# EXPERT REPORT OF DR. SHAWN PAUL YOUNG

I, Shawn Paul Young, do hereby declare as follows:

## INTRODUCTION

1. My name is Shawn Paul Young, Ph.D. I am currently a Fisheries Scientist working with the Kootenai Tribe of Idaho to implement a large-scale native fish conservation aquaculture and habitat restoration program to restore white sturgeon, burbot, and kokanee populations in the Kootenai River (Idaho, Montana, and British Columbia). I also maintain a private environmental consulting business that specializes in aquatic natural resources. My current business address is 6827 Westview Drive, Bonners Ferry, ID 83805. I submit this expert report as a private consultant to the Savannah Riverkeeper and the Southern Alliance for Clean Energy in this matter.

2. My professional and educational experience are as follows: I received a B.S. in Environmental Studies from Northland College; a M.S. in Aquaculture, Fisheries, and Wildlife Biology from Clemson University; and a Ph.D. in Fisheries and Wildlife Sciences from Clemson University. I have 17 years of experience researching the effects of human activities on fisheries and aquatic ecosystems. My experience includes 11 years studying and evaluating impacts to the aquatic resources of the Savannah River Basin. During 6 of those years, I was the lead or an assistant on several field projects studying fish in the Savannah River Basin. Target species included striped bass, American shad, shortnose sturgeon, largemouth bass, and robust redhorse and other native suckers. In addition to my professional qualifications, I am an avid outdoorsman – fishing, hunting, and enjoying nature in every manner since my early childhood.

3. I have in publication, in press, and in review 31 peer-reviewed articles relevant to fisheries and aquatic ecology. I have been consulted by public, state, federal, and academic sectors in the subject area of fish and aquatic ecology. I have presented scientific presentations at numerous professional meetings, academic seminars, and citizen fishing association functions.

4. I am familiar with the application of Southern Nuclear Operating Company ( "SNC") for a Surface Water Withdrawal Permit (a "SWW") at the Vogtle Electric Generating Plant (the "VEGP") site for the new Units 3 and 4 ("Units 3 and 4"). I have reviewed the draft permit prepared by Georgia Environmental Protection Division ("EPD") and the materials reviewed and considered by EPD in its preparation of the draft SWW permit, including those sections describing water intake, water consumption, and potential water quality issues in the Savannah River associated with surface water withdrawals for cooling water needed to operate Units 3 and 4. As discussed further below, these materials show that EPD has failed to evaluate the potential impacts of the proposed withdrawals on the fish of the Savannah River and the effects these impacts to fish could have on other users of the Savannah River.

5. I am providing this expert report in support of Savannah Riverkeeper's and the Southern Alliance for Clean Energy's comments on the draft SWW permit. The opinions and conclusions I express in this expert report are my own and should not be attributed to any other entity. This expert report sets forth my scientific opinion that the draft SWW permit (including the information used in its preparation) should include an evaluation of the potential negative effects on the fish of the Savannah River from withdrawing surface water to operate Units 3 and 4. Further, my report sets forth my opinion that biological monitoring at the water intakes for Units 3 and 4, in the immediate vicinity of VEGP, and the middle Savannah River should be required by the SWW permit. I also determine that mitigation should include actions in the freshwater

middle and lower Savannah River, given that these freshwater reaches include the VEGP site and the environment most impacted by its operations. Last, I conclude that the draft permit fails to provide adequate protection to aquatic organisms at low flows. I have applied my knowledge and experience to the materials reviewed by EPD, and to additional materials and information available but not reviewed by EPD. I believe my opinions and conclusions to be true and correct.

