RAS 12224

August 28, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DOMINION NUCLEAR NORTH ANNA, LLC	)	Docket No. 52-008-ESP
	)	
(Early Site Permit for North Anna ESP Site)	)	ASLBP No. 04-822-02-ESP
	)	

INTERVENORS' RESPONSE TO DOMINION'S SECOND MOTION FOR SUMMARY DISPOSITION OF CONTENTION 3.3.2

INTRODUCTION

Intervenors Blue Ridge Environmental Defense League, Nuclear Information and Resource Service, and Public Citizen (collectively, "Intervenors") hereby respond to and oppose Dominion Nuclear North Anna, LLC's ("Dominion") Second Motion for Summary Disposition of Contention EC 3.3.2, Impacts on Striped Bass in Lake Anna. Dominion has failed to demonstrate that there is no genuine issue as to any material fact regarding the adequacy of its analysis in the revised Environmental Report ("Revised ER") of the impact of the proposed third reactor at the North Anna Power Station on striped bass downstream of Lake Anna in the North Anna and Pamunkey Rivers, or that it is entitled to summary disposition on questions of law. Consequently, Dominion's motion should be denied.

This response is supported by Intervenors' Statement of Material Facts in Dispute; a second affidavit from Shawn Paul Young, Ph.D., a biologist and native fish

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SECY-02

biologist for Portland General Electric in Portland, Oregon, and an adjunct faculty member of Clemson University (hereafter "Young Aff."); and a declaration from Barry W. Sulkin, M.S., an environmental consultant from Nashville, Tennessee (hereafter "Sulkin Decl.").

STATEMENT OF ISSUE

In its Second Motion for Summary Disposition (hereafter "Second Motion"), Dominion argues that "the admitted contention has been reduced to the impacts on striped bass in Lake Anna and in the North Anna River downstream of the Fall Line arising from the effect of increased water temperature due to operation of a third unit." Second Motion at 2-3. However, Dominion acknowledges that the Atomic Safety and Licensing Board (hereafter "Board") clarified the contention in its June 16, 2005 ruling on Dominion's First Motion for Summary Disposition to include "the synergistic impacts of flow and temperature." Dominion Nuclear North Anna, LLC (Early Site Permit for North Anna Site), *Memorandum and Order (Granting in Part and Denying in Part Summary Disposition on EC 3.3.2 – Impacts on Striped Bass in Lake Anna)*, slip op. at 10 n.15 (June 16, 2005). Dominion attempts to sidestep the potential impacts of reduced downstream flow by arguing that because there is "no measurable or perceptible temperature increase below the Fall Line, there is no thermal impact from Unit 3 to combine with any flow effect to produce a synergistic impact on striped bass in the North Anna River." Second Motion at 6.

Intervenors do not dispute that the newly-proposed combination wet and dry cooling system would likely have only insignificant effects on the temperature of water within Lake Anna ("Lake"), and Intervenors commend Dominion for proposing this

design change. With no further temperature increase within Lake Anna, further encroachments upon the summer habitat of the striped bass fishery within the Lake would presumably be averted. Similarly, with respect to downstream impacts, Dominion's revised proposal would likely eliminate increases in the temperature of water released over the Lake Anna Dam ("Dam") to the North Anna River.

However, Intervenors take issue with Dominion's assertion that "there is no thermal impact from Unit 3...." Second Motion at 6. One significant thermal impact – increased evaporation of lake water – would still occur as a direct result of the operation of the revised cooling system. Therefore, while it appears that Dominion's revised proposal would eliminate thermal discharges directly into Lake Anna, the new, closed cycle cooling system would still have one of the same fundamental thermal impacts – lake water would evaporate when used to dissipate the heat created by the operation of Unit 3, thereby reducing downstream flows.

Intervenors therefore suggest that the issue before the Board is whether there is no genuine issue as to any material fact regarding the adequacy of Dominion's analysis of the thermal impacts of the proposed third reactor on striped bass downstream of the North Anna Dam, including the lowest stretch of the North Anna River and upper stretches of the Pamunkey.[1] Intervenors submit that Dominion has failed to sufficiently demonstrate that the thermal impacts caused by the operation of Unit 3 will not reduce downstream flows to a point that they could have no more than a "small" impact on striped bass in the

[1] Although Contention 3.3.2 only specifically mentions the North Anna River, Intervenors respectfully submit that potential impacts from the operation of Unit 3 to the very same striped bass population further downstream in the Pamunkey River are equally relevant to this proceeding, and that consideration of impacts to this striped bass population should not end where the North Anna River joins with the South Anna River and takes on a different name. However, such an extension is not essential to Intervenors' opposition to Dominion's Second Motion.

lower North Anna River and the upper reaches of the Pamunkey River. As a result, genuine issues continue to exist regarding the adequacy of Dominion's consideration of impacts on striped bass, and its Motion for Summary Disposition must be denied.

APPLICABLE LEGAL STANDARD

As set forth in the Board's decision on Dominion's First Motion for Summary Disposition, summary disposition is proper if the record clearly demonstrates that "'there is no genuine issue as to any material fact and that the moving party is entitled to a decision as a matter of law.'" Dominion Nuclear North Anna, LLC (Early Site Permit for North Anna Site), *Memorandum and Order (Granting in Part and Denying in Part Summary Disposition on EC 3.3.2 – Impacts on Striped Bass in Lake Anna)*, slip op. at 4-5 (2005) (quoting 10 C.F.R. § 2.710(d)(2)). In considering a motion for summary disposition, the Board must examine the record in the light most favorable to the non-moving party. Id. at 5. The moving party bears the burden of demonstrating that there is no genuine issue as to any material fact. If the moving party fails to make the requisite showing to satisfy its burden, the Board must deny the motion. Id.

Once the proponent of the motion for summary disposition has satisfied its initial burden, the party opposing the motion may not rest upon mere allegations or denials but must submit rebutting evidence setting forth specific facts showing that there is a genuine issue of fact. Although the non-moving party need not show it would prevail on the issue to defeat a properly supported motion for summary disposition, it must at least demonstrate that there is a genuine factual issue to be tried. Id. at 5-6.

ARGUMENT

I. Adverse Thermal Impact in the Form of Significant Evaporation of Lake Water and Corresponding Downstream Flow Reductions Still Exists with Revised Proposal

In its Second Motion for Summary Disposition, Dominion puts forward a short and simple argument. In effect, Dominion argues that Intervenors can no longer advance Contention 3.3.2 because proposed changes in the design of the cooling system have effectively eliminated potential temperature increases within the Lake and downstream in the North Anna River. Dominion acknowledges the Board's ruling in its decision on Dominion's First Motion for Summary Disposition clarifying that "the synergistic impacts of flow and temperature are within the scope of this contention to the extent that they relate to impacts on striped bass." Dominion Nuclear North Anna, LLC (Early Site Permit for North Anna Site), *Memorandum and Order (Granting in Part and Denying in Part Summary Disposition on EC 3.3.2 – Impacts on Striped Bass in Lake Anna)*, slip op. at 10 n.15 (2005). However, Dominion posits that the elimination of perceptible temperature increases within the Lake and downstream makes it impossible for there to be any such synergy, therefore rendering unnecessary any consideration of potential impacts on striped bass from reductions in downstream flow. Second Motion at 5-6.

Dominion puts undue emphasis on its elimination of perceptible temperature increases within the Lake and downstream. As set forth in the original Board's ruling on the admissibility of Intervenors' contentions, Contention 3.3.2 was "[a]dmitted...as it concerns the *adverse thermal impacts* on the striped bass population of Lake Anna."[2]

[2] This Board's June 16, 2005 decision clarified that "the contention obviously includes the North Anna River *downstream of* Lake Anna." Dominion Nuclear North Anna, LLC (Early Site Permit for North Anna Site), *Memorandum and Order (Granting in Part and Denying in Part Summary Disposition on EC 3.3.2 – Impacts on Striped Bass in Lake Anna)*, slip op. at 7 (2005) (emphasis added).

Dominion Nuclear North Anna, LLC (Early Site Permit for North Anna Site), LBP-04-18, 60 NRC 253, 271 (2004)(emphasis added). The Board used the same language in its decision on Dominion's First Motion for Summary Disposition last fall, when it ruled that "the *thermal impact* on striped bass downstream in the North Anna River does in fact fall within the scope of the contention." Dominion Nuclear North Anna, LLC (Early Site Permit for North Anna Site), *Memorandum and Order (Granting in Part and Denying in Part Summary Disposition on EC 3.3.2 – Impacts on Striped Bass in Lake Anna)*, slip op. at 6 (2005)(emphasis added). To limit consideration of "thermal impacts" to water temperature increases alone, as Dominion suggests, would preclude consideration of other impacts that are the direct result of steps taken to dissipate the additional thermal load created by the operation of Unit 3. The phrase "adverse thermal impacts" should be read to also include the evaporation of lake water in the Unit 3 cooling system and the corresponding reductions in downstream flow rates.

Of course, in earlier stages of this proceeding when Dominion was proposing a once-through cooling system, the "adverse thermal impacts" of the operation of Unit 3 were generally discussed in the context of Dominion's discharge of heated cooling water into the Lake. The thermal impacts, however, included the two key effects of that discharge. First, the heated cooling water was predicted to increase the temperature of water within the Lake, which, in turn, would also have increased temperatures of the North Anna River below the Dam. These increased water temperatures could potentially have limited striped bass habitat in the Lake and affected striped bass spawning and the development of early striped bass life stages downstream. Second, and more important for current purposes, the release of heated wastewater into the Lake would have induced

evaporative water losses from the Lake, reducing the volume of water in the Lake and thereby also reducing water volumes released from the Dam into the North Anna River. These reduced downstream flow rates posed their own danger to striped bass habitat, spawning, and life-stage development downstream of the Dam.

With the revised cooling system, Dominion is no longer proposing that the heated lake water used to cool Unit 3 be discharged back into the Lake. Under the revised proposal, however, lake water would still be used to absorb the additional thermal load from Unit 3. Instead of being discharged back into the lake, the heated lake water would now be run through a combination of wet and dry cooling towers, and evaporation of a significant portion of that water would be a primary means of thermal dissipation. See Section 3.4 of Revised ER at 3-3-57 – 3-3-61. Additional water will be withdrawn from the Lake in order to make up for the water lost to evaporation, decreasing the water available to be released from the Dam by a maximum of 25.7 cfs and 37.2 cfs during Maximum Water Conservation ("MWC") and Energy Conservation ("EC") mode operating conditions, respectively. See Revised ER at 3-5-7. As a result, the second thermal impact discussed above – increased evaporation of lake water and corresponding reductions in downstream flows – remains very much in consideration with the revised proposal. Sulkin Decl. at ¶¶ 7-9.

