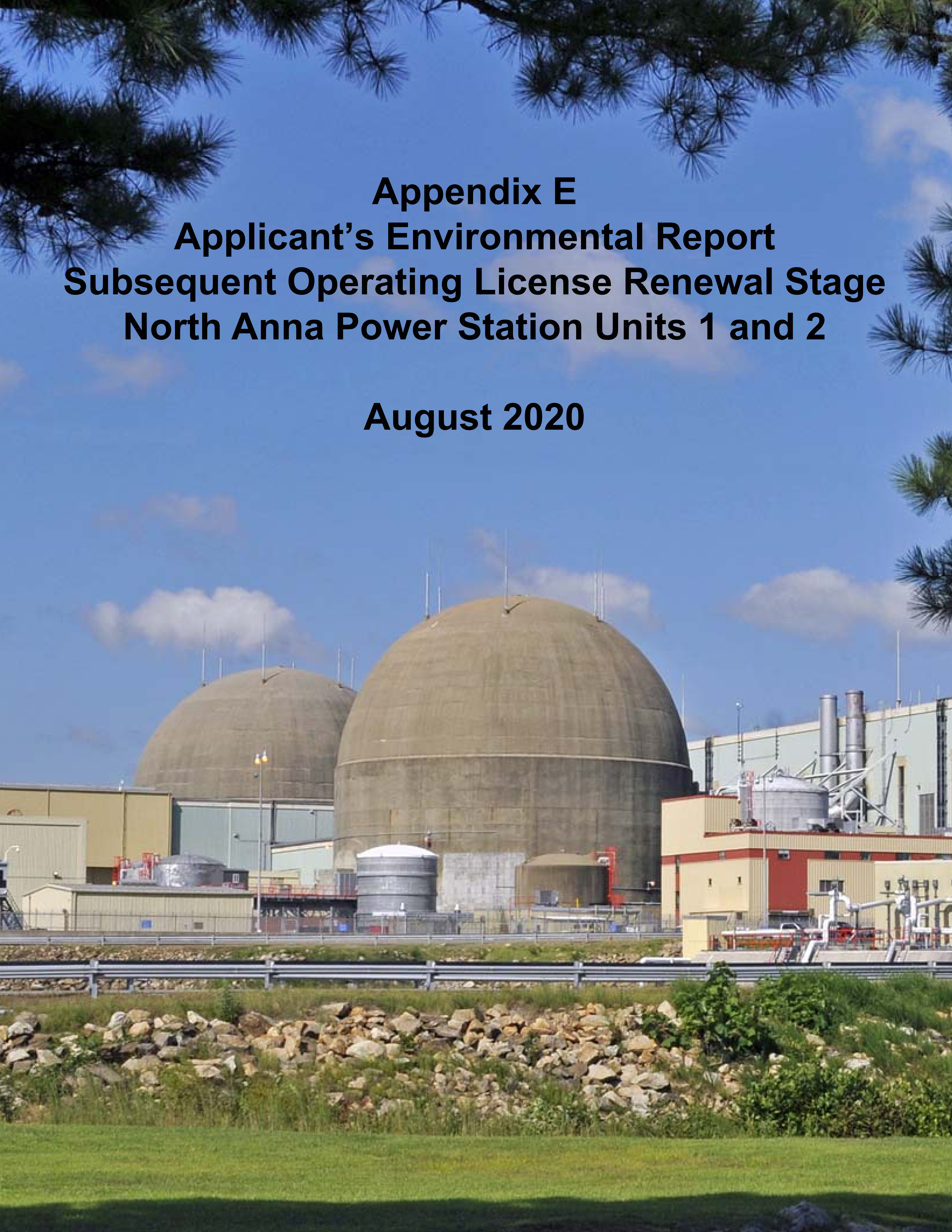
Appendix E
Applicant's Environmental Report
Subsequent Operating License Renewal Stage
North Anna Power Station Units 1 and 2

August 2020



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Abbreviations, Acronyms, and Symbols

$	dollar(s) (U.S.)
§	Section
°F	degrees Fahrenheit
µm	micrometer
A-R	agricultural-rural residence (zoning district)
AADT	average annual daily traffic
AC	alternating current
ALARA	as low as reasonably achievable
ALWR	advanced light water reactor
APE	area of potential effect
AQCR	air quality control region
ATWS	anticipated transient without scram
BBR	Buckingham Branch Railroad
BDB	beyond design basis
BEA	Bureau of Economic Analysis
BGEPA	Bald and Golden Eagle Protection Act
BIA	U.S. Bureau of Indian Affairs
BMP	best management practice
BOD	biological oxygen demand
BOVA	biota of Virginia
Btu	British thermal unit
Btu/hr	British thermal units per hour
CAA	Clean Air Act
CCB	Center for Conservation Biology
CCRM	Center for Coastal Resources Management
CCS	carbon capture and sequestration
CDF	core damage frequency

CDP	census-designated place
CERC	Corporate Emergency Response Center
CFR	Code of Federal Regulations
cfs	cubic feet per second
CILLRWC	Central Interstate Low-Level Radioactive Waste Commission
cm/sec	centimeters per second
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
COLA	combined license application
CPI	consumer price index
CPP	Clean Power Plan
CPUE	catch per unit of effort
CRDP	cultural resources description process
CVSZ	Central Virginia Seismic Zone
CWA	Clean Water Act (Federal Water Pollution Control Act)
CWIS	cooling water intake structure
CZMA	Coastal Zone Management Act
DCH	designated critical habitat
DDT	dichlorodiphenyltrichloroethane
DECON	dismantling and decontamination, one of three NRC decommissioning strategies
DMMA	dredge material management area
DNH	Division of Natural Heritage
DOE	U.S. Department of Energy
Dominion	Virginia Electric and Power Company or Dominion Energy Virginia
Dominion Energy Virginia	Virginia Electric and Power Company
DOT	U.S. Department of Transportation

DSM	demand-side management
EAB	exclusion area boundary
EDG	emergency diesel generator
EFH	essential fish habitat
EIA	Energy Information Administration
ENTOMB	permanent entombment on site, one of three NRC decommissioning strategies
EOF	Emergency Operations Facility
EP	emergency plan
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
ER	environmental report
ERFDAS	emergency response facility data acquisition system
ESA	Endangered Species Act
ESP	early site permit
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FES	final environmental statement
FPPA	Farmland Protection Policy Act
fps	feet per second
ft^3	cubic feet
FV	Fussell-Vesely (PRA importance measure)
FY	fiscal year
g	acceleration of gravity
GEIS	NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*
GHG	greenhouse gas
GPI	Groundwater Protection Initiative
gpd	gallons per day

gpm	gallons per minute
gpy	gallons per year
GTCC	greater than Class C (radioactive waste)
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Record
HAP	hazardous air pollutant
HAPC	habitat areas of particular concern
HEPA	high-efficiency particulate absorption
HIC	high integrity container
HRSD	Hampton Roads Sanitation District
HUC	hydrologic unit code
HUD	U.S. Department of Housing and Urban Development
I-64	Interstate 64
I-95	Interstate 95
IC	independent city
IEFS	ion exchange filration system
IGCC	integrated gasification combined cycle
IM	impingement mortality
IPA	integrated plant assessment
IPEEE	individual plant examination of external events
IRP	integrated resource plan
ISFSI	independent spent fuel storage installation
ISLOCA	interfacing systems loss-of-coolant accident
kV	kilovolt
kWh/m^2/day	kilowatt hour per square meter per day
LBGI	Louis Berger Group, Inc.
LHSI	low head safety injection
LLRW	low-level radioactive waste
LOS	level of service

LRA	license renewal application
M	moment magnitude
mA	milliamperes
MAAP4	Modular Accident Analysis Program, Version 4
MACCS2	MELCOR Accident Consequences Code System
Mb	body-wave magnitude (earthquakes)
MB	maximum benefit
MBTA	Migratory Bird Treaty Act
mg	million gallons
mg/L	milligram per liter
MGD	million gallons per day
mgy	million gallons of water per year
MMI	modified Mercalli intensity (seismic intensity scale)
MMBtu	million British thermal units
MOAB	motor-operated air breaker
mph	miles per hour
mrad	milliradiation absorbed dose
mrem	millirem
MRLC	Multi-Resolution Land Characteristics Consortium
msl	mean sea level
MSLB	main steam line break
mSv	millisievert
MSW	municipal solid waste
MW	megawatt
MWd/MTU	megawatt days per metric ton uranium
MWe	megawatts electric
MWt	Megawatts thermal
NA	not available/not applicable
NAAQS	National Ambient Air Quality Standards

NANIC	North Anna Nuclear Information Center
NAPS	North Anna Power Station
NAPS 3	North Anna Unit 3
NAR	North Anna Reservoir
NAVD88	North American Vertical Datum 1988
NCDC	National Climatic Data Center
NCEI	National Centers for Environmental Information
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NGCC	natural gas combined-cycle
NHPA	National Historic Preservation Act
NiCd	nickel-cadmium battery
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NUG	non-utility generation
NVE	non-viable eggs
NWI	National Wetlands Inventory
NWS	National Weather Service
ODEC	Old Dominion Electric Cooperative
OL	operating license
OALARM	offsite alarm time
ORV	off-road vehicle

OSHA	Occupational Safety and Health Administration
Pb	lead
PBAPS	Peach Bottom Atomic Power Station
PBDEs	polybrominated diphenyl ethers
pcf	per cubic foot
pc/h	passenger cars per hour
PCB	polychlorinated biphenyl
pCi/l	picoCuries per liter
PDA	personnel decontaminated area
PDELAY	plume release time
PILOT	payment in lieu of taxes
$PM_{2.5}$	particulate matter less than 2.5 micrometers in diameter
PM_{10}	particulate matter less than 10 micrometers in diameter
PM	particulate matter
ppm	parts per million
ppt	parts per thousand
PRA	probabilistic risk assessment
PSD	prevention of significant deterioration
psi	pounds per square inch
psig	pounds per square inch gauge
PV	photovoltaic
PWR	pressurized water reactor
RCRA	Resource Conservation and Recovery Act
RCS	reactor coolant system
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
RM	river mile
RO	reverse osmosis
ROW	right-of-way

rpm	revolutions per minute
RWST	rad water storage tank
SAFSTOR	safe storage, one of three NRC decommissioning strategies
SAMA	severe accident mitigation alternative
SBO	station blackout
SDTSA	state-designated American Indian statistical areas
SGTR	steam generator tube rupture
SHPO	state historic preservation office (or officer)
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SMITTR	surveillance, monitoring, inspections, testing, trending, and recordkeeping
SMMP	seismic margin management plan
SMR	small modular reactor
SO_2	sulfur dioxide
SO_x	sulfur oxides
SPCC	spill prevention, control and countermeasure
SR	State Road
SSA	sole source aquifer
SSC	systems, structures, and components
STC	source term category
SU	standard units
SW	service water
SWCGP	stormwater construction general permit
SWPPP	stormwater pollution prevention plan
TSC	Technical Support Center
TEDE	total effective dose equivalent
TMDL	total maximum daily load
TSS	total suspended solids

TWH	terrawatt hours
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USC&GS	U. S. Coast and Geodetic Survey
USCB	U.S. Census Bureau
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VAC	Virginia Administrative Code
VaFWIS	Virginia Fish and Wildlife Information Service
VCEA	Virginia Clean Economy Act
VCT	volume control tank
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Fisheries
VDH	Virginia Department of Health
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation
VEPCO	Virginia Electric and Power Company
VIMS	Virginia Institute of Marine Sciences
VMRC	Virginia Marine Resources Commission
VNHP	Virginia Natural Heritage Program
VOC	volatile organic compound
VPDES	Virginia Pollutant Discharge Elimination System
VVA	Vent Valve A
VVB	Vent Valve B
WAP	wildlife action plan

WFO	weather forecast office
WHTF	waste heat treatment facility
WMA	wildlife management area
WNS	white-nose syndrome

E1.0 INTRODUCTION

E1.1 PURPOSE OF AND NEED FOR ACTION

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. Virginia Electric & Power Company, doing business as Dominion Energy Virginia (Dominion) owns and operates North Anna Power Station (NAPS) Units 1 and 2 pursuant to NRC operating licenses (OLs) NPF-4 and NPF-7, respectively. Based on a license renewal application (LRA) submitted in 2001, the NRC issued renewed OLs in March 2003, providing authorization to operate for an additional 20 years beyond the original 40-year licensed operating term. The renewed Unit 1 OL shall expire at midnight on April 1, 2038, and the renewed Unit 2 OL shall expire at midnight on August 21, 2040. NAPS is located on the southern shore of Lake Anna in Louisa County, Virginia, approximately 40 miles north-northwest of Richmond, Virginia.

Dominion has prepared this environmental report (ER) in conjunction with its application to the NRC for a subsequent renewal of the NAPS OLs, as provided by the following NRC regulations and guidance documents:

- Title 10, Energy, Code of Federal Regulations (CFR), Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants, Section 54.23, Contents of Application—Environmental Information [10 CFR 54.23]
- Title 10, Energy, CFR, Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions, Section 51.53, Postconstruction Environmental Reports, Subsection 51.53(c), Operating License Renewal Stage [10 CFR 51.53(c)]
- NUREG 1555, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1, Revision 1: Operating License Renewal"

The NRC has defined the purpose and need for the proposed action—renewal of the OLs for nuclear power plants such as NAPS—as follows (NRC. 2013a):

> The purpose and need for the proposed action (issuance of a renewed license) is to provide an option that allows for baseload power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs. Such needs may be determined by other energy-planning decision-makers, such as State, utility, and, where authorized, Federal agencies (other than the NRC). Unless there are findings in the safety review required by the Atomic Energy Act or the National Environmental Protection Act (NEPA) environmental review that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of whether a particular nuclear power plant should continue to operate.

The renewed OLs would allow an additional 20 years of operation for NAPS Units 1 and 2 beyond their current licensed operating terms. The subsequent renewed license for NAPS Unit 1 would expire at midnight on April 1, 2058, and the subsequent renewed license for NAPS Unit 2 would expire at midnight on August 21, 2060.

Dominion has prepared Table E1.1-1 to verify compliance with regulatory requirements. Table E1.1-1 indicates the sections in the NAPS subsequent license renewal (SLR) ER that respond to each requirement of 10 CFR 51.53(c).

Table E1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements

Description	Requirement	ER Section(s)
Environmental Report—General Requirements [10 CFR 51.45]		
Description of the proposed action	10 CFR 51.45(b)	E2.1
Statement of the purposes of the proposed action	10 CFR 51.45(b)	E1.1
Description of the environment affected	10 CFR 51.45(b)	E3.0
Impact of the proposed action on the environment	10 CFR 51.45(b)(1)	E4.0
Adverse environmental effects which cannot be avoided should the proposal be implemented	10 CFR 51.45(b)(2)	E6.3
Alternatives to the proposed action	10 CFR 51.45(b)(3)	E2.6, E7.0, and E8.0
Relationship between local short-term uses of man’s environment and the maintenance and enhancement of long-term productivity	10 CFR 51.45(b)(4)	E6.5
Irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented	10 CFR 51.45(b)(5)	E6.4
Analysis that considers and balances the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse environmental effects	10 CFR 51.45(c)	E2.6, E4.0, E7.0, and E8.0
Federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and description of the status of compliance with these requirements	10 CFR 51.45(d)	E9.0
Status of compliance with applicable environmental quality standards and requirements which have been imposed by federal, state, regional, and local agencies having responsibility for environmental protection, including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements	10 CFR 51.45(d)	E9.0

Table E1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements

Description	Requirement	ER Section(s)
Alternatives in the report including a discussion of whether the alternatives will comply with such applicable environmental quality standards and requirements	10 CFR 51.45(d)	E9.7
Information submitted pursuant to 10 CFR 51.45(b) through (d) and not confined to information supporting the proposed action but also including adverse information	10 CFR 51.45(e)	E4.0 and E6.3
Operating License Renewal Stage [10 CFR 51.53(c)]		
Description of the proposed action including the applicant's plans to modify the facility or its administrative control procedures as described in accordance with §54.21. The report must describe in detail the affected environment around the plant, the modifications directly affecting the environment or any plant effluents, and any planned refurbishment activities	10 CFR 51.53(c)(2)	E2.1, E2.3, E2.4, E3.0, and E4.0
Analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for applicable Category 2 issues, as discussed below	10 CFR 51.53(c)(3)(ii)	E2.3 and E4.0
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	E4.5.1
Groundwater Resources		
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	E4.5.2
Groundwater use conflicts (plants that withdraw more than 100 gallons per minute [gpm])	10 CFR 51.53(c)(3)(ii)(C)	E4.5.3

Table E1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements

Description	Requirement	ER Section(s)
Groundwater quality degradation (plants with cooling ponds at inland sites)	10 CFR 51.53(c)(3)(ii)(D)	E4.5.4
Radionuclides released to groundwater	10 CFR 51.53(c)(3)(ii)(P)	E4.5.5
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	10 CFR 51.53(c)(3)(ii)(B)	E4.6.1
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	10 CFR 51.53(c)(3)(ii)(B)	E4.6.2
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	E4.6.3
Terrestrial Resources		
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	10 CFR 51.53(c)(3)(ii)(A)	E4.6.4
Effects on terrestrial resources (non-cooling system impacts)	10 CFR 51.53(c)(3)(ii)(E)	E4.6.5
Special Status Species and Habitats		
Threatened, endangered, and protected species, and essential fish habitat	10 CFR 51.53(c)(3)(ii)(E)	E4.6.6
Historic and Cultural Resources		
Historic and cultural resources	10 CFR 51.53(c)(3)(ii)(K)	E4.7
Human Health		
Microbiological hazards to the public (plants that use cooling ponds, lake, or canals, or that discharge to a river)	10 CFR 51.53(c)(3)(ii)(G)	E4.9.1
Electric shock hazards	10 CFR 51.53(c)(3)(ii)(H)	E4.9.2

Table E1.1-1 Environmental Report Compliance with License Renewal Environmental Regulatory Requirements

Description	Requirement	ER Section(s)
Environmental Justice		
Minority and low-income populations	10 CFR 51.53(c)(3)(ii)(N)	E3.11.2 and E4.10.1
Cumulative Impacts		
Cumulative impacts	10 CFR 51.53(c)(3)(ii)(O)	E4.12
Severe Accident Mitigation Alternatives		
Severe accidents	10 CFR 51.53(c)(3)(ii)(L)	E4.15
All Plants		
Consideration of alternatives for reducing adverse impacts for all Category 2 license renewal issues	10 CFR 51.53(c)(3)(iii)	E4.0 and E6.2
New and significant information regarding the environmental impacts of license renewal of which the applicant is aware	10 CFR 51.53(c)(3)(iv)	E4.0 and E5.0

E1.2 ENVIRONMENTAL REPORT SCOPE AND METHODOLOGY

NRC regulations for domestic licensing of nuclear power plants require reviews of environmental impacts from renewing an OL. NRC regulations 10 CFR 51.45 (as applicable) and 10 CFR 51.53(c) require that an applicant for license renewal submit with its application a separate document (Appendix E of the application) entitled "Applicant's Environmental Report—Operating License Renewal Stage." In determining what information to include in the NAPS SLR applicant's ER, Dominion has relied on NRC regulations and the following supporting documents that provide additional insight into the regulatory requirements:

- *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), Revision 1 (NRC. 2013a), and referenced information specific to transportation (NRC. 1999)
- NRC supplemental information in the *Federal Register* notice for the 2013 final rule updating 10 CFR 51 (78 FR 37282)
- *Regulatory Analysis for Amendments to Regulations for the Environmental Review for Renewal of Nuclear Power Plant Operating Licenses* (NRC. 1996a)
- Regulatory Guide 4.2, Supplement 1, Revision 1, *Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications* (NRC. 2013b)

The NRC included in 10 CFR 51 the list of 78 NEPA issues for license renewal of nuclear power plants that were identified in the 2013 GEIS (Appendix B to Subpart A of 10 CFR 51, Table B-1). Attachment A lists the 78 issues from 10 CFR 51, Subpart A, Appendix B, Table B-1 and identifies the section in this ER in which Dominion addresses each applicable issue.

E1.3 NORTH ANNA POWER STATION LICENSEE AND OWNERSHIP

Dominion Energy Virginia, incorporated in Virginia in 1909 as a Virginia public service corporation, is a wholly owned subsidiary of Dominion Energy, Inc., and a regulated public utility that generates, transmits, and distributes electricity for sale in Virginia and North Carolina. In Virginia, the company conducts business under the name "Dominion Energy Virginia" and primarily serves retail customers. In North Carolina, it conducts business under the name "Dominion Energy North Carolina" and serves retail customers located in the northeastern section of the state, excluding certain municipalities. In addition, Dominion sells electricity at wholesale prices to rural electric cooperatives, municipalities, and into wholesale electricity markets. All of Dominion's stock is owned by Dominion Energy, Inc. Dominion is subject to regulation by various federal, state, and local governmental agencies. NAPS Units 1 and 2 are predominately owned and operated by Dominion, the current NAPS licensee and applicant for SLR. Old Dominion Electric Cooperative (ODEC) also has a partial ownership (11.6%) in NAPS Units 1 and 2, which Dominion manages on its behalf.

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E2.0 PROPOSED ACTION AND DESCRIPTION OF ALTERNATIVES

E2.1 THE PROPOSED ACTION

In accordance with 10 CFR 51.53(c)(2) a license renewal applicant's ER must contain a description of the proposed action. The proposed action is to renew the OLs for NAPS Units 1 and 2, which would preserve the option for Dominion to continue operating NAPS and provide reliable baseload power for the 20-year proposed SLR operating term. For NAPS Unit 1, the proposed action would extend the OL from April 1, 2038, to April 1, 2058. For NAPS Unit 2, the proposed action would extend the OL from August 21, 2040, to August 21, 2060.

Dominion does not anticipate the continued operations of NAPS Units 1 and 2 to adversely affect the environment. Dominion also does not anticipate any license renewal-related refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process. The relationship of refurbishment to license renewal is described in Section E2.3.

Changes to surveillance, monitoring, inspections, testing, trending, and recordkeeping (SMITTR) would be implemented as a result of the 10 CFR 54 aging management review for NAPS. Potential SMITTR activities are described in Section E2.4. No plant modifications to support extended operations that could directly affect the environment or plant effluents are planned to occur during this period of extended operation.

E2.2 GENERAL PLANT INFORMATION

The principal structures at NAPS are the reactor containments, auxiliary building, fuel building, and turbine building, which includes the main control room (NAPS. 2020, Section 1.2.2). Main structures outside the power block are the intake structure, discharge structure, administration annex, independent spent fuel storage installation (ISFSI), North Anna Nuclear Information Center (NANIC), steam generator storage building, sewage treatment plant, security training center, firing range, training center, warehouses, 500-kilovolt (kV) switchyard, and meteorological towers. Figure E3.1-1 illustrates these plant structures and the exclusion area boundary (EAB), which is the same as the site boundary. As presented in Section E3.1.2, Dominion holds sole title to the portion of NAPS on which the licensed North Anna Unit 3 (NAPS 3) would be located. The remainder of the NAPS site is owned by Dominion and ODEC as tenants in common. These companies also own all land outside the NAPS site boundary that forms Lake Anna, up to Elevation 255 ft msl. Dominion is the licensed operator of the existing units, with control of the existing site and facilities and the authority to act as ODEC's agent. (Dominion. 2016b, Section 1.1.1)

E2.2.1 REACTOR AND CONTAINMENT SYSTEMS

E2.2.1.1 Reactor System

As shown in Figure E3.1-1, NAPS is a two-unit (Units 1 and 2) plant. Each unit includes a three-coolant-loop pressurized water reactor (PWR) nuclear steam supply system and turbine generator furnished by Westinghouse Electric Corporation. The balance of the plant was designed and constructed by Dominion with the assistance of its agent, Stone & Webster Engineering Corporation. (NAPS. 2020, Section 1.1)

Units 1 and 2 achieved commercial operation in June 1978 and December 1980, respectively. Each reactor unit was originally designed for a licensed core power output of 2,775 megawatts thermal (MWt), with an equivalent gross electrical output of 947 megawatts electric (MWe). In 2010, both units were uprated to a core power output of 2,940 MWt (corresponding to a nuclear steam supply system power rating of 2,952 MWt). NAPS. 2020, Section 1.1)

The nuclear steam supply system consists of a Westinghouse PWR and supporting auxiliary systems. The reactor and closed reactor coolant loops are connected in parallel to the reactor vessel, each loop containing a reactor coolant pump and steam generator. The nuclear steam supply system also contains an electrically heated pressurizer and certain auxiliary systems. (NAPS. 2020, Section 1.2.3)

The reactor core consists of a specified number of fuel rods held in bundles known as fuel assemblies (NAPS. 2020, Section 4.3.2.1). The core consists of 157 fuel assemblies (NAPS. 2020, Section 4.1). The fuel rods are constructed of Zircaloy, ZIRLO, or optimized ZIRLO cylindrical tubes containing uranium dioxide fuel pellets. The fuel assemblies are arranged in a pattern that approximates a right circular cylinder. Each fuel assembly contains a 17 x 17 rod array composed of 264 fuel rods, 24 rod cluster control thimbles, and an in-core instrumentation thimble. The fuel rods within a given assembly have the same uranium enrichment in both the radial and axial planes. (NAPS. 2020, Section 4.3.2.1)

The reactor core is of the multi-region type. Fuel assemblies are mechanically identical. In the initial core loading, three fuel enrichments were used. Fuel assemblies with the highest enrichments were placed in the core periphery, or outer region, and the two groups of lower-enrichment fuel assemblies were arranged in a selected pattern in the central region. In subsequent refueling, approximately one-third of the fuel is discharged, and fresh fuel is loaded into the core. The remaining fuel is arranged in the core in such a manner as to achieve optimum power distribution (NAPS. 2020, Section 1.2.3). The pellet enrichment is currently limited to 5.0 weight percent uranium-235 (NAPS. 2020, Section 4.3.2.7).