## BACKGROUND INFORMATION PERTAINING TO VEGP OPERATIONS, THE AQUATIC RESOURCES OF THE SAVANNAH RIVER, AND THE POTENTIAL IMPACTS OF THE DRAFT SWW PERMIT

6. The middle segment of the Savannah River serves as the source water for cooling the nuclear reactors at VEGP. Since the 1980s, VEGP, with just its two existing reactors, has been one of the largest industrial water users on the river, withdrawing an average of approximately 64 MGD and consuming 68% of that through losses during cooling. In the future, with Units 3 and 4, VEGP will likely be the largest water withdrawal for industrial purposes in the middle segment of the river with an additional maximum daily withdrawal of 74 MGD (monthly average withdrawal of 62 MGD) with an allowable consumptive loss of 71% to operate the two new units. This would make VEGP one of the largest sources of negative environmental effects on aquatic resources of the middle Savannah River, as surface water withdrawals have inherent negative impacts on aquatic biota. Negative impacts to fish, mussels, crayfish, and other aquatic organisms have already occurred under the existing permitting withdrawals; the proposed new withdrawals will exacerbate those negative impacts.

7. Surface water withdrawal/consumption and its associated impacts (entrainment, impingement, reduced flow, and flow manipulations) will continue to degrade Georgia's freshwaters and the fish they support (Barczak and Young 2009). As a hotspot for freshwater diversity, Georgia hosts 280 fish species, 98 freshwater mussel species, and 70 crayfish species,

ranking among the highest of all states in freshwater fish, mussel, and crayfish diversity (The New Georgia Encyclopedia 2003; Georgia Department of Natural Resources 2008). The Savannah River alone hosts 118 freshwater fish species (Marcy et al. 2005) and 24 freshwater mussels (Bogan et al. 2008). In Georgia, 57 fish and 51 aquatic invertebrates are state protected (GA DNR), and over 50% of the 471 species of special concern use freshwater habitats (GA DNR).

8. The negative impacts in terms of loss of economic, social, and intrinsic value provided by healthy aquatic resources should be considered before new water withdrawal and pollution discharge permits are granted. Fishing and other water recreation activities are highly valued by Georgians. Fishing continues to be of high social and economic importance to the residents of Georgia. About 11% of all Georgians fished in 2010-2011 (American Sportfishing Association 2013; U.S. Department of Interior et al. 2014). Approximately 1,000,000 resident anglers spent $872.5 million on trip-related expenses and gear for 8.7 million days spent on Georgia's freshwaters. Also, on the opposite bank of the Savannah River, 23% of South Carolina residents fish (approximately 900,000 anglers; 537,000 fish freshwaters), spending approximately $1 billion annually on trip-related expenditures and gear during 11.2 million days fishing (American Sportfishing Association 2013; U.S. Department of Interior et al. 2014). Surveys indicate that 91% of Georgian anglers only fish on Georgia freshwaters (U.S. Department of Interior et al. 2014). Thus, Georgia's citizens prefer to fish on local waters, and fishing revenues stay within Georgia's economy. Given that many fishing opportunities are in rural areas, anglers infuse significant money into smaller, rural economies. Therefore, negative impacts on fish populations can have significant negative impacts on the economy and social values of Georgia and neighboring South Carolina.

9. The Savannah River is one of Georgia and South Carolina's most popular fishing spots; and as such, the fisheries are managed cooperatively by both states. The Georgia Department of Natural Resources lists the Savannah River below New Savannah Bluff Lock and Dam as one of the "2014 Best Bets" for anglers (www.georgiawildlife.com/Fishing/Rivers). This area includes the un-impounded middle and lower freshwater segments of the Savannah River from Augusta, GA, down to the estuary at Savannah, GA. VEGP is located in this area.