Therefore, while the revised proposal appears to have eliminated thermal impacts related to increased water temperatures within the Lake and downstream, continuing thermal impacts related to lake water evaporation and corresponding reductions in downstream flow remain a hotly contested issue and support the ongoing viability of Contention 3.3.2. By avoiding any discussion of evaporation and downstream flow rates

in its Second Motion, Dominion has failed to adequately address the adverse thermal impacts of a third reactor on downstream striped bass.[3] As a result, Dominion has failed to demonstrate that there is no genuine issue as to any material fact regarding the adequacy of its analysis of the impact of the proposed third reactor at the North Anna Power Station, or that it is entitled to summary disposition on questions of law.

II. Dominion Has Failed to Adequately Address Adverse Impacts to Striped Bass Downstream of the North Anna Dam

As discussed above, Dominion's Second Motion goes no further than to argue that the temperature of the water within Lake Anna and downstream will not be increased as a result of the operation of Unit 3, and that Contention 3.3.2 must be therefore be dismissed. Dominion has not argued that the analysis contained in the revised ER adequately addresses the adverse impact of the operation of Unit 3 on downstream striped bass. As such, the adequacy of the analysis of downstream impacts contained in Dominion's revised ER is presumably beyond the scope of this briefing. However, Intervenors would nonetheless like to offer their own evaluation of the analysis contained in the revised ER, in that it is relevant to the larger purpose of this intervention proceeding.

Dominion has previously acknowledged that the Pamunkey/North Anna population of striped bass may spawn as far upstream as the stretch of the North Anna River that lies between the Fall Line and the North Anna's confluence with the South

[3] Even if the definition of "adverse thermal impacts" as it pertains to Contention 3.3.2 is limited to solely the impacts arising from increased water temperature, the evaporative impact would still fall within the scope of review. This is because the water evaporation that would occur in the new cooling system is a direct result of increases in the temperature of the lake water that is drawn into the cooling system in order to absorb the thermal load from operating Unit 3. To argue that relevant water temperature increases have now been eliminated artificially restricts consideration of the impacts of the cooling system to only the water that is being put back into the Lake, while ignoring the water that is being taken out of it.

Anna River, which forms the Pamunkey River.[4] Similarly, as referenced In Intervenors' Response to Dominion's First Motion for Summary Disposition, the Virginia Department of Game and Inland Fisheries has pointed out that "downstream reaches of the North Anna [River] can be seasonally important for [striped bass] spawning and juvenile rearing."[5] These positions are supported by scientific research showing that striped bass ascend far up into Atlantic Coast rivers to locate the freshwater rapids, shoals, and areas of riverbed elevation decline that typify fall lines and create flow velocities that will allow eggs to remain suspended for development. Young Aff. at ¶ 7. Therefore, viable spawning habitat for the Pamunkey River population of striped bass extends into the upper Pamunkey River and potentially reaches as far as the Fall Line in the lower North Anna River. Consequently, it is important that Dominion adequately address potential impacts of the operation of Unit 3 to striped bass that utilize this upstream habitat, including during the spawning period and the development of early striped bass life stages that begins in early Spring and lasts late into the summer months.

A. Dominion's Analysis Appears to Ignore Potential Impacts in the Lower North Anna River

Significantly, the analysis that Dominion includes in the ER addressing potential impacts on striped bass spawning and early life stages is primarily based upon historical

[4] See Dominion's First Motion for Summary Disposition at 11 ("[T]here is a small stretch of the North Anna River (about 2 river-miles in length) below the Fall Line, before it joins the South Anna River to form the Pamunkey River.... It is therefore possible that some striped bass might reach this small stretch of the North Anna River during their spawning runs."); see also Affidavit of John William Bolin, III at ¶17 (dated April 21, 2005 and submitted in support of Dominion's First Motion for Summary Disposition)("[S]triped bass enter the tidal, freshwater portions of rivers to spawn in the spring. It is therefore possible that some striped bass might reach this small stretch of the North Anna river during their spring spawning runs....").

[5] Virginia Department of Game and Inland Fisheries' February 15, 2005 letter to Virginia Department of Environmental Quality commenting on original Draft Environmental Impact Statement, at 4 (attached hereto as Exhibit A.)

and projected flow rates at the United States Geological Survey ("USGS") gauging station located in Hanover, Virginia. The Hanover USGS gauging station is located on the Pamunkey River, approximately 46 miles downstream from the North Anna Dam. By estimating the quantity by which evaporation from Unit 3's revised cooling system would reduce flows in the North Anna River, and then incorporating these estimates into historical flow rates at the Hanover USGS gauging station on the Pamunkey River, Dominion appears to project that a third unit would reduce flows at the Hanover gauge between 0.5 to 5 percent from what those flow rates would be without the addition of the third unit.[6] Dominion concludes that these levels of reductions would have an insignificant impact upon striped bass spawning and developing eggs, larvae and early juveniles. See Revised ER at 3-5-18.

However, the fact that flow rates may be sufficient in stretches of the Pamunkey River around the Hanover gauging station and downstream does not indicate whether there will be adequate flows to support striped bass potentially spawning upstream in the North Anna River. As discussed in the affidavit of Shawn Young, there is another USGS gauging station – Hart Corner – that is located on the North Anna River itself, approximately 30 miles downstream of the Dam and approximately 15 miles upstream of the Hanover USGS gauge. Because it is located on the North Anna River, the Hart

[6] The analysis of impacts to striped bass included in the ER consists of four paragraphs on page 3-5-18 of the ER. When Dominion refers to flow reduction percentages on this page, it is difficult to discern if Dominion is referring to flow reduction percentages at the Hanover USGS gauge, or if it is alternately referring to flow reduction percentages at the Dam. However, because Dominion prefaces the two paragraphs that more substantively discuss flow reductions with references to the Hanover gauge, it appears to Intervenors that Dominion's references to flow reduction percentages are to flow reductions that would occur at the Hanover gauge. See Revised ER at 3-5-18 ("Because of interest in striped bass spawning and early life stage rearing, the Pamunkey River flows in April and May *at the Hanover gauge* were analyzed for two-unit and three-unit operation.")(emphasis added); Revised ER at 3-5-18 ("The Pamunkey River in the vicinity of striped bass spawning is accustomed to wide variations of freshwater inflow during April and May, *as shown by the Hanover gage data.*")(emphasis added).

Corner gauging station provides a better indication of flows in the lower North Anna River than does the Hanover gauging station. Young Aff. at ¶ 10.

Comparing the Hart Corner USGS records to the Hanover USGS records, it appears that flow rates typically are significantly lower at the Hart Corner gauging station. This is not surprising, due to the fact that flows at the Hart Corner gauging station include only flows from the North Anna River, while flows at the Hanover gauging station include flows from the North Anna River, the South Anna River, and the Little River. Young Aff. at ¶ 11. The lower flows at the Hart Corner gauging station indicate that the broad conclusions Dominion extrapolates from the Hanover data regarding the "indistinguishable biological impacts" to striped bass spawning and early rearing areas do not necessarily extend to striped bass that may be utilizing the North Anna River. Young Aff. at ¶ 12.

For example, the critical factor impacting the survival of striped bass eggs is the velocity of water current, as striped bass eggs need a minimum flow velocity of 30 centimeters per second to remain suspended in the water column. Young Aff. at ¶ 13. Water currents in the Pamunkey River at Hanover could be higher than water currents upstream in the vicinity of Hart Corner as a result of the larger flows at Hanover. This is because less flow volume (measured in cubic feet per second) would likely reduce flow velocity (measured in centimeters per second), depending upon other factors such as changes in elevation and stream morphology. Young Aff. at ¶ 14. As a result, further reductions to flows from the Dam, as well as increased duration of drought flows, could have a more significant impact upon the development of eggs spawned in the North Anna River than eggs spawned in the Pamunkey River in the vicinity of Hanover and

downstream, since current velocities in the North Anna River may be reduced to a point where the eggs cannot remain suspended. Young Aff. at ¶ 14.

Since Dominion has not provided data, analysis or modeling to help determine how these reduced discharges from the North Anna Dam would equate to reduced flow velocities in the North Anna River, material questions remain regarding potential impacts to striped bass that might be utilizing the North Anna River. Therefore, by basing its analysis of potential impacts upon flow rates at the Hanover gauge in the Pamunkey River, Dominion has not met its burden of demonstrating that there is no genuine issue of material fact regarding potential impacts of the operation of Unit 3 on striped bass potentially using the North Anna River.

B. Dominion's Limited Analysis of Impacts to Striped Bass Spawning in North Anna River is Inadequate

There are two sentences in the Revised ER which suggest, albeit vaguely, that Dominion did attempt to incorporate some evaluation of conditions in the North Anna River into its discussion of potential impacts to striped bass. On page 3-5-18 of the revised ER, at the end of a paragraph discussing Pamunkey River flows at the Hanover USGS gauge, Dominion inserts a one-sentence observation that seemingly relates to springtime flow releases from the Dam and follows that with a one-sentence conclusory statement claiming there will be no impact:

> Mandated minimum flows would be highly unlikely in April and May. This would indicate that the spring spawning regime in the North Anna River below the North Anna Dam would not be impacted by operation of a new Unit 3 on Lake Anna.

However, based upon historical flow rates measured at the Hart Corner gauging station, spring and summer month flow rates – encompassing the entire striped bass

spawning and early life stage development period – have reached critically low levels in the North Anna River during drought occurrences that have taken place within the past decade. Most dramatically, during the drought of 2002, there were only six days during March and April when daily mean values for river flow at the Hart Corner gauge exceeded 100 cfs, and only one day during that period when the river flow exceeded 200 cfs. From May through August of 2002, daily mean river flows exceeded 100 cfs at the Hart Corner gauge only once. (Conversely, daily mean rivers flow rates at the Hanover USGS gauge exceeded 100 cfs every day in March and April of 2002, and exceeded 100 cfs between May 1 and August 31 of that year a total of thirty-one times.) Young Aff. at ¶ 17. River flows at the Hart Corner gauge also reached significantly low levels during the spring and summer months of 1999. Young Aff. at ¶ 17.