The reactor is controlled by rod cluster control motion and a soluble neutron absorber. The supervision of both the nuclear and turbine-generator plants is accomplished from the main control room. (NAPS. 2020, Section 1.2.4)

The core will normally operate approximately 18 months between refueling. The maximum fuel burnup limit is 60,000 megawatt days per metric ton of uranium (MWd/MTU) (NAPS. 2020, Section 4.3.1.1). Typically, the region average discharge burnup is between approximately 45,000 and 55,000 MWd/MTU (NAPS. 2020, Section 4.3.2.1). Fresh fuel assemblies for Cycle 23 and subsequent cycles for both units are of the Westinghouse RFA-2 design (NAPS. 2020, Section 4.1).

E2.2.1.2 Containment System

The containments, which house the major nuclear steam supply system components of each unit, are steel-lined, reinforced concrete structures that use dry, sub-atmospheric operation concepts (NAPS. 2020, Section 1.1). Each containment is a cylinder with a hemispherical dome and a flat, reinforced concrete foundation mat (NAPS. 2020, Section 1.2.2). The internal diameter is 126 feet and the overall height is approximately 191 feet. The design pressure is 45 pounds per square inch gauge (psig) above atmospheric pressure. (NAPS. 2020, Table 1.3-3) Each containment is designed to withstand internal pressure accompanying the design basis accident, is leak tight, and provides adequate radiation shielding for both normal operation and design basis accident conditions. (NAPS. 2020, Section 1.2.2)

The reinforced concrete structure is designed to withstand all loadings and stresses anticipated during the operation and life of the plant (NAPS. 2020, Section 3.8.2.1.1). It is designed to sustain, without loss of required integrity, all effects of gross equipment failures up to and including the rupture of the largest pipe in the reactor coolant system. Engineered safety features, comprising safety injection systems and containment depressurization systems, cool the reactor core and return the containment to sub-atmospheric pressure, thus terminating the driving force for the release of radioactivity, and maintaining the containment at sub-atmospheric pressure for as long as the situation requires. The containment and its associated engineered safety features meet the required functional capability of protecting the public from the consequences of gross equipment failures. (NAPS. 2020, Section 3.1.12.2)

During normal operation and after a loss-of-coolant accident, the containment structure is maintained at a sub-atmospheric pressure to limit the peak pressure attained during an accident and to minimize out-leakage after an accident. A combination of spray subsystems is capable of cooling and depressurizing the containment structure to less than 2.0 psig in one hour and to sub-atmospheric pressure in less than six hours following a loss-of-coolant accident. (NAPS. 2020, Section 6.1)

The structure and all penetrations, including access openings and ventilation ducts, are of proven design. The engineered safety features provided for each unit have sufficient redundancy and independence of components and power sources that, under the conditions of the assumed design basis accident, the systems can, even when operating with partial effectiveness, maintain the integrity of the containment and reduce the exposure of the public well below the criteria in 10 CFR 50.67. The steel-lined concrete containment structure provides a reliable barrier against the uncontrolled escape of fission products due to accidents and permits sub-atmospheric operation by limiting air leakage. (NAPS. 2020, Section 1.2.9) The thickness is more than adequate to meet the guideline limits of 10 CFR 50.67 at the exclusion boundary (NAPS. 2020, Section 12.1.2.8).

E2.2.2 MAINTENANCE, INSPECTION, AND REFUELING ACTIVITIES

Various programs and activities at the site maintain, inspect, test, and monitor the performance of plant equipment. These programs and activities include, but are not limited to, those implemented to achieve the following:

- Meet the requirements of 10 CFR 50, Appendix B (Quality Assurance), Appendix R (Fire Protection), and Appendices G and H (Reactor Vessel Materials);
- Meet the requirements of 10 CFR 50.55a, Codes and Standards, which invokes the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, "In-service Inspection and Testing Requirements";
- Meet the requirements of 10 CFR 50.65, the maintenance rule; and
- Maintain water chemistry in accordance with Electric Power Research Institute (EPRI) guidelines.

Maintenance and modifications of safety-related equipment are controlled and documented in accordance with the requirements of a formal quality control program for station operation and other administrative controls formulated by written procedures (NAPS. 2020, Section 13.4). Additional programs include those implemented to meet technical specification surveillance requirements; those implemented to NRC generic communications; and various periodic maintenance, testing, and inspection procedures necessary to manage the effects of aging on structures and components. Certain program activities are performed during the operation of the units, while others are performed during scheduled refueling outages. Dominion refuels each NAPS nuclear unit on an 18-month staggered schedule, which means at least one refueling every year and two refuelings every other year (Dominion. 2001, Section 3.4).

E2.2.3 COOLING AND AUXILIARY WATER SYSTEMS

During operation, heat generated in each reactor is transferred through the primary cooling system to the steam generators. Each nuclear unit has three separate closed-cycle loops, with one steam generator per loop. Steam produced in the generators is transferred to the steam turbines, which drive the generators that produce electricity. After passing through the turbines, spent steam is condensed and returned to the steam generators, and the cycle is repeated. NAPS uses an open-cycle cooling system to dissipate heat from the turbine condensers (see Figure E2.2-1). (Dominion. 2001, Section 3.1.2.1)

The entire reactor coolant system is composed of leak-tight and controlled-leakage components to ensure the reactor coolant is confined to the system or its auxiliaries. Auxiliary system components are provided to charge the reactor coolant system and add makeup water, purify reactor coolant water, provide chemicals for corrosion inhibition and reactivity control, cool system components, remove decay heat when the reactor is shut down, and provide for emergency safety injection. (NAPS. 2020, Section 1.2.3)

Water from Lake Anna is used as a cooling medium for surface condensers and other heat exchanger equipment at NAPS (NAPS. 2020, Section 1.1). A portion of the lake, called the Waste Heat Treatment Facility (WHTF) (see Figures E3.1-1 and E3.6-1), dissipates waste heat from the circulating water discharge before the return of this water to the main body of the lake, the North Anna Reservoir. The North Anna Reservoir and the service water reservoir form the ultimate heat sink for the station. (NAPS. 2020, Section 1.2.12) The water is pumped from the North Anna Reservoir, which was created by damming the North Anna River. The water discharges to the WHTF. (NAPS. 2020, Section 1.2.10)

The circulating water system provides water for cooling the main condensers and can provide water to the bearing cooling water system.

Condensers at NAPS are equipped with an Amertap system that circulates sponge rubber balls through the condenser tubes to prevent the accumulation of deposits (such as biofouling organisms). Amertap balls are slightly larger than the inside diameter of the condenser tubes; they are collected from the outlet stream and reused. No chemical biocides are used in the circulating water system. (Dominion. 2001, Section 3.1.2.1)

The service water system removes heat from the component cooling system during the normal operation or cooldown of two reactor units and from the recirculation spray subsystem during a loss-of-coolant accident. This heat is transferred to the environment via the service water reservoir or the WHTF. The service water system also provides cooling to the miscellaneous components requiring an assured supply of cooling water during a loss-of-coolant or loss-of-station-power accident. (NAPS. 2020, Section 1.2.10)

The component cooling system, an intermediate cooling system common to both units, transfers heat from heat exchangers containing reactor coolant or other radioactive or potentially radioactive liquids and gases to the service water system. The maximum heat load occurs during the initial stages of residual heat removal during reactor cooldown. The component cooling system and the residual heat removal system are designed to reduce the temperature of the reactor coolant to approximately 140°F within 20 hours after a reactor shutdown. (NAPS. 2020, Section 1.2.10)

Wells provide water for the plant's domestic water system (NAPS. 2020, Section 2.4.13.1), which supplies cold water for all domestic applications in the plant from toilets and sinks to drinking fountains and eyewash stations. The water is heated electrically and is not interconnected to any potentially radioactively contaminated system (NAPS. 2020, Section 9.2.3.1). The domestic water supply is detailed in Section E2.2.3.5.

The fire protection system furnishes water and other extinguishing agents with the capability of extinguishing any single or probable combination of simultaneous fires that might occur at the station. The system consists of a water system, low- and high-pressure carbon dioxide systems, a Halon 1301 system, a Clean Agent System, and a foam system. (NAPS. 2020, Section 1.2.10)

E2.2.3.1 Circulating Water System

When both units are operating, eight circulating water pumps draw water from the North Anna Reservoir, circulate it through the condensers, and return it to the reservoir via the 3,400-acre WHTF (Dominion. 2001, Section 3.1.2.1). For each unit, when operating in lake-to-lake mode, approximately 12,000 gpm goes to the bearing cooling water system, and the remainder goes to the main condenser (NAPS. 2020, Section 2.4.11.5). Figure E2.2-1 provides a schematic of the circulating water system. The temperature of the cooling water is increased about 14.5°F (at design station load) as it moves through the condensers (Dominion. 2001, Section 3.1.2.1).

Lake Anna is approximately 17 miles long, with an irregular shoreline of over 200 miles. It is divided into two major portions: the North Anna Reservoir and the WHTF. The lake covers a surface area of 13,000 acres and contains approximately 100 billion gallons of water. The largest segment, the North Anna Reservoir, consists of approximately 9,600 acres and functions as a storage impoundment to ensure adequate water for condenser cooling. The smaller segment, the WHTF, has an area of about 3,400 acres and is separated from the North Anna Reservoir by dikes. The first of the WHTF's three cooling lagoons receives the heated condenser cooling water after its passage through the units. The heated water transfers most of its heat to the atmosphere as it moves, via canals, to the second and third cooling lagoons. The cooled water is discharged from the third cooling lagoon to the North Anna Reservoir at a point immediately upstream of the dam. (NAPS. 2020, Section 2.1.1.2)

Circulating water is withdrawn from the North Anna Reservoir at two screenwells (one per nuclear unit) near the power station (NAPS. 2020, Section 2.4.8). Each screenwell contains four intake bays, which are each equipped with a trash rack, a traveling screen, and a circulating water pump. (Dominion. 2001, Section 3.1.2.1) These pumps are rated at 238,200 gpm at 25-foot total dynamic head when running at 250 revolutions per minute (rpm) (NAPS. 2020, Section 10.4.2.2). Before entering the pumps, water from the North Anna Reservoir passes through a trash rack at the mouth of each bay. This trash rack is serviced by a movable rake that discharges trash to a basket (NAPS. 2020, Section 10.4.2.2). Trash that gets through the trash rack is removed from the circulating water by traveling water screens upstream of each circulating pump (NAPS. 2020, Section 10.4.2.2). The traveling screens, with 1/8-inch by 1/2-inch openings, are designed to move when a predetermined pressure differential exists across the screens. Debris and fish collected from the traveling screens are washed into wire baskets for disposal as solid waste, as required by the NAPS Virginia Pollutant Discharge Elimination System (VPDES) Permit No. VA0052451. (Dominion. 2001, Section 3.1.2.1)

Circulating water is withdrawn from the North Anna Reservoir at the screenwell near the power station and, from there, is pumped through the condenser and discharged through circulating water discharge tunnels into the circulating water discharge canal, which terminates at the head end of the WHTF. The discharge canal, which is 27 feet deep and 100 feet wide (with side slopes of 1:2.5), is designed to convey the entire cooling water flow a distance of about 3,600 feet (at a velocity of 2 feet per second [fps]) to the head of the WHTF (Dominion. 2001, Section 3.1.2.1).

The circulating water then flows through sections of the WHTF and through interconnecting canals to the easternmost of a series of dikes (NAPS. 2020, Section 2.4.8). The easternmost dike contains the circulating water outlet, which is a skimmer wall structure designed to cause the WHTF effluent to enter the North Anna Reservoir as a submerged jet having an initial velocity of about eight fps to thoroughly mix the effluent from the WHTF with the residual water in the reservoir. (NAPS. 2020, Section 2.4.8) Although the discharge from this structure is submerged, the slope of the reservoir bottom immediately adjacent to the structure directs the discharge to the surface. The warmer, less dense heated effluent tends to (in the absence of wind-driven disturbances) lie on the surface of the reservoir, where the remaining waste heat is dissipated to the atmosphere. (Dominion. 2001, Section 3.1.2.1)

While flowing through the WHTF, the circulating water loses a large portion of its heat to the atmosphere. Further temperature reduction is achieved as the circulating water is entrained with the North Anna Reservoir.

The earth dikes have riprap erosion protection. The canals are constructed through soil and bedrock and are unpaved. Erosion protection is provided by vegetation along all banks, except near the circulating water outfall, where riprap is provided. (NAPS. 2020, Section 2.4.8).

E2.2.3.2 Thermal Effluent Dispersion

The design temperature increase across the condensers is 14.5°F but may be increased or decreased depending on the power station load and the number of circulating water pumps operating at a given time. At lower condenser flow rates (three circulating water pumps operating rather than four), the temperature increase across the condenser is higher, averaging approximately 18.3°F, because the temperature rise is inversely proportional to the condenser flow rate and directly proportional to the heat rejection rate. (Dominion. 2001, Section 3.1.2.1) Three or four circulating water pumps for each unit will normally be in service, depending on the circulating water temperature. The flow resulting from four pumps in service promotes the self-cleaning of condenser tubes, but in winter months when circulating water temperature is low, may cause excessive condenser vacuum (NAPS. 2020, Section 10.4.2.3).

The cooling water residence time in the WHTF is approximately 14 days, depending on condenser flow rate. More than half the station’s waste heat is dissipated in the WHTF. The only discharge from the WHTF into the North Anna Reservoir is located in the lower portion of the reservoir near the dam. The outlet is designated as Outfall 001 in the station’s current VPDES permit, and is the point at which the station’s condenser cooling water discharges to waters of the Commonwealth (the North Anna Reservoir). The discharge is a submerged, high-velocity jet that promotes rapid mixing with reservoir waters. (Dominion. 2001, Section 3.1.2.1)

Monthly heat rejection rates for the period from 1978 to 1985 were summarized in the 1986 Section 316(a) demonstration for NAPS. From 1981 to 1985, when two units operated, monthly heat rejection rates ranged from 1.42×10^8 British thermal units per hour (Btu/hr) in September 1984 to 1.26×10^{10} Btu/hr in June 1985. The current VPDES permit limit is 1.354×10^{10} Btu/hr. (Dominion. 2001, Section 3.1.2.1

Dominion conducted quarterly field temperature surveys in 1983, 1984, and 1985 to characterize the thermal plume entering Lake Anna via the discharge structure. These surveys were intended to build on and refine the results of previous pre-operational and operational studies of Lake Anna’s thermal characteristics, as well as computer simulations of the reservoir’s annual heat budget (including thermal capacity and maximum predicted water temperatures) and thermal performance under various meteorological and operating conditions. (Dominion. 2001, Section 3.1.2.1)

The high-velocity jet discharge maximizes the mixing of the heated effluent in the lower lake. Field studies in 1983 and 1985 (1984 data were not directly comparable because the station was operating at a reduced power level) showed that, during the hottest month of the year (July), near-maximum operating temperatures did not produce a distinct thermal plume in the lower lake. In fact, results showed nearly uniform temperatures occurring across horizontal layers. There was also no clearly defined thermal plume in the lower lake in fall, winter, or spring. (Dominion. 2001, Section 3.1.2.1)

Results of quarterly plume studies conducted over a five-year period from 1994–1998 as part of the post-316(a) demonstration monitoring were similar. Typically, no thermal plume was evident in spring and summer surveys. In cooler months, there were noticeable differences between upper lake, mid-lake, and lower lake temperatures (both at surface and at depth), but differential cooling and warming of surface waters in the shallow upper lake and the deeper lower lake made it difficult to identify or precisely define a thermal plume. (Dominion. 2001, Section 3.1.2.1) Post-316(a) environmental and biological studies are described in Section E3.7.3.

E2.2.3.3 Service Water System

The service water system is a common system designed for the removal of heat resulting from the simultaneous operation of various systems and components of two units based on an accident condition service water temperature of 110°F (NAPS. 2020, Section 9.2.1.1). The service water system, normally operated as a closed-loop system, uses a nine-acre reservoir and spray array to dissipate heat from the component cooling system heat exchangers and other minor system loads (Dominion. 2001, Section 3.1.2.1). Figures E2.2-2 and E2.2-3 provide schematics of the service water system. The sources of service water for NAPS are the North Anna Reservoir and the service water reservoir. These two independent sources of water provide the ultimate heat sink for NAPS. (NAPS. 2020, Section 9.2.1)

Untreated water, supplied from the North Anna Reservoir, or treated water from the service water reservoir, is circulated by pumps through the systems and components that require an ensured supply of service water under accident conditions and other systems and components (NAPS. 2020, Section 9.2.1.1). Service water is used as cooling water for heat exchangers that remove heat from the component cooling system, the recirculation spray subsystem, and other station applications such as main control room air-conditioning condensers, charging pump lubricating oil, and instrument air compressors. In addition, service water is provided as a backup supply to the steam generator feed system, the fuel pit coolers, and the recirculation air cooling coils. (NAPS. 2020, Section 9.2.1)

The service water system consists of two loops that act as mostly independent systems under normal operations, but most components can be aligned to operate on either loop. During a design basis accident, the two loops are cross connected at the recirculation spray heat exchanger supply and return headers of the accident unit. (NAPS. 2020, Section 9.2.1.1)

One service water pump is normally used to supply water to one loop at a nominal rate of 11,500 gpm (two pumps per loop may be required during hot weather). Each pump takes suction from its own screenwell in the service water pump house and discharges back to the service water reservoir via the spray and bypass system. The pumps can be cross-connected so that each pump can supply either of the two headers (NAPS. 2020, Section 9.2.1.2.1).

Each screenwell is equipped with a trash rack and with a traveling water screen. Two service water screen wash pumps are also located in two of the four screenwells. The traveling water screens are immediately preceded in the screenwell by trash racks with four-inch openings. Each screen wash system consists of one nominal 500-gpm pump, motorized strainer, and associated piping, valves, and instrumentation for each unit. (NAPS. 2020, Section 9.2.1.2.4)

Two auxiliary service water pumps are installed in the main intake structure at the North Anna Reservoir and supply service water at a nominal rate of 11,500 gpm each. They take suction from the main intake screenwells. (NAPS. 2020, Section 9.2.1.2.1) The water to the pump suctions is strained by the traveling water screens for those screenwells (NAPS. 2020, Section 9.2.1.2.3). The auxiliary service water pumps provide an alternate supply of service water to the service water supply headers. An alternate return path is also provided to the circulating water discharge tunnel from the service water return headers. (NAPS. 2020, Section 9.2.1.2.1)

The service water spray system consists of four pairs (eight total) of individually controlled spray arrays. Each pair of arrays is capable of handling 100% of the flow and heat load generated by one unit during normal operation. A winter bypass system is provided. This design provides complete bypassing of the spray arrays during the low flow, low heat load periods experienced in the winter months. Additionally, the winter bypass may be throttled or used in conjunction with the spray arrays to suit conditions present during unit operation. (NAPS. 2020, Section 9.2.1.2.2)

Makeup for the service water reservoir from the North Anna Reservoir is supplied by two nominal 910-gpm circulating water screenwash pumps or by the auxiliary service water pumps. The makeup pumps are located in the circulating water intake structure. The service water reservoir can provide service water for extended periods should the normal makeup pumps be nonfunctional. Enough water is available to guarantee 30 days of operation without makeup. (NAPS. 2020, Section 9.2.1.2.2)

To reduce undesirable concentrations of contaminants, periodic service water reservoir blowdown can be performed through a six-inch line. This line allows blowdown of service water at a rate of approximately 900 gpm from the service water return header into the Unit 2 circulating water discharge tunnel. One circulating water screen wash pump normally operates during blowdown through the six-inch line to provide makeup from Lake Anna. (NAPS. 2020, Section 9.2.1.2.2)

As depicted in Figure E3.6-3, overflow from the service water system flows to the (circulating water system) discharge canal via a VPDES-permitted and monitored outfall (Outfall 108) (Dominion. 2001, Section 3.1.2.1)

E2.2.3.4 Component Cooling System

The component cooling system consists of the component cooling water, chilled water, and neutron shield tank cooling water subsystems. These subsystems are used individually or in combination with each other to provide cooling water for the removal of heat from components in the station. (NAPS. 2020, Section 9.2.2.1) The component cooling water subsystem is an intermediate cooling system and transfers heat from heat exchangers containing reactor coolant or other radioactive liquids to the service water system. The component cooling water subsystem consists of four subsystems shared between units, with each subsystem containing one pump and one heat exchanger. (NAPS. 2020, Section 9.2.2.2.1) Figure E2.2-4 provides a schematic of the component cooling water system.

The component cooling water subsystem is designed as a closed system, with a surge tank located approximately 50 feet higher than the pump suction to provide the necessary net positive suction head (NPSH) for the component cooling pumps to prevent cavitation (NAPS. 2018a). The surge tank is generally about half full and normally vented to the process vent system. There is sufficient volume available in the surge tank to ensure no credible temperature increase could overflow the tank. The main makeup line is supplied by both main condensate systems. During operation, component cooling water is pumped through the shell side of the component cooling water heat exchangers, where it is cooled by service water, and then through parallel circuits to cool components. Most equipment cooled by the system is installed in either the reactor containments or the auxiliary building. (NAPS. 2020, Section 9.2.2.3.1)

A chilled water subsystem is provided to supply chilled water to the containment recirculation air cooling coils, the gas stripper vent chiller, some of the sampling coolers (some of the sample coolers have been abandoned in place), and the refueling water storage tank coolers. The chilled water subsystem is also available to provide cooling water to the Unit 1 isolated phase bus duct air cooler. Normal makeup for the chilled water subsystem is from the chilled water condenser. Makeup can also be provided from the water treatment system and/or the main condensate system if required. Cooling water for the chilled water condenser and the air ejector condenser is supplied from the bearing cooling water system. (NAPS. 2020, Section 9.2.2.3.2)

A neutron shield tank cooling water subsystem is provided for each reactor unit to cool the water in the neutron shield tank that is heated by neutron and gamma radiation from the reactor. The heated water in the neutron shield tank is cooled by being pumped through one of the two neutron shield tank coolers by one of the two neutron shield tank pumps or by natural circulation using both neutron shield tank coolers. (NAPS. 2020, Section 9.2.2.3.3)

E2.2.3.5 Domestic Water Supply System

NAPS has multiple groundwater withdrawal wells for domestic use. Four active wells are permitted by the Commonwealth of Virginia's Department of Health (VDH) (VDH. 1991; VDH. 2014). Wells 6, 7, and 8 comprise a single water supply system at the site (VDH. 2014). A separately permitted well (NANIC) provides the water supply for the NANIC (VDH. 1991). The system supplies cold water for all domestic applications in the plant, from toilets and sinks to drinking fountains and eyewash stations. The water is heated electrically and is not interconnected to any potentially radioactively contaminated system. Each well has its own structure, hydro-pneumatic tank, pump, and compressor. Well pumps are sized to provide adequate make-up to the system without excessive drawdown to its respective well. (NAPS. 2020, Section 9.2.3.1) Three small wells, discussed in Section E3.6.3.2, not requiring permits at the NAPS site provide minor additional water for plant use.

Dominion reports monthly average withdrawal quantities to the VDH. Table E3.6-7b shows the monthly withdrawal quantities reported between 2013 and 2019. The average groundwater withdrawal rate by NAPS in 2019 was reported as 7,969.86 gallons per day (gpd) and averaged 8,059.80 gpd between 2013 and 2019 (Table E3.6-7a). The limited use of the smaller wells is not expected to add more than one to two gpm to the NAPS average pumping rate. (Dominion. 2001, Section 3.1.2.2)

E2.2.3.6 Fire Protection System

The fire protection system is designed to furnish water and other extinguishing agents with the capability of extinguishing any single or probable combination of simultaneous fires that might occur at the station (NAPS. 2020, Section 9.5.1). The portion of the fire protection system that uses water consists of pumps, piping, hydrants, hose stations, water spray, and sprinkler systems. The motor-driven fire pump takes suction from the North Anna Reservoir and the engine-driven fire pump takes suction from the service water reservoir. Each pump is designed to maintain 100 psig at its rated flow in the yard hydrant piping loop, and each pump delivers 2,500 gpm at its designed discharge pressure. In addition to its primary function, the fire protection system also provides alternate sources of makeup water for the spent fuel pool and for the Unit 1 and Unit 2 auxiliary feedwater systems. (NAPS. 2020, Section 9.5.1.2.1)

E2.2.4 METEOROLOGICAL MONITORING PROGRAM

There are two meteorological towers at NAPS. Meteorological tower locations are illustrated in Figure E3.1-1. The primary meteorological monitoring site at NAPS consists of a Rohn Model 80, guyed, 160-foot tower located approximately 1,900 feet east of the Unit 1 reactor containment. Sensors are located at the 10-meter, 48.4-meter, and ground levels. Wind speed, wind direction, horizontal wind direction fluctuation, ambient temperature, one-half of differential temperature, and dew point are measured at the 10-meter elevation. Wind speed, wind direction, horizontal wind direction fluctuation, and one-half of differential temperature are measured at the 48.4-meter elevation. Precipitation is monitored at the ground level. An instrument equipment elevator was also installed on the primary meteorological tower which eliminated need for climbing the tower to these elevations for maintenance on these instruments. (NAPS. 2020, Section 2.3.3.2.1; Dominion. 2015a) Table E2.2-1 provides a summary of the instrument meteorological parameters monitored.

