

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
Before the Licensing Board**

**G. Paul Bollwerk, III, Chairman
Nicholas G. Trikouros
Dr. James F. Jackson**

In the Matter of)	Docket Nos. 52-025 COL and
SOUTHERN NUCLEAR OPERATING CO.)	52-026-COL
(Combined Operating License, Vogtle Electric)	ASLPB No. 09-873-01-COL-BD01
Generating Plant, Units 3 and 4)	October 30, 2009
)	

DECLARATION OF PAULA L. FELDMAN, P.E.

1. My name is Paula L. Feldman. I am a registered professional engineer licensed in the State of Georgia. I am currently employed as a Senior Project Manager by Woodard & Curran, a national environmental consulting firm, resident in its Duluth, Georgia office. I received my Bachelors Degree in Civil Engineering and my Masters Degree in Environmental Engineering from The Georgia Institute of Technology. A copy of my *curriculum vitae* is attached as Attachment A hereto.

2. I have worked for more than 16 years as an environmental engineer, specializing in integrated water resource planning, in the southeastern United States with most of my work taking place in Georgia. I have technical expertise in water supply development and conservation, among other things, and have worked for many municipal and regional planning bodies in Georgia on water planning and water resource management projects. My work has specifically included integrating climate change forecasting and modeling into water resource planning efforts; assessing future water needs and supplies, working with hydraulic and hydrologic modeling; watershed

management; and regulatory compliance issues, including requirements governing surface water bodies. I have assisted in the development and siting of a regional water supply reservoir in northeast Georgia, including yield analyses, which include assessments of minimum in-stream flow requirements. I also have experience working on environmental impact statements to comply with the National Environmental Policy Act (“NEPA”).

3. I have reviewed the Final Environmental Impact Statement (“FEIS”) prepared by the staff of the Nuclear Regulatory Commission (“NRC”) in connection with the application of Southern Nuclear Operating Company (“SNC”) for an early site permit (“ESP”) for the proposal to add new Units 3 and 4 at the Vogtle nuclear plant (“Vogtle”). I have also reviewed the First Partial Initial Decision (June 9, 2009) and the Second Final Partial Initial Decision (August 17, 2009) rendered by the Atomic Safety and Licensing Board (the “ESP Licensing Board”) in the licensing proceedings held by the NRC on the application for an ESP, as well as some of the testimony and exhibits offered by NRC staff witnesses.

4. In September 2009, the United States Army Corps of Engineers (the “Corps”) announced a proposal to restrict releases from the Thurmond Dam, which lies upstream of the Vogtle plant on the Savannah River, under certain conditions (the “Corps’ Flow Reduction Plan”). The Corps prepared an Environmental Assessment (“EA”) in connection with that proposal. I have been asked to evaluate whether the Corps’ proposal and the accompanying EA constitute significant new information that was not accounted for in the FEIS’s analysis of the potential impacts of the proposed Vogtle expansion on the Savannah River.

Summary of Conclusions

5. In summary, it is my professional opinion that the Corps' Flow Reduction Plan constitutes significant new information that was not accounted for in the FEIS's analysis. It is reasonably foreseeable, if not likely, that the Corps will restrict releases from Thurmond Dam to 3100 cubic feet per second ("cfs") and as low as 2600 cfs during the period that the proposed Vogtle Units 3 and 4 are operational. The cumulative impacts to the river of the proposed Vogtle expansion, combined with the restricted releases from the Thurmond Dam as proposed by the Corps, are likely to cause significantly greater impacts than those evaluated in the FEIS and the ESP Licensing Board's decisions.

The Corps Proposal

6. The Corps proposes to reduce discharges from the Thurmond Dam from 3600 cfs to 3100 cfs from mid-September through mid-February when the Corps' reservoirs on the Savannah River are in Level 3 drought conditions. EA at 6. The purpose of this proposed plan is to ensure that the conservation pool in the reservoirs¹ remains as full as possible until "we are certain the drought is over. This would delay the time when drought Level 4 conditions would occur in the Corps reservoirs." EA at 11, ¶ 1.1.3. Releases could be lowered to as low as 2600 cfs during these months. EA at 11, ¶ 1.2.