These flow rates, and the 2002 flow rates in particular, are low enough that it is reasonable to conclude that striped bass spawning and early life stage development in the vicinity of the Hart Corner USGS gauge could potentially have been disrupted.[7] Young Aff. at ¶ 19. For instance, as set forth in the affidavit of Shawn Young, the Virginia Institute of Marine Science ("VIMS") conducts an annual juvenile striped bass "seine survey" in which it monitors the relative annual recruitment success of juvenile striped bass in the spawning and nursery areas of the Lower Chesapeake Bay. In 1999 and 2002, recruitment success was significantly lower throughout the study area than in other recent years, including recruitment in the York and Pamunkey Rivers. Conversely, 2003

[7] It is worth noting that, in a recent letter commenting on the potential impacts of the revised cooling system, the Virginia Department of Game and Inland Fisheries recommended that the Maximum Water Conservation mode be implemented any time during the months of March and April that flows from the dam decrease below 225 cfs. This recommendation was based on the importance of higher flows during these months for a number of downstream fish species, specifically including striped bass. See Virginia Department of Game and Inland Fisheries' July 7, 2006 letter to Virginia Department of Environmental Quality re: Coastal Consistency Determination at 4 (attached hereto as Exhibit B).

marked the highest recruitment success since 1996, and VIMS concluded that the 2003 rebound "was likely a result of the cool, wet conditions that produced favorable river flow for survival and subsequent growth during the spring spawning and summer nursery seasons," in contrast to low flow conditions that persisted during the drought of 2002 and adversely impact recruitment in that year. Young Aff. at ¶ 20 (quoting VIMS study). The study's findings suggest that flow rates in Chesapeake Bay tributaries, including the Pamunkey River, were reduced to levels during the recent droughts of 1999 and 2002 that adversely impacted early life-stage development of striped bass. Young Aff. at ¶ 20.

Dominion rightfully acknowledges that impacts from the operation of Unit 3 would "include reductions in the volume of water available for release from the North Anna Dam, which would decrease the volume of water available for downstream users," and that "[t]he duration of the minimum flow release rates would increase with the addition of Unit 3." Revised ER at 3-5-16. Dominion is also correct to point out that the potential impacts from reduced downstream flow rates "would be greatest in the reach of the North Anna River extending from below the North Anna Dam to its confluence with the South Anna River." Revised ER at 3-5-16. The operation of a third unit would result in increased occurrences and duration of reduced discharges during drought years, exacerbating the adverse impacts of drought flows to striped bass potentially using the North Anna River. Moreover, during drought periods, flows from the South Anna River – the other main tributary of the Pamunkey River – are also likely to be reduced. Therefore, the operation of the third unit would likely exacerbate the potential impacts of drought flows to not only the striped bass potentially utilizing the North Anna River, but also to striped bass further downstream in the Pamunkey River.

Because the operation of Unit 3 will likely exacerbate the adverse impacts of springtime drought conditions in the North Anna River and the upper Pamunkey River, it is not enough to say, as Dominion has done in the Revised ER, that "mandated minimum flows [from the Dam] would be highly unlikely in April and May", revised ER at 3-5-18, and to conclude from that information that striped bass spawning in the North Anna River will not be impacted by the addition of Unit 3. Again, a more complete analysis of flow rates and flow velocities in the lower North Anna and upper Pamunkey Rivers during drought years is necessary to properly determine the impact on striped bass that potentially utilize these areas. Young Aff. at ¶ 21. By failing to include this type of analysis, Dominion has inadequately addressed potential thermal impacts to striped bass downstream of the North Anna Dam.[8]

[8] These thermal impacts could be exacerbated even further if three localities downstream of the Dam successfully advance proposals to augment their water supplies by withdrawing water from the North Anna and Pamunkey Rivers. Most notably, Hanover County is actively considering a plan to withdraw approximately 46 cfs from the North Anna River downstream of the Dam. See Revised ER at 3-4-16. This amount exceeds normal mandated minimum flow releases from the Dam and greatly exceeds mandated minimum flow releases during drought conditions, and would contribute to the cumulative impact of reduced water flows to striped bass potentially using the North Anna and Pamunkey Rivers. Dominion does not address the issue any further than acknowledging that "[u]se of the North Anna/Pamunkey River by the downstream counties for future water use would further reduce the overall water volume in the Pamunkey River in addition to the reduction from the addition of the new units at North Anna Power Station." Revised ER at 3-4-16.

CONCLUSION

For the foregoing reasons, Intervenors respectfully submit that Dominion's Motion for Summary Disposition must be denied.

Respectfully submitted,

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February 15, 2005

Mr. Charles H. Ellis, III
Department of Environmental Quality
Office of Environmental Impact Review
629 East Main St., Sixth Floor
Richmond, VA 23219

RE: JPA 04-216F
Early Site Permit at North Anna ESP Site
ESSLOG 19290

Dear Mr. Ellis,

We have reviewed "Draft EIS for an early site permit at the North Anna ESP site" (document NUREG-1811) and offer the following comments and recommendations. The Department of Game and Inland Fisheries (VDGIF), as the Commonwealth's wildlife and freshwater fish management agency, exercises enforcement and regulatory jurisdiction over those resources, inclusive of State or Federally *Endangered* or *Threatened* species, but excluding listed insects. We are a consulting agency under the U. S. Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), and we provide environmental analysis of projects or permit applications coordinated through the Virginia Department of Environmental Quality, the Virginia Marine Resources Commission, the Virginia Department of Transportation, the U. S. Army Corps of Engineers, the Federal Energy Regulatory Commission, and other state or federal agencies. Our role in these procedures is to determine likely impacts upon fish and wildlife resources and habitats, and to recommend appropriate measures to avoid, reduce, or compensate for those impacts.

We continue to have reservations about the proposed Unit 3 impacts on the lake and downstream resources. The document did not address the main concerns outlined in our letter of January 27, 2004. Our comments in this letter will address primarily the issues raised in Section 5.0 Station Operating Impacts at the Proposed Site.

Biological communities Section 2.7.2.1
The document's nomenclature surrounding native vs. nonnative species, appears to minimize the value of the striped bass fishery. Striped bass and other anadromous fish are native to the York River drainage and the North Anna River, while largemouth bass, bluegill, black crappie, walleye and channel catfish are not. Nevertheless, all of these species are important to the recreational fishery within the lake.

Hydrological Alterations Section 5.3

Section 5.3 addresses the water related impacts. Earlier discussions with Dominion and DEQ resulted in the selection of Lake Anna water level elevation 248 as being representative of a hydrologic drought. Based upon historic data this would have a recurrence interval of once every 8.7 years and was agreed upon as being indicative of drought conditions. This matches closely other commonly used drought indicators (e.g., 7Q10) as an indicator of drought conditions in streams for water quality and discharge permit conditions. Table 1 on page F-102 can be used to evaluate the recurrence intervals of droughts. The USGS publication referenced in that table discusses drought recurrence intervals ranging from once every 15 to 80 years. Using elevation 248 as an indicator, past Dominion records demonstrate that this level has been observed 3 times in the last 26 years, a reasonable expectation of the recurrence interval (8.6 years) for a drought. Addition of Unit 3 would increase the drought recurrence interval to every 2.6 years and more than double the total weeks of 20 cfs or lower flows from 67 to 143. Median duration of drought flows of 20 cfs would be 7 weeks with the proposed Unit 3. VA State Water Control Board Bulletin #58 reviewed flow statistics for the gage downstream at Doswell. Prior to dam construction, flows of 25 cfs or lower would occur once every 10 years for about 10 weeks. Addition of Unit 3 would significantly increase the frequency of drought flows downstream and the duration of those droughts. The change to drought flows once every 2.6 years, for median duration of 7 weeks, is a significant change from conditions prior to the plant/reservoir construction, and demonstrates the need for cumulative analysis of impacts. The Index of Hydrologic analysis computed on pages F-126-133 is not complete, as requested, since it does not evaluate pre-dam conditions. Table 1 demonstrates significant shifts in frequency of lower flows and needs to be expanded to address conditions prior to creation of the lake. Cumulative impacts of the current and future Units on downstream hydrology and biology need to be quantitatively evaluated before any determination that impacts on downstream resources are "small". Two options exist to reduce the significant impacts on downstream hydrology: change the trigger level of elevation (248) to some lower elevation that has a recurrence interval of once every 8.7 years, or have Unit 3 operate as Unit 4 under dry cooling conditions.

Intake system Section 5.4.2.1

We applaud Dominion's use of "worst case" scenarios for estimating impingement and entrainment and acknowledge their estimate of a 131% increase in impingement rate for Unit 3. In developing the total estimate of entrainment and impingement data, derived from 1979 - 1983 was added to worst-case Unit 3 operation. What is unclear is if the 1978-83 values used for Units 1 & 2 reflect current operating conditions and are valid. Has the Unit 1 and 2 water volume pumped increased or decreased from the 1979-1983 period? We understand that plant-operating time, efficiency and volume of water pumped have increased since the study period. In that case, the table reflecting the impacts of Units 1 and 2 needs to be revised to reflect current operating conditions.

Several problems are apparent in the tables in this section. In reviewing the tables, Tables 5-4 thru 5-6 do not reflect "yearly totals". Rather, they reflect only seasonal losses (March-July).

This needs to be corrected to reflect annual losses for the remaining seven months. If summer, fall, and winter data were not collected, that data may have to be extrapolated by the best fitting of a nonlinear function to the available data. Only then can the full impacts start to be addressed. Tables 5- 2 and 5-5 may have significant errors, or the reasons for differences are not fully explained. For example, in Table 5-2 for Unit 3, January striped bass and bluegill numbers impinged are greater than in Units 1 & 2 (Table 5-1), but black crappie, gizzard shad, white perch and yellow perch numbers are less than in Units 1 & 2. Similar discrepancies exist for other rows and for the cumulative Tables 5-3 and 6. These discrepancies should be further explained.

We disagree with the assessment of "small" impact due to the most prevalent species impinged (gizzard shad) based upon the magnitude of such an increase (131%). Gizzard shad are indeed a "prolific forage fish", but their abundance has been low in VDGIF samples in two recent years. This species is the primary forage for stocked pelagic predators (striped bass and walleye) and also supplements largemouth bass diet. Further declines in striped bass habitat (another contested issue) combined with potential reductions in the forage base could significantly impact this recreationally and economically important fishery. Section 5.4.2.2 estimates the impingement loss to the fish population as a percentage of the estimated total lake population as derived from cove rotenone. We applied this same technique to entrainment numbers and calculate that 6.8% of the gizzard shad and 87% of the black crappie are lost due to entrainment. When combined with impingement 7.7% of the gizzard shad and 93.9% of the black crappie numbers are killed by the intake structure. We do not consider losing almost 8 and 94% of these populations from an intake a small impact. Several problems exist with this approach and these need to be addressed. Lakes undergo eutrophication with age and that is occurring at Lake Anna as the watershed becomes more fully developed. As that occurs, the biomass of fish increases. The current biomass is undoubtedly higher than twenty years ago when the original entrainment/impingement analysis was conducted. The report uses cove rotenone data but does not account for spatial and temporal variation within that data. Within large reservoirs, biomass typically declines downstream through a trophic gradient. That is apparent from our routine sampling as well as historic rotenone data. The impacts of entrainment and impingement may be even more spatially and numerically significant in the lower lake where the numbers of fish are less than above the Rt. 208 bridge.