10. The middle and lower Savannah River support significant recreational fishing for freshwater resident species such as largemouth bass, redear sunfish, bluegill, and catfish; as well as for anadromous species such as striped bass and American shad. However, many fish species in the middle Savannah River are greatly reduced from their historical numbers. The declines cited by fisheries experts are due to the incremental impacts from dams, urbanization, industrialization, and nuclear power facilities (Marcy et al. 2005). This includes the operation of the VEGP (Marcy et al. 2005). The fishing moratorium on endangered shortnose sturgeon and endangered Atlantic sturgeon remains due to severely depleted sub-populations in the Savannah River; the recovery of the robust redhorse, a sucker once proclaimed extinct, is still in the early stages; and status of several species (American eel, quill-back sucker, and brassy jumprock sucker) are still undetermined. Additional units at VEGP will only increase the stress that the Savannah River ecosystem is already experiencing. Increasing water withdrawal/consumption while reducing the river's assimilative capacity will increase the probability for entrainment and impingement at intake structures; and increase aquatic organism exposure to thermal and chemical effluent. This will perpetuate the poor condition of Savannah River fishes and hamper restoration efforts.

11. Several fish species appear to be exhibiting some recovery or at least a halt in decline, which is likely due to increased awareness of fish ecology and of human impacts on fish populations, prompting conservation and management actions. For instance, the moratorium on striped bass harvest was lifted in 2005 (Georgia and South Carolina Departments of Natural Resources), and American shad populations appear to have stabilized (Bailey et al. 2004; ASMFC 2014). Recent Federal Energy Regulatory Commission (FERC)-relicensing and Savannah Harbor Expansion Project (SHEP) mitigation agreements have combined efforts to improve fish abundance through the coordinated construction of several fish passage structures at migration obstructions near Augusta, GA (ASMFC 2014). Combining mitigation from harbor deepening in the estuary that serves as critical nursery area for life stages of many anadromous fish, with mitigation to restore access to more freshwater spawning areas upriver makes sense. Further, lower-river commercial fishing regulations have been revised to increase abundance of the migratory anadromous species such as American shad (ASMFC 2014) during their freshwater spawning migrations into freshwater. This strategy better accounts for the complex life history of many Savannah River fish that live part of their life in freshwater and also saltwater, with a need to return to freshwater spawning areas. The FERC and SHEP mitigation and fishing regulations attempt to restore several rare and endangered species while also increasing abundance of several species targeted in fisheries.

12. Despite mitigation upriver and downriver, there has been very little consideration, if any at all, of the negative impacts on fish from large-scale water withdrawal at industrial/energy facilities in the middle and lower Savannah River, nor of mitigation to offset these impacts. Water withdrawal can have significant negative impacts on ichthyoplankton (a term used to define the cumulative early life stages of fish - eggs, larvae, and early juveniles) drifting down

the river past industrial/energy facilities that pump large quantities of water from the river. Fish eggs, larvae, and young juveniles are often entrained due to their lack of mobility. Entrainment may be defined as capturing organisms inhabiting surface waters when those waters are withdrawn from the river at intake structures. The “entrained” organisms are then confined to the facility; and in this case, VEGP Units 3 and 4 cooling water system. Typically, this results in 100% mortality; and the number of eggs, larvae, and juveniles killed can have significant negative effects on fish populations. Also, juveniles, sub-adult, and adult fish of smaller, less-mobile species may be “impinged” and killed on travelling screens of these facilities’ intake structures.

13. Thermal and chemical effluents are other sources of negative impacts on aquatic organisms near industrial and energy facilities. Often, surface waters are withdrawn for cooling or to complete manufacturing processes, and then in full or partially discharged back into the river. Upon discharge, typically waste heat is still present and sometimes above ambient river temperatures. Also, chemicals added to the source water within the facilities are still present upon discharge. This creates a “thermal and/or chemical plume” below the discharge location. The extent of a thermal and/or chemical plume depends on the volume of water discharged, discharge water temperature, chemical concentration of discharge, ambient temperature of river receiving the discharge, and the river flow/discharge at a given time. The greater the volume of discharge, difference between discharge temperature and ambient temperature, and chemical concentration of discharge, the higher the probability of significant negative effects on aquatic organisms such as ichthyoplankton.