Likelihood of Future Severe Droughts

7. The Corps' EA says that the "present drought is expected to end" before the new Vogtle Units 3 and 4 would come on line, thus suggesting that the proposed restrictions on releases from Thurmond Dam will not take place after Units 3 and 4 becomes operational. EA at 78. Contrary to this suggestion, it is not only reasonably foreseeable, but I believe likely, that the Corps will have to implement the proposed

¹ The conservation pool is the active storage pool of the reservoir.

restrictions recurrently over the next several decades. The Corps says it would implement this plan whenever level 3 drought conditions are reached before the conservation pools are refilled. EA at 10-11. The Corps' proposal apparently was prompted by the recent severe (Level 3) drought in the southeast that began in 2006, which placed "extreme pressure and difficulties" on the Savannah River reservoir system. EA at 10. Although the most recent drought to which the Corps refers ended in June 2009, has ended,² such drought conditions can reasonably be expected to recur in the future -- which is presumably why the Corps proposed this plan. As the Corps states, "[w]ith the uncertainties that surround the subject of weather and rainfall forecasting, the District is uncertain whether the drought will worsen and we will again reach level 3 conditions before the pools refill. This EA was developed so that the District would be prepared to conserve water in the reservoirs again in the fall/winter should the system again reach Level 3 conditions." EA at 10-11.

8. Although predicting weather and rainfall is uncertain business, the risk of severe drought likely will *increase* in the future in light of anticipated climate change patterns.³ Generally accepted climate change models indicate that significant changes in weather patterns are likely to occur in the southeastern United States in the next several decades, resulting in lower lake levels and water supply shortages. A leading authority has stated: "Future droughts are likely to be intense with the potential to exacerbate

² www.cbsatlanta.com/news/19712975/detail/html (last visited 10/27/2009)

³ J.H. Christensen et al., "Regional Climate Projections," in *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, S. Solomon et al., (eds.) (Cambridge, U.K.: Cambridge University Press, 2007).

stresses and water use conflicts.”⁴ Reviewing past drought patterns, Georgia’s state climatologist, David Stooksbury, states that Georgia “can expect a drought of two or more years on average about once in 25 years.”⁵

9. In short, if Vogtle Units 3 and 4 are approved and become operational, the additional water demands placed on the river by those units will very likely occur during periods when the Corps restricts discharges from Thurmond Dam under its recently proposed flow reduction plan. The cumulative impacts of these reasonably foreseeable events have not been addressed in the ESP FEIS and could be significant.⁶

Relationship of Discharges From Thurmond Dam to River flows at Vogtle

10. In the Vogtle ESP licensing proceedings, the NRC witnesses asserted (and the ESP Licensing Board found) that river flows near the Vogtle plant historically have been higher than release rates at the Thurmond Dam, and “rarely fell” below 3800 cfs even when releases from the Thurmond dam have dropped to as low as 3100 cfs. Second Final Partial Initial Decision, ¶ 4.18. NRC staff concluded that the impacts of the proposed Vogtle expansion on the river would be SMALL because water use of Units 3 and 4 would constitute a very small fraction of the assumed low flow of 3800 cfs. For

⁴ Aris P. Georgakakos, “Climate Change Assessment for the ACF River Basin,” Georgia Water Resources Institute Report, 2003.

⁵ David E. Stooksbury, “Historical Droughts in Georgia and Drought Assessment and Management,” *Proceedings of the 2003 Georgia Water Resources Conference, held April 23-24, 2003*, University of Georgia, Kathryn Hatcher, editor, Institute of Ecology, University of Georgia, Athens, Georgia.

⁶ The ESP FEIS did not even include the most recent drought (now the drought of record) in its evaluation, because it was considered to be too extreme. NRC staff, while acknowledging that there have been two recent periods of significant droughts, stated that they did not “necessarily” see these as indicative of a long-term trend. Second and Final Partial Initial Decision, ¶ 4.19. For the reasons discussed above, drought conditions at least as severe as those recently experienced are likely to recur in the future and should be considered in assessing potential environmental impacts of the Vogtle expansion.

example, consumptive water use of Units 3 and 4 (not including Units 1 and 2) would, according to the NRC, use only 1.7 percent of the assumed low flow of 3800 cfs. ESP FEIS at 7-4 and 7-5.