Dominion acknowledges that 300 million fish could be entrained annually. The statement on page 5-25 that "fish entrained most frequently are prolific high reproductive potential and compensatory responses of the fish population occur to offset losses, the staff concludes that the impacts of entrainment would be small" is subjective and not based on scientifically sound evidence.

It is apparent that the entrainment tables need to be corrected to reflect an actual annual loss. Entrainment/impingement table discrepancies need to be corrected or explained and a much more rigorous spatial and temporal evaluation needs to be conducted before it can be concluded that the impacts of entrainment and impingement are small. We continue to recommend the use of state of the art screens as encouraged by EPA in their recent screen recommendations. Based upon a thorough literature review in VA., we currently recommend 1 mm opening and 0.25 fps

intake velocity to protect aquatic life. This would greatly alleviate the entrainment/impingement issue as would use of a dry cooling tower.

Striped Bass Reservoir Habitat

We agree with the descriptive statements on page 5-30 lines 24-33. However, line 37 incorrectly states that striped bass are not native to this watershed. The use of nomenclature surrounding native vs. nonnative species appears to minimize the value of the striped bass fishery. This is incorrect. Striped bass are, in fact, native to the York River drainage and downstream reaches of the North Anna can be seasonally important for spawning and juvenile rearing. The lake population is correctly acknowledged as being supported by stocking. In recognition of this fact, we strive to stock Chesapeake strain striped bass in the reservoir so as not to change the genetics of downstream populations.

An extensive amount of temperature data from historic monitoring of the lake was used to model thermal conditions at various locations in the lake. Despite that extensive data set, no modeling of summer striped bass habitat was conducted to support statements that the impacts would be small in normal years and moderate in drought years (page 5-31 lines 18-19). In combination with the elevated temperatures and increased frequency of drought conditions (lowering to elevation 248) within the lake, the striped bass population could be stressed every 2.6 years. One cannot state with confidence that installation of a third unit *would* cause acute mortality from exacerbated summer habitat squeeze; but concurrently, one cannot state with confidence that such mortality *would not* occur. At some point, striped bass will begin to die as water quality declines (based primarily on higher water temperatures and lower dissolved oxygen). Since no modeling of summer habitat was conducted, it is unknown if the additive impacts of a third unit would allow reservoir conditions to reach this point, and the exact point at which this will occur is unknown; but to discount the possibility is subjective. Even with the elimination of Unit 4, the predicted maximum surface temperature increase at the dam of 3.6 degrees Fahrenheit could result in striped bass mortalities depending on the plume configuration, inflow, and stratification pattern. Striped bass habitat modeling is necessary and essential in the final document to explain the potential of a new (third) unit and its impact on striped bass habitat.

The comment regarding droughts, "In such circumstances, mitigation to reduce the impact could be accomplished by stocking more fish, stocking larger fish, or managing the fishery to provide more catch opportunities of large fish", is incorrect and not a scientifically recognized fishery management solution. Such a comment does not recognize the biological and physical factors necessary for a successful striped bass population.

North Anna River Fishery Issues

The downstream impacts to fisheries resources were ignored in the draft document despite the increased frequency of low flows. Currently, (with two units in the regulated "base scenario"), 67 weeks of drought conditions (20 CFS or less) out of a 26-year period would be expected. Given the addition of a third unit, the expected drought frequency would rise to 150 weeks

(about 2.6 years). The Tennant method is a common desktop method and summer flows in the 20-30% mean annual flow range are beneficial for sustainable fisheries. Because it has been called the Montana Method, it has been deemed as only applicable in Western streams. That misconception is false as it was developed "over the past 17 years from work on hundreds of streams in the states north of the Mason-Dixon Line between the Atlantic Ocean and the Rocky Mountains" (Fisheries 1(4): 6-10). Summer flows below the desired level of 68 cfs (20% of MAF) are the norm under current conditions and will worsen under future conditions. We recommended that an Instream Flow Incremental Methodology Study be conducted to properly evaluate this project on the stream fauna. The expected increased frequency of drought flows to a common occurrence (2.6 years) is expected to have significant impacts. Conclusions need to be based upon sound scientific modeling. If Dominion can offer a better approach to modeling flow impacts, we would be happy to consider any alternative. However, in response to the statement, "long-term monitoring of the North Anna River has documented improvements in the abundance and diversity of aquatic biota since impoundment", VDGIF is unaware of any intensive data analysis to support such an assertion. Our analysis of the Dominion data set documented changes that are reflective of drought conditions. Placing the population under frequent drought stress will shift the community substantially. This analysis was provided to Dominion on June 18, 2005. Recent VDGIF surveys of the North Anna River have suggested that the primary sportfish, smallmouth bass, has much lower abundances than in other rivers in the region. Other fish populations were present in relatively low levels. It is the opinion of VDGIF biologists that the low abundance and biomass of predator and forage species in the North Anna River is related to higher than naturally occurring incidences of drought conditions. There also is the possibility that drought flow conditions could adversely impact downstream anadromous nursery areas. This potential impact should be evaluated. Increasing the drought frequency to the proposed extent would have a negative impact on this fishery. Such impacts are not acceptable.

The balance of a major argument within the document centers on subjective speculation on whether the installation of Units 3 and/or 4 would present complications for fish populations. VDGIF thinks there would be complications, but Dominion and NRC disagree. More likely at issue is not if complications would occur, for they almost certainly would; but the extent of such complications and the population-level impacts. Without extensive modeling, it is impossible to argue either point successfully. We recommend the application of sound scientific modeling to the decision process and that these appropriate corrections based on model outcomes be incorporated in the final document.

Thank you for the opportunity to comment on this proposed management plan. Please call Andrew Zadnik or me at (804) 367-6913 if we may be of further assistance.

Sincerely,

Raymond T. Fernald, Manager
Nongame and Environmental Programs

COMMONWEALTH of VIRGINIA

L. Preston Bryant, Jr.
Secretary of Natural Resources

Department of Game and Inland Fisheries

Colonel W. Gerald Massengill
Interim Director

July 7, 2006

Mr. Charles H. Ellis, III
Department of Environmental Quality
629 East Main St., Sixth Floor
Richmond, VA 23219

RE: North Anna Early Site Permit
Coastal Consistency Determination
05-079F
ESSLOG 19290 (20374)

Dear. Mr. Ellis:

We have reviewed the subject Consistency Determination and offer the following comments and recommendations. The Department of Game and Inland Fisheries (DGIF), as the Commonwealth's wildlife and freshwater fish management agency, exercises enforcement and regulatory jurisdiction over those resources, inclusive of state or federally endangered or threatened species, but excluding listed insects. We are a consulting agency under the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), and we provide environmental analysis of projects or permit applications coordinated through the Virginia Department of Environmental Quality (DEQ), the Virginia Marine Resources Commission, the Virginia Department of Transportation, the U. S. Army Corps of Engineers, the Federal Energy Regulatory Commission, and other state or federal agencies. Our role in these procedures is to determine likely impacts upon fish and wildlife resources and habitats, and to recommend appropriate measures to avoid, reduce, or compensate for those impacts.

This project involves an application from Dominion Virginia Power Company (Dominion) for an Early Site Permit (ESP) for the North Anna Nuclear Power Plant, located on Lake Anna in Louisa County. The ESP would be for activities related to the addition of nuclear reactors Unit 3 and Unit 4 at the plant. We first commented on this project in February 2005. At that time, we expressed concern that this project may result in significant adverse impacts upon fisheries resources in Lake Anna and the North Anna River. The impacts could result from fish impingement/entrainment at the intake and the increased frequency of drought flows downstream. Because of these concerns, we indicated that the project would be inconsistent with the Fisheries Management enforceable policy of the Virginia Coastal Resources Management Program. In late October 2005, Dominion announced that it had devised a new method of cooling Unit 3. The proposed Unit 3 will now utilize a combination wet/dry cooling process instead of once through cooling. The purpose of the modification is to lessen the evaporative loss from Unit 3. The proposed Unit 4 would remain a dry cooling unit. We understand that the Unit 3 circulating water system would operate in either of two operating modes:

NA -- Exhibit B, Intervenors' Response (8-28-06)

- Energy Conservation (EC).. In this mode, the dry cooling process would be turned off, with reliance on wet towers for heat removal..
- Maximum Water Conservation (MWC). In this mode, a minimum of 1/3 of the heat would be removed by the dry towers. The remainder would be removed, as required, by the wet towers.

In the following sections are our comments on the revised design related to resources under our jurisdiction and our recommendations for mitigating potential adverse impacts upon these resources.

Striped Bass Reservoir Habitat

With the proposed wet/dry cooling system for Unit 3, heated water in the lake will not be increased, as the heat is dissipated through the cooling towers with only a minimal amount returned to the lake. Therefore, we do not expect changes in striped bass habitat with the proposed Unit 3 revision.

Intake systems

The current intake screen at the plant has a 9.5 mm mesh size and an intake velocity of 0.7 feet per second (fps). The same design is proposed for the Unit 3 intake structure. With the redesign of Unit 3's cooling process the expected number of fish impinged by Unit 3 would be reduced from approximately 240,000 to 5,400 annually. The number of fish entrained by Unit 3 would be reduced from 147 million to 3.4 million annually. Our earlier recommendations were for a 1-mm mesh size screen and intake velocity of 0.25 fps. During several meetings with the Nuclear Regulatory Commission (NRC) and Dominion, there was discussion regarding the lack of sweeping velocity in a reservoir situation. Based upon these discussions we reviewed the literature for fish screen recommendations. The most liberal recommendations encountered were for a 2-mm mesh size and 0.5-fps intake. The proposed 9.5 mm screen will only exclude fish larger than 3.4 inches from the intake. By utilizing a 2 mm screen, fish larger than 1 inch will be excluded. Therefore, to increase resource protection, we recommend a 2-mm mesh size and 0.5-fps intake velocity for the new Unit 3 and Unit 4.

Hydrologic Alterations

Some issues of concern still exist regarding the increased evaporation from the lake and subsequent impacts upon downstream hydrology due to Unit 3. We recommend that these concerns be addressed by changing the proposed operating rules for implementation of the MWC mode cooling process. We feel that implementation of these recommendations will result in this project being consistent with the Fisheries Management enforceable policy of the Virginia Coastal Resources Management Program. Our concerns are that the increased frequency of flows below 40 cfs will cause the downstream hydrology to change to a drier condition than would occur naturally, thereby resulting in lower flows on downstream resources in the Pamunkey River. The required release flow of 40 cfs is 11.6% of mean annual flow. Normal

summer flows on a stream this size would be from 70 to 100 cfs or 20-30% of mean annual flow. Reduced flows result in reduced summer habitat for resident species as well as downstream migratory species. An analysis of Dominion's long term North Anna River monitoring data demonstrated that the fish community requires a diverse flow pattern, with different species doing best in wet years. This is similar to study results from the James River and the North Fork Shenandoah River.