14. Further, the river flow at the time of discharge plays a significant role in determining probability of negative impacts. The percent of the total river flow withdrawn at a given time is

termed “percent hydraulic entrainment”. The lower the river flow, the higher the percent hydraulic entrainment. Also, at low river flows, the fish eggs, larvae, and juveniles are more concentrated, increasing their susceptibility to being entrained by the intakes. This is a very important consideration for organism entrainment. As the percent hydraulic entrainment increases, so too does the probability that ichthyoplankton will be captured and killed by VEGP’s cooling water intakes. A reduced flow would place more of the drift community at danger of entrainment due to river channel confinement. That is low water levels would confine organisms to smaller habitat concentrating the number of organisms per unit of area in the vicinity of the intake structures. This confinement increases the vulnerability to entrainment, and could have differential impacts from season to season and from species to species.

15. Low river flows also place more of the drift community, organisms that are passively transported with the river flow and include ichthyoplankton and aquatic invertebrates, at risk of thermal and chemical impacts also due to river channel confinement. Low water levels would confine organisms to smaller habitat, concentrating the number of organisms per unit of area in the vicinity of the thermal and/or chemical plume. Further, low flow reduces the river volume, and thus, the “assimilative capacity” or ability for heat dissipation and chemical dilution. This confinement increases the vulnerability to thermal and chemical stressors, leading to mortality. Thermal tolerance also varies from species to species, and also across life history stages of individual species.

16. The draft permit appears to require no biological monitoring or mitigation actions in the middle Savannah River which is critical egg incubation, larval development, and early juvenile rearing habitat linking upriver, freshwater spawning areas to downriver, estuarine juvenile rearing areas. The middle and lower reaches of the river serve as the incubation and early

rearing habitats for the anadromous species such as sturgeons, shad/herrings, and striped bass. Without successful incubation and early life survival and development, annual recruitment is suppressed, resulting in population declines or lack of response to restoration efforts. There is a significant lack of biological monitoring and mitigation from uses such as surface water withdrawal and consumption in the middle and lower freshwater segments. Biological monitoring and mitigation requirements are warranted given the importance of the middle and lower freshwater areas to the fish community.

## CONCLUSIONS

17. **VEGP Units 3 and 4, especially in conjunction with operation of existing Units 1 and 2, have the potential for large impacts on the Savannah River fish assemblage. Based upon my review of materials used by EPD to prepare the draft SWW permit, EPD did not review available information pertaining to the fish populations of the Savannah River; and therefore did not conduct any analysis of potential negative impacts to fish populations caused by water withdrawals at VEGP.** It is reasonable to expect that such a review/evaluation/analysis would be completed in this matter given that fishing is a "water use classification" under EPD water quality standards (GAEPD 2001). Negative impacts on Savannah River fish populations would impact fishing opportunities and the associated economic impact that fishing provides to Georgia and neighboring South Carolina, as well as current and future restoration plans aimed at restoring fish abundance.

18. **EPD did not review/analyze the effects of entrainment and impingement on the aquatic organisms of the Savannah River due to increased withdrawals authorized by the draft permit. Such a review/analysis is warranted due to the use of the project vicinity by several rare and endangered fish species, and fish species supporting fisheries and the**

**associated economy built around fishing.** Reiterating the biological uniqueness and importance of the middle Savannah River, the list of organisms that complete some or all of their life history by using the river reach affected by the facility is numerous and includes endangered Atlantic Sturgeon, endangered Shortnose Sturgeon, rare sucker species such as Robust Redhorse and Brassy Jumprock, Striped Bass, American Shad, American Eel, Largemouth Bass, catfish, and other fish that includes prey species such as blueback herring. Also, numerous freshwater mussels, crayfish, amphibians, and reptiles are found in this ecosystem.