11. These statements, however, do not provide any basis to conclude that the surface water impacts of the proposed Vogtle expansion (or the Corps' Flow Reduction Plan) would be SMALL. For purposes of water quality protection, water withdrawal is not permitted, and its impacts are not assessed, on the basis of the percent of river flow consumed by the proposed new user. Rather, potential adverse water impacts are evaluated and permitted based on the ability of a proposed withdrawer to maintain downstream flows at a rate that equals or exceeds the "7Q10" -- the minimum 7-day average flow experienced on a river segment during any 10-year period. The percent of normal or low flow volumes consumed by the proposed new use, standing alone, is irrelevant.

13. Apparently, NRC staff concluded that 3800 (more precisely, 3828) cfs is the 7Q10 flow that must be maintained at the Vogtle plant to protect the river as determined by the 7Q10 flow. This conclusion was based on calculations using historical flow data collected from April 1986 until March 2003 at the "Savannah River at Augusta" gage site maintained by the USGS. See ESP FEIS at 2-20.

14. In fact, the "Savannah River at Augusta" gage (Gage # 02197000) is not the closest gage to the Vogtle site. It lies about 34 river miles upstream of Vogtle. Another gage, known as "Savannah River Near Jackson," is located closer to Vogtle, only six

miles upstream of the Vogtle plant. (Gage # 02197320).⁷ See Attachment B hereto, based on USGS stream gage data taken from “Digital Environmental Atlas of Georgia,” Georgia Geologic Survey Publication CD-1, Version 2 published by USGS (2002). Historical flow data from the closer gage more accurately determines potential impacts of the Vogtle plant. At this location, the 7Q10 flow as determined by the Georgia Environmental Protection Division’s Watershed Protection Branch (“EPD-WPB”) is 4070 cfs, not 3800 cfs.⁸ Thus, even if one could assume that river flows at the gage nearest Vogtle plant would “rarely” drop below 3800 cfs when releases from Thurmond Dam decrease to 3100 cfs, those river flows would be more than 200 cfs below the 7Q10 flow required at the to protect the Savannah River and its resources. (It also says nothing about what the river flows near Vogtle would be if discharges from Thurmond Dam drop to 2600 cfs, as is contemplated by the Corps’ Flow Reduction Plan).

15. Furthermore, even if flows of 3800 cfs at Vogtle were adequate to protect the river, the NRC staff has not presented data from which one could confidently conclude that those in-stream flow levels will be maintained when the Corps implements its proposed Flow Reduction Plan. The NRC staff has merely presented some data points showing that on past occasions when releases from Thurmond Dam dropped to their “historical lows” of 3100 cfs, river flows around Vogtle “rarely” dropped below 3800

⁷ The ESP FEIS (at 2-18 and 21-91) does set forth historical flow measurements for the period for the “Savannah River at Jackson” gage for the period October 1971 through September 2002, but does not calculate a 7Q10 flow for that location based on the data presented.

⁸ Telephone conversation between Jennifer Suttles, PE of Woodard and Curran, and Paul Lamarre, Georgia EPD-WPD, Water Quality Monitoring Unit, October 27, 2009. The state’s determination of the applicable 7Q10 flow closest to Vogtle differs not only because it is based on data from a different location on the river (closer to Vogtle), but also because the State’s calculation is based on historical monitoring data for a much longer period -- from January 1953 until July 2006, as opposed to the 17 years of data on which the NRC’s calculation for the Augusta gage was based.

cfs. But the NRC has not presented any comprehensive analysis or modeling to demonstrate that the watershed conditions that existed on those occasions in the past are likely to exist for all or most of the time during five months each year when the Corps may implement its Flow Reduction Plan. Without presenting more complete information, more comprehensive analysis and modeling results, there is no valid basis to conclude that future implementation of the Corps' proposed plan will maintain in-stream river flows near Plant Vogtle at 3800 cfs, let alone 4070 cfs.

Potential Downstream Impacts

16. The potential cumulative impacts in question are not necessarily confined to the area in the immediate vicinity of the Vogtle plant, but could extend far downstream, potentially to Savannah Harbor. This is illustrated by the fact that the Corps' EA discusses the potential impacts of the proposed Flow Reduction Plan all the way to Savannah Harbor. For example, the EA addresses the proposed flow restrictions on (1) dissolved oxygen concentrations in the river downstream of the Vogtle site; (2) chloride concentrations in the estuarine portions of the river downstream to Savannah Harbor; and (3) downstream impacts of municipal and industrial water supply needs and intakes. EA at 47-76.

