day to reach the park. As discharge changes, however, velocity also changes due to adjustments in river stage and hydraulic radius, so these estimates are general. Waves or pulses in low water periods travel more slowly than similar waves or pulses during high discharge periods.

Table 3
River Distances and Average Travel Times for Flow

USGS Stream-Gaging Station	Distance to Park (miles)	Travel Time to Park (hours)
Broad River at Alston	48.71	26.7
Saluda River near Columbia	26.46	14.5
Congaree River at Columbia	23.46	12.9

River flows measured at 15-minute intervals during November, 2004 illustrate the travel behavior of waves or pulses on the Congaree River (**Figure 14**). The recorded gage data from the Saluda River near Columbia and from the Broad River near Alston illustrate two aspects of the system: the observed travel velocity is highly similar to the calculated velocity, and releases from Saluda Dam do not substantially affect discharges at the park over short periods of daily flows. First, two black arrows in **Figure 14** indicate high gage recordings at the Broad River at Alston, and the park that occur approximately one day apart, as predicted by the Manning Equation. The gray arrows in **Figure 14** indicate a similar arrangement during a lower flow period. A distance of 3 miles separates the gage on the Saluda River near Columbia from the gage on the Congaree River at Columbia. Thus, a wave of water recorded below the dam would take approximately 1.6 hours to travel between the two sites. **Figure 14** supports this calculation, where any discharge peak from below the dam arrives at the Congaree station in approximately that time period. This graph supports the average flow velocity of 1.82 mph for the study area reaches.

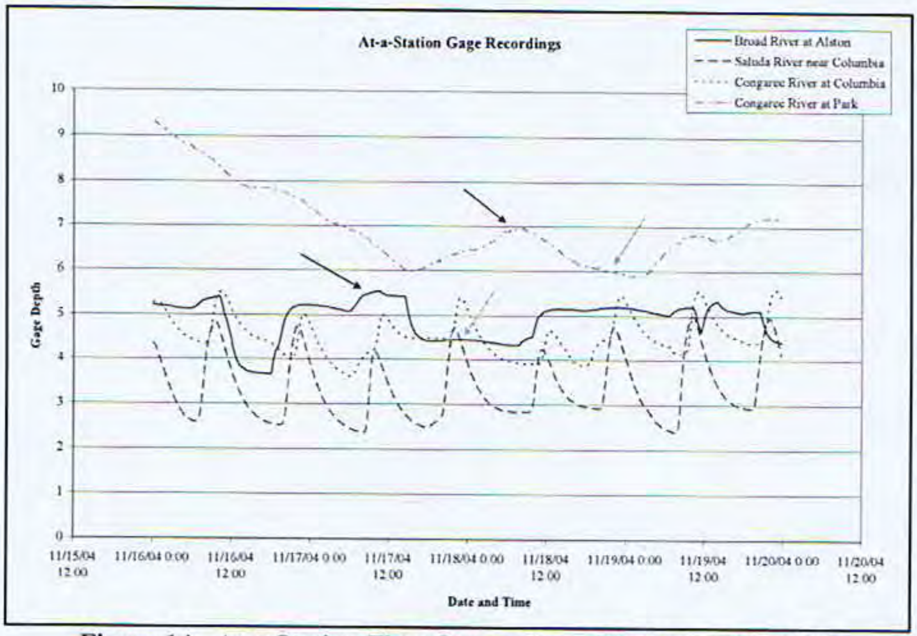

Figure 14 - At-a-Station Flow Comparison, Mid-November 2004
Source: Data from U.S. Geological Survey

Second, **Figure 14** also indicates that releases from the Saluda Dam, on average, do not significantly affect daily variations in flow of the Congaree River at Congaree National Park. On average, twice as much water flows down the Broad River than in the Saluda. When the two converge, the peaking nature of the Saluda River is largely negated by Broad additions. By the time a Saluda Dam-generated peak reaches the park (14.5 hours), its effects have been mostly attenuated by distance and the volume of flow added by the Broad River. On average, stage fluctuations at the park occur between 0.25 to 0.5 feet in response to Saluda Dam releases; reaching the park in approximately 15 hours (**Figure 15**). The data indicate however that the Broad River discharges are so much greater than the flows of the Saluda that the Broad is the major determinant of hydrologic conditions in the Congaree River at the park.