19. In the 1970's and early 1980's, some biological data were collected for the early site permit of Vogtle Units 1 & 2. These data included some ichthyoplankton abundance and fish presence data related to entrainment and impingement. The studies found that the drift community, including eggs and larvae of 34 fish species, were non-uniformly distributed and varied over time and space in the vicinity of VEGP (Nichols 1983; Wiltz 1981 and 1983). These fish included sturgeon spp., sucker spp., American shad, and Savannah darter. At the nearby Savannah River Site (SRS), larval shortnose sturgeon, a federally endangered species, and a high number of American shad and blueback herring larvae have been captured at water intake structures during the 1980's and 1990's (Paller et al. 1986; Wike 1998). But it was not until 2008 that SNC next collected any other biological data related to the potential impacts from water withdrawal at VEGP. And even then, the methods and duration were questionable, as only 5 months of data directly investigating entrainment were collected. To my knowledge none has been collected since. During the 5 months of ichthyoplankton sampling, early life stages of minnow species, American shad, other herring/shad species (possibly blue-back herring), suckers, and darters were captured in the river near VEGP; and, early life stages of suckers and sunfish were most commonly entrained (Southern Nuclear Operating Company 2008). From my

review of the permit application materials, EPD did not review the meager data available, or require that any new data be collected and furnished.

20. Annual entrainment studies should be completed as river flows may be variable from year to year, leading to annual variability in the magnitude of ichthyoplankton entrainment. The pattern of drift community distribution (i.e. the pattern of egg, larval, and early juvenile stages of fishes) would vary in time and space due to river flow fluctuations. The Savannah River fish assemblage utilizes several life history strategies to survive the inherent temporal and spatial heterogeneity of riverine habitats. Also, dispersal mechanisms vary from species to species and across life history stages of each species. Differences in physiology make some species more susceptible to entrainment than others. Some examples are adhesive, versus buoyant eggs; immobile larvae, versus highly mobile larvae; and, resident fish with small home ranges that may never require inhabiting the river near VEGP, versus migratory fish that ultimately must pass the vicinity of VEGP during vulnerable early life history stages on their journey down the Savannah River to the Atlantic Ocean.

21. **EPD did not review/analyze the effects of thermal and chemical discharge on the aquatic organisms of the Savannah River due to VEGP operations. Again, a review/analysis is warranted due to the use of the project vicinity by several rare and endangered fish species, and fish species supporting fisheries and the associated economy built around fishing.** The draft permit assumes that water withdrawn from the Savannah River, which has not been lost due to evaporation in the cooling process, will be discharged back into the River, in accordance with a discharge permit that has yet to be applied for and issued to SNC. Because that discharge is contemplated by the draft water withdrawal permit, the impacts of the discharge should be considered. The discussion and information in paragraphs 18 and 19 are

relevant to evaluating impacts from thermal and chemical discharge. Ichthyoplankton, the earliest life stages of fish, are most susceptible to thermal and chemical effluents. Georgia water quality standards maximum allowable thermal discharge temperature into waters supporting fishing is stated as 90 ºF (GAEPD 2001). This temperature kills the early life history stages of several highly-valued fish that maybe found near VEGP, and most likely also causes mortality in many less-studied Savannah River fish species. American shad eggs suffer mortality at 80.1 ºF, and larvae suffer mortality at 87 ºF (Stier and Crance 1985). Blueback herring eggs and larvae suffer mortality at 85.5 ºF (Pardue 1983). The federally endangered shortnose sturgeon's eggs suffer mortality at 75 ºF, and larvae suffer mortality at 85 ºF (Crance 1986). Striped bass eggs suffer mortality at 75 ºF, and larvae suffer mortality at 85 ºF (Bain and Bain 1982; Fay et al. 1983). Fay et al. (1983) also provides data and synthesis from a number of studies on the effects of thermal pollution discharge on early life stages of striped bass, "Most early striped bass life stages show significant elevated mortality when exposed to rapid changes in water temperature (such as that in a thermal discharge plume)". Fay et al. (1983) provides evidence that striped bass larval survival is significantly affected by sudden temperature elevations of 18 ºF, and mortality exceeds 50% when water temperatures reach 90 ºF.

