KAS 13668

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North Anna ESP Hearing
Topic 1 – Surface Water Impacts and Possible Mitigation Measures

NRC Staff Presentation

Lance W. Vail, PNNL—Hydrology
Jeffrey A. Ward, PNNL—Aquatic Ecology
Dr. Michael T. Masnik, NRC—Aquatic Biology
Dr. Michael J. Scott, PNNL—Socioeconomics

Template=SECY-027

SECY-02

U.S. NUCLEAR REGULATORY COMMISSION

In the Matter of Dominion Nuclear North Anna, LLC

Docket No. 52-008-ESP Official Exhibit No. 18

OFFERED by: Applicant/Licensee Intervenor

(NRC Staff) Other

IDENTIFIED on 4/24/07 Witness/Panel Vail, Ward, Masnik, Scott

Action Taken: (ADMITTED) REJECTED WITHDRAWN

Reporter/Clerk MC

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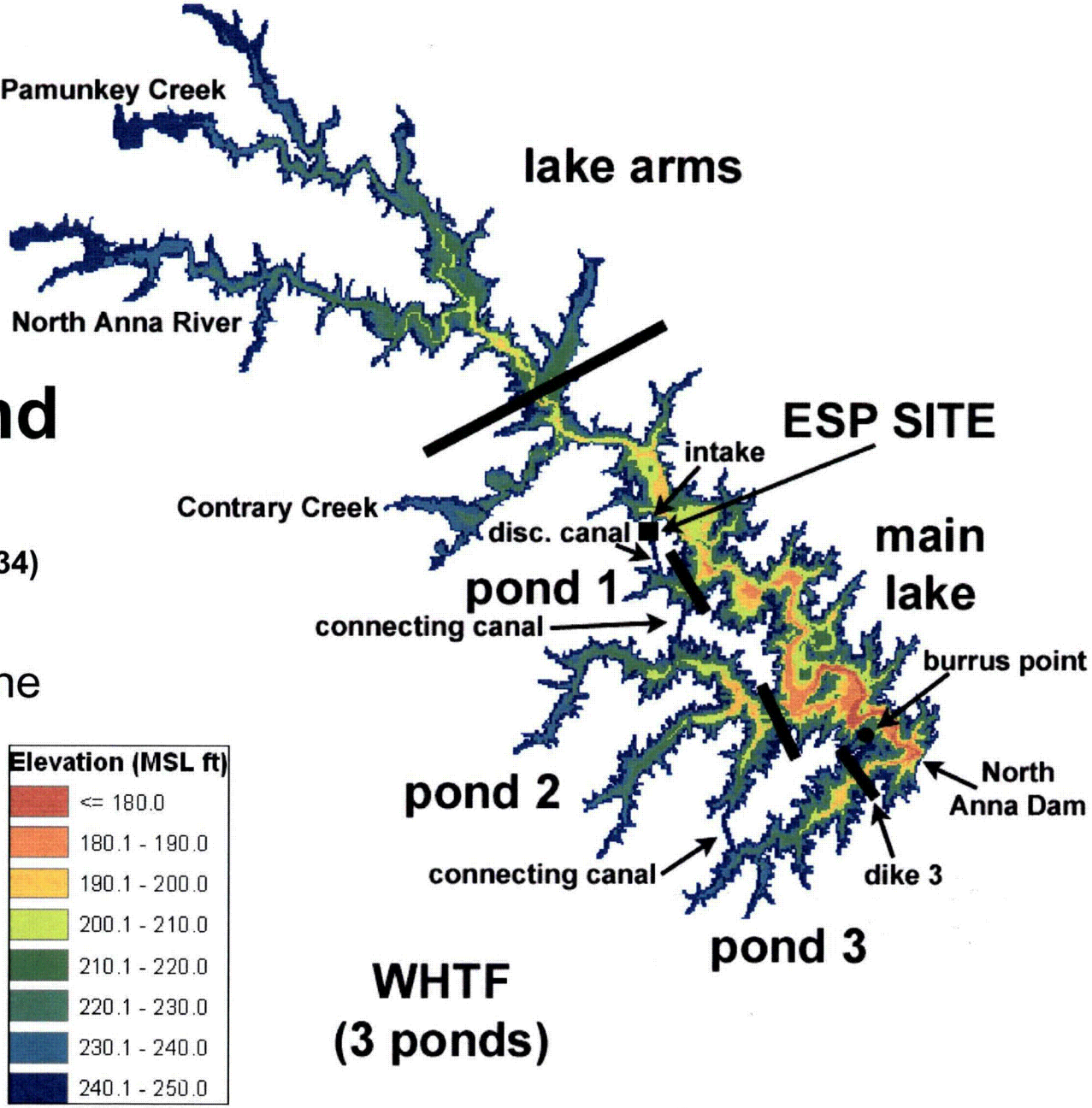
Bathymetry and Lake Features