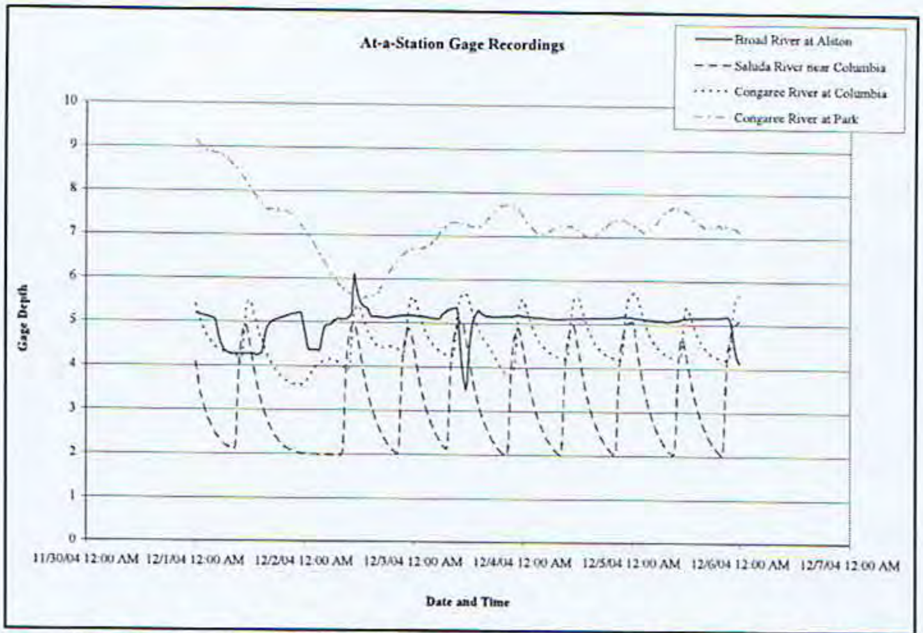

Figure 15 - At-a-Station Flow Comparison, Early December 2004
Source: Data from U.S. Geological Survey

Flows in Cedar Creek at Congaree National Park

Cedar Creek is a north-bank tributary of the Congaree River that flows through Congaree National Park. Its responses to flow changes in the Congaree River give an indication of hydrologic responses in the park to changes on the main river. The USGS reports the Cedar Creek at Congaree National Park near Gadsden, SC as "located in the Congaree River flood plain. When flood conditions exist on the Congaree River (stages greater than about 16 ft gage height at [gage site] 02169625 [Congaree River at Congaree National Park near Gadsden, SC]) varying degrees of backwater affect flow at this site" (U.S. Geological Survey 2005). Daily flow records at both sites provide evidence to define the hydrologic connection between the Congaree River and Cedar Creek. At the timescale of two years, there appears to be a close relationship between these two locations, at a range of depths **(Figure 16)**. At the timescale of a single month, however, the data show that a close connection between the two sites becomes apparent when gage depth reaches approximately 8 (not 16 ft) on the Congaree River (**Figures 17** and **18**).