The NAPS backup meteorological monitoring site consists of a Rohn Model 25, free-standing 10-meter tower. This tower is located approximately 1,300 feet northeast of the Unit 1 reactor containment and serves as the backup meteorological monitoring site. A sensor at the top of the mast monitors wind speed, wind direction, ambient temperature, and horizontal wind direction fluctuation. (NAPS. 2020, Section 2.3.3.2.1; Dominion. 2015a)

The nearest major structure from the primary tower is the training center building (completed in 1982), located 740 feet from the tower on a line of bearing of 205° from true north. The minor structures, forming the recreational facility in the immediate vicinity of the tower, have been evaluated as having no adverse effect on the measurements taken at the tower. Trees in the immediate vicinity of the tower have been topped to heights of 10-15 feet. The nearest contiguous tree line is more than 500 feet away from the tower, and tree heights are 40-50 feet. (NAPS. 2020, Section 2.3.3.2.2)

The primary tower is a guyed, triaxial, open-lattice structure. The lower level instrumentation is at 10 meters above ground level. The upper instrumentation is at 158.9 feet above the finished plant grade. The wind speed, wind direction, and horizontal wind direction fluctuation sensors are mounted on booms longer than one times the tower face width. The wind sensors are positioned so the tower will not influence the prevailing south-southwest wind flow detected by the sensors. Temperature and differential temperature sensors are housed in motor-aspirated shields to insulate them from thermal radiation. (NAPS. 2020, Section 2.3.3.2.2)

Wind speed, wind direction, and horizontal wind direction fluctuation are measured at both the lower and upper tower levels. Electro-mechanical instruments are used to measure wind speed and wind direction, and horizontal wind direction fluctuation is calculated by the digital data acquisition system. (NAPS. 2020, Section 2.3.3.2.3)

Temperature is measured at the 10-meter level and differential temperature is measured between the 10-meter and 158.9-foot level. The sensors consist of one single-element high-precision platinum resistance temperature sensor located at the 158.9-foot level for measuring part of the differential temperature, and one single-element precision platinum resistance sensor to be located at 10-meter level for measuring ambient temperature and the other part of differential temperature. The sensors' signals are input into a temperature/delta temperature processor to provide output signals proportional to one ambient and one differential temperature. (NAPS. 2020, Section 2.3.3.2.3)

The meteorological monitoring installation is calibrated not less than semiannually. Inspection, service, and maintenance is performed as required to ensure not less than 90% data recovery. Redundant recording systems are incorporated into the program to further minimize data loss due to recorder failure. (NAPS. 2020, Section 2.3.3.2.4). Based on five years of meteorological data from 2013–2017, the recovery rate at NAPS has been greater than 90%.

Data from the primary and backup meteorological towers are sent to the station's control room as 4-20 milliamperes (mA) current signals over individual shielded pair cables. Once there, the parameters are collected by the plant computer system via the intelligent remote multiplex system.

Once collected by the multiplex system, the parameters are placed in the plant computer system database, making the site meteorological field data available for display in the station's technical support center (TSC) and the corporate emergency response center (CERC), which is the consolidated emergency operations facility (EOF) for NAPS and Surry Power Station. The EOF is located at Dominion's Innsbrook technical center. Certain input sensor information in the control rooms is also hardwired for display on the main control room meteorological panels. (NAPS. 2020, Section 2.3.3.2.5.1)

A shelter is located at the base of each tower. These shelters are insulated, and thermostatically controlled heat and air conditioning maintains an interior temperature within a range appropriate for proper equipment operation. The enclosures are located to minimize any micrometeorological effects on the tower instrumentation. (NAPS. 2020, Section 2.3.3.2.5.2) Inside the shelters, the signals are routed to the appropriate signal-conditioning equipment, whose outputs go to digital data recorders and an interface with the intelligent remote multiplex system. (NAPS. 2020, Section 2.3.3.2.1)

Microprocessor-based data acquisition systems are the primary method of data acquisition. The sensor analog signals are collected, processed, and telemetered to a system computer. (NAPS. 2020, Section 2.3.3.2.5.2). In addition to being transmitted real-time to the plant computer system, the data are telemetered daily to a computer in the corporate office. The data are reviewed each workday by meteorologists in Dominion's power delivery group emergency preparedness center, who check it for representativeness and reasonability. The data are compared with other company meteorological tower sites, as well as with the real-time data received at the corporate meteorological operations center (NAPS. 2020, Section 2.3.3.2.6).

The onsite meteorological monitoring program is conducted in accordance with the criteria of Regulatory Guide 1.23, Section C.3. Proposed Revision 1 to Regulatory Guide 1.23 was used for guidance in designing the primary meteorological measurements system (NAPS. 2020, Section 2.3.3.2.1).

Regional and site meteorology and air quality are presented in detail in Section E3.3.

E2.2.5 POWER TRANSMISSION SYSTEM

E2.2.5.1 In-Scope Transmission Lines

Based on the NRC's Regulatory Guide 4.2, Supplement 1 (NRC. 2013b, Section 2.2), transmission lines subject to evaluation of environmental impacts for license renewal are those connecting the nuclear power plant to the switchyard where electricity is fed into the regional power distribution system, and power lines that feed the plant from the grid during outages. All in-scope transmission lines are located completely within the NAPS EAB, as shown in Figure E2.2-5.

The output of the two units is delivered to a 500-kV switchyard through the unit main step-up transformers. The switchyard serves three 500-kV lines and one 230-kV line. The plant is connected to the switchyard by two 500-kV transmission lines, three 34.5-kV underground lines, and two 34.5-kV overhead lines (available as back-up in case of a failed underground line or alternate feeders when the underground lines are out of service for testing, maintenance, or replacement) that supply power to the three reserve station service transformers. (NAPS. 2020, Section 8.1.1). Each NAPS unit is connected to the 500-kV switchyard through an approximately 2,700-foot long transmission line.

Each main generator feeds electric power through a 22-kV isolated phase bus to a bank of three single-phase transformers for each unit, stepping the generator voltage of 22-kV up to the transmission voltage of 500-kV. Surge arrestors (one per phase) have been installed in the isolated phase bus to protect the 22-kV system (main generator and isolated phase bus, etc.) from incurring damage in the event of a high-to-low fault in the generator step-up transformers. Station service transformers connected to the 22-kV isolated phase bus from each main generator normally supply power to the auxiliaries of each unit by stepping down the 22-kV to 4.16-kV. (NAPS. 2020, Section 8.2.1)

Reserve station service power, for start-up and emergency use, is supplied by three 3-phase 34.5/4.16-kV transformers located near the power station. The 34.5-kV supply to these reserve station service transformers comes from two or more of the following: two 500/36.5-kV transformers located in the 500-kV switchyard and one 230/36.5-kV transformer located in the 230-kV switchyard. A switching capability is provided so all three of the 34.5/4.16-kV transformers can be supplied from any of the station reserve transformers if necessary. (NAPS. 2020, Section 8.2.1The reserve station service power is always available to the safety-related equipment and has the capacity to drive the station auxiliaries in the event of a loss of the normal alternating current (AC) power supply (NAPS. 2020, Section 8.1.2).

E2.2.5.2 Vegetation Management Practices

The in-scope transmission lines are completely within the NAPS EAB as shown in Figure E2.2-5. The transmission lines cross the NAPS industrial area, where vegetation is sparse. Corridors in timberlands and in the vicinity of road crossings are maintained on a three-year cycle by mowing or, if inaccessible to mowers, by use of non-restricted-use herbicides. Once every three years, all lines are inspected from the ground and measured when necessary to confirm clearance. Problems noted during any inspection are brought to the attention of the appropriate organizations for corrective action. (Dominion. 2001, Section 3.1.3)

E2.2.5.3 Avian Protection

Threatened and endangered species potentially occurring near NAPS, or within counties occurring within a six-mile radius of NAPS, are described in Section E3.7. As addressed in Dominion's migratory bird protection guidance document (Dominion. 2009a), avian monitoring is established and conducted as needed based on the specific Dominion project. Dominion cooperates with both the U.S. Fish and Wildlife Service (USFWS) and state agencies during various project activities to properly evaluate potential impacts to migratory birds and to establish acceptable avian monitoring protocols. Additionally, Dominion requires the following protective measures to be implemented within critical bald eagle habitat areas (Dominion. 2009a):

- Installation of new and/or replacement utility poles in critical habitat areas should be built to “raptor safe” standards.
- Distribution lines located in these areas may be required to be equipped with raptor-proof design standards. These new design standards incorporate the use of protective spacing, 10-foot cross-arms, perch deterrents, and shielding and materials requirements to minimize the risk of electrocutions.

E2.2.5.4 Public

All in-scope transmission lines are located completely within Dominion-owned property. The public does not have access to this area, and therefore, no induced shock hazards would exist for the public (see Figure E2.2-5).

E2.2.5.5 Plant Workers

NUREG-1437 suggests that occupational safety and health hazard issues are generic to all types of electricity generating stations, including nuclear power plants, and are of small significance if the workers adhere to safety standards and use protective equipment (NRC. 2013a, Section 3.9.5.1).

Dominion maintains the safety-specific policies for all work conducted at electrical transmission locations requiring personal protective equipment, such as working around energized equipment. Dominion's Electric Transmission Accident Prevention Manual provides a comprehensive description of the company's electrical transmission safety guidance and associated forms. (Dominion. 2016a)

E2.2.6 RADIOACTIVE WASTE MANAGEMENT SYSTEM

Dominion uses liquid, gaseous, and solid radioactive waste management systems to collect and treat the radioactive materials produced as byproducts of NAPS operations. These systems process radioactive liquid, gaseous, and solid effluents to maintain releases within regulatory limits and to levels as low as reasonably achievable before they are released to the environment. The

NAPS waste processing systems meet the design objectives of 10 CFR 50, Appendix I. (NRC. 2002a, Section 2.1.4)

The waste disposal systems provide all equipment necessary to collect, process, and prepare for disposal of all radioactive liquid, gaseous, and solid waste produced as a result of station operation. The waste disposal systems are capable of handling the waste produced by both units. Liquid waste is collected and processed through the ion exchange filtration system (IEFS) and/or the demineralizers in the waste disposal building. Continuous radiation monitoring is provided for treated liquid waste before its release to the circulating water discharge tunnel. Liquid waste is analyzed and monitored to ensure that discharge concentrations are maintained as low as practicable and well within the limits of applicable regulations. Gaseous waste is diluted, filtered, and discharged to the environment with a yearly average activity level as low as practicable. Spent resins are placed into approved containers, dewatered, and shipped from the site for ultimate disposal at an authorized location. (NAPS. 2020, Section 1.2.5)

Each of the liquid, solid, and gaseous waste disposal systems is designed to serve both reactor units (NAPS. 2020, Section 11). During normal operation, small quantities of radioactive liquids and gases will be discharged on a controlled basis to the environment. These discharges will be kept within the limits set by 10 CFR 20 and will be in conformance with the offsite dose calculation manual and applicable technical specifications that govern plant operations. (NAPS. 2020, Section 11B.1) The policies and objectives of Dominion are to ensure the exposure of personnel to radiation is maintained as low as reasonably achievable (NAPS. 2020, Section 12).

Non-fuel solid waste results from treating and separating radionuclides from gases and liquids and from removing contaminated material from various reactor areas. Solid waste also consists of reactor components, equipment, and tools removed from service, as well as contaminated protective clothing, paper, rags, and other trash generated from plant design modifications and operations and routine maintenance activities. Solid waste is shipped to a waste processor for volume reduction before disposal or is sent directly to the licensed disposal facility. Spent resins and filters are dewatered and packaged for shipment to licensed offsite processing or disposal facilities. (NRC. 2002a, Section 2.1.4)

Fuel rods that have exhausted a certain percentage of their fuel and are removed from the reactor core are called spent fuel. Spent fuel assemblies at NAPS are currently stored onsite in a spent fuel pool and in storage casks located in the ISFSI. The ISFSI operates under a separate license covering three dry storage pads. NAPS has facilities allowing temporary onsite storage of mixed waste, which contains both radioactive and chemically hazardous waste. (NRC. 2002a, Section 2.1.4) However, NAPS does not routinely generate mixed waste. ISFSI license information is provided in Table E9.1-1.

E2.2.6.1 Liquid Waste Disposal Systems

The liquid waste disposal system is common to both reactor units and accommodates the radioactive waste produced during simultaneous operation of the two units. The liquid waste disposal system was designed to satisfy the applicable sections of the general design criteria and to meet the criteria of 10 CFR 20, 10 CFR 50, and 10 CFR 100 so as not to endanger the health of station operating personnel or the general public. (NAPS. 2020, Section 11.2.1)

With the exception of the IEFS, waste disposal building, demineralizer, and spent resin transfer equipment, liquid waste processing equipment is located below grade in the auxiliary building or decontamination building. The liquid waste disposal system was designed to receive, process, and discharge potentially radioactive liquids from a variety of sources, including the chemical and volume control system, the boron recovery system, the steam generator blowdown system, the vent and drain system sumps, laboratory drains, personnel decontamination area drains, the decontamination system, the sampling system, laundry drains, and spent resin flush water. The system design considers potential personnel exposure and ensures that radioactive releases to the environment are as low as reasonably achievable (ALARA). During normal plant operation, the total activity from radionuclides leaving the discharge canal does not exceed the limits of applicable regulations. (NAPS. 2020, Section 11.2.2)

The condensate polishers could generate radioactive waste in the form of spent powdered resin in a slurry with water. The slurry is accumulated in the secondary phase separator in the turbine building. If the resin slurry in the secondary phase separator is nonradioactive, the resin slurry is treated as non-hazardous chemical waste. If the slurry is radioactive, it is pumped to an appropriate container and disposed of as radioactive waste. (NAPS. 2020, Section 11.2.2.1)

The chemical and volume control system consists of two subsystems: the charging, letdown, and seal-water system; and the chemical control, purification, and makeup system (NAPS. 2020, Section 9.3.4.2).

The charging and letdown functions of the chemical and volume control system maintain a programmed water level in the reactor coolant system (RCS) pressurizer, thus maintaining proper reactor coolant inventory during all phases of plant operation. A portion of the charging flow is directed to the reactor coolant pumps through a seal-water injection filter. The No. 1 seal leak-off flow discharges to a common manifold, exits from the containment, and then passes through the seal-water return filter and the seal-water heat exchanger to the suction side of the charging pumps. The Nos. 2 and 3 seal leak-off flows are discharged to the primary drain transfer tank in the waste disposal system. (NAPS. 2020, Section 9.3.4.2.1)

The boron recovery system is a common system serving both units. This system degasifies and stores borated radioactive water from the reactor coolant system letdown by the chemical and volume control system. The system processes this letdown by evaporation, filtration, and demineralization to produce primary-grade water and concentrated boric acid solution for plant reuse or disposal. Stripped gases are sent to the gaseous waste disposal system. (NAPS. 2020, Section 1.2.10)

Reactor coolant letdown and reactor coolant drains, with entrained hydrogen and fission gases, enter the boron recovery system via the chemical and volume control system and the vent and drain system. This liquid enters the gas stripper, is stripped of the majority of the dissolved gases, and, if necessary, passed through an ion exchanger for the removal of soluble fission and corrosion products. After subsequent filtration to remove additional particulate materials, the liquid is held up in the three boron recovery tanks for processing in the boron recovery evaporators or disposal via the liquid waste system. (NAPS. 2020, Section 9.3.5.2)

The steam generator blowdown system is divided into two parallel systems. During steam generator blowdown from the high-capacity steam generator blowdown system, the liquid passes to the flash tank, where the steam is drawn off to the third-point feedwater heaters. The liquid is drained to the blowdown flash tank drain cooler, then discharged to the circulating water discharge tunnel. (NAPS. 2020, Section 10.4.6.2)

The low-capacity blowdown system is a backup to the high-capacity steam generator blowdown system. When the low-capacity blowdown system is in operation, blowdown from any or all of the three steam generators passes to and flashes in the blowdown tank. The blowdown tank is equipped with a vent condenser that condenses vapor discharge from the tank. Condensate from the blowdown tank and vent condenser is drained to the liquid waste disposal system. Non-condensibles are vented to the atmosphere. (NAPS. 2020, Section 10.4.6.2)

The vent and drain system collects potentially radioactive fluids and gases from various systems and discharges them either to the waste disposal systems liquid or gaseous or to the boron recovery system (NAPS. 2020, Section 9.3.3).

The drains are separated into those carrying waste fluids to the waste drain tanks for processing and disposal, and those carrying reactor coolant fluids to the primary drain transfer tank for processing and recovery (NAPS. 2020, Section 9.3.3.1). Liquids from potentially contaminated sources, other than those originating in the reactor coolant system, are transferred to the high-level waste drain tanks in the liquid waste disposal system via the high-level waste drain header. Liquids collected in the high-level waste drain tanks are processed through filters and demineralizers, pumped to the low-level waste drain tanks, and then released if they meet release limits. If the liquids do not meet release limits, then they are reprocessed. (NAPS. 2020, Section 9.3.3.2)

Both containment structures, the auxiliary building, the fuel building, the decontamination building, both safeguards areas, the valve pit areas, and both in-core instrumentation areas have been provided with sumps for collecting drainage. The drainage is transferred by sump pumps to either the high- or low-level waste drain tank, depending on the activity level, from all the sumps except the decontamination building sump, which is pumped to the fluid waste treatment tank. (NAPS. 2020, Section 9.3.3.2)

The sampling system transmits representative liquid and gaseous samples to the sampling sinks for laboratory analysis. (NAPS. 2020, Section 1.2.10) The sampling system is designed to provide a means of obtaining representative primary and secondary liquid and gaseous samples as required to effectively monitor the operation of both units. The system provides samples from numerous different sources, which can be sampled either locally or at sample sinks in the auxiliary building and service building. (NAPS. 2020, Section 9.3.2.1.1)

All high-temperature samples, except the pressurizer vapor space sample, are cooled by sample cooling coils located in the auxiliary building sample room. Samples leaving the coolers can be directed either to a purge line or to the sample sink. The pressurizer vapor space samples are bled through capillary tubes and collected in a sample vessel. Samples of low-temperature liquids or gases, such as the high-level waste drain tank, are not cooled further. (NAPS. 2020, Section 9.3.2.1.2)

The aerated low- and high-activity liquid purge headers are discharged to the low- and high-level waste drain tanks, respectively. The hydrogenated liquid purge header may be discharged into either the Unit 1 or Unit 2 volume control tank or the gas stripper. Primary-grade water is supplied to flush and clean the sample sinks and sampling utensils. All drains from the auxiliary building sample sinks flow to the vent and drain system. Drains from the service building sample sink flow to the low-level waste disposal system. (NAPS. 2020, Section 9.3.2.1.2)

The IEFS is a portable unit containing the sluicable filtration and demineralizer pressure vessels. Liquid radioactive waste may be treated prior to release by the IEFS as the sole method of treatment, or by using the IEFS in conjunction with other components of the liquid waste disposal system (typically the demineralizers in the waste disposal building). The IEFS consists of filtration and demineralizer vessels. The demineralization system is hose-connected into the in-plant source of wastewater, while the effluent side of the system is hose-connected into the in-plant systems for hold-up, monitoring, and discharge. (NAPS. 2020, Section 11.2.2.2)

Wastewater is pumped to the IEFS by the high-level waste drain tank pumps. A self-priming booster pump is provided at the inlet to provide satisfactory flow rates through the filtration and demineralizer pressure vessels. Also, a pressure relief valve is mounted on the inlet header to prevent over-pressurization of the system. Each filter vessel contains media for removal of suspended solids and activated corrosion products. The demineralizer vessels are loaded with ion-exchange media for removal of dissolved impurities. (NAPS. 2020, Section 11.2.2.2)

The treated water is discharged through control and monitoring devices. The effluent of the system is transferred to the low-level waste tanks for hold-up and monitoring. The contents of the low-level waste tanks can receive additional treatment by the demineralizers in the waste disposal building, can be transferred back to the high-level waste tanks, or can be discharged into the circulating water system. (NAPS. 2020, Section 11.2.2.2)

System influents from the vent and drain system, which include the effluent from various building sumps, are directed by valve lineup to either the high-level or low-level waste drain tanks, according to influent activity level. Laundry waste and cold laboratory drainage, personnel decontamination area (PDA) shower drainage, and PDA sink drainage are discharged into the contaminated drain tanks. Hot laboratory drainage and spent resin flush water are discharged directly into the high-level waste drain tanks. (NAPS. 2020, Section 11.2.3)

High-level liquid waste from the vent and drain, liquid waste disposal, chemical and volume control, and boron recovery systems is discharged to the high-level waste drain tanks. The contents of the high-level waste drain tanks are processed by the IEFS. The contents of these tanks may be transferred to the low-level waste drain tanks by means of a line under administrative control in the event that the high-level waste drain tank contents do not require further treatment. The decontamination system fluid waste treating tank in the decontamination building can be used for additional storage of high-level wastes. The influent to the high-level drain tanks also may include the contents of the low-level drain tanks and the contaminated drain tanks should the activity level of the liquids in these tanks require further processing. The high-level tanks afford a hold-up period for sampling the liquid before it is processed. (NAPS. 2020, Section 11.2.3)

The low-level waste drain tanks accumulate low-level waste liquid from the IEFS, vent and drain, and boron recovery systems as well as from the fluid waste treating tank, and boron recovery test tanks. The contents of the low-level waste drain tanks are pumped to the waste header, through the clarifier, and are discharged to the circulating water system or are processed through the liquid waste demineralizer, if needed, prior to discharge. (NAPS. 2020, Section 11.2.3)

The demineralizers in the waste disposal building also could receive liquids from the contaminated drain tank, the steam generator blowdown tank, and the blowdown from the service water reservoir (NAPS. 2020, Section 11.2.3).

All liquid waste discharges to the circulating water system are monitored to ensure radiological control. Periodic sampling of the liquid waste effluent is conducted. Liquid waste discharges are automatically isolated downstream of the clarifier demineralizer filter on a signal from the radiation monitor. The discharge flow from the liquid waste disposal system is combined and mixed with the water in the circulating water discharge tunnel so that the concentration of activity of the combined effluent is maintained as low as reasonably achievable and well within the limits established by applicable regulations. (NAPS. 2020, Section 11.2.3)

The only release point from the liquid waste disposal system to the environment is to the circulating water discharge tunnel. The circulating water discharge tunnel flows into the discharge canal via the seal pit. (NAPS. 2020, Section 11.2.6) The liquid waste disposal system is designed to minimize the discharge of radioactivity in liquid effluent from the station. To accomplish this, extensive use is made of demineralization and filtration. (NAPS. 2020, Section 11.2.5)

Effluent from the liquid waste disposal system is the source of radionuclides in the North Anna Reservoir and WHTF. This effluent is discharged from the station into the discharge canal, where it is diluted by the circulating water supplied from the reservoir and then discharged into the WHTF. Radionuclides that enter the WHTF via this route can eventually pass into the reservoir at the skimmer wall structure, which is the outlet from the WHTF to the reservoir. From the reservoir, the radionuclides flow over the dam and spillway or are recirculated to the circulating water intake. (NAPS. 2020, Section 11.2.5.1)

The maximum permissible concentrations of radionuclides set forth in 10 CFR 20 are not to be exceeded in the North Anna Reservoir, WHTF, or discharge canal for the design case. Because of recirculation effects, and because the discharge point from the station is at the discharge canal, the point of maximum concentration for any radionuclide is in the discharge canal. (NAPS. 2020, Section 11.2.5.1)

Dominion does not anticipate any increase in liquid waste releases beyond normal operations during the proposed SLR operating term.

E2.2.6.2 Gaseous Waste Disposal System

The gaseous waste disposal system is designed to maintain effluent radioactivity levels as low as practicable and below the limits of applicable regulations. The system is designed to satisfy the applicable sections of the general design criteria, and to meet the requirements of 10 CFR 20, 10 CFR 50, and 10 CFR 100, so as not to endanger the health of station operating personnel or the general public. (NAPS. 2020, Section 11.3.1)

The gaseous waste disposal system is common to both units and is sized to treat the radioactive gases released during simultaneous operation of both units. Fission product gases and uncondensed radioactive vapors are held for decay, filtered, and diluted with ventilation air until they may be safely released through one of the two vent stacks on top of the Unit 1 containment. (NAPS. 2020, Section 11.3.1)

The gaseous waste disposal system is designed to provide adequate storage for radioactive decay time of the waste gases and, in addition, provide for hold up of these gases when adverse meteorological conditions make it desirable to discontinue release of waste gas to the environment (NAPS. 2020, Section 11.3.1).

The system is designed to receive, decay, process, dilute, and discharge potentially radioactive gases, fission product gases, and uncondensed vapors from the vent and drain system, boron recovery system, primary coolant leakages, and the reactor plant. The system is a closed loop consisting of two waste gas compressors, two waste gas decay tanks, and connecting piping to collect and filter vapors from tanks containing radioactive liquids. (NAPS. 2020, Section 11.3.2)

Fission gases and hydrogen are removed from the chemical and volume control system for plant shutdown by venting the volume control tank to the gaseous waste disposal system (NAPS. 2020, Section 9.3.4.2.2.3). The vent and drain system vents are separated into aerated vents in which air is the predominant gas (filtered and discharged to the atmosphere via the process vent), and gaseous vents in which hydrogen and radioactive gases such as argon, krypton, and xenon are predominant (discharged to the gaseous waste disposal system) (NAPS. 2020, Section 9.3.3.1).

The boron recovery system is capable of removing gases from both units simultaneously at the maximum letdown flow rate (NAPS. 2020, Section 9.3.5.1). Non-condensable gases removed from the letdown in the gas stripper are separated from the steam in the gas stripper vent condenser and chiller and discharged into the gas stripper surge tank by the gas stripper diaphragm compressors. The surge tank discharges either to the volume control tank to return the hydrogen and radioactive gases to the reactor coolant system, or to the gaseous waste disposal system. The surge tank contains sufficient gas to fill the gas stripper, preventing the in-leakage of air during standby or draining operations. If the stripper is to be opened to the atmosphere, the unit will be purged with nitrogen. (NAPS. 2020, Section 9.3.5.2)

Sampling system purge headers are available for hydrogenated gaseous purge and gaseous purge. The hydrogenated gaseous purge header is discharged to the gas stripper in the boron recovery system. The gaseous purge header is discharged into the waste gas charcoal filters. (NAPS. 2020, Section 9.3.2.1.2)

Waste gases are regulated by the process vent subsystem and the ventilation vent subsystem of the gaseous waste disposal subsystem (NRC. 2002a, Section 2.1.4.2).