17. The EA presents modeling results suggesting that, if releases from Thurmond dam are limited to 3100 cfs, concentrations of dissolved oxygen ("DO") in the river would remain at or above (*i.e.*, in compliance with) the regulatory standard of 5 milligrams per liter, or parts per million ("ppm"), which is necessary to support the designated use of the river to support striped bass. EA at 53. However, the impacts on DO concentrations if releases are reduced to 2600 cfs (as may occur) were not modeled.

EA at 53. And none of the modeling accounted for the potential combined impacts of the restricted dam releases coupled with the addition of Vogtle Units 3 and 4, since the EA assumes incorrectly that the Flow Reduction Plan will never be implemented while Units 3 and 4 are operational.

18. It is important to note that the potential impacts of Vogtle Units 3 and 4 do not arise solely from their consumptive water use. The new reactors also will discharge heat to the river. All else being equal, increasing the heat in the river will reduce the DO levels in the river. And all else being equal, the lower the river flow, greater the adverse impact of those thermal discharges on DO levels. Thus, the cumulative impacts of proposed Vogtle Units 3 and 4, in combination with the Corps' proposed Flow Reduction Plan, are of concern because the combination of reduced river flows and the additional thermal discharges. These impacts have not been addressed in the Corps' EA. They have also not been addressed in the ESP FEIS.

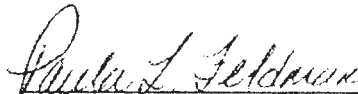
19. The EA also presents modeling of potential impacts of the Corps' proposed Flow Reduction Plan on potential estuarine water quality in the segment of the Savannah River from Clyo to the Savannah Harbor. The EA reports that there is a clear relationship between discharge rates from Thurmond Dam and chloride concentrations -- lower flows result in higher chloride concentrations. EA at 53. The City of Savannah's water supply needs are sensitive to chloride levels in excess of 12 ppm due to adverse impacts on its industrial water customers. According to the EA, the proposed Flow Reduction Plan "combined with low downstream inflows could increase the number and magnitude of chloride concentrations greater than 12 [ppm] at the City of Savannah's water withdrawal." EA at 54. Again, however, the modeling undertaken in connection

with the Corps' proposal did not include the consumptive water withdrawals of Vogtle Units 3 and 4. Again, the cumulative impacts of Units 3 and 4, combined with the Corps' proposed Flow Reduction Plan and low watershed runoff during drought conditions, could cause unacceptably high chloride concentrations in the City of Savannah's water supply, which could also adversely affect Savannah's industrial water customers. These cumulative impacts should be modeled to gain an accurate and complete understanding of the potential cumulative impacts of Vogtle Units 3 and 4 on the City of Savannah's drinking water supplies.

20. Further, some water supply providers have experienced difficulties using their intakes under river flows associated with discharges of 3600 cfs from Thurmond Dam. Additional reductions in flows, such as those that would result from Vogtle Units 3 and 4, may have even greater negative impacts on these water supply intakes and their customers. Again, the EA does not model these potential cumulative impacts, nor does the ESP FEIS. From a long-range planning perspective, this analysis is necessary to ensure that water is available to Vogtle and downstream communities who are dependent on the Savannah River for water supply needs under drought conditions.

I swear under penalty of perjury pursuant to 28 U.S.C. § 1746 that the foregoing is true and correct to the best of my knowledge, information and belief.

Dated: October 29, 2009



Paula L. Feldman, P.E.

ATTACHMENT A

PAULA FELDMAN, PE

SR. PROJECT MANAGER

WOODARD & CURRAN



Professional Profile

Paula has over 16 years of environmental engineering experience specializing in integrated water resources planning. She has technical expertise in water supply development and conservation, water treatment and distribution, wastewater collection and effluent management, and regulatory compliance.