Frequency of 20 cfs flows

Normal water elevation of the lake is 250 feet above mean sea level (msl). Current operating rules for the power plant allow the flows to be reduced from a required 40 cfs to 20 cfs whenever the lake elevation reaches 248 ft msl. Prior to lake construction, flows were less than 20 cfs 4.2% of the time. Currently, flows are decreased to 20 cfs an average of 5.2% of the time. With the proposed Unit 3 wet/dry cooling system, the frequency and duration of these 20-cfs events would increase to 7.3% of the time. This is an improvement from the original proposal, which would have resulted in flows being reduced to 20 cfs 11.8% of the time. With the existing two units, there are two 20-cfs flow events predicted over a 24-year period. The proposed Unit 3 would increase that to five 20-cfs flow events over a 24-year period. With a third unit, the duration of the first two events is increased by an additional 4 to 5 weeks. The three additional events have durations of two to thirteen weeks. We feel that a solution exists to reduce the frequency and duration of 20-cfs events. For each additional inch of water stored, an additional 27 days are provided during which flows can be maintained at 40 cfs. By storing three inches of water, resulting in a lake elevation of 250.25 ft msl, the five 20-cfs events are reduced to three events and the duration of the third event is reduced from 13 weeks to one week. The other two events would have the same duration as they previously did. Therefore, we recommend that the normal operating elevation be seasonally (April-November) increased to 250.25 ft msl in order to minimize the impacts of an increased frequency and duration of 20-cfs flows on downstream resources. Rules could be in place to reduce the pool to elevation 250 prior to predicted severe storm events such as hurricanes and tropical depressions.

Altered flow regime above 40 cfs.

The proposed Unit 3 will withdraw a maximum of 49.6 cfs, with an average use of 34.3 cfs. Return water could range from near 0 to 49.6 cfs depending upon the operation of the dry cooling unit and ambient air temperature. Under summer conditions, dry tower return rates could be in the range of 25%. Winter returns could be 100% with minimal evaporative loss from the lake. Use of only the wet tower will result in almost 100% evaporative water loss. We believe that impacts will occur upon the fishery depending upon season and flows. These impacts can be minimized by use of the dry tower to reduce consumptive water loss. Table 1 (attached) summarizes the flows of the North Anna River under four conditions: 1) prior to construction of Lake Anna, 2) under current conditions, 3) with the addition of Unit 3 as proposed, and 4) with the MWC mode utilized. Some discrepancies occur in the table due to the fact that Unit 3 values were computed using weekly averages instead of daily values. This is particularly apparent in the spring months during median (50th percentile) and 75th percentile events, when flows with Unit 3 are shown as being higher than existing values.

In developing our recommendations, we recognize that the creation of Lake Anna has improved water quality downstream from Contrary Creek, which has benefited several fishery resources. During dry conditions in late summer (10th percentile), some flows now are slightly higher than

before (Table 1). However, during the majority of time since creation of the lake and operation of the power plant, there has been a negative impact on flows. Almost all monthly percentile flows are now less due to natural and accelerated water evaporation (Table 1). In managing an aquatic resource, low, normal, and high flows are important for various species. Naturally variable flows result in a balanced and diversified fish community. Changes in flow of more than 10% can produce habitat changes of 10%. We have highlighted in Table 1 those instances where, 1) natural flows have been reduced by more than 10% of the pre-lake flows, and 2) where use of the MWC mode would increase post Unit 3 flows by more than 10%. Use of the dry cooling system in the summer also can be effective in helping create seasonal variation during wetter years.

Some of the biologically important fishery resources and most critical seasons are as follows:

- Herring spawning during March. Based upon results on the Rappahannock and James rivers, herring runs are strongest when flows are near normal. Low flows have resulted in reduced numbers moving upstream.
- Shad spawning during late March/April. Upstream migration is less during dry years.
- Smallmouth bass spawning in May/June and juvenile bass development/survival during June. Statewide, we have documented that juvenile bass survival is highest when June flows are between the median and average values. June flows, from Table 1, are currently below median values and would decrease more with the addition of Unit 3 to 43% of pre-lake values. Water conservation during this period should enhance smallmouth bass juvenile survival.
- Juvenile shad survival on the Pamunkey River is best during wet summers. The Pamunkey system has the healthiest shad population in Virginia and serves as the brood source for shad reestablishment in the James River system. We have reviewed the impacts of stream flow on American shad juvenile production in the Pamunkey River. These data were presented to Dominion and the NRC in separate meetings in spring 2006. Shad juvenile year class strength and survival were assessed by evaluating catch-per-unit effort of returning brood stock, ages 4 to 6 years. In summary, the best juvenile shad survival occurred during wetter June-August years (those with the flows at the 80th percentile). Lake Anna is about 1/3 the drainage area of the Pamunkey River at the gage station near Hanover, and is an important contributor to that river's flow. Flow losses within Lake Anna due to evaporation can have a significant impact upon downstream shad resources.

To address our concerns, we recommend the following operating rules for implementation of the Maximum Water Conservation (MWC) mode:

- In March and April, we recommend implementation of the MWC mode when flows are less than 225 cfs. Flows are in the lower quartile, and water conservation savings can result in significant habitat savings and return flows to near existing conditions. These flows are particularly important for herring, shad, migratory striped bass, and resident sucker and minnow spawning.
- In May, we recommend implementation of the MWC mode when flows are less than 175 cfs. These flows are important for smallmouth bass nesting. The addition of Unit 3 would reduce flows by 30% from pre-lake conditions.

- In June, we recommend implementation of the MWC mode when flows are less than 120 cfs. This value is close to the average value and will enhance smallmouth bass spawning success and subsequent catch to anglers.
- From July - October we recommend implementation of the MWC mode when flows are less than 90 cfs. High flows are important for the habitat requirements of resident fish species that do best in wet years. Without water conservation in wet years, those optimal habitat conditions are not achieved. Wet years also are important for producing strong year classes of American shad in the Pamunkey River.

Under the current proposal, the MWC mode would be implemented after a 7-day waiting period when water surface elevation is below 250 msl and releases are 40 cfs. We recommend against the 7-day waiting period before implementing water conservation. We recommend implementation when downstream flows have a three-day rolling average at the above triggers.

Other Wildlife Resources

In addition to our concerns regarding potential adverse impacts upon fishery resources, we have notified Dominion and the NRC of the existence of at least two new bald eagle nests at Lake Anna. We understand that the NRC may informally consult with the U. S. Fish and Wildlife Service regarding these two nests. We support this consultation and also recommend that Dominion contact DGIF biologist Jeff Cooper (540-899-4169; Jeff.Cooper@dgif.virginia.gov) to address potential adverse impacts upon bald eagles due to this project.

Thank you for the opportunity to provide comments on this project. Please contact Andrew Zadnik at 804-367-2733 if we can be of further assistance.

Sincerely,

for Raymond T. Fernald, Manager
Nongame and Environmental Programs

Table 1. Flows (cfs) downstream of Lake Anna based upon pre-lake conditions, existing operations, with the addition of Unit 3 under proposed operation, and with Unit 3 under implementation of the Maximum Water Conservation (MWC) cooling mode.

	Percentile															
	10%				25%				50%				75%			
Months	Pre-lake	Current	Unit 3	MWC	Pre-lake	Current	Unit 3	MWC	Pre-lake	Current	Unit 3	MWC	Pre-lake	Current	Unit 3	MWC
March	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	455	479	400	367	687	712
April	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	274	297	388	362	442	446
May	110	40	40	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	261	250	288	304
June	70	40	40	40	81	40	40	40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	36	40	40	40	50	40	40	40	76	53	40	40	[illegible]	[illegible]	[illegible]	[illegible]
August	15	40	30	40	42	40	40	40	67	52	40	40	[illegible]	[illegible]	[illegible]	[illegible]
September	12	40	30	30	25	40	40	40	47	47	40	40	95	56	40	40
October	20	40	21	21	40	40	40	40	72	50	40	40	[illegible]	[illegible]	58	[illegible]

The highlighted cells show flow values where, 1) natural flows have been reduced by more than 10% of the pre-lake flows, and 2) where use of the MWC mode would increase post Unit 3 flows by more than 10%.
The values with a line drawn through are not logical, since post project values are higher than pre-lake values. This is because the analysis technique used weekly averages instead of daily values.

August 28, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DOMINION NUCLEAR NORTH ANNA, LLC	)	Docket No. 52-008-ESP
	)	
(Early Site Permit for North Anna ESP Site)	)	ASLBP No. 04-822-02-ESP
	)	

INTERVENORS' STATEMENT OF MATERIAL FACTS IN DISPUTE, and RESPONSE TO DOMINION'S "STATEMENT OF MATERIAL FACTS ON WHICH NO GENUINE DISPUTE EXISTS"

I. Material Facts in Dispute

Intervenors Blue Ridge Environmental Defense League, Nuclear Information and Resource Service, and Public Citizen (collectively, "Intervenors") submit, in support of their Response to Dominion's Second Motion for Summary Disposition, this Statement of Material Facts in Dispute.

1. The revised closed cycle cooling system for Unit 3 that Dominion has proposed will result in a thermal impact in the form of significant evaporation of lake water from the wet cooling tower and corresponding reductions in flow rates downstream of the North Anna Dam.

2. Dominion has failed to adequately address the potential thermal impact of increased evaporation and corresponding reductions in downstream flow in its revised Environmental Report.

3. Predictions of future flow rates at the Hanover United States Geological Survey ("USGS") gauging station in the Pamunkey River do not provide a suitable basis for assessing impacts to striped bass potentially using the North Anna River as spawning habitat. Flow rates at the Hart Corner USGS gauging station in the lower North Anna River are a better indicator.

4. As a result of the differences between flow rates at the Hart Corner and Hanover USGS gauging stations, water current velocities that may be sufficient to support striped bass egg development near and downstream of the Hanover gauging station may not be sufficient to support striped bass eggs spawned in the lower North Anna River.

5. Dominion has not provided data, analysis or modeling in the ER demonstrating whether and how reduced discharges from the North Anna Dam resulting from the operation of Unit 3 would translate to reduced flow velocities in the North Anna River.

6. Flow rates in the lower North Anna River and upper Pamunkey River during drought periods have reached significantly low levels in the past decade that have likely had an adverse impact upon striped bass. Operation of Unit 3 would increase the number and duration of minimum flow release rates from the North Anna Dam, decreasing flows in the upper North Anna River and lower Pamunkey River. These reductions in downstream flow will likely exacerbate the adverse impacts of drought flows to striped bass potentially using the lower North Anna River and upper Pamunkey River.