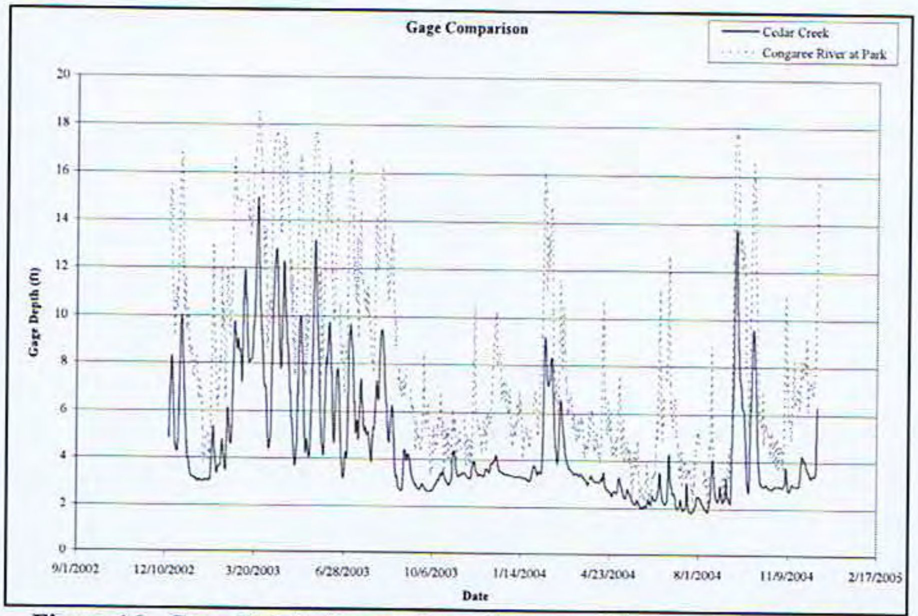

Figure 16 - Gage Height Comparison, Congaree River and Cedar Creek
Source: Data from U.S. Geological Survey

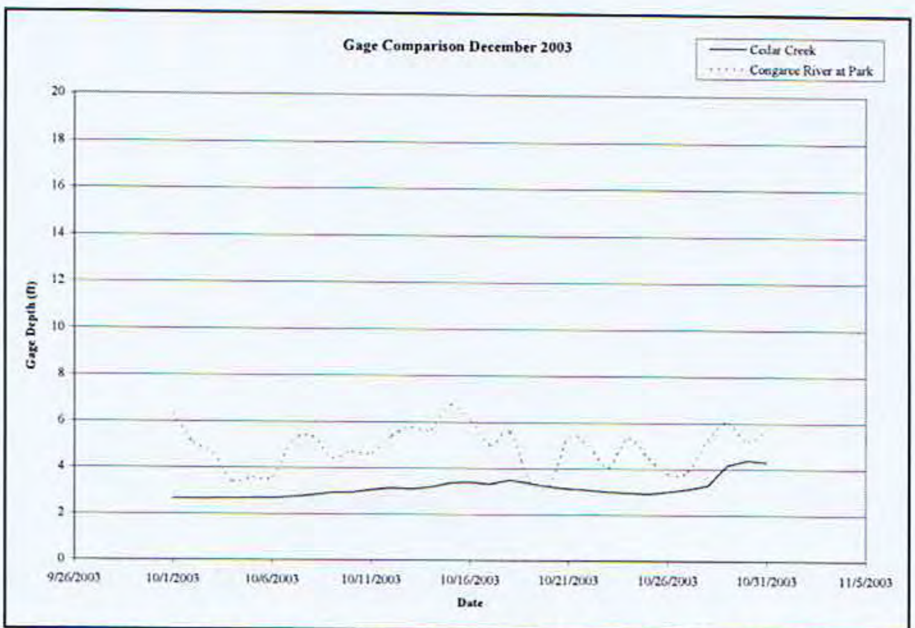

Figure 17 - Gage Height Comparison, Congaree River and Cedar Creek (Dec 2003)
Source: Data from U.S. Geological Survey