She has worked closely with many municipal utilities to develop long-range infrastructure plans that include demographic and land use planning elements, evaluating water and wastewater treatment facilities, creating capital improvement plans, as well as financing strategies, economic analyses, permitting, and regulatory issues. She has developed master plans for over 30 water and wastewater facilities and successfully managed the delivery of master planning projects, including the City of Gainesville and the Counties of Rockdale, Forsyth, and Paulding in Georgia.

Related Experience

Water Resources Master Planning

Metro North Georgia Water Planning District (MNGWPD) – Water Supply and Conservation and Wastewater Management Plan. Managed the water demand and wastewater flow forecasts, water conservation and the inventory of water supply sources for the Metro Water District, which includes the City of Atlanta and 15 surrounding counties. The forecasts and water conservation program were rigorously modeled and presented to the Technical Coordinating Committee as well as public forums for input. Future water supply and wastewater management needs were identified through this study and practical solutions for meeting the needs of the region were identified with specific county-level implementation programs.

Clarksville Gas and Water, Clarksville TN - Sewer System Master Plan and Hydraulic Model. Managed the development of the of a collection system master plan for Clarksville, TN, which has over 200 pump stations to convey wastewater flow to a central treatment facility. This project included hydraulic modeling of the collection system and modeling evaluations of the planning alternatives, developed through collaborative workshop sessions. From the recommended plan, a 5-year capital improvements plan was developed in coordination with CGW staff, taking into account financial constraints and funding availability.

Rockdale County, GA – Water and Wastewater Master Plan Update. Project Manager directing the development of a water and wastewater master plan for Rockdale County, Georgia, including water demand and wastewater flow forecasts for a 25-year planning horizon. Identification of water supply and wastewater management needs were completed and alternative water supply and wastewater

Education

- M.S., Environmental Engineering, Georgia Institute of Technology
- BCE, Civil Engineering, Georgia Institute of Technology

Registrations

- PE - 023402 - Registered Professional Engineer - GA

management strategies were crafted to provide protection of resources and budgetary constraints. A capital improvements and financial plan was also developed as part of the project.

City of Gainesville, GA – Wastewater Master Plan. Project Manger for the City of Gainesville's system-wide wastewater master plan. Wastewater flow projections were developed by sub-basin and a hydraulic sewer model was developed and calibrated. Five system-wide alternatives were devised through collaborative workshop sessions with Gainesville staff and were evaluated using the model. Recommendations for treatment locations, capacities and collection system improvements and expansions were made; a phased capital improvements plan for the recommendations was developed to prioritize infrastructure recommendations.

City of Dahlonega, GA – Water and Wastewater Master Plan. Project Manger for the City of Dahlonega's water and wastewater system plan. Work included developing water demand and wastewater flow projections for the 20-year planning horizon for the City. Managed computer hydraulic modeling for the water distribution and wastewater collection systems to assess existing and future capacity needs. Conducted thorough analysis of recommendations for process improvements, and developed probable costs for recommended improvements, along with a phased implementation plan.

Oconee County, GA – Local Resevior Planning. Prepared a yield analysis for a northeast Georgia county reservoir, evaluated the downstream impacts and minimum in-stream flow requirements based on USGS gage station data.

Athens-Clarke County, GA – Water and Wastewater Connection Fee Evaluations. Evaluated water and wastewater connection fees in Athens-Clarke County and developed an inventory of all assets. Used a spreadsheet model developed specifically for the County to complete a full cost connection fee analysis.

Forsyth County Water and Sewer Department, GA – Wastewater Master Planning. Developed a wastewater system master plan for the County. Evaluated 54 alternativese which included various types of treatment regimes, using a spreadsheet hydraulic model.

Paulding County, GA – Wastewater Master Plan. Managed the development of a wastewater system master plan for the County, including wastewater flow projections through 2030, assessment of the existing wastewater collection system, and future infrastructure recommendations. Developed estimates of probable cost and phased implementation plans.



Barrow County, GA – Wastewater Master Plan. Developed scenarios that that included different treatment strategies ranging from land application to membrane facilities capable of reuse quality effluent. Developed a spreadsheet hydraulic model for each alternative using economic and non-economic criteria. Developed a capital improvements plan for the recommended option.