The process vent subsystem dilutes and discharges the effluents of the gaseous waste disposal system to the atmosphere. The ventilation vent subsystem regulates the discharge of air from potentially contaminated areas, and from the steam reliefs of the boron evaporators, waste disposal evaporator (the waste disposal evaporator is not used: the IEFS [DURATEK] is used instead), gas strippers and waste gas decay tanks to the atmosphere. (NAPS. 2020, Section 11.3.2)

Gaseous waste enters the process vent subsystem of the gaseous waste disposal system from the waste gas decay tanks, the vent and drain system, the containment purge system and the containment vacuum system. Overpressure relief protection is provided at the waste gas decay tanks. The protective devices consist of rupture disc assemblies followed by bellows-sealed pressure relief valves. The use of bellows seals and rupture discs precludes leakage of the waste gas to the environment during normal operation of the gaseous waste disposal system. The piping downstream of the protective devices relieves to a vent stack upstream of all radiation monitoring equipment. (NAPS. 2020, Section 11.3.2)

After sufficient decay time and sampling, the gas is released into the process vent system at the suction of the process vent blowers. These blowers also take suction on the containment vacuum compressor discharge and on the vents of liquid waste tanks, as well as the bleed of the nitrogen supply line. These gases are mixed with filtered air from the auxiliary building and drawn through charcoal and high-efficiency particulate air (HEPA) filters to remove iodine. The gases then pass through a regenerative heat exchanger and are discharged to the atmosphere. (NAPS. 2020, Section 11.3.2)

The ventilation vent subsystem is considered a portion of the gaseous waste disposal system only for purposes of radiological surveillance, and it is designed on this basis. The relief valves that relieve into the ventilation vent stack contain potentially radioactive gases and hydrogen. Because the gases to be handled are predominantly of nonradioactive origin, this subsystem has been considered an auxiliary system. (NAPS. 2020, Section 11.3.3.1)

Dominion does not anticipate any increase in gaseous waste releases beyond normal operations during the proposed SLR operating term.

E2.2.6.3 Solid Waste Disposal System

Solid waste from NAPS consists of spent resin slurries, spent filter cartridges, and miscellaneous materials from station and radwaste facility operation and maintenance such as contaminated rags, paper, and equipment parts. Spent resin slurries from the plant's ion exchangers are collected in a shielded resin hold-up tank in the decontamination building and then dewatered and transferred to a high-integrity container (HIC) for shipment for disposal. Spent filter cartridges are also placed in HICs in preparation for disposal. Miscellaneous solid waste materials are placed in appropriate containers and shipped offsite for compacting and disposal. (NRC. 2002a, Section 2.1.4.3)

The solid waste disposal system provides hold-up, packaging, and storage facilities for the eventual shipment off the site and the ultimate disposal of radioactive waste. Materials that may be handled as solid waste include spent resin slurries; spent filter cartridges; and other miscellaneous solid radioactive material resulting from station operation and maintenance. (NAPS. 2020, Section 11.5.1)

Spent resin material will be transferred as slurry to be dewatered and shipped, in disposal containers, which are placed in shielded shipping casks as required for offsite shipping and disposal. The shielded shipping casks are generally reused. (NAPS. 2020, Section 11.5.2.1)

Spent resin facilities are located below grade in the decontamination building. A shielded resin hold-up tank accumulates spent resin from ion exchangers. A transfer system permits the spent resin to be flushed from the hold-up tank, dewatered, and shipped. (NAPS. 2020, Section 11.5.3.3)

The resin in an ion exchanger is considered spent when the decontamination factor drops below a predetermined value, the dose rate on the outside of the ion exchanger approaches a predetermined value, or the pressure drop across the ion exchanger becomes excessive. The unit is then isolated, and primary-grade water or recycled resin flush water is used to flush the spent resin into the spent resin hold-up tank. The spent resin remains in the hold-up tank and flushed liquid passes through a filter and discharges by way of the spent resin dewatering tank and the vent and drain system to one of the waste drain tanks. (NAPS. 2020, Section 11.5.3.3)

Filters in radioactive liquid service are removed from service when the pressure drop across the filter becomes excessive or the radiation level approaches the transport cask shielding capabilities. To remove the expended cartridges from filters located in limited access shielded cubicles, the filter removal shield is positioned on the shield floor over the filter vessel after removal of the shield plug. The filter cover is opened remotely, and the cartridges are drawn up into the shield. The spent filter and shield are transferred to the waste solids area. The spent filter is lowered into a shielded disposable HIC in preparation for disposal. Filters located in limited access shielded cubicles that present a low radiological risk may be removed without use of the filter removal shield prior to being lowered into a disposal container in preparation for disposal. Other filters that are not located in limited access shielded cubicles are removed without the use of the filter removal shield. These filters are removed and transported to waste solids. (NAPS. 2020, Section 11.5.3.4)

The waste disposal evaporator is abandoned in place (NAPS. 2020, Section 11.5.2.2). The clarifiers are no longer operated in a manner which generates sludge. They serve only as hold-up tanks to provide additional decay time. (NAPS. 2020, Section 11.5.2.3)

Dominion does not anticipate any increase in solid waste releases beyond normal operations during the proposed SLR operating term.

E2.2.6.4 Ultimate Disposal Operations

Material handled as radioactive solid waste may include spent resin, spent filter cartridges, sludges, and miscellaneous solid materials resulting from station operation and maintenance, such as contaminated rags, paper, and equipment parts. For ultimate disposal, this waste is packaged and shipped offsite to approved radwaste processors. These processors minimize the amount of waste prior to shipment to specifically approved burial grounds. The packaging meets all applicable NRC and U.S. Department of Transportation (DOT) regulations (10 CFR 71 and 49 CFR 170 through 179) for transportation of radioactive materials. (NAPS. 2020, Section 11.5.5)

Dominion contracts for waste disposal transportation and burial services, and uses only approved containers for shipment in accordance with the requirements of applicable regulations. The shipping containers are stored until they are shipped offsite for ultimate disposal. (NAPS. 2020, Section 11.5.5)

Low-level radioactive waste (LLRW) is classified as Class A, Class B, or Class C (minor volumes are classified as greater than Class C). Class A includes both dry active waste and processed waste (e.g., dewatered resins). Classes B and C normally include processed waste and irradiated hardware. NAPS has a contract with Energy Solutions for processing and disposal of its low-level waste. Energy Solutions operates processing facilities in Erwin and Oak Ridge, Tennessee, and disposal facilities for Class A waste in Barnwell, South Carolina, and Clive, Utah (Energy Solutions. 2018). In 2018, low-level waste was shipped to the facility in Oak Ridge, Tennessee (NAPS. 2019a). Classes B and C waste constitute a low percentage by volume of the total LLRW generated and can be stored onsite in a low-level waste storage facility. NAPS non-routinely generates greater-than-Class C (GTCC) waste, which is stored onsite until a facility to store or dispose of GTCC waste is licensed by the NRC. Disposal of GTCC waste is the responsibility of the federal government.

NAPS does not routinely generate mixed waste and there was no generation of mixed waste from 2013–2017. If generated, low-level mixed waste would be managed and transported to an offsite facility licensed to accept and manage the waste in accordance with appropriate site and company procedures.

E2.2.7 NONRADIOACTIVE WASTE MANAGEMENT SYSTEM

The Resource Conservation and Recovery Act (RCRA) governs the disposal of solid waste. Solid and hazardous waste in Virginia are regulated and administered by the Virginia Department of Environmental Quality (VDEQ), the Virginia Waste Management Board, and the U.S. Environmental Protection Agency (EPA). (VDEQ. 2019a)

NAPS generates nonradioactive waste from plant maintenance, cleaning, and operational processes. Table E2.2-2 provides the amount of nonradioactive hazardous and nonhazardous waste generated at NAPS from 2013–2017. Municipal waste is disposed of at the local permitted solid waste management facility. The sanitary sewage treatment system is discussed in Sections E3.6.1.2.3 and E9.5.3.4.

E2.2.7.1 Hazardous Waste

Dominion's hazardous waste guidance provides stepwise guidance for handling, transportation, recordkeeping, management, and reporting of hazardous waste. NAPS is not required to have a hazardous waste permit. The Virginia Waste Management Board promulgates waste management regulations, while the VDEQ's waste management program regulates management of hazardous waste within the state. Virginia's hazardous waste regulations are codified at Title 9 of the Virginia Administrative Code (VAC), Chapters 20–60. Virginia has been authorized by the EPA to implement its own state hazardous waste program in lieu of the federal program. (Dominion. 2015b)

Dominion's environmental management system requires that each business group implement processes or procedures for minimizing waste and emissions. Additionally, projects must consider, as applicable, environmental or biological protections, incentives to encourage material substitutions, avian protection, or LEED certification for new buildings. By participating in these processes, Dominion works toward eliminating costly municipal solid waste and select industrial wastes (including hazardous waste), benefiting their bottom line and the environment. (Dominion. 2015b)

Dominion maintains an electronic waste management database known as the Waste Disposal Management System. Within that database, Dominion tracks all waste disposal, including hazardous waste, and can check trends in disposal and recycling efforts. The only wastes not included in this database are used kitchen grease, recycled paper, scrap metal, and domestic garbage. This enables Dominion to make informed decisions about more appropriate future disposal and recycling opportunities. (Dominion. 2015b)

For most hazardous waste records, the regulations require that records be retained for at least three years from the date the hazardous waste for which the record pertains is last shipped offsite. It is a Dominion best management practice (BMP) to maintain most records for a minimum of five years in accordance with the Dominion record retention schedule. (Dominion. 2015b)

E2.2.7.2 Nonhazardous Waste

Dominion's nonhazardous waste management guidance provides Dominion's operations with information on how to comply with solid waste management regulations and Dominion BMPs for nonhazardous waste and summarizes the regulatory provisions and BMPs applicable to Dominion facilities based on current understanding of applicable law, regulations, and Dominion's current business practices (Dominion. 2013a).

As addressed in Dominion's nonhazardous waste management guidance, dredged material is considered nonhazardous waste (Dominion. 2013a). Dredging is not performed at NAPS and no future dredging activities are anticipated.

E2.2.7.3 Waste Vendor Selection

Dominion maintains a list of waste vendors approved for use across the entire company. Table E2.2-3 provides the names of waste vendors and amount of nonradioactive hazardous and nonhazardous waste from NAPS handled by each vendor during 2013–2017. Dominion facilities should only use the hazardous and nonhazardous waste treatment, storage, and disposal facilities contained on the current approved waste disposal list managed by Dominion corporate environmental services and supply chain. (Dominion. 2004)

Table E2.2-1 Meteorological Parameters Monitored at NAPS

Parameter (elevation level)	Primary Tower	Backup Tower
Wind speed (48.4 meters)	X	n/a
Wind direction (48.4 meters)	X	n/a
Horizontal wind direction fluctuation (48.4 meters)	X	n/a
Wind speed (10 meters)	X	X
Wind direction (10 meters)	X	X
Horizontal wind direction fluctuation (10 meters)	X	X
Ambient temperature (10 meters)	X	X
Dew point (10 meters)	X	n/a
Differential temperature (48.4 meters and 10 meters)	X	n/a
Precipitation (grade level)	X	n/a

(Dominion. 2015a)

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Asbestos	**19,775**		**13,000**	**2,600**	
Class II non-friable asbestos	19,775				
Non-Friable Asbestos			**13,000**	**2,600**	
Category 1 NF material			8,000		
Roofing material			2,500		
Waste roofing material			2,500		
(Blank)				2,600	
Hazardous	**1,524.98**	**4,009.75**	**2,524.42**	**2,712**	**1,620.6**
Aerosol Cans	**40.8**	**16**	**30**	**117**	**80**
Broken Mercury Articles/Devices	**0.58**				**1.1**
Broken mercury thermometer with mercury contaminated material					1
Contaminated mercury waste (D009)	0.08				
Mercury from a cleaned-up spill					0.1
Waste contaminated with mercury (D009)	0.5				
Other–Specify	**689.6**	**748.75**	**1,068.42**	**539**	**826.5**
Broken mercury thermometer				0.1	
Caustic semi-solid waste paint remover (D002/I)	56				
Corrosive cleaning solution (contains sodium hydroxide)			20		
Corrosive resin conditioner (D002)	8.9				
Cracked, non-leaking mercury thermometer				0.1	
Expired 1000 ppm chromium std.					0.9
Expired 1000 ppm lead std.					0.5
Expired 70% nitric acid (2.5-litre glass bottles)					93

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Expired acetone					1
Expired adhesives				1.5	
Expired adhesives, solvents, and markers				5	
Expired ammonia CHEMets			0.8		0.5
Expired ammonia CHEMets (contains mercury) (D002, D009)	0.3				
Expired ammonia CHEMets (D002, D009)		0.1			
Expired ammonia comparator kit					1
Expired ammonium hydroxide			7.5	1	
Expired carbon monoxide Drager tubes				0.5	
Expired carbon monoxide testing Drager tubes				0.4	
Expired chromium 1 reagent powder pillows (D002)	0.1				
Expired chromium std.		0.2	0.02	0.7	0.3
Expired cleaner/degreaser			46		
Expired CO_2 Drager tubes		0.15			
Expired conditioner					7
Expired conditioners and neutralizer					18
Expired corrosive conditioner					2
Expired corrosive epoxy hardener (D002)	0.1				
Expired cyclohexanone					0.7
Expired denatured methanol					46
Expired Drager (carbon monoxide detector) tubes	0.3				
Expired Drager tubes			0.6		
Expired epinephrine (acute hazardous waste)			1		

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Expired flammable adhesives	12		6	4	26
Expired flammable adhesives (D001)	1	20.5			
Expired flammable adhesives and markers			10		
Expired flammable adhesives and primers					30
Expired flammable adhesives and solvents		1			
Expired flammable marker					0.2
Expired flammable primer					18
Expired flammable sealant			0.2		
Expired flammable sealants and adhesives (D001)	12				
Expired Hysol resin/hardener cartridges					5
Expired ignitable adhesives			2		
Expired ignitable coating kits					4
Expired ink and gasket compounds					3
Expired laboratory reagent saturated with AGCL				1.7	
Expired lead acetate trihydrate					1
Expired Naco CS corrosion inhibitor (Oxidixer-D001)		50			
Expired NH_4 CHEMets			1.3		
Expired NH_4 CHEMets (D002 and D009)	0.2				
Expired Nochromix glass cleaner packets				1.8	
Expired petroleum ether				5	
Expired pipe cement primer			10		

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Expired potassium dichromate				2.2	0.2
Expired rad shield material (contains lead) (D008)		50			
Expired resin conditioner (1-gallon jugs)					26
Expired RTV solvent coating			2		
Expired sealants and caulking		3			
Expired silica L.R. reagent kit				1	
Expired solvent-based coatings					5
Expired solvent coatings				13	
Expired solvents (D001, U159, U220, U239)	0.5				
Expired solvents (F003, D001)		0.5			
Flammable adhesives (D001)	1				
Flammable adhesives and inks (D001)		14			
Flammable adhesives and markers (D001)		7			
Flammable adhesives and sealants (D001)	12				
Flammable adhesives and sealants			20		
Flammable adhesives	5	1			3
Flammable sealants (D001)	3				
Hazardous spill clean-up material				1	
Ignitable adhesives and markers		1			
Ignitable adhesives	2				
Leaking lead/acid batteries			3		

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Miscellaneous flammable solvents and adhesives (D001)	0.6				
Used ammonia CHEMets (D002, D009)		0.5			
Used Drager tubes					0.2
Used gun-cleaning material				100	100
Waste 1000 ppm lead standard			8		
Waste ammonia CHEMets					1
Waste fuel oil mixed with toluene	71				
Waste gun-cleaning liquid			80		133
Waste gun-cleaning material (D005 and D008)	200	300			
Waste gun-cleaning material (lead)					
Waste gun-cleaning material	300	300	600	400	300
Waste H-901G residual removed from a Brominator			250		
Waste hydrazine 35% (U133)	2.8				
Waste lead (D008)	0.8				
Paint/Resins	**794**	**3,165**	**1,191**	**794**	**680**
Expired acrylic sealant (D001)		800			
Expired flammable two-part epoxy kits					10
Expired primer					6
Waste paint/thinner		1,588	1,191	794	664
Waste paint/thinner (D001)	794	397			
Waste paint/thinner (D001 and F003)		380			
Parts Washer Solvent		**80**	**235**	**1,262**	**33**
Expired flammable solvent (5-gallon bucket)					33
Used gun-cleaning liquid		80			

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Waste de-greasol solvent				370	
Waste gun-cleaning water with detergent			54	66	
Waste isopropyl alcohol			181		
Waste Limosol barrel #1				413	
Waste Limosol barrel #2				413	
Non-Hazardous	**33,654.4**	**22,464**	**47,642**	**4,441.3**	**10,953.5**
Adhesives/Sealants	**276.6**	**303**	**28**	**1.3**	**70**
Expired Nordstrom sealant (5-quart cans)					60
Expired gasket sealant				1.3	
Expired non-hazardous adhesives and lubricants			20	10	8
Expired non-hazardous adhesives					10
Expired non-hazardous sealants			3		
Non-hazardous epoxy		140			
Non-hazardous joint sealant	200				
Non-hazardous RTV sealant		11			
RTV caulking	0.5				
(Blank)	76.1	152	5		
Other–Specify	**33,377.8**	**22,161**	**47,614**	**4,096**	**10,577.5**
Combustible liquid, n.o.s. (fuel oil & water)	7,672.8				
Cooling system cleaner spill clean-up waste					5
Expired algicide		509			
Expired and cured boiled linseed oil	35				
Expired anti-foam agent		330			
Expired cable lubricant					35
Expired chemistry reagents (18-Crown-6)					1
Expired coolant additive					1,400
Expired corrosion inhibitor (VPCI-337)	44				

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Expired degreaser cleaner (5-gallon container)					66
Expired glycerol					10.5
Expired graphite grease and non-hazardous epoxy compound				10	
Expired grease		1		40	6,552
Expired grease and non-hazardous epoxy					2
Expired lubricants and markers			15		
Expired lubricant			150		
Expired monoethanolamine			1,336		
Expired neutralizer					5
Expired non-hazardous concrete sealant (5-gallon bucket)					43
Expired non-hazardous filter coating spray			12		
Expired non-hazardous flocculant		990			
Expired non-hazardous joint lubricant	32				
Expired non-hazardous lubricant	22	60		1	
Expired non-petroleum compressor oil (5-gallon container)					36
Expired propylene glycol					44
Flammable liquid, n.o.s. (gasoline & water)	7,506				
Miscellaneous expired lubricants	11				
Miscellaneous non-hazardous lubricants	3				
Non-flammable aerosols		31			
Non-hazardous 2-part epoxy					58

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Non-hazardous adhesives and lubricants	12	85			
Non-hazardous adhesives					5
Non-hazardous aerosol		1			
Non-hazardous cutting fluid					3
Non-hazardous cutting oil		33			
Non-hazardous markers, adhesives, and lubricants		1			
Non-hazardous sealants	20				
Non-hazardous used Powdex resin			20,000		
Non-hazardous gasket sealant					4
Spent Powdex resin			4,000		
Expired scintillation cocktail (2-gallons)	20				
Used Fyrquel® EHC fluid			22,101		
Used grease		120			
Used Powdex resin	18,000	20,000		4,000	2,300
Waste sealed capacitors				35	
Parts Washer Solvent				**344**	**297**
Expired non-hazardous solvent (5-gallon buckets)					133
Non-hazardous used solvent					164
Non-hazardous waste solvent (PF solvent)				344	
Silica Gel					**9**
Expired Sealant					9
PCBs	**42**	**577**	**162.66**	**52.36**	**73.942**
Other–Specify		**229.5**	**114.7**		
Fluorescent lamp ballasts (not labelled no PCBs)			32		
Fluorescent lamp ballasts		31.5			
Non-leaking waste fluorescent lamp ballasts (without no PCBs labels)		105			

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Used fluorescent lamp ballasts (may contain PCBs)		30			
Used lamp ballasts (without no PCBs labels)		63			
Waste fluorescent lamp ballasts			27.7		
Waste lamp ballasts (without no PCBs labels)			55		
PCB Item (≥ 50 ppm)	**42**	**347.5**	**47.96**	**52.36**	**73.942**
Discarded and unmarked fluorescent lamp ballasts	3.5				
Fluorescent lamp ballasts			19.36		
Unmarked waste fluorescent lamp ballasts					7.04
Used fluorescent lamp ballasts		31.5			
Used fluorescent lamp ballasts without no PCBs label (container: Na-1-2016 bucket)				27.94	
Used fluorescent lamp ballasts (without no PCBs label)	31.5				
Used un-labelled fluorescent lamp ballasts		21			
Used unmarked fluorescent lamp ballasts	7				
Waste fluorescent lamp ballasts		35		24.42	
Waste fluorescent lamp ballasts (without no PCBs label)					31.46
Waste lamp ballasts (with no PCBs label)			28.6		
Waste lamp ballasts (without no PCBs label)					24.442
Waste transformer capacitors (contains PCBs)		260			
(Blank)					11

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Recyclable	**524,287.84**	**1,132,651.96**	**235,554.74**	**1,625,704.26**	**324,036**
Fossil Fuels and Oil–Oil for Energy Recovery (burned oils, debris, filters, solids)	**4,000**	**10,000**	**30,000**	**12,000**	**19,000**
Oily waste roll-off swap out	4,000				
Oily waste roll-off swap		10,000	30,000		
Oily waste roll-off					4,000
Soil contaminated with fuel oil					15,000
(Blank)				12,000	
Fossil Fuels and Oil–Oil Recovery (oil-water mixes)	**35,028**	**8,340**	**7,506**		**34,194**
Oily and soapy wastewater			7,506		
Waste diesel fuel and water	14,178				
(Blank)	20,850	8,340			34,194
Fossil Fuels and Oil–Reclaimed Oil (used oil for reprocessing)	**57,129**	**87,394.86**	**89,571.6**	**60,590.1**	**34,194**
(Blank)	57,129	87,394.86	89,571.6	60,590.1	34,194
Metals–Aluminum	**38,180**	**20,000**			
Scrap aluminum	14,880				
Scrap wire and cable, aluminum, mixed, bare and insulated, unprepared	23,300				
Wire, aluminum		6,000			
(Blank)		14,000			
Metals–Copper Wire	**13,229**				
Scrap copper	13,229				
Metals–Other Ferrous	**234,740**	**593,364**		**1,464,912**	**160,746**
Iron and steel		593,364			
Iron and steel, mixed miscellaneous	234,740				
(Blank)				1,464,912	160,746
Metals–Other Non-Ferrous		**15,060**			
(Blank)		15,060			

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Metals–Scrap (mixed)	**31,250**	**309,454**			
2014 scrap metal total		309,454			
Scrap iron and steel, carbon, steel, unprepared	31,250				
Other–Antifreeze, Glycols	**72,641.4**	**84,359.1**	**107,552.64**	**88,187.16**	**75,894**
EDG coolant water					15,846
EDG coolant				30,441	
Used EDG coolant				31,692	
(Blank)	72,641.4	84,359.1	107,552.64	26,054.16	60,048
Other–Computer Equipment	**10**		**24**	**15**	
Used circuit boards			24		
Waste circuit boards components				10	
Waste circuit boards (recyclable electronic waste)	10				
Waste electronic boards				5	
Other–Lead-Acid Batteries			**900**		
(Blank)			900		
Other–Specify	**38,080.44**		**0.5**		**8**
Non-PCB transformer mineral oil	38,080.44				
Recyclable circuit boards			0.5		
Waste circuit boards					8
Tires		**4,680**			
(Blank)		4,680			
Universal	**2,855.4**	**70,565.3**	**1,805.35**	**1,448.15**	**49,510.85**
Batteries–Lead-Acid	**1,524**	**68,458**			**48,164**
EC-15 battery	1,524				
(Blank)		68,458			48,164
Batteries–Lithium	**71.3**	**70.0**	**68.4**	**54.9**	**50.85**
Batteries–Nickel Cadmium (NiCd)	**24**	**153.9**	**66**	**60**	**31**
Batteries–Nickel Metal Hydride	**12**	**7.9**	**13.95**	**7.4**	**12**
Cathode Ray Tubes (CRT) (Rhode Island only)				**5**	
Used AA hollow cathode lamps				5	

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Lamps – Fluorescent (4')		**1,280**	**960**	**790**	**800**
(Blank)		1,280	960	790	800
Lamps – Fluorescent (8')			150	80	80
(Blank)			150	80	80
Lamps–Fluorescent (other–specify)	**1,060**	**460**	**394**	**360**	**280**
8-ft. tubes	120				
CFLs				40	
Used 4-ft. tubes	40				
Used 6-ft. and 8-ft. tubes		100			
Used CFLs	200	260	274	230	130
Used fluorescent U-tubes				30	
Used U-tubes	60	100	120	60	150
(Blank)	640				
Lamps–High Pressure Sodium	40			30	
(Blank)	40			30	
Lamps–Metal Halide	120	134	150	60	90
(Blank)	120	134	150	60	90
Mercury-Containing Equipment/Articles	**4.1**	**1.5**	**3**	**0.85**	**3**
Discarded sodium analyzer probes	0.9				
Discarded switch and thermometers	2				
Expired mercury switches			0.1		
Expired sodium analyzer probes		1			
Expired thermometers	0.5				
Mercury containing lamps from analytical instrumentation				0.1	
Mercury switches			0.2		
Projector lamp assembly					1
Used analyzer lamp assemblies	0.6				
Used capacitor		0.5			
Used mercury switches	0.1				
Used projector lamp					0.5

Table E2.2-2 Nonradioactive Waste Quantities at NAPS

Waste	Year Weight (lbs)				
	2013	2014	2015	2016	2017
Used sodium analyzer probes (contains mercury)				0.25	
Used sodium analyzer probes			1.5		
Used UV lamps					0.5
Waste sodium analyzer probes (contains mercury)				0.5	
Waste sodium analyzer probes			0.5		1
Waste thermostats			0.7		
Grand Total (lbs)	**582,139.62**	**1,230,268.01**	**300,689.17**	**1,636,958.07**	**386,194.89**

Table E2.2-3 NAPS Nonradioactive Waste Vendors and Quantities, 2013–2017

Waste/Waste Vendor	Year Weight (lbs)					
	2013	2014	2015	2016	2017	Grand Total (lbs)
Asbestos/Waste Management (Amelia Landfill, Amelia, VA)	**19,775**		**13,000**	**2,600**		**35,375**
Hazardous	**1,524.98**	**4,009.75**	**2,524.42**	**2,712**	**1,620.6**	**12,391.75**
Clean Harbors	1,522.68	4,008.75	2,524.42	1,949.7		10,005.55
Clean Harbors (El Dorado, AR)	640.1	3,675.1	2,485.5			6,800.7
Clean Harbors (Reidsville, NC)	882.58	33.65	38.92	350.7		1,305.85
Clean Harbors (Spring Grove Resource Recovery, Inc.) (Cincinnati, OH)		300				300
Safety-Kleen Systems, Inc. (Smithfield, KY)				1,599		1,599
Clean Water Limited		**1**				**1**
Clean Harbors (El Dorado, AR)		1				1
Triumvirate Environmental/A&A				**762.3**	**1,620.6**	**2,382.9**
AES (Calvert City, KY)				349		349
Clean Earth of Calvert City (formerly AES)					558.8	558.8
Ross Incineration Services (Grafton, OH)				413.1	1,061.8	1,474.9
Triumvirate Environmental, LLC (NYC) (Astoria, NY)				0.2		0.2
(blank)	**2.3**					**2.3**
Clean Harbors (El Dorado, AR)	2.3					2.3
Non-Hazardous	**33,654.4**	**22,464**	**47,642**	**4,441.3**	**10,953.5**	**119,155.2**
Clean Harbors	**1,8475**	**22,464**	**25,541**	**4,346.3**		**70,826.3**
Clean Harbors (Chattanooga, TN)			150			150
Clean Harbors (El Dorado, AR)	278	688	1,391			2,357
Clean Harbors (Reidsville, NC)	197	1,776				1,973
Clearfield MMG–formerly Soilex (Chesapeake, VA)		20,000	24,000	4,000		48,000