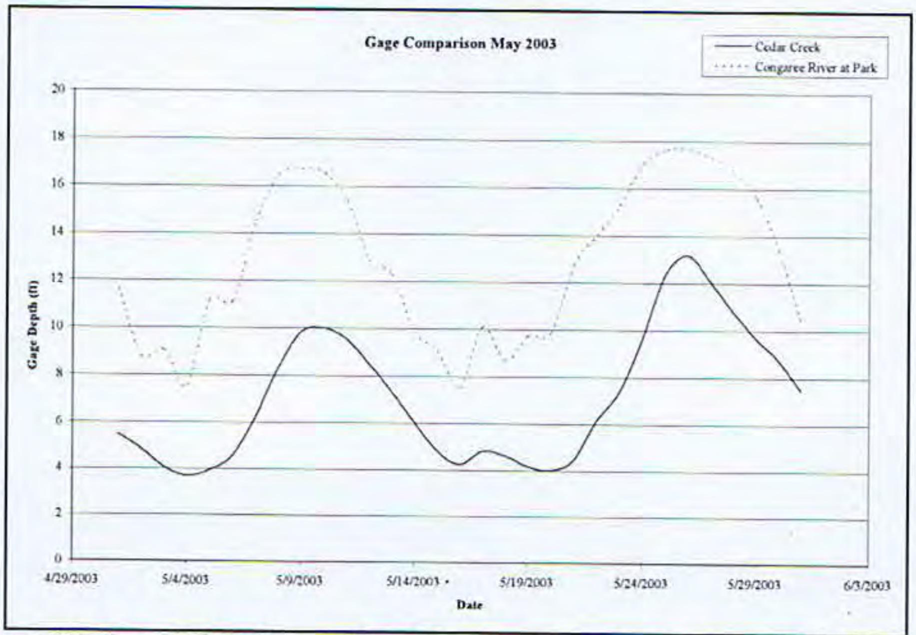

Figure 18 - Gage Height Comparison, Congaree River and Cedar Creek (May 2003)
Source: Data from U.S. Geological Survey

Conclusions

Analysis of the observational data from stream gages in the Saluda, Broad, and Congaree rivers reveal the following answers to the questions that initiated this report:

What are the relative contributions of the Saluda and Broad Rivers to the Congaree River at the park? The Broad River contributes approximately two-thirds of the mean annual flow of the Congaree River, and the Saluda River contributes approximately one-third. The Broad River flows are so large, with respect to those in the Saluda, that the Broad is the primary influence on the Congaree in the vicinity of the park.

To what degree does the operation of the Saluda Dam on the Saluda River affect the hydrology of the Congaree River at the park? Operations of Saluda Dam have relatively little effect on flows of the Congaree River near the park, with daily and hourly fluctuations introduced into the Saluda essentially washed out by variations in the Broad River contributions. Minimal fluctuations in flow occur at the park (0.25 – 0.5 feet in gage height) as a result of Saluda Dam operations.

Were recent operations of Saluda Dam during modifications of the structure run-of-river, and did they influence flows of the Congaree River at the park? Recent operations of Saluda Dam are unlikely to have influenced flows in the Congaree River near the park. Dam operations during the drawdown period were not exactly run-of-river, but were modified run-of-river.

How quickly does the Congaree River transmit waves or pulses of flow from the Columbia area to the park area? Waves or pulses of flow require about 15 hours to reach the Congaree River near the park from the Saluda River near Columbia (essentially Saluda Dam), and about a day to reach the park from the Broad River near Alston (essentially Parr Shoals Dam).

At what stage level in the Congaree River at the park do main river flows begin to affect flows in Cedar Creek? Although previous U.S. Geological Survey estimates were that Congaree River waters begin to affect the flow of Cedar Creek at its gage site when main river flows reach a stage depth of 16 feet, recent investigations show influence beginning when stage depths reach 8 feet.

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Appendix B

Saluda Hydroelectric Project (FERC Project 516) Recreation Site Property Designation

APPENDIX B
Saluda Hydroelectric Project (FERC Project 516)
Recreation Site Property Designation