7. A more complete analysis of flow rates and flow velocities in the lower North Anna and upper Pamunkey Rivers during drought years is necessary to properly determine the impact of the operation of Unit 3 on striped that potentially utilize these river stretches. There is no data on historical striped bass summer distribution or habitat use in the ER that supports Dominion's assumption that striped bass will be able to find other suitable summer habitat after an additional unit goes into operation.

8. Dominion has failed to evaluate whether possible future water withdrawals from the North Anna River would exacerbate thermal impacts on striped bass occurring in the lower reaches of the North Anna River and the upper reaches of the Pamunkey River.

II. Response to Dominion's "Statement of Material Facts on Which No Genuine Dispute Exists"

1. Intervenors admit the assertion set forth in paragraph 1 of Dominion's Statement of Material Facts on Which No Genuine Dispute Exists (hereinafter "Statement").

2. Intervenors deny knowledge or information sufficient to form a belief as to the truth of the assertions in paragraph 2 of Dominion's Statement.

3. Intervenors deny knowledge or information sufficient to form a belief as to the truth of the assertions in paragraph 3 of Dominion's Statement.

4. Intervenors deny knowledge or information sufficient to form a belief as to the truth of the assertions in paragraph 4 of Dominion's Statement.

5. Intervenors deny knowledge or information sufficient to form a belief as to the truth of the assertions in paragraph 5 of Dominion's Statement.

6. Intervenors admit the assertions set forth in the first and third sentences of paragraph 6 of Dominion's Statement. Intervenors deny knowledge or information sufficient to form a belief as to the truth of the assertion in the second sentence of paragraph 6 of Dominion's Statement.

7. Intervenors deny knowledge or information sufficient to form a belief as to the truth of the assertions in paragraph 7 of Dominion's Statement.

8. Intervenors admit the assertions set forth in paragraph 8 of Dominion's Statement.

Respectfully submitted,

Morgan W. Butler
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COUNSEL FOR INTERVENORS BREDL, NIRS AND PUBLIC CITIZEN

August 25, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DOMINION NUCLEAR NORTH ANNA, LLC	)	Docket No. 52-008-ESP
	)	
(Early Site Permit for North Anna ESP Site)	)	ASLBP No. 04-822-02-ESP
	)	

SECOND AFFIDAVIT OF SHAWN PAUL YOUNG, PH.D.

County of Jefferson)
) ss.
State of Oregon)

I, Shawn Paul Young, being duly sworn, depose and say as follows:

Background

1. My name is Shawn Paul Young, Ph.D. I am currently a native fish biologist for Portland General Electric, Portland, Oregon. My business address is 726 Lower Bend Road, Madras, OR 97741. I also hold adjunct faculty status at Clemson University, my previous employer. I submit this affidavit as a private consultant to the Intervenors in this matter.

2. My professional and educational experience is summarized in the curriculum vitae attached to this affidavit. 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 ten years experience researching the effects of hydroelectric facilities and reservoir management on both introduced and native fisheries, including six years experience studying reservoir striped bass behavior and

habitat use in relation to water quality. In addition to my professional qualifications, I have been an avid outdoorsman, fishing, hunting, and enjoying nature in every manner since my early childhood.

3. I have completed four major peer-reviewed publications derived from my thesis and dissertation research in the subject area of reservoir striped bass populations. Two manuscripts have been published, and two are in the final review stage for publication within the journals of the American Fisheries Society, the pre-eminent professional society for fisheries scientists, of which I am an active member. I have been consulted by state, federal, academia, and public sectors in the subject area of striped bass ecology. I have presented scientific presentations on the subject at 11 professional meetings as well as 8 times as an invited speaker to citizen fishing associations. At Clemson University, I was honored with an outstanding employee award in 2003, and the fisheries research facility previously under my management twice received facilities excellence awards.

4. I am familiar with the application of Dominion Nuclear North Anna, LLC ("Applicant" or "Dominion") for an Early Site Permit ("ESP") at the North Anna ESP site, Dominion's Environmental Review ("ER"), and Dominion's Second Motion for Summary Disposition and accompanying affidavit of Patrick J. Ryan. I have reviewed materials and data provided within the documents describing the changes in design for the additional third unit and the subsequent thermal regime, flow patterns, reservoir flow into North Anna River, and occurrences of low flow and drought conditions pertaining to the striped bass populations and aquatic organisms of Lake Anna, the North Anna River, and the Pamunkey River.

5. I am providing this affidavit in support of Intervenors' contentions outlined in Contention EC 3.3.2 -- Impacts on Striped Bass in Lake Anna. The opinions and conclusions I express in

this affidavit are my own and should not be attributed to Portland General Electric or Clemson University. My affidavit explains justification for the contentions stated and the request that additional data be collected and modeling be performed to properly evaluate potential effects of the proposed third reactor unit on striped bass within the lower North Anna River and the upper Pamunkey River. I have extrapolated my knowledge and experience in this subject matter to the scenarios and data explained and detailed within Dominion's ER and Second Motion for Summary Disposition and related documentation. I have arrived at conclusions dealing with the matters stated herein and believe them to be true and correct.

Dominion's Analysis Does Not Adequately Address Potential Thermal Impacts to Striped Bass in Lower North Anna River and Upper Pamunkey River

6. It appears that Dominion has taken steps to effectively eliminate further increases to water temperatures in Lake Anna and downstream that would be caused by the discharge of heated water into the Lake. Dominion acknowledges that the design for the third unit's cooling towers will increase evaporation of Lake water, correspondingly reducing flows and prolonging periods of reduced flow over the Lake Anna Dam. However, Dominion has not provided sufficient information in the ER that would enable it to adequately determine the impacts of these reduced flows to striped bass downstream of the Dam. First, Dominion points to modeled flows at the Hanover United States Geological Survey ("USGS") gauging station on the Pamunkey River as evidence that striped bass will not be impacted by reduced flows. However, flows at the Hanover gauging station are not an accurate indicator of flows or potential impacts further upstream in the North Anna River. Second, where Dominion has seemingly offered conclusions specifically related to potential impacts in the North Anna River, those conclusions are not supported by the limited evidence Dominion offers. Instead, historical flow rates from a USGS station that is located on the lower North Anna River itself suggest that a third unit could

exacerbate the adverse impacts of drought-flow conditions to striped bass potentially using the lower North Anna River and upper Pamunkey River.

A. Pamunkey River Flows at Hanover Gauging Station Ignore Potential Impacts Upstream in Lower North Anna River

7. Dominion has previously acknowledged in its First Motion for Summary Disposition and accompanying affidavit of John William Bolin, III, that the Pamunkey/North Anna striped bass population may spawn as far upstream as the lowest stretch of the North Anna River, between the Fall Line and the confluence of the North Anna River and the South Anna River (forming the Pamunkey River). Moreover, scientific literature I have reviewed supports the conclusion that striped bass may ascend as far as the Fall Line in the lower North Anna River to spawn. Striped bass are known to ascend far up into Atlantic Coast rivers to locate the freshwater rapids, shoals, and areas of riverbed elevation decline that typify fall lines and create flow velocities that will allow eggs to remain suspended for development (Merriman 1941; Dudley et al. 1977; Carmichael et al. 1998). Thus, viable spawning habitat for the Pamunkey/North Anna population of striped bass extends into the freshwater portion of the Pamunkey River upstream of the Hanover gauging station, and as Dominion acknowledges, potentially reaches as far upstream as the Fall Line in the lower North Anna River.

8. Based upon my review of Dominion's analysis of potential impacts to striped bass contained in Section 5.2.2.2 of Dominion's ER, Dominion's conclusions appear to be primarily based upon analysis of historical flows at the Hanover United States Geological Survey gauging station. However, as I discuss below, flows rates at the Hanover gauging station are not necessarily indicative of potential impacts to striped bass that may utilize the lower North Anna River.

9. The Hanover USGS station is located on the Pamunkey River approximately 46 miles downstream from the North Anna Dam and approximately 21 miles downstream from the Fall Line. In the ER, Dominion appears to have projected how a third unit equipped with the revised closed cycle cooling system would impact flow rates at the Hanover gauging station. Dominion concludes that flows at the Hanover gauging station during the months of April and May will be reduced by 0.5 to 5 percent when compared to what the April and May flows would be without the addition of a third unit. Dominion then concludes that these levels of reduction will have an insignificant impact upon striped bass spawning and developing eggs, larvae and early juveniles.

10. There is another USGS gauge located at Hart Corner on the lower North Anna River, near Doswell, Virginia. This gauge is approximately 30 miles downstream of the Dam, and approximately 15 miles upstream of the Hanover gauge. This gauge is well outside the reach of the tidal flow dynamics that Dominion claims could help mitigate potential impacts of instream flow reductions to striped bass spawning and rearing areas downstream of the Hanover gauge. Since it is located on the North Anna River, flow rates measured at the Hart Corner gauge are a better indicator of flows in the lower North Anna River than are the flow rates at the Hanover gauging station on the Pamunkey River. The Hart Corner gauge therefore provides a stronger basis than the Hanover gauge for predicting impacts to striped bass potentially using the lower North Anna River.

11. I have reviewed the historical flow rates for the Hart Corner and Hanover USGS gauging stations that are posted on a USGS website, available at http://waterdata.usgs.gov/va/nwis/rt. When I compared the Hart Corner USGS historical flow records to the Hanover USGS historical flow records, I found that spring and summer flows typically are significantly lower at the Hart

Corner gauging station. This is not surprising, due to the fact that flows at the Hanover gauge include flows from both the North Anna and South Anna Rivers, as well as the Little River.

12. Dominion's general conclusions regarding potential impacts to striped bass in the Pamunkey River are extrapolated from the higher flow rates at the Hanover gauge. Thus, the value of those conclusions as they relate to potential impacts to striped bass that might be utilizing the North Anna River further upstream are significantly undermined.

13. One specific way those conclusions are undermined is the likely difference in the velocity of water current at the Hart Corner gauging station as compared to Hanover gauging station. Striped bass eggs need a minimum flow velocity of 30 centimeters per second to remain suspended in the water column, coupled with water temperatures of 17 - 21°C to optimize survival to the larval stage (Bain and Bain 1982; Fay et al. 1983).

14. Water current velocities in the North Anna River at the Hart Corner gauging station could be significantly lower than water currents downstream in the Pamunkey River in the vicinity of Hanover as a result of the lower flows at Hart Corner. This is because less flow (measured in cubic feet per second) would likely reduce flow velocity (measured in centimeters per second), depending upon other factors such as changes in elevation, stream morphology, etc. Therefore, reduced flows from the Dam could have a more significant impact upon the development of eggs that are spawned in the North Anna River than eggs spawned in the vicinity of Hanover and downstream, since current velocities in the North Anna River may be diminished to a point where the eggs cannot remain suspended.