(adapted from EIS, Fig. 2-5, p. 2-34)

- 17 miles long
- 272 miles of shoreline



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Water Use Assessment Assumptions

- Inflows
  - Tributary inflows are not measured.
  - Approximated by scaling up inflows from an adjacent watershed.
- Meteorology
  - Accounted for precipitation, wind speed, humidity, air temperature variations using observed data.
- Outflows
  - If elevation >250 ft, release derived from historical data.
  - If elevation between 248 and 250 ft, release 40 cfs.
  - If elevation <248, release 20 cfs.
- Unit 4 has no impact on lake level or downstream flows

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Assessment Scenarios

- Scenario 1: Existing Units
- Scenario 2: Addition of Unit 3
  - Added a constant forced evaporative loss of 8707 gpm from the lake.
  - Forced evaporation rate is the maximum PPE-stated average over any 365 day period.

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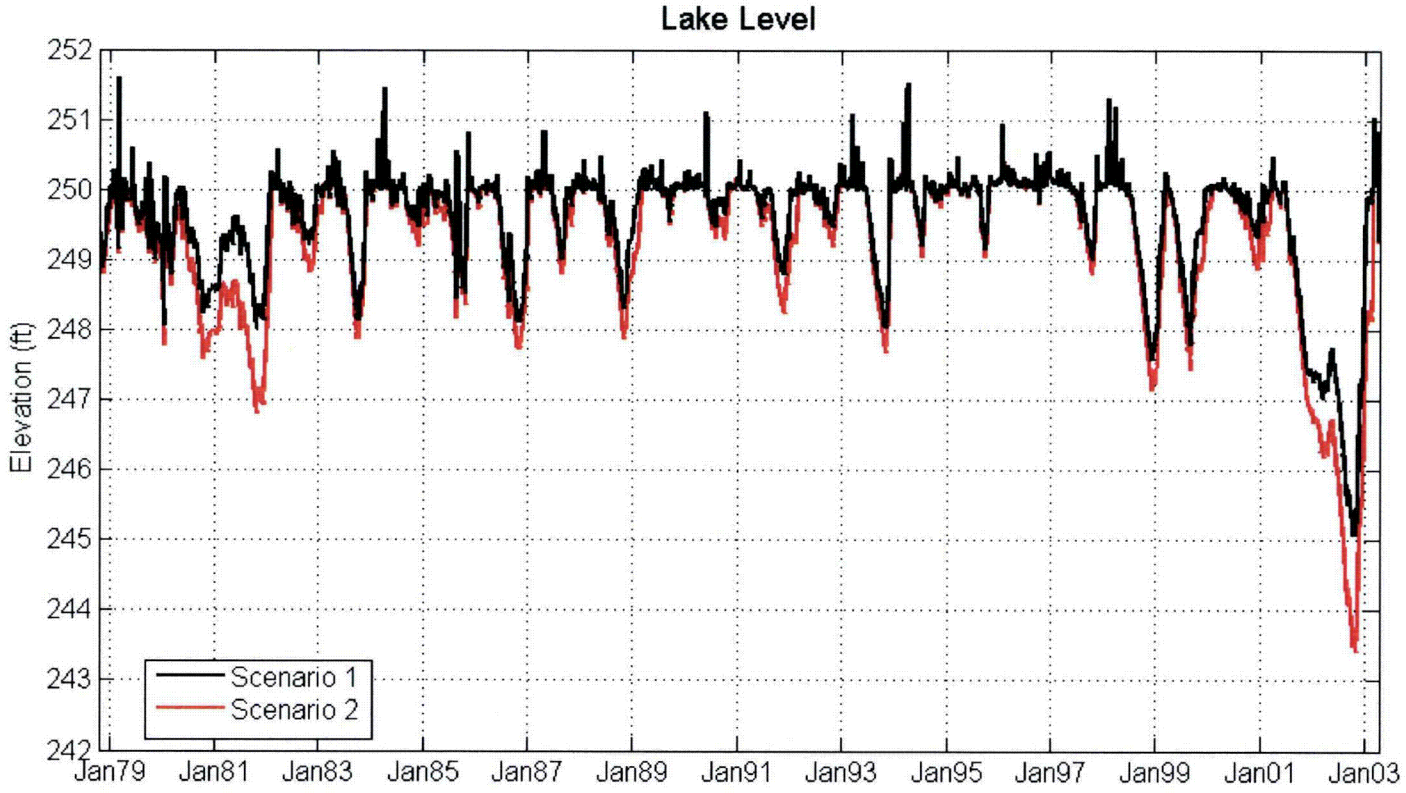
Assessment Results