Park Site Number	Sheet Number	Park Site Name	Existing Park	Existing Future Park	Proposed Future Park	Acres Inside PBL	Acres Currently Outside PBL*	Total Acres
1-01	1	Park Site 1 - Lexington Side	X			17.84	0	17.84
1-02	2	Larry L. Koon Boat Landing	X			1.83	0	1.83
1-02A	3	Shull Island Future Site		X		22.4	0	22.4
1-02B	2	Shull Island	X			0.36	0	0.36
1-03	4	Murray Shores	X			1.61	0	1.61
1-04	5	Riverbend	X			1.77	0	1.77
1-04A	5	Riverbend Future Site		X		9.84	0	9.84
1-04B	5	Riverbend Proposed Site			X	5.87	0	5.87
1-05	6	Sunset	X			2.28	0	2.28
1-05A	7	Simpson's Ferry		X		11.58	0	11.58
1-05B	6	Sunset Proposed Site			X	9.58	22	31.58
1-06	8	Rocky Point	X			1.73	0	1.73
1-06A	9 & 10	Long Pine (Includes Parcels A & B)		X		31.42	0	31.42
1-06B	9	Long Pine Proposed			X	0	20	20
1-07	11	Hilton	X			4.36	0	4.36
1-07A	12	Hilton Future Site		X		27.86	0	27.86
1-08	13	Dam Site - Irmo Side	X			6.83	0	6.83
1-09	14	Saluda Shoals**	X			160	0	160
1-10	15	James R. Metts Landing	X			2.28	0	2.28
1-11	16	Dreher Island State Park	X			348	0	348
1-12	17	Macedonia Church		X		4.83	0	4.83
1-13	18	Higgins Bridge	X			1.12	0	1.12
1-14	19	Kempson Bridge	X			0.98	0.05	1.03
1-15	20	Gardendale	X			4.65	0	4.65
1-16	21	Water Treatment Plant		X		4.3	0	4.3
1-17	22,23,24	Stone Mountain		X		26.49	0	26.49
1-18	25	Cloud's Creek		X		3.04	0	3.04
1-19	26	Big Creek		X		22.34	0	22.34
1-19A	26	Big Creek Proposed			X	0	15	15
1-20	27	Little Saluda Point		X		15.4	0	15.4

APPENDIX B

Saluda Hydroelectric Project (FERC Project 516)

Recreation Site Property Designation

Park Site Number	Sheet Number	Park Site Name	Existing Park	Existing Future Park	Proposed Future Park	Acres Inside PBL	Acres Currently Outside PBL*	Total Acres
1-20A	27	Little Saluda Point Proposed			X	14.18	0	14.18
1-21	28	Bundrick Island		X		87.89	0	87.89
1-22	29	Lake Murray Estates Park	X			7.15	0	7.15
1-25	30	Old Corley Bridge Road			X	0	2	2
1-26	31	Shealy Road Access			X	15.62	12	27.62
1-27	32	Shealy Point			X	36.9	3.2	40.1
1-28	33	Rocky Creek			X	102	546	648
1-29	34	Little Harmon's Bridge			X	2.83	0.87	3.7
1-30	35	Crayne's Bridge Public Park			X	9.9	38	47.9
1-31	36	Twelve Mile Creek			X	52	0	52
1-32	37	Candi Lane			X	0	3.08	3.08
1-33	38	Lower Saluda River			X	275.14	0	275.14
					Total	1354.2	662.2	2016.4

* - Note - all recreation site property currently outside the Project Boundary Line (PBL) will be surveyed and brought inside the PBL after issuance of the new license.

** - Saluda Sholas Park - The acreage designated as inside the PBL is leased to the Irmo Chapin Recreation Commission (ICRC) which owns Saluda Shoals Park. Saluda Shoals Park includes property outside of the PBL which is owned by ICRC, however, SCE&G is only taking credit in our license application for the 160 acres inside the PBL. Any Saluda Shoals Park property outside of the PBL is not accounted for as part of the acres listed since SCE&G does not own it and does not plan to bring it into the PBL.

Exhibit F of the Saluda Hydroelectric Project Recreation Plan

Files Included Separately

Figure D-2

Lower Saluda Proposed Recreation Sites

Figure D-2
Lower Saluda
Proposed Recreation Sites
Revision 1 (11-20-09)

Proposed Future Rec Site	Number
E.P. Corley	1
Kleckley	2
Kleckley	3
Corley	4
Gardendale	5
Gardendale	6
Drafts	7
Mathias	8
Meetze	9
Trapp	10
Richland Power Company	11
M. Hook	12
W. Hook	13
B. Hook	14
Twelve Mile Creek	1-31
Candi Lane	1-32