15. This question warrants adequate investigation, but Dominion has provided no data, analysis or modeling to determine how reduced discharges from the North Anna Dam would equate to reduced flow velocities in the North Anna River. Based on the information I have

seen, I don't believe Dominion can confidently extrapolate flow rates from the Hanover gauging station to determine impacts to striped bass potentially using habitat further upstream in the North Anna River.

B. Dominion's Conclusion Regarding Potential Impacts in the North Anna River is Not Supported by the Limited Evidence Offered in the ER

16. Apart from the general conclusions its draws from its analysis of flow rates at the Hanover gauging station in the Pamunkey River, Dominion does appear to form a conclusion regarding potential impacts to the striped bass' spring spawning regime in the North Anna River, specifically. In Section 5.2.2.2 of the Revised ER, Dominion states that minimum flows from the North Anna Dam would be highly unlikely in April and May. This indicates, according to Dominion, that "the spring spawning regime in the North Anna River below the North Anna Dam would not be impacted by operation of a new Unit 3 on Lake Anna."

17. In my review of the historical flow records from the Hart Corner USGS gauging station, I found that flows at that location have been significantly reduced during drought occurrences over the past decade during the period of time that encompasses the entire striped bass spawning period and early life stage development (March 1 to September 1). Most dramatically, during the drought of 2002, there were only six days during March and April when daily mean values for river flow at the Hart Corner gauge exceeded 100 cfs, and only one day when the river flow exceeded 200 cfs. In May, June, July and August of 2002, daily mean river flow rates exceeded 100 cfs at the Hart Corner gauge only once. (Conversely, at the Hanover USGS gauge, daily mean river flow rates exceeded 100 cfs every day in March and April of 2002, and exceeded 100 cfs in May, June, July and August of 2002 a total of thirty-one times.) River flows at the Hart Corner gauge also reached very low levels during the spring and summer months of 1999 as a result of a drought that occurred that year.

18. Pertinently, in a July 7, 2006 letter to the Virginia Department of Environmental Quality commenting on the potential impacts of the revised cooling system, the Virginia Department of Game and Inland Fisheries recommended that the Maximum Water Conservation Mode be implemented for the third unit any time during the months of March and April that flows from the dam decrease below 225 cfs. This recommendation was based on the importance of higher flows during these months for a number of downstream fish species, specifically including striped bass.[1]

19. While Dominion asserts that mandated minimum flows from the Dam would be highly unlikely in April and May, the flow rates measured at the Hart Corner USGS gauge demonstrate that there will still be drought periods of very low flow between March 1 and September 1 when striped bass spawning and early life stage development is taking place. The historical flow figures I have evaluated from the Hart Corner gauge, and the 2002 flow rates in particular, demonstrate that flow rates during past drought periods have been reduced to levels that likely had an adverse effect on these stages of striped bass development.

20. For instance, the Virginia Institute of Marine Science conducts an annual juvenile striped bass "seine survey" in which it monitors the relative annual recruitment success of juvenile striped bass in the spawning and nursery areas of the Lower Chesapeake Bay. In 1999 and 2002, recruitment success was drastically lower throughout the study area than in other recent years, including recruitment in the York and Pamunkey Rivers. Conversely, 2003 marked the highest recruitment success since 1996, and VIMS concluded that the 2003 rebound "was likely a result of the cool, wet conditions that produced favorable river flow for survival and subsequent growth during the spring spawning and summer nursery seasons," in contrast to low flow conditions that persisted during the drought of 2002 and adversely impact recruitment in that year. (Austin et

[1] This letter is attached to Intervenors' Response as Exhibit __.

al. 2004). The study's findings suggest that flow rates in the Pamunkey River during the recent droughts of 1999 and 2002 were reduced to levels that adversely impacted early life-stage striped bass development.

21. As Dominion acknowledges on page 3-5-16 of the revised ER, a third unit will increase the number and prolong the duration of low flows that are released from the North Anna Dam during these drought periods. Moreover, during drought periods, the North Anna River can become the primary contributor of flow to the upper Pamunkey River, since mandated minimum flows are required in the North Anna River (as a result of the Dam), but not in the South Anna River. Thus, the operation of a third unit would likely exacerbate the potential impacts of these low flows to not only the striped bass utilizing the North Anna River, but also to striped bass further downstream in the Pamunkey River. As such, I feel significant information is lacking from the ER to enable Dominion to be able to accurately and confidently assess impacts to striped bass utilizing the lower North Anna and upper Pamunkey Rivers. Again, a more complete analysis of flow rates and flow velocities in the lower North Anna and upper Pamunkey Rivers during drought years is necessary to properly determine the impact on striped bass utilizing these areas.

Further the affiant sayeth not.

Shawn Paul Young, Ph.D.
585 SW 1st Street
Madras, OR 97741

Subscribed and sworn to before me
this 25th day of August 2006.

Notary Public
My Commission expires: 5-22-07

OFFICIAL SEAL
JASON J HAGEN
NOTARY PUBLIC-OREGON
COMMISSION NO. 368939
MY COMMISSION EXPIRES MAY 22, 2007

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Education

PhD Fisheries and Wildlife Biology (Fisheries Emphasis). May 2005. Clemson University. Clemson, SC. Dissertation: *Behavior and mortality of adult striped bass in J. Strom Thurmond Reservoir, South Carolina-Georgia.*

MS Aquaculture, Fisheries, and Wildlife Biology (Fisheries Emphasis). August 2001. Clemson University. Clemson, SC. Thesis: *Habitat utilization by striped bass in J. Strom Thurmond Reservoir, South Carolina-Georgia.*

BS Environmental Studies. May 1996. Northland College. Ashland, WI.

Professional Experience

Native Fish Biologist (June 2006 – Present)
Portland General Electric, Pelton-Round Butte Hydroelectric Project, Madras, OR
I conduct research and monitoring activities investigating the native fish assemblage within Lake Billy Chinook, Lake Simtustus, and the tributaries above the Pelton-Round Butte Hydroelectric Dam complex in the middle Deschutes River Basin. I am also a lead biologist for the reintroduction of anadromous salmonids above Pelton-Round Butte Dams.

Aquatic Ecology / Fisheries Expert (January 2005 –Present)
Southern Environmental Law Center and Public Citizen, Charlottesville, VA
I review and comment on Draft Environmental Impact Statements and Environmental Reviews pertaining to potential impacts of proposed human alterations on aquatic ecosystems with expertise in reservoir and large-river fish and macro-invertebrate populations.

Interim Lecturer (Adjunct Professor) – Aquatic Ecology (August 2005 – May 2006)
Department of Forestry and Natural Resources, Clemson University
WFB 300 Wildlife and Fisheries Biology (Team-taught course): I lectured on aquatic animal ecology and taxonomy. Lecture topics included fish, crocodilians, sea turtles, pinnipeds, sirenians, and cetaceans.
ENR 302 Natural Resource Measurements (Team-taught course): I lectured on aquatic survey methods and techniques. Lecture/Lab topics included bio-telemetry, water quality/environmental monitoring, capture and tagging methods for fish and aquatic invertebrates, population estimation of fish and aquatic invertebrates, and stream habitat surveying.

Aquatic Animal Research Laboratory, Facility Manager (June 2000 – May 2006)
Biologist II, Clemson University, Clemson, SC

I conducted research and managed facilities at a leading fisheries/aquaculture research laboratory. Our research specialized in identifying factors that affect fish and aquatic invertebrate physiology, behavior, and population dynamics. I have conducted research on habitat requirements of marine, estuarine, anadromous, and freshwater species at the larval, juvenile, and adult life-history stages. I have studied the effects of biotic and abiotic factors such as temperature, salinity, dissolved oxygen, total ammonia, nitrite, metals toxicity, feed rations, and population density on the health, survival, growth, condition, and behavior of fish and aquatic invertebrates.

Knowledge, Skills, and Abilities:

- Knowledge of fish and aquatic invertebrate physiology, ecology, health, and care.
- Aquaculture methodology, operation, and water quality monitoring.
- Supervise/assist primary researchers, graduate assistants, and student workers.
- Experimental techniques - tissue sampling, blood chemistry and osmolality.
- Assist in statistical analysis and technical writing for publication of research and for oral presentation of research at professional meetings *(please refer to Publications and Presentations)*.
- Construction and repair of re-circulating and flow-through culture systems; plumbing, electrical, carpentry, general construction, and mechanical repair.
- Budgeting; record and data storage; maintain lab protocols and operating procedures.

Graduate Research Assistant (June 1999 – May 2005)
SC Cooperative Fish and Wildlife Research Unit, Clemson University
My dissertation and thesis culminated several telemetry field studies of behavior, mortality, and habitat selection of reservoir striped bass coupled with extensive water quality monitoring. The research identified seasonal migration patterns, daily movement patterns, and seasonal habitat selection in relation to water quality; sources and magnitude of mortality; temporal and spatial patterns of mortality; and, potential to successfully live-release striped bass angled during fishing tournaments. Through graduate coursework, I also acquired extensive knowledge of fisheries science and management; physiology, ecology and conservation of aquatic organisms; limnology and hydrology; and experimental statistics *(please refer to transcripts)*.

Knowledge, Skills, and Abilities:

- Assisted with the following research projects:
  - Striped bass habitat use in Lake Murray, SC.
  - Largemouth bass movement in Steele Creek-Savannah River Nuclear Reservation.
  - American shad population estimation and passage at Savannah River Lock and Dam.
  - Robust redhorse/Savannah River sucker species ecology: Behavior and habitat use.
  - Shortnose sturgeon ecology in lower Savannah River: Behavior and habitat use.
- Supervise and conduct long-term telemetry studies.
- Surgical implantation of telemetry devices and fish tagging methods.
- Procedures and methodology for long-term habitat/ water-quality modeling and monitoring.
- Data management, statistical analysis, technical writing for dissertation and thesis completion, publication in peer-reviewed journals, and presentation of project results at professional and public meetings *(please refer to Publications and Presentations)*.

Previous Professional Experience

Fisheries Field Technician (October 1997 - May 1999) Idaho Department of Fish and Game
Position Description: I conducted research on the effects of hydroelectric generation on behavior and survival of salmonids (rainbow trout and bull trout), burbot, and white sturgeon in the Kootenai River, ID-MT. Major responsibility was to conduct large-scale radio-telemetry studies to acquire knowledge of seasonal movements and migratory behavior to and from spawning grounds, and determine affect of flow fluctuation on behavior. Fish were captured by screw-traps, gill-nets, hoop-nets, set-lines, angling and electrofishing (back-pack and boat).

Fisheries Bio-Aide (April 1997 – September 1997) Idaho Department of Fish and Game
Position Description: I conducted numerous salmonid (rainbow/steelhead, king salmon, bull trout, cutthroat trout, and brook trout) population estimates through back-country snorkel surveys and electro-fishing in rivers, streams and reservoirs with backpack units and boat units.