- Scenario 1 minimum = 245.2 ft
- Scenario 2 minimum = 243.5 ft

(from EIS, Fig. K-3, p. K-11 and Table K-4, p. K13)

Elevation Difference	Percent of Time of the Total Simulation
Less than 3 inches	69.0%
Less than 6 inches	85.0%
Less than 12 inches	94.2%
Average difference	2.8 inches
Maximum difference	1.7 ft

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Aquatic Impacts—Lake Anna and Downstream

- Lake Anna
- Impacts to downstream biota
  - Impacts of reduced flow
  - Effects of constant downstream flows
  - Reduction in flow variation (reestablishment of normative flows)
- Studies - completed and proposed
- Mitigation

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Impacts to Lake Anna Biota

- Staff assessed the impacts of an additional unit to aquatic biota inhabiting Lake Anna.
- Staff focused its assessment on potential impacts to the Lake Anna fishery.
- Potential sources of impact considered included impingement, entrainment, thermal effects, water quality alterations, construction related and habitat loss.

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Impacts to Lake Anna Fishery: Staff Conclusions

The staff concludes that there would be no detectable impacts to fish populations inhabiting Lake Anna due to the construction and/or operation of Units 3 and 4.

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Impacts to Downstream Biota

- Staff assessed the impacts of Unit 3 to aquatic biota in the North Anna and Pamunkey Rivers downstream of the North Anna Dam.
- Aquatic biota evaluated were fish, invertebrates, and aquatic and riparian plant communities.
- Potential stressor on the biota is flow (from dam releases).