22. The discharge temperature and that of the "mixing zone" are important considerations. Exposure time is an important consideration and dependent on river flow and velocity. River flow and velocity also determine the "assimilative capacity" which will determine the area of the "mixing zone". The longer the exposure to greater than ambient temperatures and increased chemical concentrations, the higher the probability of negative physiological effects.

23. **The draft permit appropriately recognizes that the proposed water withdrawals will exacerbate the river's impairment for dissolved oxygen. However, the permit fails to**

**require adequate mitigation.** There has been a history of water quality issues in the middle Savannah River, with low dissolved oxygen concentrations not fully supporting the fish community (GAEPD 2001). Georgia water quality standards list 5 ppm, or 5 mg/L, as the minimum to fully support fish (GAEPD 2001). This standard is supported by research that shows many fish begin to suffer negative physiological effects when DO concentrations drop below 5 ppm (Neill and Bryan 1991). Further, as a cold-blooded animal that has a body temperature dependent on the ambient temperature, fish oxygen needs increase with increasing water temperatures. As river temperature increases, body temperature also increases; and in turn, metabolism increases. Ultimately, the increased metabolism increases oxygen demand. Thus, maintaining DO concentrations during summers with low flow is an important consideration.

24. EPD included a "special condition" in the draft permit requiring SNC to artificially oxygenate the Savannah River Estuary, which is 100 miles downriver from VEGP (see Surface water withdrawal permit # 017-0191-11, page 2, Special Condition #3). The argument for Savannah River Estuary oxygenation was to offset VEGP chemical loads that would exacerbate current dissolved oxygen issues. The estuary oxygenation site is 100 miles downriver. Estuary oxygenation is already in the initial stages to offset the impacts from the Savannah Harbor Expansion Project (SHEP) which entails large-scale dredging to deepen the shipping port. Further, the use of Speece Cone oxygenation technology is unproven. Under the SHEP mitigation agreement, dredging can proceed only after the Speece Cone technology proves reliable to maintain biologically significant dissolved oxygen concentrations. Therefore, EPD should require other oxygenation options in lieu of or in addition to Speece Cones. Most important, mitigation for dissolved oxygen impairment should be required and prioritized in the

vicinity of VEGP, given that this area will suffer direct impacts. However, no such mitigation has been proposed in the draft permit.

25. **EPD did not adequately review and/or analyze environmental impacts at different river flows, and fails to provide adequate protection to aquatic organisms at low flows.** Under low-flow conditions, the percentage of the river being withdrawn for cooling increases. Therefore, the larger the percentage of river being withdrawn, the higher the probability of entrainment and impingement of aquatic organisms including fish eggs, larvae, and juveniles. Also, low-flows reduce the capacity of the river to dilute the thermal and chemical discharges. With reduced capacity for dilution, the detrimental effects on aquatic organisms from elevated river temperatures, decreased oxygen concentrations, and chemical concentrations will increase in duration and magnitude. The draft permit does not discuss any requirements that would change VEGP operations to ensure protection of aquatic resources at low flows, particularly during the spring months when most fish spawning occurs and ichthyoplankton are most abundant in the middle Savannah River; and during summer months when water temperatures are highest, adding to already present thermal stress.

26. Negative impacts from VEGP are currently, and may be to a greater extent in the future, synergistic with basin-wide river management intended to satisfy the multitude of users/stakeholders/interests and to account for natural precipitation patterns. The amount of water available at VEGP is primarily controlled by the water discharge/operations at the upriver United States Army Corps of Engineers (USACE) hydroelectric dams above Augusta, Georgia. The USACE operations must balance water use above and below J. Strom Thurmond Dam, the most downstream hydroelectric dam that determines the flows of the un-impounded middle and lower reaches. The river flow at VEGP determines the percent of river flow withdrawn at a given

time because river flows may vary but the amount withdrawn for the cooling water system will be consistent to maintain full operations at VEGP. The lower the river flow, the higher the percent hydraulic entrainment. Again, as the percent hydraulic entrainment increases, so too does the probability that ichthyoplankton will be captured and killed by VEGP's cooling water intakes; and that the assimilative capacity of the river is reduced, which may increase thermal and chemical exposure and cause water quality issues.