Oconee County, GA – Wastewater Master Plan. Developed wastewater master plan for the County requiring the expansion of the existing wastewater system and development of an overall treatment and collection system strategy. Prepared five treatment alternatives ranging from land application to reuse quality membrane facilities. Developed and evaluated a collection system plan for the selected scenario using a spreadsheet hydraulic model and prepared a capital improvements plan for the recommended option.

City of Toccoa, GA - Wastewater Master Plan Served as Project Engineer for water and sewer rate studies for the City. Work included budget analysis and water and wastewater usage analysis. Determined actual and theoretical water and sewer rates. Recommended rate structures based on the results of these evaluations.

Gainesville, GA – Wastewater Master Plan. Served as Project Engineer for a wastewater facilities master plan for the City. Projected population with wastewater service and projected wastewater flows to each treatment facility and used the projections to determine phasing of the wastewater treatment facility upgrades and expansions to the City.

Lowndes County, GA – Water and Wastewater Master Plan. Developed water and wastewater master plans for the County including projecting water demands and wastewater flows and evaluating water and wastewater facilities. Modeled and evaluated average day, peak day, and fire flow demands and evaluated the water quality in the distribution system.

Northeast Georgia Regional Reservoir. Assisted in the development and siting of a regional water supply reservoir in Northeast Georgia. Yield analyses taking into account minimum in-stream flow requirements were developed for a variety of impoundment locations.

Athens-Clarke County, GA – Water and Wastewater Service Delivery Plan. Developed water and wastewater service plans for the County. Work included population projections, water demand, and wastewater flow through the planning year 2015, and, using the projected demands and flows, evaluated the existing facilities. Recommended improvements to meet future needs and input recommendations into capital improvements plan.

Monroe Water, Light, and Gas Commission, Monroe, GA – Water Conservation Plan. Lead Engineer responsible for developing water conservation plan. Work included analyzing water use data, building codes, municipal codes, and developed a drought contingency plan along with a emergency response plan.

Athens Area Technical School, Athens, GA – Wastewater Infrastructure Plan. Served as lead engineer responsible for estimating wastewater flows over a 20-year planning period for the proposed Athens Area Technical School. Evaluated two alternative gravity sewer routes and a wastewater pump station and force main for feasibility and cost effectiveness. Prepared a design development report to recommend the most effective method of wastewater collection in Elberton, Georgia.

Hydraulic Modeling

City of Columbus, GA – Water System Evaluation. Evaluated a 12-mgd water system using WaterCAD modeling software as part of a facilities master plan for the City. Work involved distribution system testing and model calibration, water demand evaluations including unaccounted-for water and recommendations including the addition of distribution system storage and increased transmission main sizes that would provide adequate fire protection.

City of Butler, OH – Hydraulic Modeling. Served as project engineer responsible for analyzing a 15-mgd water distribution system. Used EPANet, a distribution system computer model, to formulate and evaluate four water supply alternatives to determine the hydraulic impact and required system improvements in Butler County, Ohio.

Monroe Water, Light, and Gas Commission, Monroe, GA – Hydraulic Modeling. Served as lead engineer responsible for evaluating a 5-mgd municipal water distribution system for Monroe Water, Light, and Gas Commission. Developed a model of the distribution system, collected pressure-flow test information, calibrated the model based on the field data, and evaluated the existing system. Modeled and evaluated average day, peak day and fire demands and recommended short-term improvements based on the model results. Projected water demands through the year 2020 and used them to evaluate the future system and to determine improvements needed to adequately supply these demands. Also recommended long-term improvements and prepared a report documenting the findings of the study.

Town Creek Wastewater Plant, Macon, GA – Hydraulic Analysis. Evaluated a transient hydraulic condition analysis at the proposed 80-mgd Town Creek water treatment plant, in Macon, Georgia, using the SURGE computer program. Modeled the two raw water pumping systems and the finished water pump station and distribution system and used these models to evaluate pressure surge conditions and appropriate system improvements.



Lowndes County, GA – Hydraulic Modeling. Served as lead engineer responsible for preparing a design development report for the addition of a 500,000-gallon elevated water storage tank to a water distribution system in Lowndes County, Georgia. Determined the tank's location, volume, and overflow elevation. Developed and used an EPANet hydraulic computer model and conducted a present-worth analysis to estimate the cost of owning and maintaining the tank over its useful life. Estimated capital costs and presented the results in a report.