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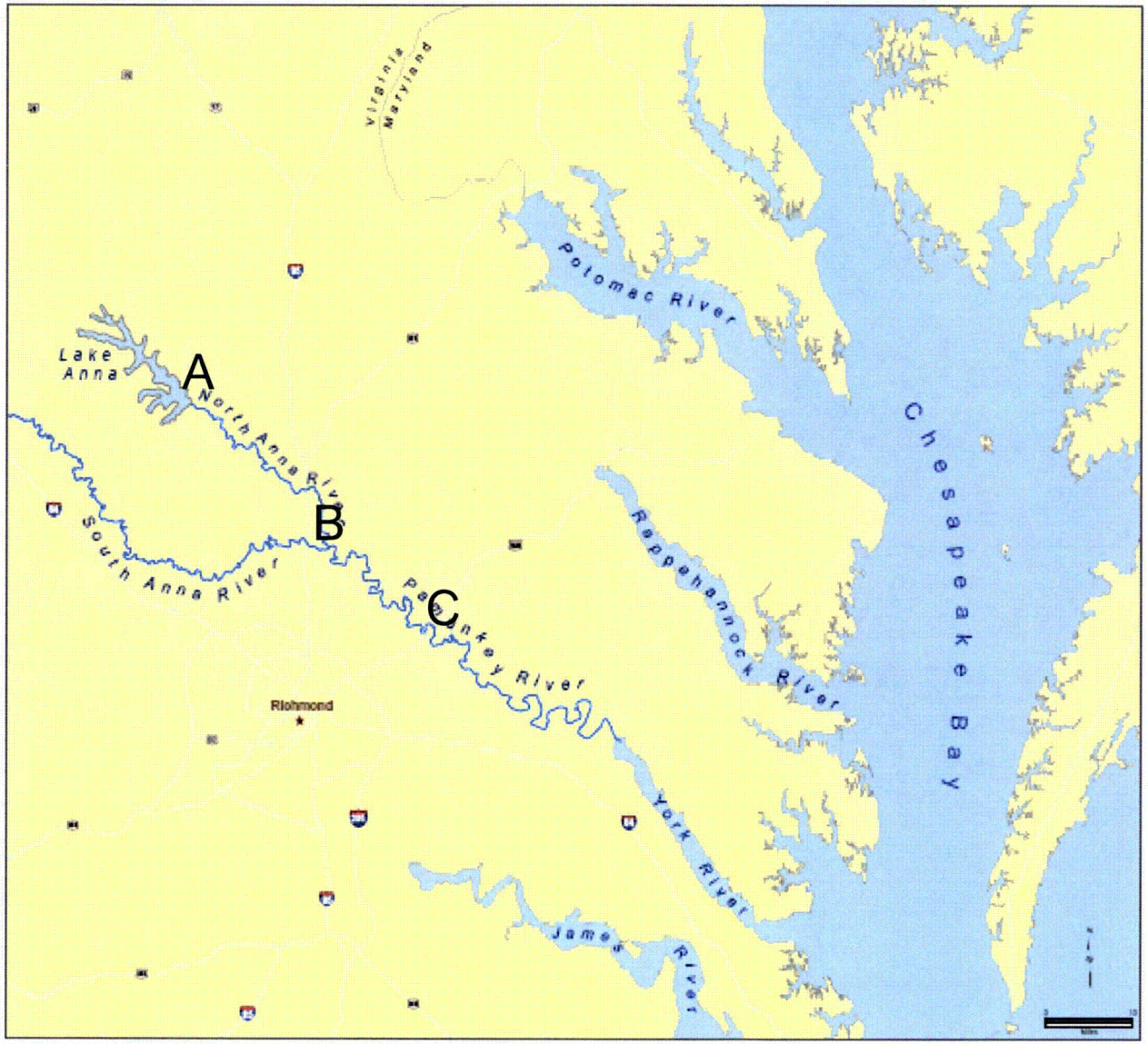
Downstream from Lake Anna

This figure represents the general pattern of the stream connections and the basic river system geography, but may not be accurately scaled.



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Impacts of Flow to Downstream Biota

- Staff determined that river flow was the predominant stressor of concern and could affect downstream aquatic resources by:
  - Reductions in flow volume into the North Anna River due to the operation of Unit 3.
  - Constant downstream flows during drought conditions.
  - Alternative flow regimes for the North Anna River
- Staff examined potential impacts to representative or important species of fish, invertebrates, and aquatic and riparian plants communities with respect to past, present, and future river conditions.

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Assumptions for Evaluating Downstream Flow Impacts to Fish

- The existing Lake Level Contingency Plan will continue.
- Representative or important species include:
  - Striped bass
  - American shad
  - Blueback Herring
  - Smallmouth bass
  - Largemouth bass
  - Minnows
- Populations are most sensitive to flow during spawning and early life history stages

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Changes in Downstream Flow Associated with Unit 3 Operation

(adapted from EIS, Table 5-6, p. 5-32)

Lake and Dam Conditions		Fraction of Time	
Lake Level Elevation (ft)	North Anna Dam Discharge (cfs)	NAPS Units 1 and 2	NAPS Units 1 and 2 + Unit 3
At or above 250	>40	37%	34%
Between 250 and 248	40	57%	55%
At or below 248	20	6%	11%