Table E2.2-3 NAPS Nonradioactive Waste Vendors and Quantities, 2013–2017

Waste/Waste Vendor	Year Weight (lbs)					
	2013	2014	2015	2016	2017	Grand Total (lbs)
RECO Biotechnologies/Aqua Clean Environmental of Virginia LLC (Richmond, VA)	18,000					18,000
Safety-Kleen Systems, Inc. (Smithfield, KY)				346.3		346.3
Heritage-Crystal Clean, LLC			22,101			22,101
Heritage-Crystal Clean (formerly FCC)-US Filter Recovery Services (Rockville, VA)			22,101			22,101
Triumvirate Environmental/A&A				95	10,953.5	11,048.5
Covanta Asheboro, NC (former Garco, Inc.)					8,653.5	8,653.5
Triumvirate Environmental/A&A (Baltimore, MD)				95		95
Waste Recovery Solutions aka Covanta Enviro Solutions (Myerstown, PA)					2,300	2,300
W.E.L., Inc.	15,178.8					15,178.8
W.E.L. Inc. (Concord, VA)	15,178.8					15,178.8
(blank)	0.6					0.6
Clean Harbors (El Dorado, AR)	0.6					0.6
PCB	**42**	**577**	**162.66**	**52.36**	**73.942**	**907.962**
Clean Harbors	42	577	162.66	7.04		788.7
Clean Harbors (Deer Park)	10.5					10.5
Clean Harbors (Spring Grove Resource Recovery, Inc.) (Cincinnati, OH)	31.5	577	162.66	7.04		778.2
Triumvirate Environmental/A&A				45.32	73.942	119.262
Triumvirate Environmental – Baltimore, LLC (Ashland)					38.5	38.5
Triumvirate Environmental/A&A (Baltimore, MD)				45.32	35.442	80.762

Table E2.2-3 NAPS Nonradioactive Waste Vendors and Quantities, 2013–2017

Waste/Waste Vendor	Year Weight (lbs)					
	2013	2014	2015	2016	2017	Grand Total (lbs)
Recyclable	**524,287.84**	**1,132,651.96**	**235,554.74**	**1,625,704.26**	**324,036**	**3,842,234.8**
AERC			**900**			**900**
AERC (Richmond, VA)			900			900
Clean Harbors	**4,010**	**10,000**	**30,024.5**	**12,010**		**56,044.5**
Clean Harbors (El Dorado, AR)			24			24
Clean Harbors (Reidsville, NC)	10		0.5	10		20.5
Clearfield MMG - formerly Soilex (Chesapeake, VA)			30,000	12,000		42,000
Wheelabrator Portsmouth (Portsmouth, VA)	4,000	10,000				14,000
D.H. Griffin		**309,454**				**309,454**
DH Griffin Wrecking Company, Inc.		309,454				309,454
FCC Environmental	**164,798.4**	**165,081.96**	**14,436.54**			**344,316.9**
Heritage-Crystal Clean (formerly FCC)-US Filter Recovery Services (Rockville, VA)	164,798.4	165,081.96	14,436.54			344,316.9
Gerdau				**141,492**		**141,492**
NL–Admin Only				141,492		141,492
Heritage-Crystal Clean, LLC			**190,193.7**	**148,777.26**	**138,027**	**476,997.96**
Heritage-Crystal Clean (formerly FCC)-US Filter Recovery Services (Rockville, VA)			190,193.7	144,607.26	128,436	463,236.96
Heritage-Crystal Clean, LLC					9,591	9,591
Hydrocarbon Recovery Services/US Filter Recovery Services				4,170		4,170

Table E2.2-3 NAPS Nonradioactive Waste Vendors and Quantities, 2013–2017

Waste/Waste Vendor	Year Weight (lbs)					
	2013	2014	2015	2016	2017	Grand Total (lbs)
Industrial Marine (IMS) Environmental Services–aka HEPACO	**38,080.44**				**21,255**	**59,335.44**
HEPACO - Industrial Marine (IMS) Services (Norfolk, VA)	38,080.44				6,255	44,335.44
RECO Biotechnologies/Aqua Clean Environmental of Virginia LLC (Richmond, VA)					15,000	15,000
NL–Admin Only	**317,399**	**633,104**		**1,323,420**	**160,746**	**2,434,669**
DH Griffin Wrecking Company, Inc.				1,217,140		1,217,140
Dominion Salvage (Richmond, VA)				106,280		106,280
NL–Admin Only	317,399	633,104			160,746	1,111,249
Triumvirate Environmental/A&A				5	4,008	4,013
Triumvirate Environmental/A&A (Baltimore, MD)				5	4,008	4,013
(blank)		15,012				15,012
Heritage-Crystal Clean (formerly FCC)-US Filter Recovery Services (Rockville, VA)		15,012				15,012
Sanders Lead Company (Troy, AL)						0
Universal	**2,855.4**	**70,565.3**	**1,805.35**	**1,448.15**	**49,510.85**	**126,185.05**
Clean Harbors	1,269.8	2,107.3	1,805.35	575.25		5,757.7
Clean Harbors (El Dorado, AR)	1,180	1,914.9	1,717.65			4,812.55
Clean Harbors (Reidsville, NC)	18.5	125	19.3	28		190.8
Clean Harbors (Spring Grove Resource Recovery, Inc.) (Cincinnati, OH)				515.35		515.35
Retriev Technologies Inc. (formerly Toxco Inc)	71.3	67.4	68.4	31.9		239
Integrated Power Sources of Virginia	1,524					1,524
Sanders Lead Company (Troy, AL)	1,524					1,524

Table E2.2-3 NAPS Nonradioactive Waste Vendors and Quantities, 2013–2017

Waste/Waste Vendor	Year Weight (lbs)					
	2013	2014	2015	2016	2017	Grand Total (lbs)
NL–Admin Only		68,458			48,164	116,622
NL–Admin Only		68,458			48,164	116,622
Triumvirate Environmental/A&A				872.9	1,346.85	2,219.75
Triumvirate Environmental – Baltimore, LLC (Ashland)					810.45	810.45
Triumvirate Environmental/A&A (Baltimore, MD)				872.9	536.4	1,409.3
(blank)	61.6					61.6
Clean Harbors (El Dorado, AR)	40.6					40.6
Clean Harbors (Reidsville, NC)	21					21
Grand Total	**582,139.62**	**1,230,268.01**	**300,689.17**	**1,636,958.07**	**386,194.892**	**4,136,249.762**

Figure E2.2-1 NAPS Circulating Water System

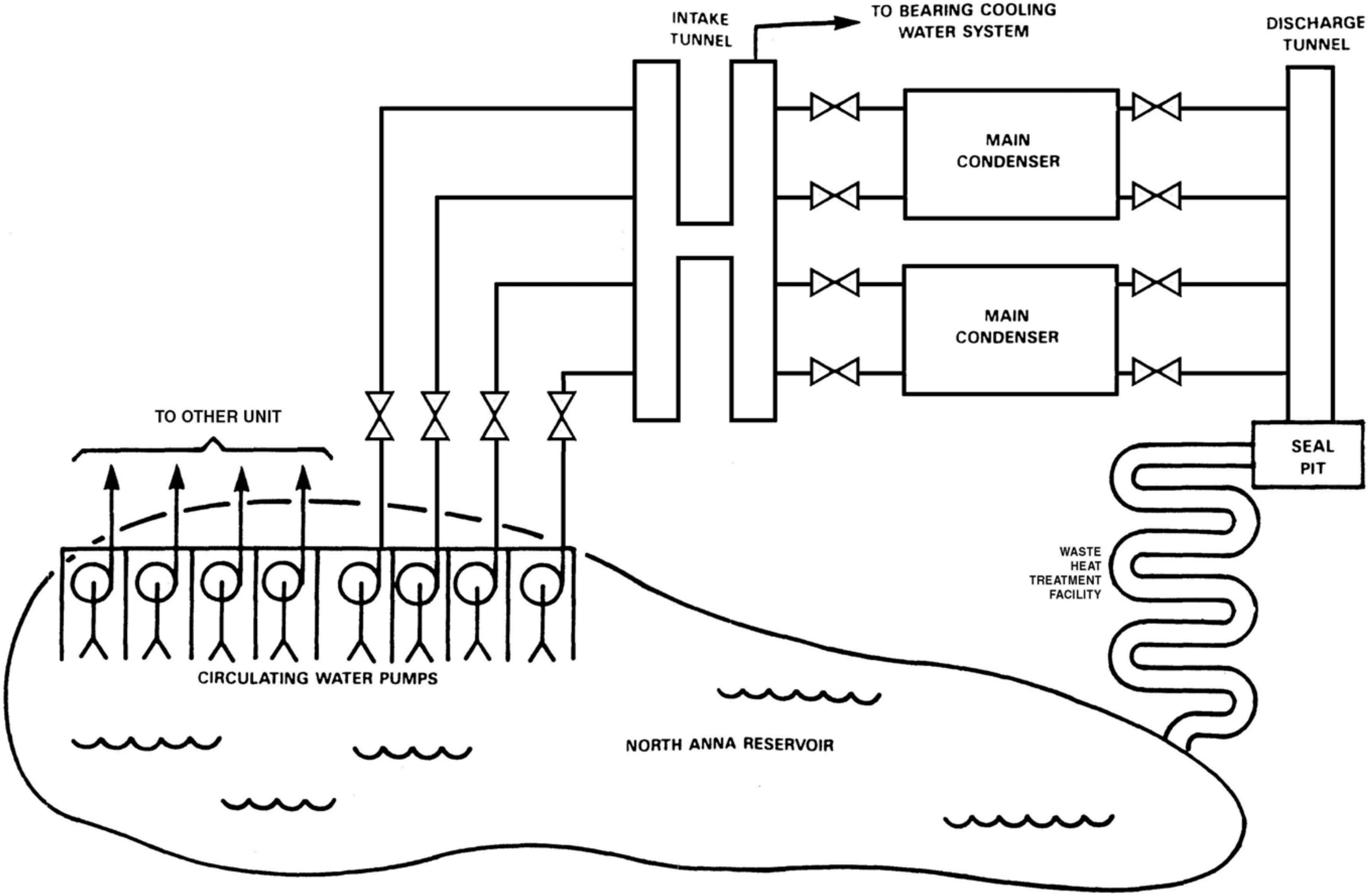


Figure E2.2-2 NAPS Service Water System (Figure 1 of 2)

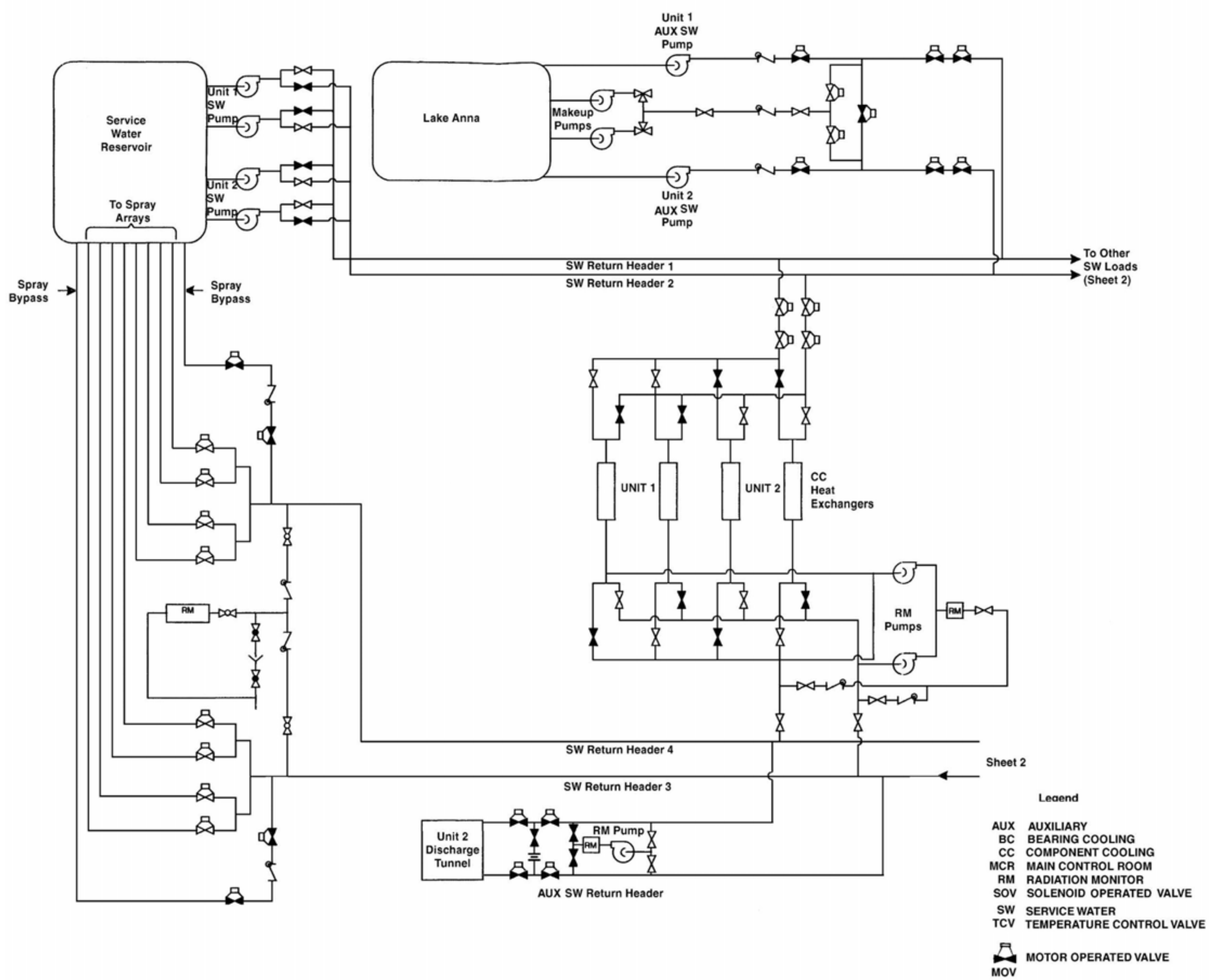


Figure E2.2-3 NAPS Service Water System (Figure 2 of 2)

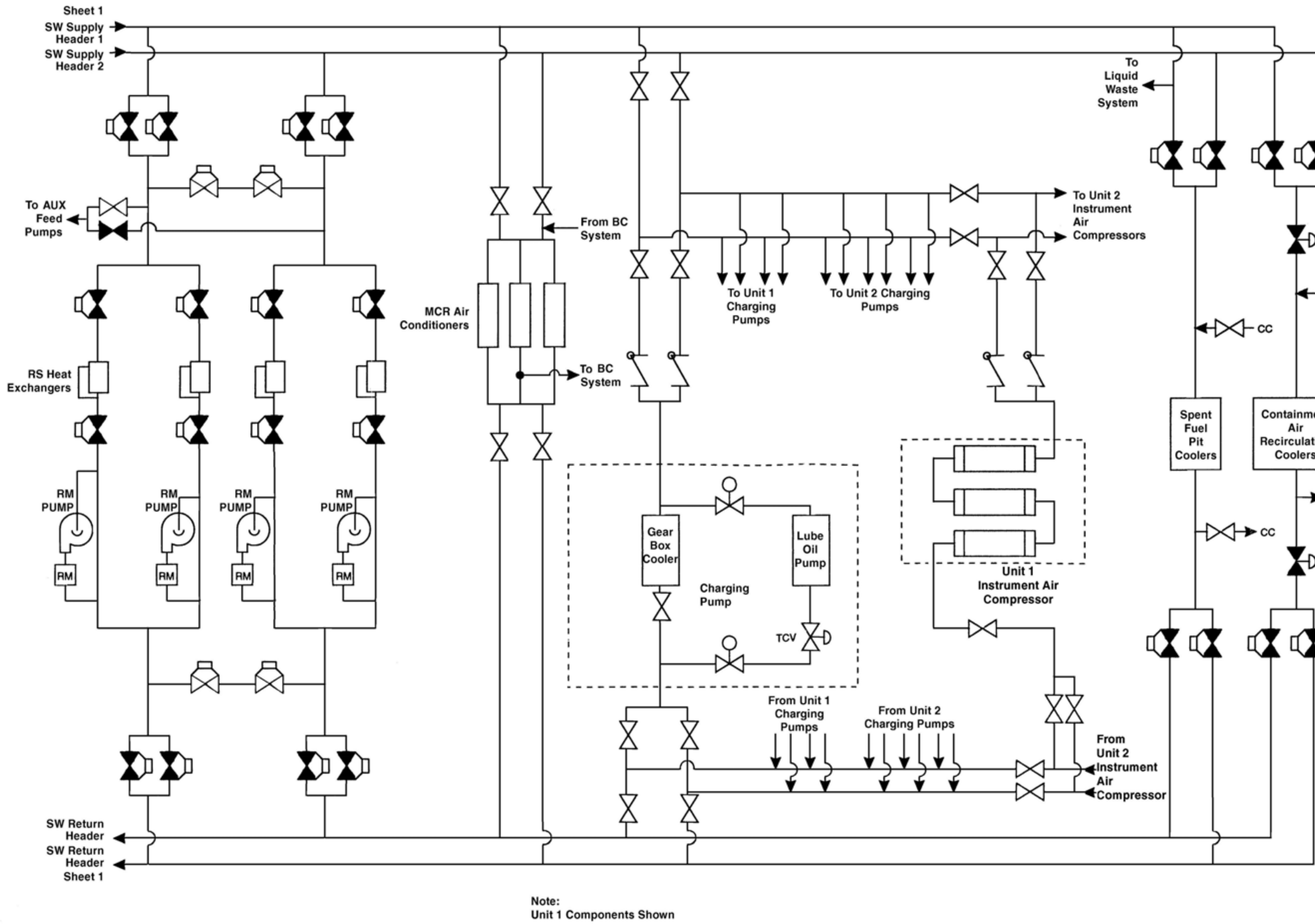


Figure E2.2-4 NAPS Component Cooling Water System

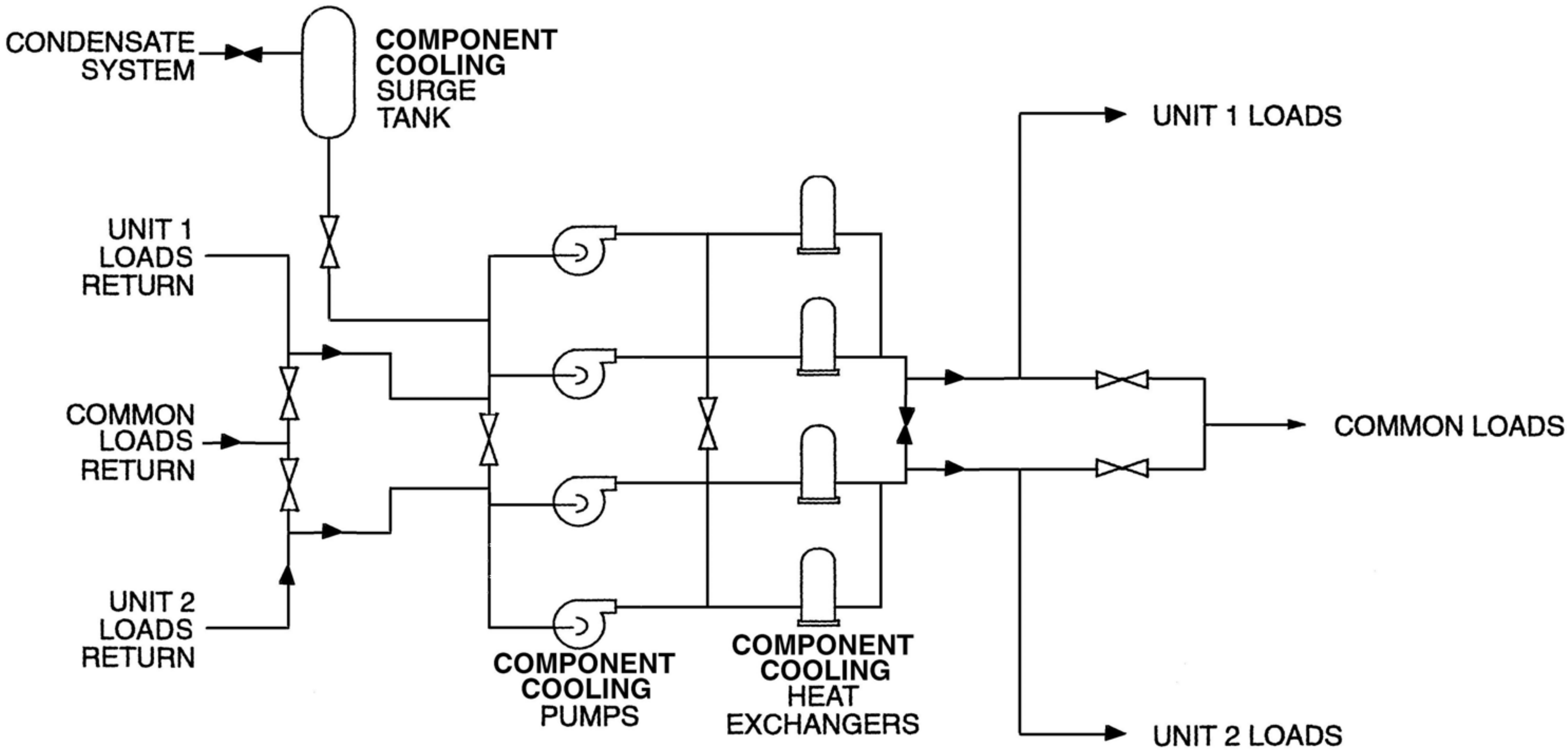
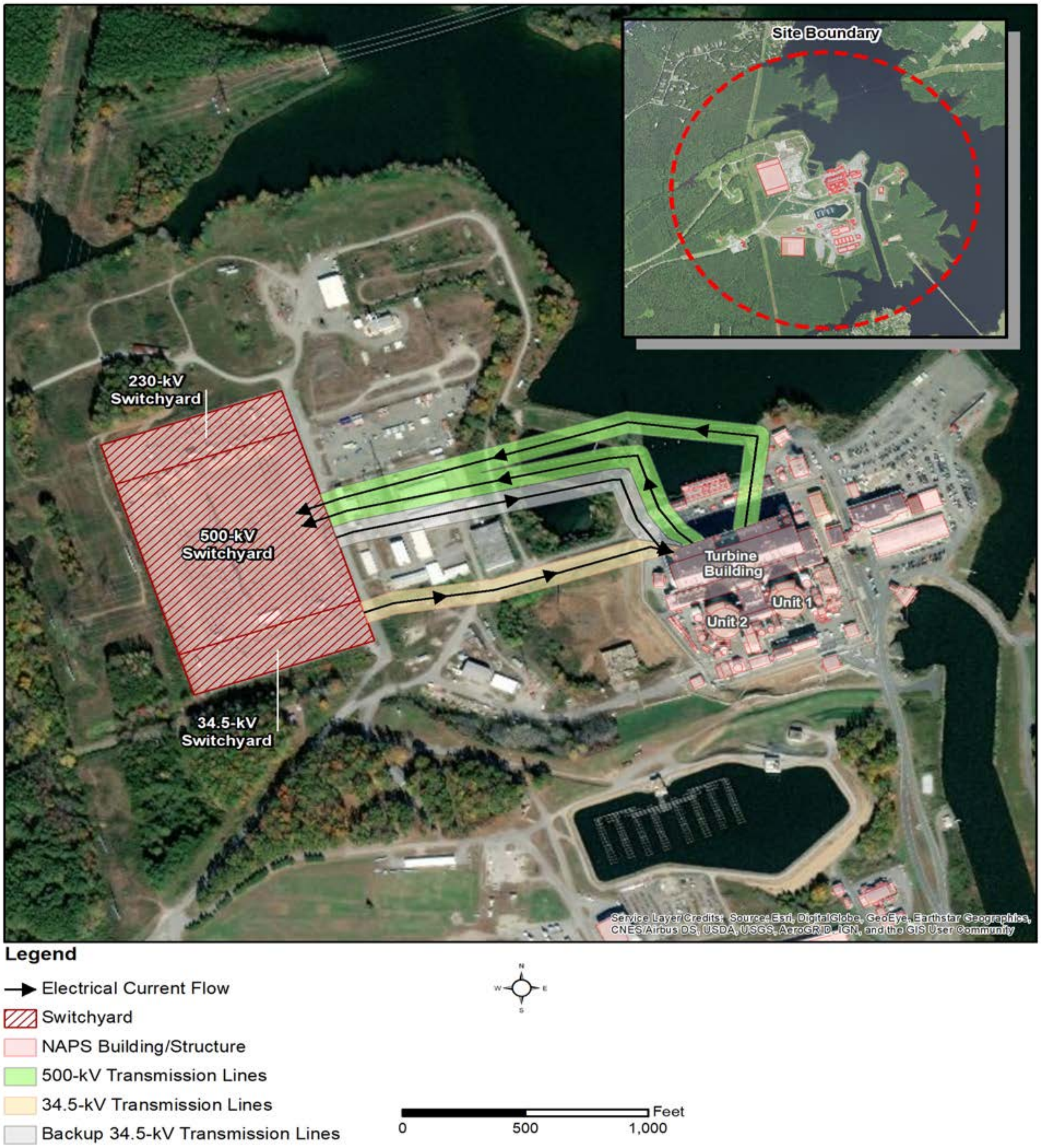


Figure E2.2-5 NAPS In-Scope Transmission Lines



E2.3 REFURBISHMENT ACTIVITIES

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant’s ER must contain a description of the applicant’s plan to modify the facility or its administrative control procedures as described in accordance with § 54.21. If license renewal-related refurbishment is planned at a facility, the applicant’s ER would include analysis of environmental impacts of the proposed refurbishment activity. [10 CFR 51.53(c)(3)(ii)]. This report must describe in detail the modifications directly affecting the environment or any plant effluents.