Fisheries Volunteer (Sept 1996 – Dec 1996) USGS-BRD, Great Lakes Division
Position Description: I assisted with assessment of Lake Trout restoration efforts in western Lake Superior by using large-scale gill netting from a research vessel. Subsequent laboratory duties involved stomach diet analysis of Lake Herring by zooplankton and benthic organism identification.

Fisheries Crew Hand (November 1996) Red Cliff Tribal Fisheries
Position Description: I assisted with gill net lifts and fish collection; collection of morphometric data of Lake Trout and Lake Whitefish in western Lake Superior.

Fisheries Aide (June 1996 – Sept 1996) US Forest Service, Superior National Forest
Position Description: I conducted stream habitat surveys for creation of a GIS database of brook trout habitat and abundance throughout watersheds within the Superior National Forest.

Publications

Burkey, K. B., **S. P. Young**, J. R. Tomasso, and T. I. J. Smith. (In Press). 2006. Low-salinity resistance of juvenile cobia. North American Journal of Aquaculture.

Young, S. P., J.R. Tomasso, and T.I.J. Smith. (In Press). 2006. Survival and water balance of black sea bass held in a range of salinities and calcium-enhanced environments after abrupt salinity change. Aquaculture.

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Young, S. P., S. M. Welch, and A. G. Eversole. Survival and injury to crayfish subjected to electrofishing.

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Atwood, H.L.; **S.P. Young**, J.R. Tomasso, and T.I.J. Smith. 2004. Resistance of cobia juveniles to low salinity and low temperature. 28th Annual Larval Fish Conference, Early Life History Section, American Fisheries Society. Clemson, SC.

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Young, S.P. 2002. Strain-specific characteristics to manage sub-populations of fish species. Case Study: Lake trout restoration in Lake Ontario. Department of Biological Sciences Discussion Group. Clemson University.

Awards

- 2004 Animal Research Committee Excellence Award, Clemson University.
- 2003 Outstanding Classified Employee Award - Clemson University
- 2003 Employee Performance Award, Clemson University.
- 2003 Animal Research Committee Excellence Award, Clemson University

Professional Membership

- American Fisheries Society (General Member)
  - Fisheries Management Section, Physiology Section, Fish Health Section, Water Quality Section, Early Life History Section, and Fish Culture Section Member

August 24, 2006

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DOMINION NUCLEAR NORTH ANNA, LLC	)	Docket No. 52-008-ESP
	)	
(Early Site Permit for North Anna ESP Site)	)	ASLBP No. 04-822-02-ESP
	)	

DECLARATION OF BARRY W. SULKIN

County of Davidson)
)
State of Tennessee)

I, Barry W. Sulkin, declare as follows:

1. I am a citizen and resident of Davidson County, Tennessee, living at 4443 Pecan Valley Road, Nashville, Tennessee 37218. I am an environmental consultant and have been hired by the intervenors in this matter. This declaration is based on my personal knowledge, experience, and training, and a review of documents related to this matter. My curriculum vitae is attached.

2. I received my Bachelor of Arts in Environmental Science in 1975 from the University of Virginia where I received a Du Pont Scholarship. My areas of study included chemistry, biology, limnology and hydrology of streams and lakes, including thermal pollution. I received my Masters of Science in Environmental Engineering in 1987 from Vanderbilt University, as described below. I helped shape the contention on

3. In 1976 I joined the staff of what is now called the Tennessee Department of Environment and Conservation (TDEC) as a Water Quality Specialist, and continued to work for this agency for almost 14 years. I worked in the Chattanooga, Knoxville, and Nashville field offices and the central office of what is now called the Division of Water Pollution Control. I received on the job training in addition to formal education in stream assessment. My duties included inspections and enforcement coordination for the water pollution programs, as well as work with the drinking water, dam safety, underground storage tank, and solid/hazardous waste programs. I also conducted investigations regarding fish kills, spills, and general complaints, including problems involving stream alterations and relocations. I was also involved in developing, implementing, and enforcing the state's Aquatic Resource Alteration Permit (ARAP) program, as well as activities related to the Corps of Engineers 404 permit program and the state's 401 certification component.

4. In 1985 I became State-wide manager of the Enforcement and Compliance Section for the Division of Water Pollution Control. In this capacity I was responsible for investigating and preparing enforcement cases, supervising the inspection programs and permit compliance monitoring, and special projects and field studies including water quality and assimilative capacity and permit modeling. While in this position I took an educational leave to obtain my Masters of Science in Environmental Engineering in 1987 from Vanderbilt University. I returned to my position as manager of the Enforcement and Compliance Section in 1987, where I remained until 1990.

5. Since 1990, I have engaged in a private consulting practice specializing in water quality problems and solutions, regulatory assistance, NPDES permits, stream surveys, and various environmental investigations related to water. I have worked for many private clients over the past 16 years where I have been required to interact with state and federal environmental agencies. I have researched the matters for which I give opinion in this declaration.

6. I am familiar with the application of Dominion Nuclear North Anna, LLC for an Early Site Permit (ESP) at the North Anna site, and with Dominion's revisions to cooling system design for Unit 3. I have reviewed excerpts of the Environmental Report included with Dominion's ESP Application Revision 7, the NRC's Supplemental Draft EIS, Dominion's Second Motion for Summary Disposition and related documents submitted in this matter.

7. It is not accurate to say, as Dominion does in its Second Motion for Summary Disposition, that "there is no thermal impact from Unit 3...." Dominion's Second Motion for Summary Disposition, p. 6. Increases in water temperature and reductions in downstream flow due to evaporative loss are two different types of thermal impact. While the direct thermal impact associated with the release of heated cooling water into Lake Anna would be effectively eliminated, the related thermal impact of reduced flow due to evaporative loss from the cooling system when it operates as a wet cooling tower would remain a cause for concern downstream of Lake Anna.

8. Dominion's revised proposal would use a closed cycle cooling system that would alternate between wet and dry cooling towers depending upon lake levels, as opposed to the once-through cooling system it originally proposed and the dry cooling

system later proposed for Unit 4. Under the original once-through proposal, heated lake water run through the cooling system for Unit 3 would have been discharged directly back into Lake Anna, and the elevated temperature of the discharged water would have increased water temperatures in the Lake and induced evaporative losses of water from the surface of the lake. Instead of transferring heat into the lake, the revised proposal for a closed cycle cooling system will instead use lake water to transfer heat into the atmosphere via evaporation when used in the predominant wet cooling cycle. As set forth in Dominion's April 13, 2006 letter to NRC, "[a]fter passing through the dry coolers, the water then passes through a wet cooling tower section, where the remaining heat is dissipated by spraying the water into an air stream, achieving the majority of the heat transfer by evaporation of a portion of the water." (Dominion's April 13, 2006 letter, Enclosure 1, Response to NRC Questions, at p. 6). Water would be withdrawn from Lake Anna in order to make up the water lost to evaporation.

9. Therefore, despite the operational difference as to how the thermal load is discharged, both cooling processes have a significant thermal impact – evaporation of lake water – in common.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 24th day of August, 2006.

Barry W. Sulkin

BARRY SULKIN
ENVIRONMENTAL CONSULTANT
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EDUCATION

1987 M.S., **Vanderbilt University** - Nashville, Tennessee
Major: Environmental Engineering - VU/State of TN Scholarship
Master's Thesis: "HARPETH RIVER AT FRANKLIN DISSOLVED OXYGEN STUDY" Field study/computer modeling of impacts of sewage treatment plant

1975 B.A., **University of Virginia** - Charlottesville, Virginia
Major: Environmental Science - du Pont Scholarship

Additional undergraduate courses: math and engineering at University of Tennessee - Knoxville 1982-1984

HONORS

River Hero Award, presented by River Network 2006
Order of the Engineer, Vanderbilt University Link, 1992
Lifetime Achievement Award, Tennessee Environmental Council, 1990
Water Conservationist of the Year, Tennessee Conservation League, 1989
State of Tennessee/Vanderbilt Scholarship, 1985 - 1987
du Pont Scholarship, University of Virginia, 1971 - 1975
Eagle Scout, 1967

AFFILIATIONS/ORGANIZATIONS (current and previous)

Tennessee Environmental Council - Board of Directors
National Environmental Health Association - Registered Environmental Health Specialist
Water Environment Federation
International Erosion Control Association
American Society of Civil Engineers
Tennessee Scenic Rivers Association
Davidson County Grand Jury, Nashville, TN

PROFESSIONAL EXPERIENCE - PRESENT

Sept. 1990 - Present: **Environmental Consultant** - Self-employed

Consultant and scientist serving clients such as attorneys, businesses, environmental/citizen organizations, municipal and state government, individuals, media, and sub-contractor for other consultants; Activities include research projects, permit negotiations, information and file research, photography, site evaluations, and expert witness & public hearing presentations concerning water quality, air pollution, road building, solid waste, superfund, and other environmental issues. Clients have included Tennessee and New York Attorney General's Offices; City of Columbia, Robert Orr/Sysco, Whitson Lumber Company, Flynt Engineering Company, UT Center for Industrial Services, TN Assoc. of Business, TN Forestry Assoc., Georgia Center for Law in the Public Interest; Southern Environmental Law Center; Trial Lawyers for Public Justice, TN Citizens for Wilderness Planning, Dickson County Board of Zoning Appeals, Middle TN Lumber Company; also TN Director of Public Employees for Environmental Responsibility (PEER). Also employed by EPA as special expert to serve on Federal Advisory Committee for Detection and Quantitaion and Uses in the Clean Water Act representing environmental groups, since June 2005.

PROFESSIONAL EXPERIENCE - PREVIOUS

1976 - 1990: **Environmental Specialist/Manager**
Tennessee Department of Environment & Conservation
Division of Water Pollution Control

Inspector for drinking water and pollution programs in central and field offices in Nashville, Knoxville and Chattanooga; Special projects assistant to Director; Instructor for University of Tennessee Graduate Environmental Engineering Program in Nashville; Last position held beginning 1985 as Manager of Enforcement and Compliance Section.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
DOMINION NUCLEAR NORTH ANNA, LLC	)	Docket No. 52-008-ESP
	)	
(Early Site Permit for North Anna ESP Site)	)	ASLBP No. 04-822-02-ESP
	)	

CERTIFICATE OF SERVICE

I hereby certify that on August 28, 2006, copies of Intervenors' Response to Dominion's Second Motion for Summary Disposition of Contention 3.3.2 with Statement of Material Facts in Dispute, the Second Affidavit of Shawn Paul Young, Ph.D., and the Declaration of Barry W. Sulkin, were served on the following by first-class mail and, where indicated by an asterisk, by electronic mail.

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