Legend

PBL

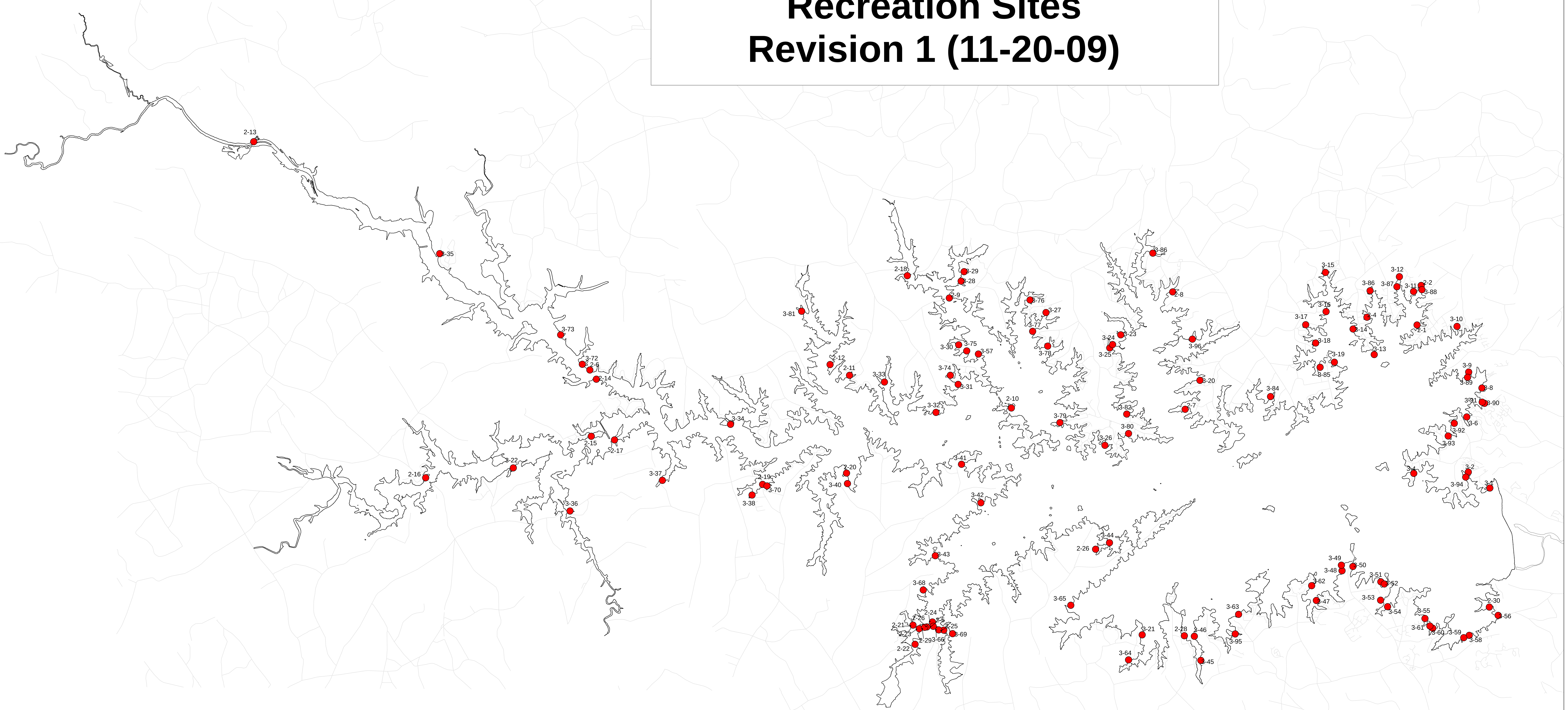
Saluda River

SCE&G A SCANA COMPANY

1 inch equals 1,000 feet

Recreation Plan Figure A-4 Revision 1

Figure A-4
Commercial and Private Recreation Sites
Revision 1 (11-20-09)