The incremental aging management activities implemented to allow operation of a nuclear power plant during a renewal term are assumed to fall under one of two broad categories. One of these categories involves refurbishment actions, which usually occur infrequently and possibly only once in the life of the plant for any given item. The other category is SMITTR actions, most of which are repeated at regular intervals and schedules. (NRC. 2013a, Section 2.1.1)

The NRC requirements for the renewal of OLs for nuclear power plants include preparation of an integrated plant assessment (IPA) [10 CFR 54.21]. The IPA must identify systems, structures, and components (SSCs) subject to an aging management review. The objective of the IPA is to determine whether the detrimental effects of aging could preclude certain SSCs from performing in accordance with the current licensing basis during the additional 20 years of operation requested in the SLR application (SLRA). An example of an SSC subject to aging is the reactor vessel.

The NAPS IPA that Dominion conducted under 10 CFR 54, which is described in the body of the SLRA, has identified no license renewal-related refurbishment or replacement actions needed to maintain the functionality of SSCs, consistent with the current licensing basis, during the period of extended operation. Dominion does not anticipate the continued operations of NAPS to adversely affect the environment. Dominion also does not anticipate the need for any refurbishment for purposes of SLR as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

E2.4 PROGRAMS AND ACTIVITIES FOR MANAGING THE EFFECTS OF AGING

In accordance with 10 CFR 51.53(c)(2), a license renewal applicant's ER must contain a description of the applicant's plans to modify the facility or its administrative control procedures as described in accordance with § 54.21.

The programs for managing the effects of aging on certain structures and components within the scope of license renewal at the site are described in the body of the SLRA (see Appendix B of the NAPS SLRA). The integrated plant assessment of structures and components required by 10 CFR 54.21 identified the activities necessary to manage the effects of aging on structures and components during the subsequent period of extended operation beyond the initial license renewal term.

E2.5 EMPLOYMENT

The non-outage NAPS plant workforce (onsite permanent full-time employees and contract workers) consists of 903 persons and includes approximately 175 badged temporary supplemental employees (Table E2.5-1). There are no plans to add additional permanent employees to support plant operations during the proposed SLR operating term, and as noted in Section E2.3, no license renewal-related refurbishment activities have been identified. Neither are there plans to add additional permanent operational staff to support any SMITTR activities at the plant during the proposed SLR operating term.

During refueling outages, which usually last approximately 32 days per unit, there are typically an additional 500-1,000 contractor employees onsite, depending on the outage scope. Refueling and maintenance outages for NAPS Units 1 and 2 are on a staggered 18-month schedule per unit.

Table E2.5-1 NAPS Employee Place of Residence Information, August 2018

State, County, and City/Towns/Communities[a]	Permanent/Contract Full-Time Employees
VIRGINIA	
Albemarle County	**1**
Scottsville	1
Alexandria[b]	**1**
Alexandria	1
Amelia County	**1**
Amelia Courthouse	1
Buckingham County	**9**
Arvonia	2
New Canton	2
Buckingham	1
Dillwyn	4
Caroline County	**21**
Bowling Green	1
Ruther Glen	19
Woodford	1
Charles City County	**1**
Providence Forge	1
Charlottesville[b]	**8**
Charlottesville	8
Chesterfield County	**16**
Midlothian	9
Mosely	1
North Chesterfield	2
Richmond	1
Chester	2
Chesterfield	1
Culpeper County	**11**
Culpeper	5
Lignum	1
Rapidan	3
Reva	2
Cumberland County	**1**
Cumberland	1

Table E2.5-1 NAPS Employee Place of Residence Information, August 2018

State, County, and City/Towns/Communities[a]	Permanent/Contract Full-Time Employees
Fairfax County	**1**
Falls Church	1
Fluvanna County	**21**
Palmyra	12
Troy	1
Kents Store	8
Fredericksburg[b]	**65**
Fredericksburg	65
Goochland County	**19**
Goochland	9
Hadensville	1
Maidens	2
Manakin-Sabot	2
Sandy Hook	5
Hanover County	**82**
Ashland	16
Beaverdam	21
Doswell	2
Hanover	1
Mechanicsville	18
Rockville	5
Montpelier	19
Henrico County	**79**
Glen Allen	52
Henrico	23
Sandston	3
Richmond	1
King George County	**4**
King George	4
King William County	**1**
Aylett	1
Lexington[b]	**1**
Lexington	1

Table E2.5-1 NAPS Employee Place of Residence Information, August 2018

State, County, and City/Towns/Communities[a]	Permanent/Contract Full-Time Employees
Louisa County	**325**
Zion Crossroads	3
Bumpass	78
Gum Spring	7
Louisa	125
Mineral	111
Trevilians	1
Madison County	**2**
Madison	2
New Kent County	**1**
Quinton	1
Orange County	**104**
Burr Hill	1
Locust Grove	13
Mine Run	1
Rhoadesville	6
Unionville	10
Barboursville	4
Gordonsville	18
Orange	51
Powhatan County	**12**
Powhatan	12
Prince William County	**3**
Manassas	1
Triangle	1
Woodbridge	1
Richmond[b]	**31**
Richmond	31
Roanoke County	**1**
Vinton	1
Rockingham County	**2**
Elkton	2

Table E2.5-1 NAPS Employee Place of Residence Information, August 2018

State, County, and City/Towns/Communities[a]	Permanent/Contract Full-Time Employees
Spotsylvania County	**69**
Partlow	6
Spotsylvania	62
Thornburg	1
Stafford County	**3**
Stafford	3
Staunton[b]	**2**
Staunton	2
Virginia Beach[b]	**1**
Virginia Beach	1
NORTH CAROLINA	
Pasquatank County	**1**
Elizabeth City	1
OHIO	
Shelby County	**1**
Sidney	1
PENNSYLVANIA	
Lycoming County	**1**
Cogan Station	1
SOUTH CAROLINA	
Florence County	**1**
Florence	1
Employee Total	**903**

a. Based on NAPS staff assigned city/town zip code.

b. Virginia independent cities.

Note: The NAPS employee numbers include permanent onsite plant staff and temporary contract workers, but does not include staffing information for the refueling outage workforce.

E2.6 ALTERNATIVES TO THE PROPOSED ACTION

The proposed action as described in Section E2.1 is for the NRC to subsequently renew the NAPS Units 1 and 2 renewed OLs for an additional 20 years. Because the NRC decision is to renew or not renew the existing NAPS renewed OLs, the only fundamental alternative to the proposed action is the no-action alternative, which would result in the NRC not renewing the NAPS renewed OLs. Because NAPS provides a significant block of long-term baseload capacity for the Dominion service area, it is reasonable to assume that the decision not to renew the NAPS license would involve replacement of its 1,672 MWe of generation. Dominion has considered a range of replacement power alternatives from which to select those alternatives to be further analyzed for replacement of NAPS baseload power generation.

Because replacement of the lost NAPS generation is a large consideration under the no-action alternative, this alternative will be analyzed with this component (loss of NAPS generation) as well as the decommissioning of the facility.

E2.6.1 ALTERNATIVES EVALUATION PROCESS

Dominion developed the following set of evaluation criteria to review NAPS replacement alternatives:

- The purpose of the proposed action (SLR) is the continued production of 1,676 MWe of baseload generation.
- Alternatives evaluated in this ER would need to provide baseload generation.
- Alternatives considered must be fully operational by April 1, 2038, when the current Unit 1 OL expires. This would require the permitting, construction of the facility, and connection to the grid be completed prior to this date.
- Alternatives must be electricity-generating sources that are technically feasible and commercially viable.

E2.6.2 ALTERNATIVES CONSIDERED

Using a screening process based on the above criteria, Dominion evaluated the full range of alternatives considered in the GEIS (NRC. 2013a) in light of the need to meet the criteria as well as federal regulations and Virginia's voluntary renewable portfolio standards. Consideration of generation options is also undertaken annually by Dominion for preparation of its integrated resource plan (IRP), so this screening and selection of generating options to meet the power demands of Dominion's customers was relied upon for evaluating replacement alternatives for NAPS. A detailed alternatives discussion is presented in Chapter E7.0.

The IRP's strategies for meeting the power need of Dominion's customers considered compliance with existing and future environmental regulations. The 2018 and 2019 IRPs addressed the company's approach to the development of new generation that focuses on reducing power station carbon dioxide emissions and strategic retirement of carbon-emitting generation. (Dominion. 2018a; Dominion. 2019a). In 2020, Dominion announced a significant expansion of its greenhouse gas (GHG) emissions reduction goals, establishing a new company-wide commitment to achieve net zero carbon dioxide and methane emissions by 2050. Net zero does not mean eliminating all emissions; rather, any remaining emissions are balanced by removing an equivalent amount from the atmosphere. (Dominion. 2020a) The Commonwealth of Virginia also passed the Virginia Clean Economy Act (VCEA), which mandates the retirement of all generation units that emit carbon dioxide as a byproduct of combustion by 2045 unless the retirement of a particular unit would threaten grid reliability and security, thus establishing a new barrier to the development of fossil fuel-fired generation in Virginia. The 2020 IRP incorporates the Dominion policy and includes plans for complying with the VCEA (Dominion. 2020a). Dominion's service area also includes North Carolina. In North Carolina, the Clean Energy Plan, a compilation of policy and action recommendations developed through a public stakeholder process, sets a statewide carbon neutrality goal by 2050 (Dominion. 2020a). Therefore, fossil fuel-fired generation alternatives were ruled out as reasonable generation alternatives due to these barriers to obtaining state approvals and permits.

The following generation sources were selected as reasonable replacement alternatives based on capability to provide reliable baseload power:

- New advanced light water reactor (ALWR) nuclear plant with net electricity generation comparable to NAPS.
- New small modular reactor (SMR) nuclear plant at the NAPS site with net electricity generation comparable to NAPS.

The alternatives selected as reasonable replacement baseload generation alternatives are presented in Section E7.2.1.

Dominion determined the following alternatives were not considered reasonable replacements in comparison to renewal of the NAPS OLs:

- Power purchases
- Conservation
- Other Dominion plant reactivation or extended service life
- Wind with energy storage
- Solar with energy storage
- Geothermal
- Hydropower
- Municipal solid waste and landfill gas-fired facilities
- Biomass and wood waste
- Agriculture-derived fuels
- Energy crops
- Coal-fired integrated gasification combined cycle (IGCC) technology
- Fuel cells
- Ocean wave and current energy
- Petroleum liquids
- Coal-fired plants
- Natural gas-fired plants

The alternatives not selected as reliable baseload generation for replacing the NAPS generation are presented in Section E7.2.2. Alternatives for reducing environmental impacts are addressed in Section E7.3.

E3.0 AFFECTED ENVIRONMENT

NAPS is located in the northeastern portion of Virginia in rural Louisa County, with areas within the site boundary extending into Spotsylvania County. NAPS Units 1 and 2 are located on a peninsula located on the southern shore of Lake Anna. Plant property within the site boundary comprises approximately 1,803 acres, of which 760 acres are covered by water. (NAPS. 2020, Section 2.1.1).

E3.1 LOCATION AND FEATURES

NAPS is located adjacent to Lake Anna in Louisa County at the end of State Route (SR) 700. While the majority of the site is located in Louisa County, the northeastern portion of the site boundary also falls within neighboring Spotsylvania County. Figure E3.1-1 shows the NAPS site boundary, facility structures, switchyard, and the EAB. Topographic features adjacent to NAPS and within the site boundary are shown in Figure E3.1-2. The NAPS location is latitude 38° 3' 36" north and longitude 77° 47' 23" west for Unit 1 and latitude 38° 3' 38" north and longitude 77° 47' 26" west for Unit 2. (NAPS. 2020, Section 2.1.1.1).

E3.1.1 VICINITY AND REGION

The vicinity of NAPS is defined as the area within a six-mile radius of a center point established equidistant between the Unit 1 and Unit 2 containment structures. As seen in Figure E3.1-3, the vicinity includes portions of Louisa and Spotsylvania counties. Table E3.11-1 provides a list of cities and towns located within a 50-mile radius of NAPS, with population and distance from the plant. No communities fall within the vicinity of the plant. The closest community to NAPS, located approximately seven miles west-southwest, is the town of Mineral, Virginia, in Louisa County. In 2017, Mineral had an estimated population of 499, an increase from a population of 467 in 2010 and 424 in 2000. The town of Louisa is the Louisa County seat and is located approximate 12 miles west of NAPS. The town of Louisa had an estimated population of 1,663 in 2017, an increase from a population of 1,555 in 2010 and 1,401 in 2000. (USCB. 2018a).

Louisa County is a small (population) rural county not included in a metropolitan or micropolitan statistical area (NACo. 2018a). As presented in Table E3.11-2, in 2017 the U.S. Census Bureau (USCB) estimated that Louisa County's population was 35,860, up from 33,153 persons in 2010 and 25,627 in 2000. Spotsylvania County is a medium-sized (population) county included in the Washington-Arlington-Alexandria, DC-VA-MD-WV metropolitan statistical area (NACo. 2018a). In 2017, Spotsylvania County had an estimated population of 133,033, up from 122,397 persons in 2010 and 90,395 in 2000. (USCB. 2018b)

The area surrounding NAPS is covered with forest and brushwood interspersed with an occasional farm. The topography in the site vicinity is characteristic of the central Piedmont Plateau with a gently undulating surface varying from 200 to 500 feet above sea level. With the damming of the

North Anna River, Lake Anna was constructed to serve the needs of NAPS. The earthen dam that creates Lake Anna is about five miles southeast of the site, and the land adjacent to Lake Anna is becoming increasingly residential with the development of homes (see Figure E3.1-3). (NAPS. 2020, Section 2.1.1.1 and 2.1.1.2) As shown in Figure E3.6-1, Lake Anna is approximately 17 miles long, with an irregular shoreline of over 200 miles. The lake is divided into two major portions, the North Anna Reservoir and the WHTF. The largest segment, the North Anna Reservoir, consists of approximately 9,600 acres and functions as a storage impoundment to ensure adequate water for Unit 1 and Unit 2 condenser cooling. The smaller segment, the WHTF, has an area of about 3,400 acres. It is separated from the North Anna Reservoir by dikes and includes three cooling lagoons. (NAPS. 2020, Section 2.1.1.2)

The region of NAPS is defined as the area within a 50-mile radius of a center point established equidistant between the Unit 1 and Unit 2 containment structures. As seen in Figure E3.1-4 and described in Table E3.11-1, the communities of Spotsylvania and Fredericksburg are northeast of the site (approximately 15 miles and 25 miles, respectively); and the city of Charlottesville is approximately 38 miles west of the plant. The Virginia state capital, Richmond, is also within the 50-mile region, located southeast of the plant. (USDOT. 2018) Washington, D.C., is approximately 70 miles northeast of NAPS. Below the North Anna Dam, the North Anna River flows southeasterly, joining the South Anna River to form the Pamunkey River about 27 miles southeast of the site. (NAPS. 2020, Section 2.1.1.1)

All or parts of 32 counties and four independent cities are located within the 50-mile radius of NAPS (see Table E3.11-2. Of the counties, 31 are in Virginia and one is in Maryland, as seen in Figure E3.1-4. As of 2017, there was one independent city (IC) with a population of over 100,000 located within the 50-mile region, and this was the city of Richmond, Virginia (see Table E3.11-1). In addition, there were three Virginia ICs (Charlottesville, Fredericksburg, and Manassas), and seven census-designated places (CDPs) with populations of over 25,000 within the 50-mile region, including Dale City, Lake Ridge, Linton Hall, Marumsco, Mechanicsville, Short Pump, and Tuckahoe. (USCB. 2018a)

As seen in Figures E3.1-3 and E3.1-4, Interstate 64 (I-64) runs predominately east-west across the state south of NAPS. Highways US 1 and Interstate 95 (I-95), the two principal highways joining Richmond with the rest of the eastern corridor, pass within 15 and 16 miles, respectively, east of NAPS. Virginia SR 700 provides staff access to the plant site and access by the general public to the NAPS information center. SR 601 and SR 652 run parallel to the Lake Anna shoreline and pass about 2.2 miles northeast and 1.5 miles south of the plant site, respectively. SR 208 crosses Lake Anna at a point about two miles northwest of the site and joins US Highway 522 about five miles west-northwest of NAPS. (NAPS. 2020, Sections 2.1.1.1, 2.1.2.3, and 2.2.1.3)

The Buckingham Branch Railroad (BBR) leases the short line track system from CSX that runs from Doswell (near Richmond), Virginia, to Clifton Forge (Virginia/West Virginia border), Virginia. The

BBR short line track spans the entire length of Louisa County from east to west and serves the Dominion spur track that provides access to NAPS. The closest access to Amtrak passenger rail service in Louisa County is Charlottesville, Virginia. (BBR. 2018; LCDED. 2018).

Other than the NAPS helipad (private use), there are five airfields within approximately 10 miles of the plant: Caton South Heliport (private use), Lake Anna Airport (public use), Seven Gables Airport (private use), Cub Field Airport (private use), and Louisa County Freeman Field Airport (public use). Charlottesville-Albemarle Airport, the nearest full-service commercial airport, is 36 miles west of NAPS, with Richmond International Airport located 46 miles southeast of NAPS. (AirNav. 2019)

The Port of Virginia at Hampton Roads is the closest port to Louisa County (approximately 120 miles southeast) (LCDED. 2018). There are no large boats or barges on Lake Anna. The only boat activity expected on Lake Anna is small sport and pleasure craft. There are six marinas in the vicinity of the plant site on the North Anna Reservoir. The closest is 1.4 miles north-northeast of the site. The remaining marinas are located between 2-2.5 miles away from the plant. (NAPS. 2020, Sections 2.2.1.5 and 2.2.2.1.2) There are no significant industrial activities within five miles of the plant site. Based on trends for industrial growth in Louisa County, it is not expected that any major industrial expansion will occur in the area. There are no natural gas pipelines or mining activities located within 10 miles of the plant. (NAPS. 2020, Sections 2.2.1.1 and 2.2.2.1.3).

E3.1.2 STATION FEATURES

The principal structures at NAPS are identified in Section E2.2. The plant site boundary, which is the same as the EAB, is shown in Figure E3.1-1. Dominion holds sole title to the portion of NAPS on which the licensed NAPS 3 would be located. The remainder of the NAPS site is owned by Dominion and ODEC as tenants in common. These companies also own all land outside the NAPS site boundary that forms Lake Anna, up to Elevation 255 ft msl. Dominion is the licensed operator of the existing units, with control of the existing site and facilities and the authority to act as ODEC's agent. (Dominion. 2016b, Section 1.1.1) The station and all supporting facilities, including the North Anna Reservoir and WHTF, earthen dam, dikes, railroad spur, and roads constitute approximately 13,775 acres. (NAPS. 2020, Section 2.1.1.2)

The perimeter of the EAB on land is adequately posted with "No Trespassing" signs. Also, floating bottom-moored buoys supporting "No Trespassing" signs have been placed on NAPS Lake Anna security buoy barriers, located in the North Anna Reservoir and the WHTF. Along the shoreline of Lake Anna, outside the EAB, Dominion has granted to each landowner an easement to use the portion of Dominion property above the fluctuating water line for the erection of piers, jetties, or other recreational structures for access to lake waters. Such structures require Dominion approval as to type and location and are permitted only to the extent that they will not be detrimental to the development, operation, and maintenance of the NAPS electric generating facilities, dam, reservoir, dikes, and cooling lagoons. Regarding the land bordering the WHTF cooling lagoons, Dominion has granted to each owner a permit to use the Dominion lands above the fluctuating water level. This permission is expressly revocable by Dominion to the extent necessary to preserve the character and maintain the operation of the WHTF as a private water treatment facility. A limited number of landowners have been granted permission to erect docks on the shoreline within the EAB. (NAPS. 2020, Section 2.1.2.1) The nearest residences to the plant are located approximately 0.9 miles north-northeast and northeast from the center point of the Unit 1 reactor (NAPS. 2018c).

A portion of the smallest WHTF cooling lagoon lies within the EAB (see Figure E3.1-1). Access to all the WHTF cooling lagoons is restricted to property owners and their guests, and there is no access by boat from the North Anna Reservoir. Boaters on the North Anna Reservoir would have access to waters within the EAB via marinas and boat ramps. Should an emergency at NAPS necessitate controlling boating and water use on Lake Anna, actions would be initiated in accordance with the guidelines presented in the NAPS emergency plan. (NAPS. 2020, Section 2.1.2.2)

E3.1.3 FEDERAL, NATIVE AMERICAN, STATE, AND LOCAL LANDS

As shown in Figure E3.1-6, there are a variety of national, state, and local parks; national and state wildlife refuges and management areas; conservation and recreational areas; and military installations located in the NAPS 50-mile region. Located in Spotsylvania County approximately five miles northwest of the plant, Lake Anna State Park is the closest publicly accessible property to NAPS (see Figure E3.1-5). There are no other federal, state, or local lands located within the six-mile vicinity of NAPS. (Louisa County. 2018a; Louisa County. 2019a; Spotsylvania County. 2019a; USDA. 2018a).

There are no federally recognized Indian reservations or Native American tribal lands held in trust by the federal government located within the 50-mile region of NAPS (USBIA. 2019; USCB. 2018c; USCB. 2019a). Within the Commonwealth of Virginia, the following American Indian tribal groups are federally recognized and eligible for funding and services from the U.S. Bureau of Indian Affairs (BIA) without regard to the existence of a reservation trust designation for the tribe: the Pamunkey, Chickahominy, Eastern Chickahominy, Upper Mattaponi, Rappahannock, Monacan, and Nansemond Indian tribes. These tribes are also formally recognized by the Commonwealth of Virginia, along with the Cheroenhaka (Nottoway), Mattaponi, Nottoway of Virginia, and Pattawomeck. State recognition for an American Indian tribe does not guarantee funding from the state or the federal government. (NCSL. 2018) The closest state-designated tribal lands to NAPS is the Pamunkey (state) reservation and the Chickahominy and Eastern Chickahominy state-designated tribal statistical areas (SDTSA) (USCB. 2018c; USCB. 2019a). These tribal locations are outside the NAPS 50-mile region, southeast of Richmond, Virginia (see Figure E3.1-6).

E3.1.4 FEDERAL AND NON-FEDERAL RELATED PROJECT ACTIVITIES

No major changes to NAPS Units 1 and 2 operations or plans for future expansion of plant infrastructure during the SLR term are anticipated. In a separate action, on June 2, 2017, the NRC issued Dominion a combined license for North Anna Unit 3 (NAPS 3), a proposed new light-water nuclear reactor at NAPS. (NRC. 2017a) Dominion is not pursuing development activities of and has made no decision to proceed with the construction of NAPS Unit 3.