City of Spartanburg, SC – Hydraulic Modeling. Evaluated a transient hydraulic condition analysis at the proposed 30-mgd Lake Blalock water treatment plant in Spartanburg, South Carolina, using the SURGE computer program. Modeled the raw water pump system and the finished water pump station and distribution system. Using these models, evaluated pressure surge conditions and appropriate system improvements.

South Dade County, FL – Hydraulic Modeling. Developed a 20-year water supply master plan for South Dade County, Florida. Developed and calibrated a water distribution system model using the CyberNet hydraulic computer model, projected water demands, disaggregated the demands to representative nodes within the model, evaluated the system and determined whether adequate water supply exists to extend the service area. Formulated and evaluated 23 system alternatives, including interconnections with other cities, using the distribution system model. Conducted a cost evaluation of each alternative, including all aspects of the water system, raw water supply, water treatment, and distribution. Presented the results of the evaluation in a water system master plan report.

Treatability Studies

Monroe Water, Light, and Gas Commission, Monroe, GA – Treatability Studies. Served as lead project engineer for the development of a sludge management plan for the Monroe Water, Light, and Gas Commission in Monroe, Georgia. Evaluated a 500-acre, potential land application site, coordinated and conducted soil and wastewater sampling, analyzed laboratory test results, and calculated application rates for appropriate crops as well as build-up of metals in the soil. Identified areas suitable for land application and selected a land application method for each area. Prepared a technical report summarizing the findings and prepared and submitted a permit application to the state regulatory agency.

City of Greenwood, SC – Treatability Studies. Conducted jar tests to determine the type polymer and dose to remove excess metals in the wastewater in Greenwood, South Carolina.

Everglades National Park, FL – Treatability Studies. Served as project engineer responsible for conducting jar tests to determine the type of treatment required to remove total organic carbon, color, and hardness from the groundwater at the Everglades National Park in Florida.

Water, Wastewater, and Stormwater Design

Georgia International Horse Park, Conyers, GA – Water and Wastewater Design. Served as lead engineer for the design of water and wastewater facilities at the Georgia International Horse Park, site of the equestrian Olympic venue. Estimated water and wastewater flows and sized water mains, gravity sewer lines, a force main and a pump station. Also prepared detail design including contract documents and oversight of drawing production for 10,000 feet of 8-inch water mains, 12,000 feet of 8-inch gravity sewer, a 500-gpm wastewater pump station, and 20,000 feet of 8-inch wastewater force main in Conyers, Georgia.

City of Toccoa, GA – Stormwater Design. Served as project engineer for drainage and roadway improvements in Toccoa, Georgia, including detailed design, preparation of specifications, and oversight of CAD drawing preparation for improvements along three urban streets. Designed culverts, storm sewers, catch basins, curb and gutter, drop inlets, and roadway widening, as well as sanitary sewer relocation.