Lake Murray Public Access Recreation

NAME	CODE	Description
Lake Murray Marina	2-1	Restaurant
Billy Dreher Island State Park	2-10	
P-L Landing	2-11	Ramp; Dock; Food; Motel
Holland Landing	2-12	Food; Camping; Bait & Tackle
Saluda River Resort	2-13	Ramp; Tackle; Food; Camping
Blacks Bridge Marina	2-14	Ramp; Dock; Food; Bait & Tackle
Barn	2-15	Food; Bait & Tackle; Camping
Little River Landing	2-16	Ramp; Bait & Tackle; Food
Little River Marina	2-17	Ramp; Dock; Bait & Tackle; Food
Crayne's Landing	2-18	Bait & Tackle;Food;Ramp;Dock;Fishing Dock
Spinner's Marina	2-19	Ramp; Dock; Bait & Tackle; Food; Multi-Slip;Cottage Rental
Agnew Lake Services	2-2	
Acapulco	2-20	Ramp; Dock
The Last Resort	2-21	Boat Ramp;Multi-Slips
Roys Landing	2-22	Ramp; Dock
Adams Towne	2-23	Ramp; Dock; Camping
Holiday Shores Point	2-24	Ramp; Dock
Southshore Marina	2-25	Bait & Tackle; Food
Siesta Cove	2-26	Camping; Food; Bait & Tackle
Captain's Choice Marine	2-27	Boat Sales;Repairs
Hendrick Landing	2-28	Ramp; Dock
Weed's	2-29	Boat Sales
Jakes Landing	2-30	Food
Lighthouse Marina	2-4	Restaurant;Ramp
Charlie's Fisherman's Wharf	2-5	Restaraunt;Multi-Slip
Riverwinds Landing	2-6	Cottage Rental;Ramp;Multi-Slip;Bait & Tackle
Putnams Landing	2-7	Bait-Tackle; Food
Eptings Landing	2-8	Camping
Bucks	2-9	Ramp; Dock
Lake Murray Private Access Recreation		
Columbia Sailing Club	3-1	Private Club
Ballentive Cove	3-10	Subdivision
North Lake Development	3-11	Subdivision
Shadowood Subdivision	3-12	Subdivision
Coast Guard Auxillary	3-13	
Woodmen of the World	3-14	Private Club
Cedar Cove Subdivision	3-15	Private Club
Forty Love Point Subdivision	3-16	Private Club
Indian Fork	3-17	Private Club
Lake Murray Boating/Sporting Club	3-18	Private Club
Lake Murray Sailing Club	3-19	Private Club
Yacht Cove	3-2	Condo
Hilton Place	3-20	Subdivision
Turner's Pointe	3-21	Multi-Slip;Ramp;Subdivision
Camp Barstow (Boy Scouts of America)	3-22	Camping;Swimming;Docks
Plantation Hills	3-23	Subdivision
Shady Acres	3-24	Subdivision
Night Harbor	3-25	Subdivision
Timberlake	3-26	Subdivision
Stephenson Lakes	3-27	Subdivision
Lake Wood	3-28	Subdivision
Smallwood	3-29	Subdivision
Newberry Lions Club	3-30	Private Club
Newberry Exchange Club	3-31	Private Club
Edgewater Shores	3-32	Subdivision
The Club at Plantation Point	3-33	Multi-Slip;Ramp;Subdivision
Newberry Firemans Association	3-34	
Lake View Subdivision	3-35	Subdivision
Clouds Creek Estates	3-36	Subdivision
Crystal Springs Creek	3-37	Subdivision
Nautical Shores Subdivision	3-38	Subdivision
Pine Island Club	3-4	Private Club
J.B. Martin Employee Club	3-40	Private Club
Columbia Farms Employee Club	3-41	Private Club
Lexington County Law Enforcement	3-42	Private Club
Harbor Watch	3-43	Subdivision
Leesville Fire Department	3-44	Private Club
Moss Rock Subdivision	3-45	Subdivision
Hallmark Shores	3-46	Subdivision
The Landings	3-47	Subdivision
Mallard Shores	3-48	Condo
Spences Point	3-49	Condo
Lands End	3-50	Condo
Harborside	3-51	Condo
Windward Pointe	3-52	Subdivision
Harbor Place	3-53	Subdivision
Mallard Cove	3-54	Condo
Secret Cove	3-55	Subdivision
Boardwalk Villa	3-56	Condo
Friendly Boating Club	3-57	Private Club
Hegman Place	3-58	Common;Subdivision
Pilgrim Point	3-59	Common;Subdivision
Clearwater Cove	3-6	
Whitewater Bay	3-60	Common;Subdivision
Kingston Harbour	3-61	Common;Subdivision
Spence Plantation	3-62	Common;Subdivision
Cherokee Shores	3-63	Multi-Slip;Ramp;Subdivision
Hammock Bay	3-64	Common;Subdivision
Pintail Point	3-65	Multi-Slip;Ramp;Subdivision
Adams Towne	3-66	Ramp;Docks;Camping
Lake Village	3-68	Common;Subdivision
Marina Cove	3-69	Common;Subdivision
Sandhill Landing	3-70	Common;Subdivision
The Barn	3-71	Food; Bait & Tackle; Camping;Ramp
El Paraiso	3-72	Common:Subdivision
Harborview	3-73	Common;Subdivision
Autumn Cay	3-74	Common;Subdivision
Beaufort Shores	3-75	Common;Subdivision
The Oaks	3-76	Common;Subdivision
The Reserve at Lake Murray	3-77	Common;Subdivision
Paradise Cove	3-78	Multi-Slip;Ramp;Subdivision
Crystal Pines	3-79	Common;Subdivision
The Village	3-8	Subdivision
Magnolia Key	3-80	Common;Subdivision
Churchhill Landing	3-81	Common;Subdivision
The Penisulas	3-82	Common;Subdivision
Bush River Plantation	3-83	Common;Subdivision
Palmetto Shores	3-84	Common;Subdivision
The Estates at Hilton	3-85	Common;Subdivision
Lakeport	3-86	Common;Subdivision
Lakeside	3-87	Multi-Slip;Ramp;Subdivision
Johnny Shealy	3-88	Ramp
Bell Mont	3-89	Common;Subdivision
Tattlers Wharf	3-9	Subdivision
Wexford	3-90	Common;Subdivision
The Palms at Rocky Point	3-91	Common;Subdivision
Selwood Shores	3-92	Common;Subdivision
Regatta	3-93	Common;Subdivision
Lake Murray Docks, Inc	3-94	Private Club;Multi-Slip
Beechcreek Place	3-95	Common;Subdivision
Manor of Wingfield	3-96	Common;Subdivision