To date, no additional federal or non-federal projects have been identified as taking place in the vicinity of NAPS. In addition, no new business development or current business expansion has been announced. (LCDED. 2018; Spotsylvania County. 2019b)

Figure E3.1-1 NAPS Plant Layout

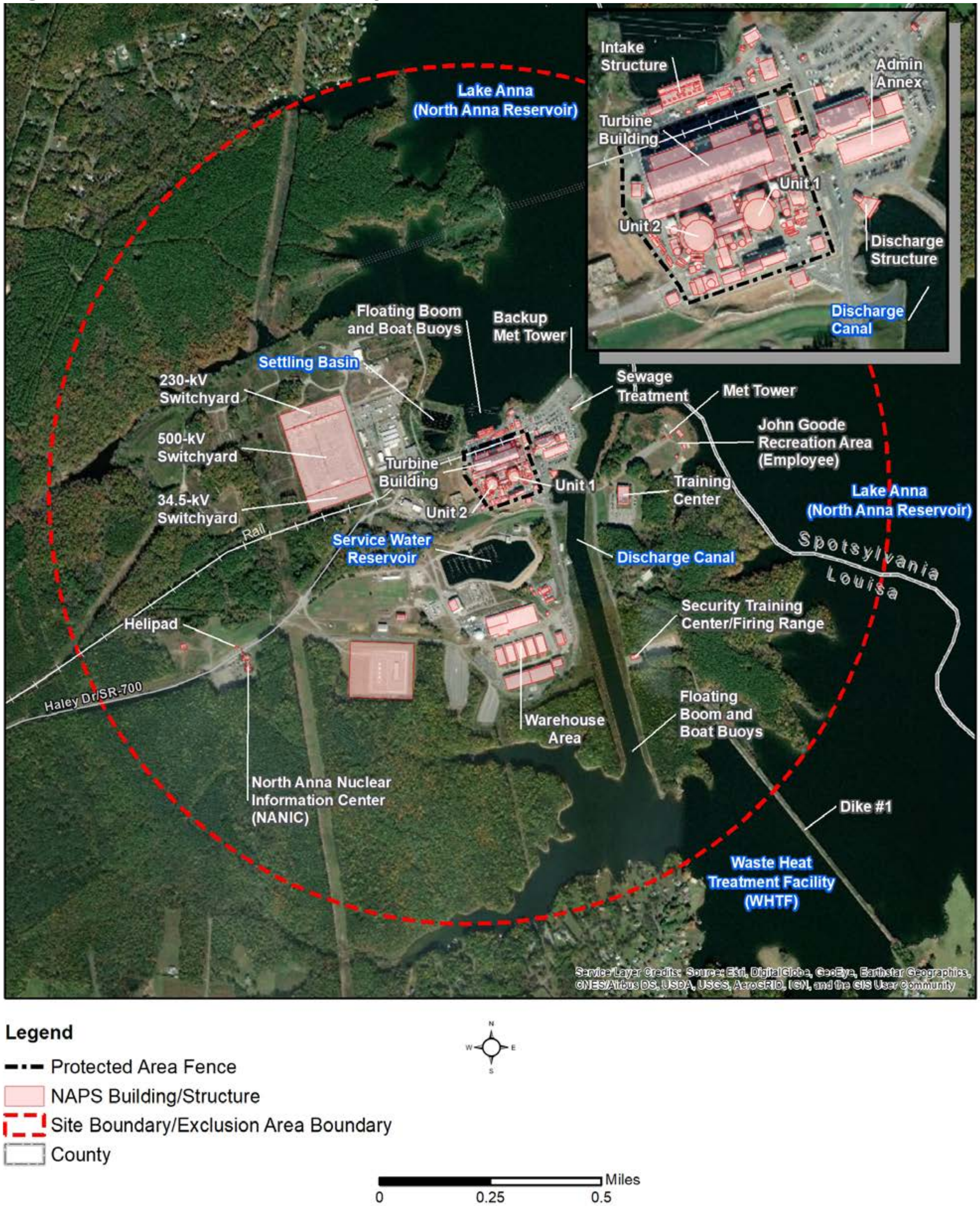


Figure E3.1-2 NAPS Property and Area Topography

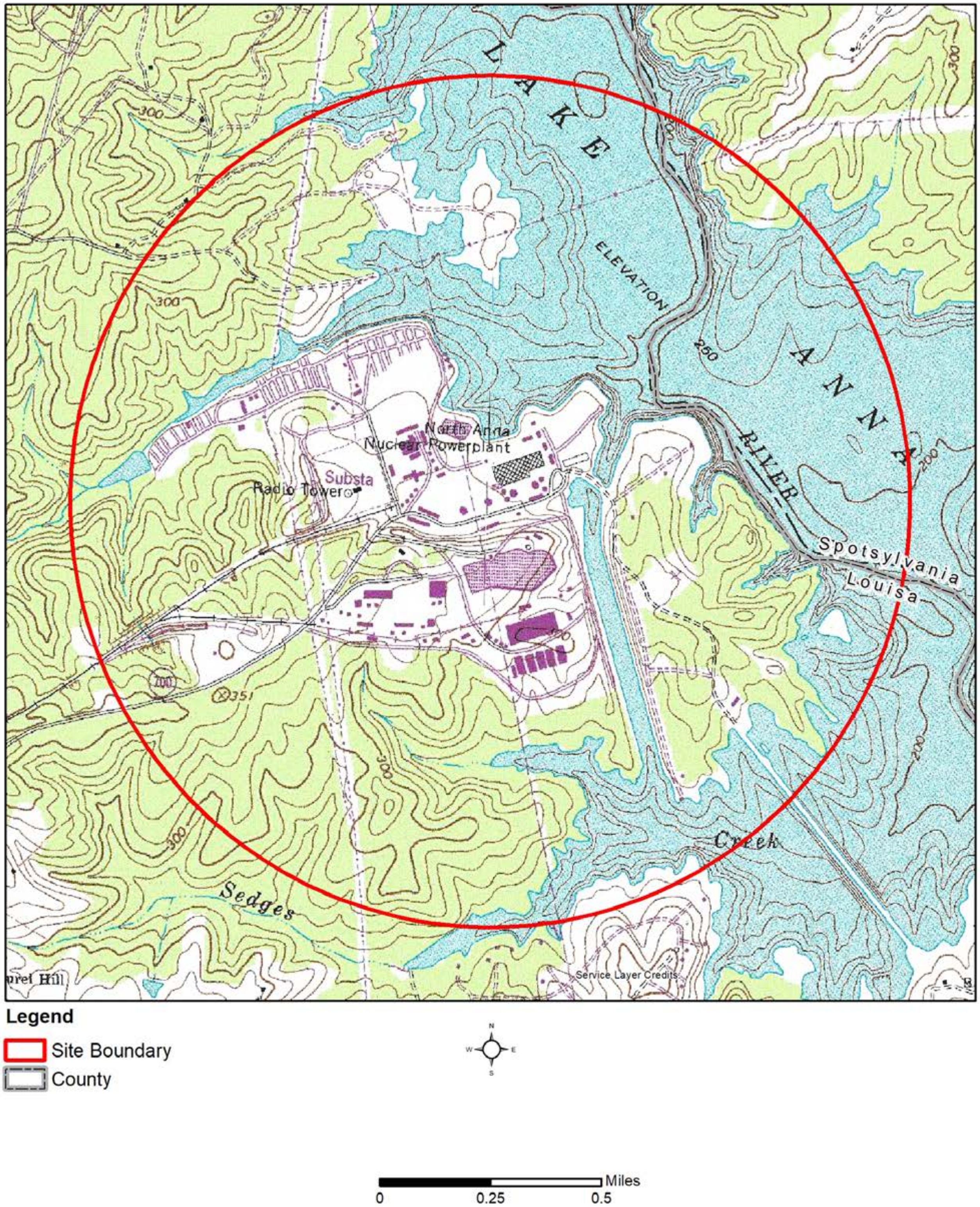


Figure E3.1-3 NAPS Site and 6-Mile Radius of NAPS

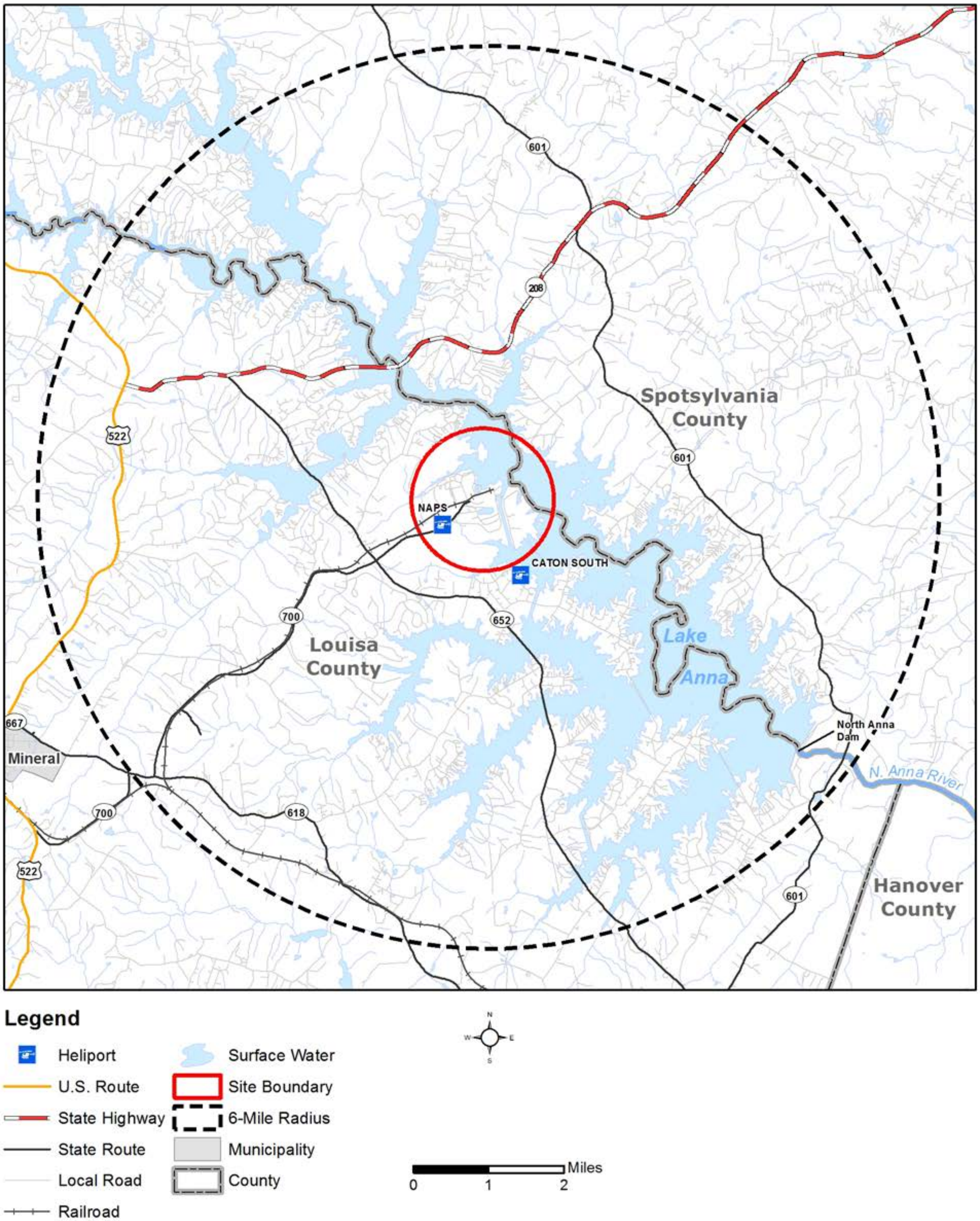


Figure E3.1-4 NAPS Site and 50-Mile Radius of NAPS

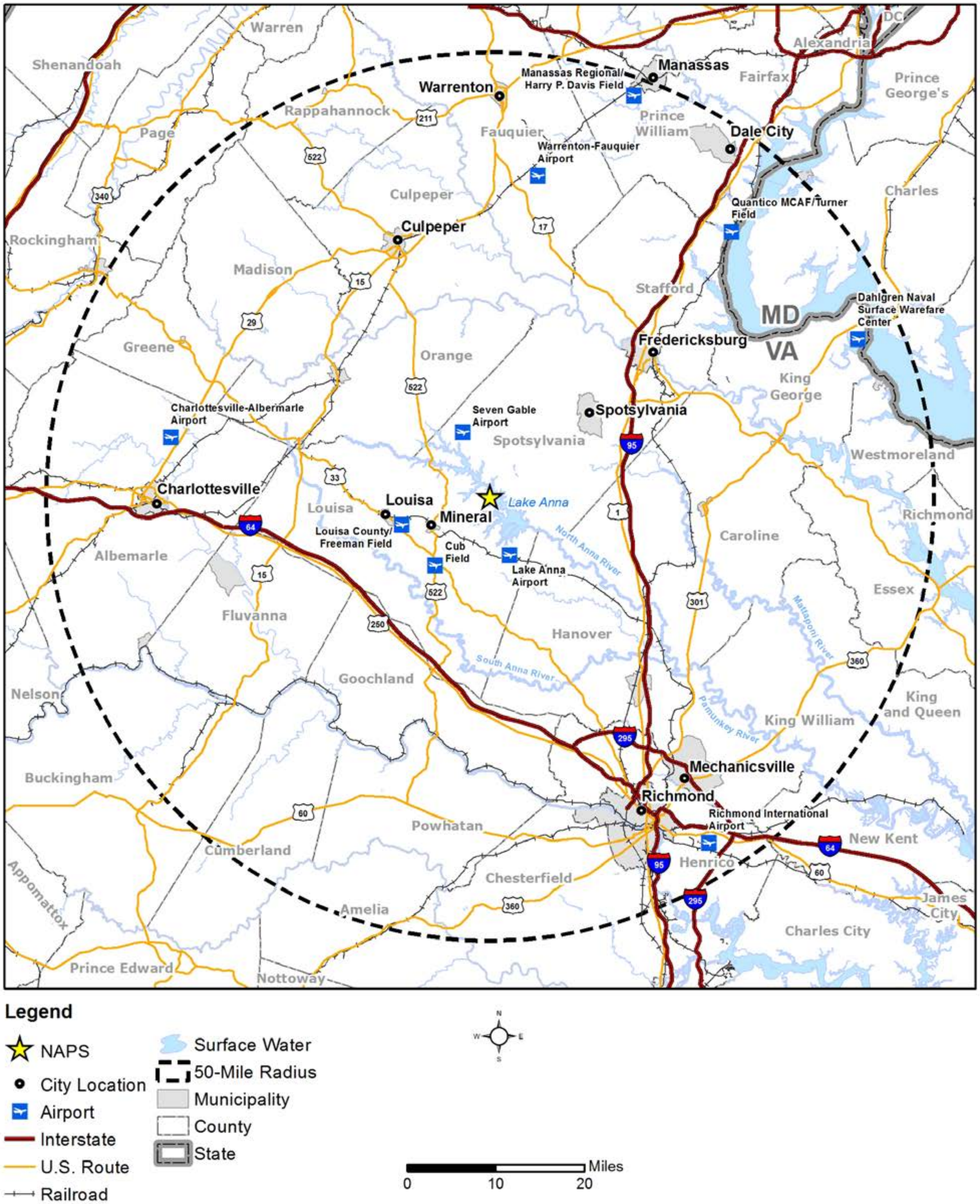


Figure E3.1-5 Federal, State, and Local Lands within a 6-Mile Radius of NAPS

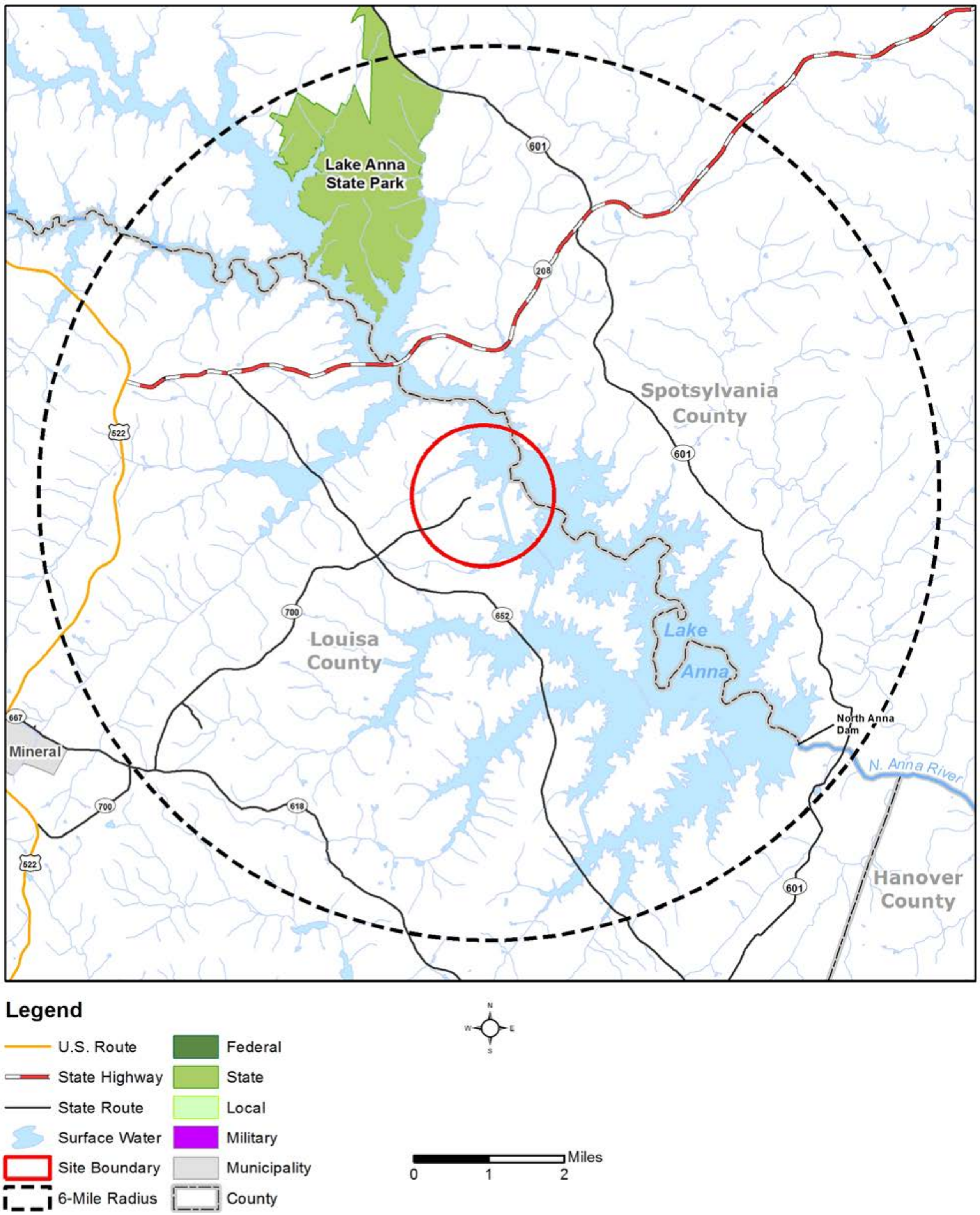
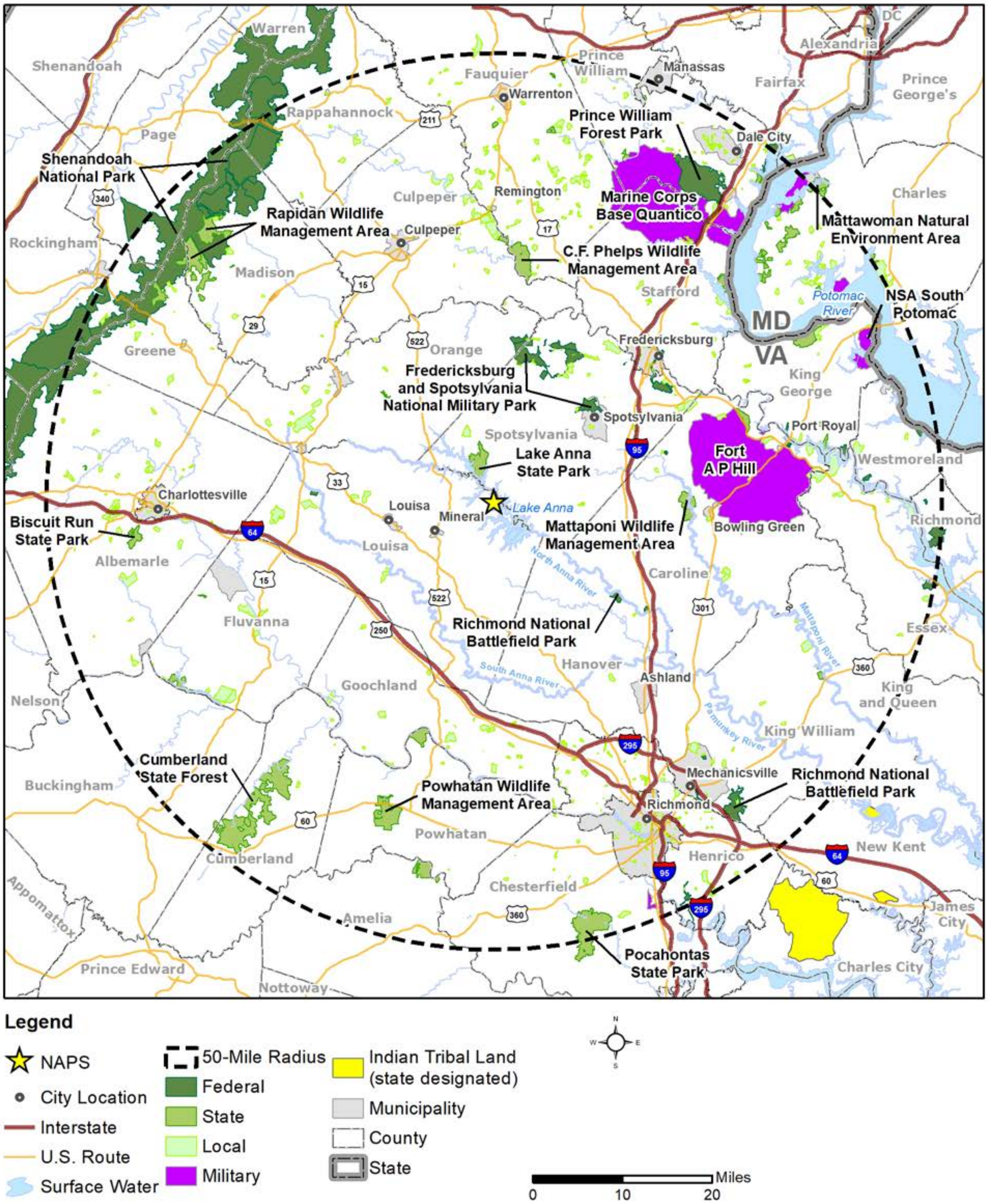


Figure E3.1-6 Federal, State, and Local Lands within a 50-Mile Radius of NAPS



E3.2 LAND USE AND VISUAL RESOURCES

Land use descriptions focus on Hanover, Henrico, Louisa, Orange, and Spotsylvania counties, Virginia, because, as described in Section E2.5, approximately 73% of the permanent and temporary badged NAPS workforce live in these counties.

E3.2.1 ONSITE LAND USE

NAPS is located on the border of Louisa and Spotsylvania counties in northeastern Virginia, on a peninsula along the southern shore of Lake Anna. The 1,803-acre site, of which 760 acres are covered by water, is accessible via SR 700 (Dominion. 2001, Section 2.1). The earthen dam that creates Lake Anna is located approximately five miles southeast of the site. The North Anna River flows southeasterly and merges with the South Anna River to form the Pamunkey River about 27 miles southeast of the site. The topography of the NAPS site is generally characterized as a gently undulating surface that varies from 60 m (200 feet) to 150 m (500 feet) above mean sea level. The peninsula upon which NAPS is located is primarily covered with pine and hardwood forests. (Dominion. 2006a, Sections 2.1 and 2.2)

The nearest community to NAPS, located approximately seven miles west-southwest, is the town of Mineral, Virginia, in Louisa County. The town of Louisa is the Louisa County seat and is located approximately 12 miles west of NAPS. As described in Table E3.11-1, the city of Richmond, Virginia, is the largest population center in the region, and is located approximately 50 miles south south-east of NAPS.

As shown in Table E3.2-1 and Figure E3.2-1, satellite imagery by the Multi-Resolution Land Characteristics Consortium (MRLC) illustrates that forest is the largest land use and land cover category within the NAPS site boundary, covering approximately 37.2% of the site. These onsite forested areas are classified primarily as deciduous forest (19.3%); evergreen forest (17.0%); and mixed forest (0.9%). Based on MRLC technology, open water comprises 33.8% of the site. The areas within the NAPS site boundary that have been developed to support plant operations are the next-largest land use category, with approximately 16.3% of the site falling under the developed categories. The remaining seven land use and land cover classification categories found on site comprise approximately 12.8%. (MRLC. 2019)

NAPS is zoned as an I-2 industrial general zoning district by Louisa County. Under an I-2, Louisa County by-right use permitting allows for utility service. Areas adjacent to NAPS are identified by land use designations of industrial, agricultural, commercial, and residential. (Louisa County. 2019b)

Dominion holds sole title to the portion of NAPS on which the licensed NAPS 3 would be located. The remainder of the NAPS site is owned by Dominion and Old Dominion Electric Cooperative as tenants in common. These companies also own all land outside the NAPS site boundary that forms

Lake Anna, up to Elevation 255 ft msl. Dominion is the licensed operator of the existing units, with control of the existing site and facilities and the authority to act as ODEC's agent. (Dominion. 2016b, Section 1.1.1)

As described in Section E3.1, for residential properties located around the WHTF cooling lagoons, Dominion allows use of the Dominion-owned lands above the fluctuating water level through a permit process; however, this permission is expressly revocable by Dominion to the extent necessary to preserve the character and maintain the operation of the WHTF as a private water treatment facility. A limited number of landowners have been granted permission to erect docks on the shoreline within the EAB. (NAPS. 2020, Section 2.1.2.1) The nearest residences to the plant are located approximately 0.9 miles north-northeast and northeast from the center point of Unit 1 reactor (NAPS. 2018c). A portion of the smallest WHTF cooling lagoon lies within the EAB (see Figure E3.1-1). Access to all the WHTF cooling lagoons is restricted to property owners and their guests, and there is no access by boat from the North Anna Reservoir. Boaters on the North Anna Reservoir would have access to waters within the EAB via marinas and boat ramps. Should an emergency at NAPS necessitate controlling boating and water use on Lake Anna, actions would be initiated in accordance with the guidelines presented in the NAPS emergency plan. (NAPS. 2020, Section 2.1.2.2)

There are no anticipated future plans to explore for subsurface minerals within the plant site boundary during the SLR term.

E3.2.2 OFFSITE LAND USE

As shown in Table E3.11-2 and Table E3.11-3, total county population for Hanover, Henrico, Louisa, Orange, and Spotsylvania counties has increased between 2010 and 2017, and is projected to increase through 2060.