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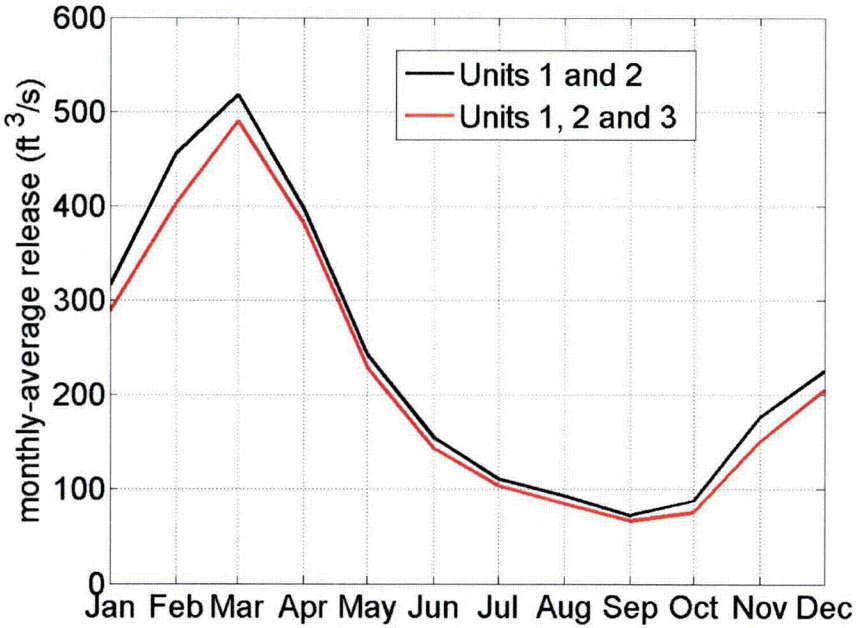
Impacts of Changes in Flow Regime to Representative Important Species

Monthly average release during non-drought conditions
(generated from the water budget—EIS, Appendix K)



Spawning times for
Representative Important Species (RIS)

RIS Species	Spawning Period[1]
Striped bass	March-May
American shad	March-May
Blueback herring	April-May
Largemouth bass	May-June
Smallmouth bass	May
Minnows	May-August

1 Source: Jenkins, R.E. and N.M. Burkhead. 1993. *Freshwater Fishes of Virginia*. American Fisheries Society. EIS Chapters 2 and 5.

Impacts to representative important fish species from operation of Unit 3 are expected to be insignificant.

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Invertebrates, Aquatic Plants, and Riparian Vegetation Downstream of the North Anna Dam

- Benthic communities:
  - Crayfish
  - Aquatic insects
  - Oilgochaetes
- Aquatic plants:
  - Periphyton (diatoms)
  - Submerged and emergent aquatic vegetation
- Riparian vegetation include:
  - Willow, cottonwoods

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Impacts of Reduced Flow to Benthic Invertebrates and Riparian and Aquatic Plants

- Impacts of reduced flow conditions due to the addition of Unit 3 are expected to be undetectable:
  - Addition of Unit 3 would extend low-flow (20 cfs) conditions especially during drought events.
  - Existing biota and plant assemblages have adapted to the existing flow regime and are tolerant of occasional low-flow conditions.

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Studies Performed or Imminent: Aquatic Resources

- **Available studies and information:**
  - Studies in support of the application
  - Studies done in support of NAPS Units 1 and 2 licensing and/or operation
  - Commonwealth of Virginia sponsored studies
  - Grey literature
  - Peer reviewed journal articles
  - Anecdotal information
- **Imminent studies**
  - Instream Flow Incremental Methodology (IFIM) study required by Commonwealth of Virginia

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Mitigation Considered for Protecting Aquatic Resources

- Decision by applicant to pursue closed-cycle cooling for Unit 3 mitigates impacts to Lake Anna fishery resources.
- Designing the intake structure to have a design intake water velocity of 0.5 ft/sec or less to reduce impingement losses.
- Use fine mesh (1.0-mm (0.04-in.)) screening on intake to reduce entrainment losses.
- Increasing the storage capacity of Lake Anna to mitigate concerns related to reduced flow in the North Anna River during low water or drought conditions.
- Varying release rates at North Anna Dam to mitigate the concern of constant downstream flows during low water or drought conditions by re-establishing more normative flows.

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Socioeconomic Impacts of Lake Anna Water Levels

- SMALL impact in normal water years.
- MODERATE temporary impact on private lakefront property views from water levels below 248' (observed in 2001-2002 drought).
- MODERATE temporary impacts on boating and usability of private docks/boathouses/boat ramps from lake levels below 248' and above 250' 6".