27. **EPD did not address, nor require environmental/biological monitoring or mitigation for, the negative impacts on the aquatic resources in the vicinity of VEGP nor any of the 100+ miles of freshwater portion of the middle/lower freshwater segments of the Savannah River.** It is reasonable to expect that EPD require basic biological and water quality monitoring at the VEGP site. Instead, EPD's only mitigative "special condition" was to have Southern Company artificially oxygenate the Savannah River Estuary, which is 100 miles downriver from VEGP (see Surface water withdrawal permit # 017-0191-11, page 2, Special Condition #3). The argument for Savannah River Estuary oxygenation was to offset VEGP chemical loads that would exacerbate current dissolved oxygen issues. This argument may be factually correct in that actions/impacts are perpetuated through the river continuum; but it completely neglects the environment of the immediate vicinity and the entire 100 miles of the middle to lower freshwater Savannah River which is degraded, and will continue to be degraded, from the harmful effects of operations. Further, estuary oxygenation is already in the initial stages to offset the impacts from the Savannah Harbor Expansion Project, which entails large-scale dredging to deepen the shipping port. Instead or in addition, biological monitoring and mitigation in the vicinity of VEGP is warranted to determine and offset the negative effects of entrainment and impingement

of aquatic organisms into the cooling water system, and mitigation options are available to minimize entrainment and impingement.

28. The SWW permit should require the following biological and water quality monitoring:

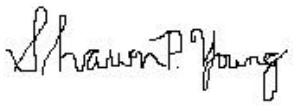
- 12-month entrainment and impingement studies for a period of 3 years pre- and 3 years post-operation of Units 3 and 4. Ichthyoplankton sampling should include transects just upriver of all intakes, and also the intakes for Units 1 - 4. This will determine direct impacts on fish from Units 3 and 4 operations.
- Entrainment monitoring should be required when drought contingency plans are in effect. This will determine the extent to which entrainment increases during low flows.
- Water quality monitoring 1 km above VEGP, at the point of discharge, within the mixing zone, at end of mixing zone, and 1 km downriver of mixing zone. This will determine direct impact on water quality in the vicinity of VEGP.

29. The SWW permit should require the following additional mitigation measures:

- SNC should install the best available technology in the form of barriers, flow deflectors, nets, and fish deterrents at VEGP intakes.
- SNC should investigate alternative methods of cooling to reduce water withdrawal, consumption, and discharge.
- SNC should provide funding of fisheries research projects in the un-impounded freshwater middle and lower Savannah River in the amount of $10 million dollars. Annually, for the first ten years of Units 3 and 4 operations, SNC should provide funding to GADNR / SCDNR cooperative management of middle Savannah River fish populations, with an emphasis on rare, anadromous and freshwater species.

- SNC should become an equal contributing partner in the funding of habitat restoration plan developed and agreed upon by stakeholders involved in the Savannah Harbor Expansion Project (SHEP).

30. In conclusion, the draft permit fails to protect the aquatic resources of the middle and lower freshwater Savannah River. This includes the fish populations, and the fishing opportunities they provide to Georgia and South Carolina residents. A proper analysis of impacts from entrainment, impingement, thermal discharge, and chemical effluent should be completed to understand the effects of VEGP on the middle and lower Savannah River. Proper biological monitoring in scope and duration would provide the data needed to properly evaluate the environmental impacts from VEGP operations. Finally, because water withdrawals and subsequent discharge of thermal and chemical effluent at VEGP will have negative effects on aquatic resources, SNC should provide funding to assist with the research and restoration of fish populations that rely on the middle and lower Savannah River.

Expert:  Date: May 15, 2014

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