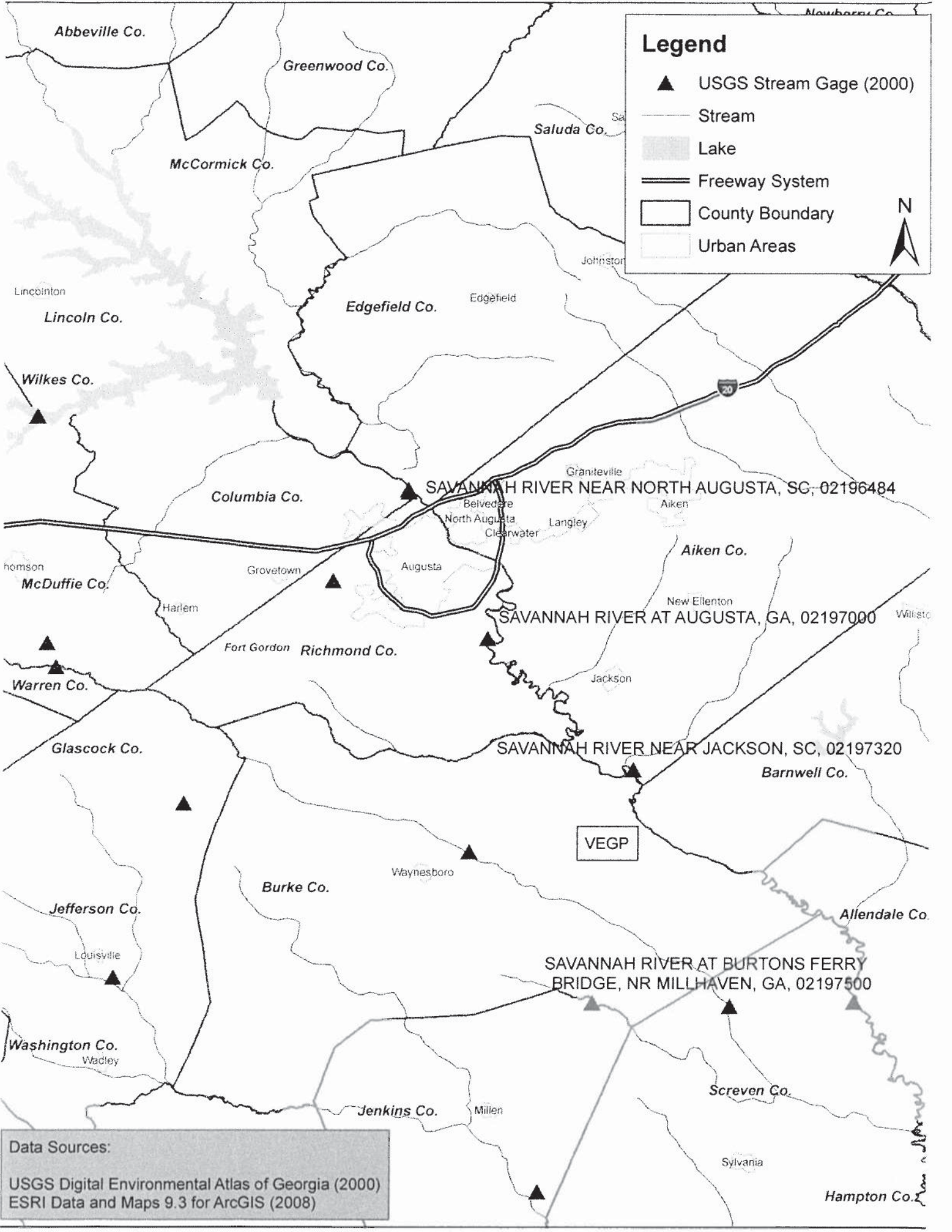
City of Toccoa, GA – Water Design. Served as lead engineer for detailed design, preparation of specifications, and oversight of CAD drawings of 160,000 feet of water mains ranging in size from 8 to 12 inches in diameter in Toccoa, Georgia, as part of a special purchase local option sales tax referendum.



Publications and Presentations

- “The Collapse-Pulsing Condition during Sub-fluidization Air Scour Granular Activated Carbon Media Filter Backwash”, American Filtration Society, 1993.
- Presentation of “Collapse Pulsing Condition during Sub-fluidization Air Scour GAC Filter Backwash”, Georgia Association of Water Professionals, Annual Conference, 1993.
- Presentation of “SCADA Data and Use in Distribution System Hydraulic Modeling,” Georgia Association of Water Professionals, Annual Conference, 1997.
- “Water Reuse – A Water Supply Option in the Metropolitan Atlanta Area?,” Georgia Water Resources Conference Proceedings, 2005.
- Presentation of Wastewater Planning Alternatives, Rockdale County Public Meeting, Rockdale Water Resources, 2006
- Presentation of Wastewater Master Plan Recommendations, Paulding County Board of Commissioners Meeting, 2006.
- Presentation of “Master Planning – Why It’s Essential for Utilities,” Georgia Association of Water Professionals, Annual Conference, 2007.
- Presentation of Water Conservation Measures, Technical Coordinating Committee, MNGWPD, 2007.
- Presentation of Water Demand Forecasts, Technical Coordinating Committee and Basin Advisory Councils, MNGWPD, 2008.
- Presentation of “Defining Sustainability in the Context of Water Resources Planning”, Georgia Association of Water Professionals, Fall Conference 2009.

ATTACHMENT B



Data Sources:
 USGS Digital Environmental Atlas of Georgia (2000)
 ESRI Data and Maps 9.3 for ArcGIS (2008)