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1 inch equals 1 miles

Exhibit B-1 Revision 1

EXHIBIT B-1

Saluda Hydroelectric Project P-516

Gross Annual Generation for the Period 1988 - 2007

YEAR	GROSS ANNUAL GENERATION (MWH)	ON PEAK (Weekdays HE 8-23) MWH	OFF- PEAK MWH
1988[1]	60,747	40,799	19,948
1989	209,182	173,605	35,577
1990[1]	269,289	176,292	92,997
1991	222,560	149,902	72,658
1992	210,541	132,041	78,500
1993	286,302	174,785	111,517
1994	219,788	116,707	103,081
1995	297,211	173,863	123,348
1996	233,394	127,136	106,258
1997	204,329	106,523	97,806
1998	332,152	171,716	160,436
1999	49,826	29,848	19,978
2000	93,281	60,627	32,654
2001	50,260	38,129	12,131
2002	93,875	53,112	40,763
2003	301,240	167,459	133,781
2004	94,426	49,117	45,309
2005	205,898	106,333	99,565
2006	67,438	41,379	26,059
2007	99,635	58,798	40,837
2008	25,343	15,912	9,431
AVERAGE 1988 - 2007	**180,069**	**107,409**	**72,660**

Notes:

[1] Peak and off-peak generation for 1988 and 1990 was estimated based on hourly generation data for January through November; December hourly generation data was not available for these years. Annual gross generation for these years is correct and is based on monthly total generation for all 12 months.