As described in Section E3.1, the vicinity (six-mile radius) surrounding NAPS includes portions of Louisa and Spotsylvania counties. The land use and land cover categories located within the vicinity of NAPS are illustrated in Figure E3.2-2. Lake Anna is the predominant natural feature in the vicinity, and as noted in Table E3.2-2, forest is the largest land use and land cover category at approximately 47.9%: deciduous forest (33.5%); evergreen forest (12.5%); and mixed forest (1.9%). The next largest land use and land cover category in the vicinity is open water at 14.2%. Developed land is the third largest land use and land cover category identified in the six-mile vicinity, at approximately 7.6%. The remaining seven land use and land cover categories found within the vicinity comprise approximately 30.3%. (MRLC. 2019)

Louisa County occupies approximately 317,632 acres of land, of which 80,223 acres (25.3%) are proportioned to farmland. The 2012 Census of Agriculture reports that the county had a total of 485 farms, with an average farm size of 165 acres. Approximately 349 farms produced crops, with primary crops reported as corn for grain (1,649 acres), wheat (1,117 acres), soybeans

(3,921 acres), and forage (19,567 acres). Livestock is also an important agricultural product in the county, with livestock commodities such as cattle and calves (222 farms), hogs and pigs (24 farms), layers (91 farms), and sheep and lambs (27 farms) reported. Other agricultural uses of farmland within the county included woodlands (29,406 acres on 340 farms), permanent pasture and rangeland (16,027 acres on 350 farms), and pastureland (19,453 acres on 368 farms). (USDA. 2012)

Spotsylvania County occupies approximately 263,638 acres of land, of which 42,191 acres (16.0%) are proportioned to farmland. The 2012 Census of Agriculture reports that the county had a total of 369 farms, with an average farm size of 114 acres. Approximately 249 farms produced crops, with primary crops reported as corn for grain (1,881 acres), wheat (707 acres), soybeans (3,228 acres), and forage (9,621 acres). Livestock is also an important agricultural product in the county, with livestock commodities such as cattle and calves (58 farms), hogs and pigs (19 farms), layers (74 farms), and sheep and lambs (19 farms) reported. Other agricultural uses of farmland within the county included woodlands (12,762 acres on 211 farms), permanent pasture and rangeland (8,413 acres on 249 farms), and pastureland (11,796 acres on 270 farms). (USDA. 2012)

Hanover County occupies approximately 299,863 acres of land, of which 94,297 acres (31.4%) are proportioned to farmland. The 2012 Census of Agriculture reports that the county had a total of 600 farms, with an average farm size of 157 acres. Approximately 418 farms produced crops, with primary crops reported as corn for grain (14,846 acres), wheat (9,353 acres), soybeans (22,894 acres), and forage (11,993 acres). Livestock is also an important agricultural product in the county, with livestock commodities such as cattle and calves (196 farms), hogs and pigs (19 farms), layers (94 farms), and sheep and lambs (14 farms) reported. Other agricultural uses of farmland within the county included woodlands (23,351 acres on 396 farms), permanent pasture and rangeland (11,116 acres on 361 farms), and pastureland (14,087 acres on 398 farms). (USDA. 2012)

Henrico County occupies approximately 187,853 acres of land, of which 12,891 acres (6.9%) are proportioned to farmland. The 2012 Census of Agriculture reports that the county had a total of 117 farms, with an average farm size of 110 acres. Approximately 84 farms produced crops, with primary crops reported as corn for grain (2,102 acres), wheat (1,215 acres), soybeans (3,789 acres), and forage (1,596 acres). Livestock is also an important agricultural product in the county, with livestock commodities such as cattle and calves (34 farms), hogs and pigs (4 farms), layers (20 farms), and sheep and lambs (3 farms) reported. Other agricultural uses of farmland within the county included woodlands (18,699 acres on 53 farms), permanent pasture and rangeland (58 farms), and pastureland (2,776 acres on 68 farms). (USDA. 2012)

Orange County occupies approximately 218,100 acres of land, of which 104,806 acres (48.1%) are proportioned to farmland. The 2012 Census of Agriculture reports that the county had a total of 547 farms, with an average farm size of 192 acres. Approximately 370 farms produced crops, with primary crops reported as corn for grain (4,681 acres), wheat (3,468 acres), soybeans (6,804 acres), and forage (20,425 acres). Livestock is also an important agricultural product in the county, with livestock commodities such as cattle and calves (289 farms), hogs and pigs (22 farms), layers (85 farms), and sheep and lambs (21 farms) reported. Other agricultural uses of farmland within the county included woodlands (27,177 acres on 357 farms), permanent pasture and rangeland (30,964 acres on 418 farms), and pastureland (35,768 acres on 445 farms). (USDA. 2012)

The Commonwealth of Virginia mandates that cities and counties have comprehensive land use plans. As specified in the Code of Virginia § 15.2-2223, local planning commissions are required to "prepare and recommend a comprehensive plan for the physical development of the territory within its jurisdiction." The comprehensive plan presents long-range recommendations for the general development of the territory covered by the plan. It may include, but is not limited to, the following (COV. 2019):

- Transportation planning;
- Designation of areas for various types of public and private development and use (e.g. residential, industrial, agricultural, etc.);
- Designation of a system of community service facilities (e.g. parks, forests, waste disposal areas, etc.);
- Designation of historical areas and areas for urban renewal or other treatment;
- Designation of areas for implementation of reasonable ground water protection measures;
- A capital improvements program, a subdivision ordinance, a zoning ordinance, etc.;
- The location of existing or proposed recycling centers;
- The location of military bases, military installations, etc.;
- The designation of corridors or routes for electric transmission lines of 150 kilovolts or more; and
- Designation of areas and implementation of measures for construction, rehabilitation and maintenance of affordable housing.

Comprehensive plans are in place for Louisa County, Spotsylvania County, Orange County, Henrico County, and Hanover County, and reflect planning efforts and public involvement in the planning process. (Hanover County. 2018; Henrico County. 2009; Louisa County. 2019c; Orange County. 2018; Spotsylvania County. 2018a)

Louisa County is a primarily rural agricultural county. Its dominant land uses are agriculture and forestry. The county has maintained a rural character, promoting small towns, villages, and open spaces while avoiding urban sprawl. Country stores are preferred to strip malls, and many historical towns and sites are preserved to promote tourism and maintain local heritage. Louisa County plans to ensure that growth occurs in appropriate higher density areas, so the rural nature of the county is preserved. Open spaces such as agricultural lands and forest will be designated as areas to preserve. If a land use change is required, solutions will be designed that maintain the rural character of the county. (Louisa County. 2019c)

Due to its developed transportation infrastructure, military bases, and proximity to Washington, D.C., and Richmond, Spotsylvania County is one of Virginia's fastest growing counties. The county's highest density locations are near the I-95 corridor and near Fredericksburg. The primary land use in Spotsylvania County is expected to be rural residential. The county uses a primary development boundary as a tool to direct land use changes. The boundary defines the area within which public water and sewer utilities will be provided, and encourages efficient use of land by developing industry and higher density populations where infrastructure exists. This preserves the rural character and maintains the agricultural viability of the county in areas outside of the primary development boundary (Spotsylvania County. 2018a).

Both Henrico and Hanover counties neighbor the independent city of Richmond and are two of the 13 counties comprising the greater Richmond metropolitan statistical area. Henrico County has rapidly developing urban and industrial areas, and its plan establishes general development guidelines and recommendations for the evaluation of development in the county, and delineates land use groups to identify which land use characteristics are desired in that group (Henrico County. 2009). Hanover County is mainly agricultural, with suburban areas along transportation corridors. Its goal is to have orderly growth, and development of both residential and non-residential uses to accommodate future and existing residents while encouraging and promoting commerce (Hanover County. 2018).

Orange County is northwest of Lake Anna, closer to Charlottesville than Richmond. The county is mainly forested, with agricultural land use being the next most abundant land use category. In its planning, Orange County's priority is to preserve its unique historic and environmental resources (Orange County. 2018).

E3.2.3 VISUAL RESOURCES

As presented in Sections E3.1, NAPS is located on the northern boundary of Louisa County, Virginia, on the south side of Lake Anna. Figure E3.1-1 shows the building site layout and the site boundary in association with Lake Anna. As presented in Section E3.2.1, the largest land use categories on the NAPS site are forested at approximately 37.2%, and developed at approximately 16.3%.

The tallest structures on the site are the reactor containment buildings, which are approximately 191 feet in height (NAPS. 2020, Table 1.3-3). Predominant visual features at NAPS are the reactor containment buildings, the turbine buildings, and transmission lines. The site structures located within the protected area of the plant are set back from the main body of Lake Anna and surrounded by forest. Viewing site structures from the water is limited to the northeast side of the site. Areas around Lake Anna are also heavily forested, further limiting viewing opportunities. Because of the wooded setting, remote location, and absence of refurbishment plans for purposes of SLR, NAPS would continue to have minimal visual impact on neighboring properties or from the viewpoint of Lake Anna (see Section E3.1.3).

Table E3.2-1 Land Use/Land Cover, NAPS Site

Category	Acres	Percent
Open Water	610.47	33.8
Developed, Open Space	84.07	4.7
Developed, Low Intensity	66.05	3.7
Developed, Medium Intensity	62.05	3.4
Developed, High Intensity	81.84	4.5
Barren Land (rock/sand/clay)	9.12	0.5
Deciduous Forest	348.05	19.3
Evergreen Forest	306.90	17.0
Mixed Forest	16.68	0.9
Shrub/Scrub	164.35	9.1
Grassland/Herbaceous	11.79	0.7
Pasture/Hay	12.01	0.7
Cultivated Crops	6.23	0.3
Woody Wetlands	25.35	1.4
Emergent Herbaceous Wetlands	1.56	0.1
Total	**1,806.52[a]**	**100.0**

(MRLC. 2019)

a. Acreages are based on the Multi-Resolution Land Characteristics Consortium (MRLC) land use/land cover data. These data are presented in a raster (pixel-based) format. Because of their square geographies, they do not exactly match the NAPS site boundary. This geographic variation creates a small difference between the total acreage reported in Table E3.2-1 compared to the NAPS site boundary acreage stated throughout the ER.

Table E3.2-2 Land Use/Land Cover, 6-Mile Radius of NAPS

Category	Acres	Percent
Open Water	10,292.42	14.2
Developed, Open Space	4,793.05	6.6
Developed, Low Intensity	384.30	0.5
Developed, Medium Intensity	254.20	0.4
Developed, High Intensity	94.52	0.1
Barren Land (rock/sand/clay)	118.54	0.2
Deciduous Forest	24,224.78	33.5
Evergreen Forest	9,055.69	12.5
Mixed Forest	1,404.64	1.9
Shrub/Scrub	9,821.17	13.6
Grassland/Herbaceous	1,963.30	2.7
Pasture/Hay	4,299.11	5.9
Cultivated Crops	2,758.81	3.8
Woody Wetlands	2,793.72	3.9
Emergent Herbaceous Wetlands	157.68	0.2
Total	**72,415.93**	**100**

(MRLC. 2019)

Figure E3.2-1 Land Use/Land Cover, NAPS Site

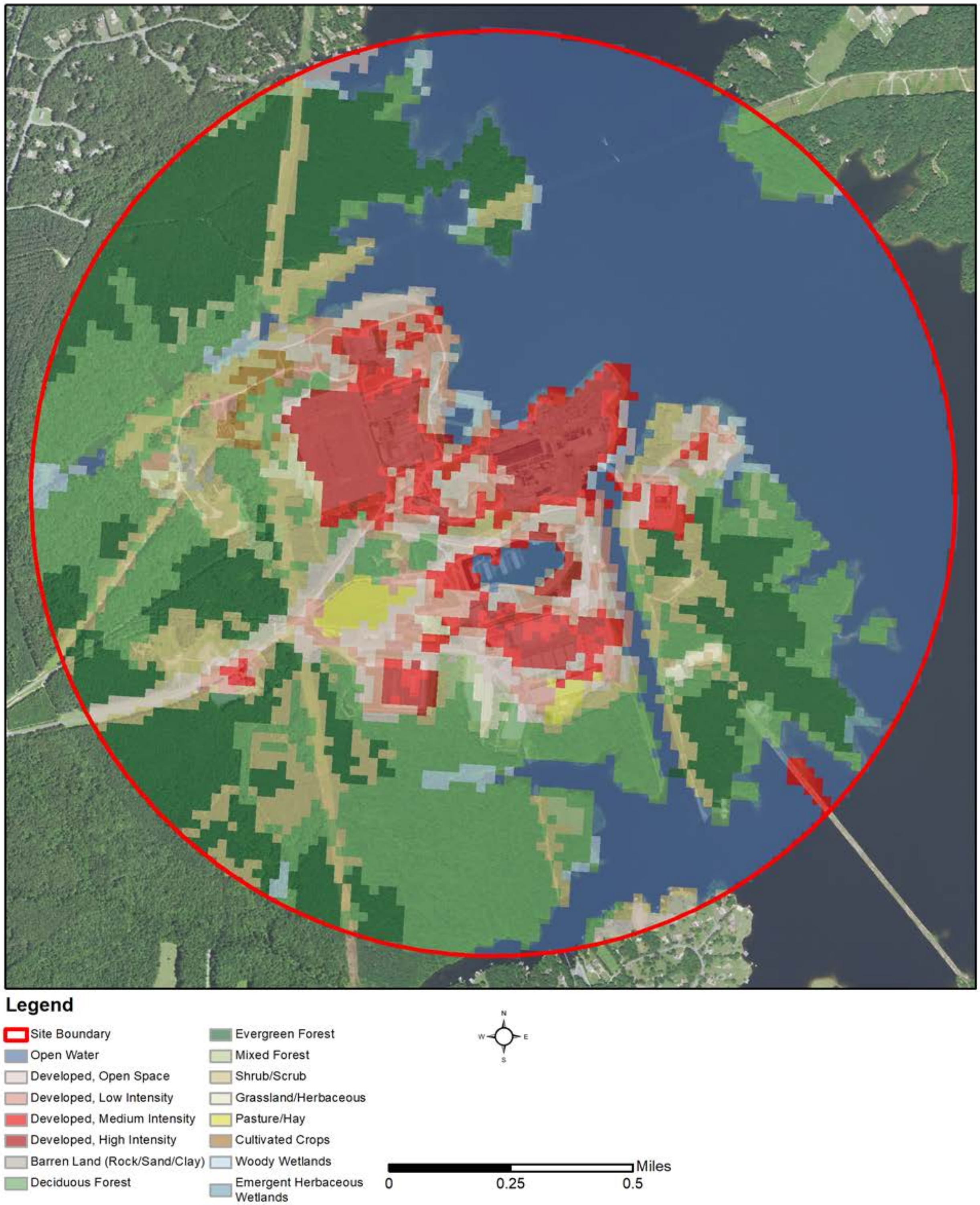
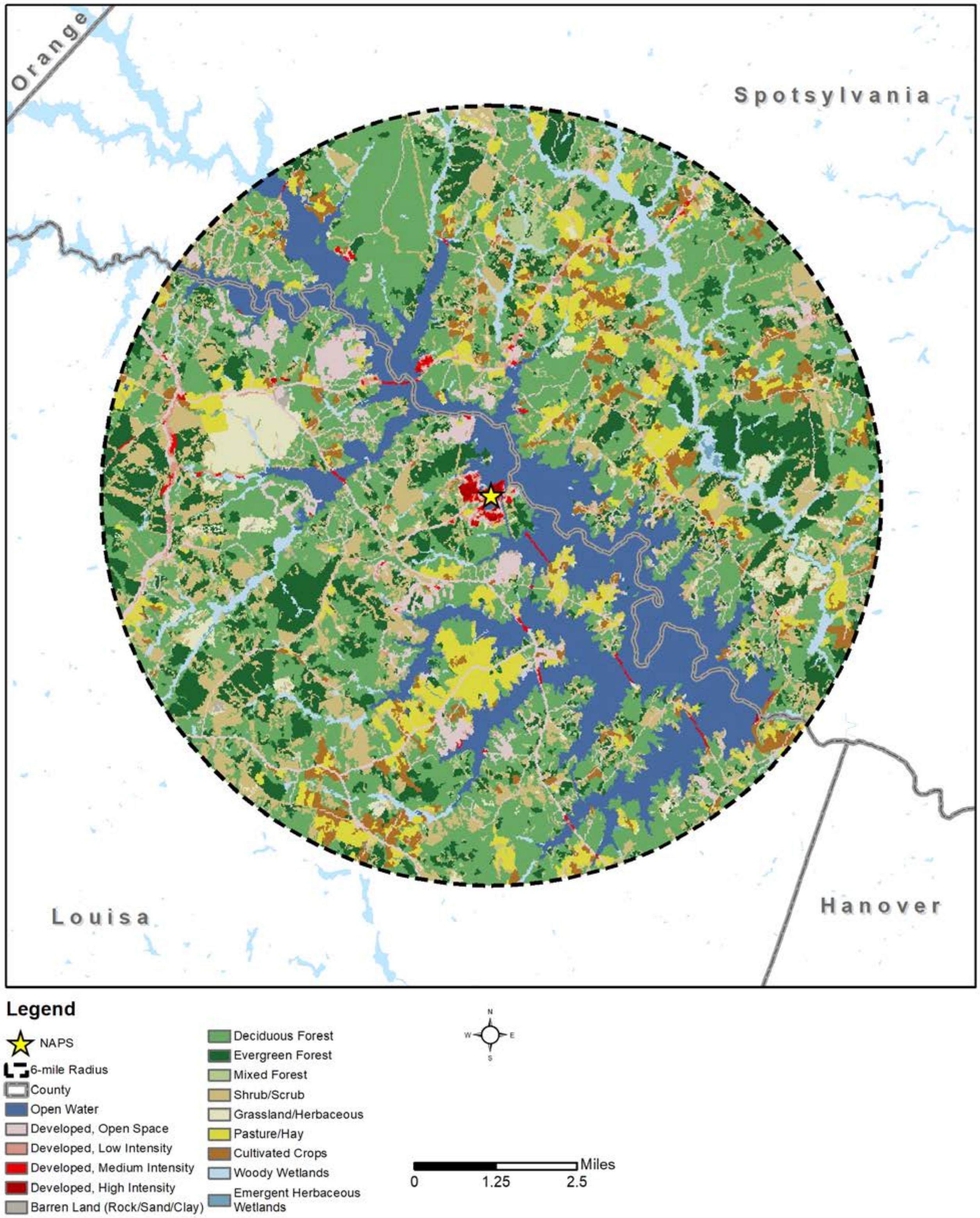


Figure E3.2-2 Land Use/Land Cover, 6-Mile Radius of NAPS



E3.3 METEOROLOGY AND AIR QUALITY

The meteorology, climate, and air quality of NAPS were previously evaluated during the NAPS Units 1 and 2 initial OLs, initial license renewal approval processes, and as part of an early site permit (ESP) for an adjacent power plant with up to two new reactors. (Dominion. 2001, Section 2.12; Dominion. 2006a; NRC. 2002a, Section 2.2.4). In 2015, the meteorology equipment at NAPS was replaced.

The description of the site's general climate is based on regional climatological and meteorological information primarily collected for Richmond, Virginia, and supplemented by the meteorological information collected at the NAPS site and taken from the National Weather Service (NWS) cooperative network stations (Dominion. 2001, Section 2.7.1).

E3.3.1 GENERAL CLIMATE

Richmond, Virginia, is located in east-central Virginia at the head of navigation on the James River and along a line separating the coastal plain (Tidewater Virginia) from the piedmont. The Blue Ridge Mountains lie about 90 miles to the west and the Chesapeake Bay is 60 miles to the east. The climate is classified as modified continental. Summers are warm and humid and winters generally mild. The mountains to the west act as a partial barrier to outbreaks of cold continental air in winter. The cold winter air is delayed long enough to be modified, then further warmed as it subsides in its approach to Richmond. The open waters of the Chesapeake Bay and the Atlantic Ocean contribute to humid summers and mild winters. The coldest weather in Richmond normally occurs in late December and January, when low temperatures (°F) usually average in the upper 20s, and the high temperatures in the upper 40s. Temperatures seldom lower to 0°F, but there have been several occurrences of below zero temperatures. Summertime high temperatures above 100°F are not uncommon, but do not occur every year. Precipitation is uniformly distributed throughout the year. Dry periods lasting several weeks do occur, especially in autumn when long periods of pleasant, mild weather are most common. There is considerable variability in total monthly precipitation amounts from year to year. Hurricanes passing near Richmond have produced record rainfalls. In 1955, three hurricanes brought record rainfall to Richmond within a six-week period. The most noteworthy of these were hurricanes Connie and Diane, which brought heavy rains five days apart. (NCDC. 2019)

The general climatic characteristics at the NAPS site are similar to those of Richmond, Virginia (Dominion. 2006a, Section 2.7.1). However, during light wind conditions, the local environmental conditions predominate, resulting in a channeling effect of winds such that the airflow patterns follow the topographical contour lines of the region. Lake Anna has a moderating effect with respect to extreme temperatures in the immediate vicinity of the site. During periods of temperature inversions or light wind conditions, local dispersion conditions can be somewhat restricted. (Dominion. 2006a, Section 2.7.1.1)

E3.3.2 METEOROLOGY

E3.3.2.1 Wind Direction and Speed

The prevailing wind at the NAPS site is from the south-southwest during the summer season and from the northwest during the winter season. These wind directions are due primarily to the location of the Bermuda high off the eastern coast of the United States during the summer season and the development of a cold, high-pressure zone over the eastern portion of the United States during the winter season. However, the topographical features of the site in conjunction with the location of semi-permanent pressure zone have an influence on wind direction distribution. The average annual wind speed is 6.3 miles per hours (mph). (NAPS. 2020, Section 2.3.2.2.1.1) Similar to Richmond, the average onsite summer wind speed (4.8 mph) is also lower than those during other seasons.

For Richmond, the 41-year period of record data show the annual prevailing wind direction (i.e., the direction from which the wind blows most often) is from 200 degrees (i.e., from the south-southwest). Monthly prevailing winds are from the south-southwest during much of the spring and summer, from March through August. From September to November, and during February, the mean prevailing wind is northerly. In December and January, the mean prevailing wind is from the south-southwest. As listed in Table E3.3-1, the mean wind speed over the past 33-year period of record was 7.7 mph. A maximum three-second wind speed of 72 mph was recorded in September 2003. (NCDC. 2019)

Mean monthly wind speeds at the NAPS site are provided in Table E3.3-2, based on a 30-year record (1988–2017) of measurements from the onsite meteorological monitoring system, lower level (32.8 feet above ground level). Annual wind rose diagrams for the period 2013–2017 are provided in Figures E3.3-1, E3.3-2, E3.3-3, E3.3-4, and E3.3-5.

E3.3.2.2 Temperature

Representative regional temperature averages and extremes are available from the Richmond monitoring station. The local climate data summary for the Richmond area indicates that the mean daily maximum temperature is highest during July (88.6°F) and decreases to the seasonal low in January (47.4°F). The Richmond area experiences normal temperatures above 90°F approximately 42 days per year from April through October. The highest temperature of record (105°F) occurred in July 2010. The mean daily minimum temperature is above 50°F from May through September and is at its lowest in January, when the mean daily minimum decreases to 28.5°F. Record low temperatures below 0°F have been recorded in December through February, with below freezing temperatures normally occurring approximately 74 days per year from October through April. The lowest temperature of record in Richmond is -12°F, occurring in January 1940. (NCDC. 2019) Monthly and annual daily mean temperature data and temperature extremes for the Richmond area are summarized in Table E3.3-3.

On average, NAPS has slightly lower temperatures than Richmond. However, the deviation between the average temperatures at NAPS and Richmond's average temperatures does not exceed 2°F. (NCDC. 2019)

Review of data collected from the NAPS meteorological tower monitoring stations for the period of record from 1988–2017 indicates that the mean monthly temperature at the site is highest during July (77.1°F) and decreases to the lowest in January (36.2°F). The NAPS site experiences temperatures above 90°F from April through September. The highest recorded temperature of record of 99.8°F occurred in July 1988. Temperatures below 0°F were recorded at the site in January and February between 1988–2017. The lowest temperature (-3.5°F) for the past 30 years was recorded in February 1996.

The monthly average temperatures, and record minimum and maximum temperatures (°F) recorded by the NAPS meteorological monitoring system at the site for the past 30 years (1988–2017) are provided in Table E3.3-4.

E3.3.2.3 Precipitation

The precipitation records of normal rainfall totals for the Richmond area indicate that precipitation of 0.01 inches or more occurs on average for 114 days per year, with seven or more days per month receiving at least some precipitation. The annual average precipitation in Richmond is 43.60 inches per year. Precipitation in the area is relatively well-distributed throughout the year with a mean of approximately three or more inches falling during most months. The seasonal maximum precipitation occurs during the summer (approximately 31% falling July through September), which also coincides with record events where more than six inches have occurred in a 24-hour period. There is considerable variability in total monthly amounts from year to year. While the summer months may experience significant rainfall events, those months can also be very dry. (NCDC. 2019)

Normal regional precipitation and extremes are presented in Table E3.3-5. The maximum 24-hour precipitation total recorded at Richmond, 8.79 inches, occurred in August 1955. Richmond received a record minimum monthly rainfall total (0.01 inches) in October 2000.

Although onsite rainfall measurement is not required by regulation, precipitation measurements are collected at ground level at the NAPS meteorology monitoring station on an hourly basis. Review of data collected for the period from 1988–2017 indicates that the average monthly precipitation is highest in September (3.55 inches), July (3.16 inches), and August (2.98 inches) and is lowest in

February (1.79 inches) (Table E3.3-6). The NAPS data also indicate that while significant rainfall may occur in some years during June to September, these months can also receive very little precipitation, which is consistent with the precipitation of Richmond. Based on data collected over the 30-year period, the NAPS site receives approximately 31 inches of precipitation per year, less than Richmond.

E3.3.2.4 Snow and Glaze

In the Richmond area, snow usually remains on the ground only one or two days at a time. Ice storms (freezing rain or glaze) are not uncommon, but they are seldom severe enough to do any considerable damage. A notable exception was the glaze storm of January 27-28, 1943, when nearly one inch of ice accumulation caused heavy damage to trees and overhead transmission lines. (NCDC. 2019)

Richmond receives on average approximately 12.4 inches of snow per year. Since 1988, annual snowfall has ranged from as little as 0.8 inches (2007–2008) to 28 inches (2009–2010). (NCDC. 2019) Snowfall at the site is not recorded by NAPS.

E3.3.2.5 Relative Humidity and Fog

The closest available fog data for the NAPS region are from the NWS observation stations at Richmond International Airport, Richmond. The local climatological data for Richmond indicate an average of 22.2 days per year of heavy fog. Heavy fog is defined by the NWS as fog which reduces visibility to 0.25 mile or less. (NCDC. 2019) The NAPS site is characterized by gently rolling terrain that rises to an average height of 50 to 150 feet above Lake Anna's level. Therefore, low regions at the site and also in the vicinity of the lake would be expected to have a higher frequency of fog occurrences attributed to the accumulation of relatively cool surface air due to drainage flows from higher elevations compared to the relatively flat region at Richmond International Airport. (NAPS. 2020, Section 2.3.2.2.1)

E3.3.2.6 Severe Weather

E3.3.2.6.1 Thunderstorms

Thunderstorms are occasional in the site region, with a normal occurrence of about 37 per year, with the greatest occurrence during the month of July. (NAPS. 2020, Section 2.3.1.3.6) The mean number of days with thunderstorms in each month for Richmond is provided in Table E3.3-7. Based on National Centers for Environmental Information (NCEI) records, Louisa County, Virginia, has recorded 144 significant thunderstorm events since 1960, with most of the thunderstorms occurring in May, June, and July (NCEI. 2019).

E3.3.2.6.2 Tornadoes

During the period of January 1916 through December 1987, a total of 65 tornadoes on land were reported within a 50-mile radius of the NAPS site, for an average of 0.915 tornadoes per year within this radius (NAPS. 2020, Section 2.3.1.3.2).

Based on NCEI records, a total of eleven tornadoes have been recorded in Louisa County, Virginia, since 1960. The highest tornado intensity observed in Louisa County was F2 in August 1962, while the rest were F0/EF0 (two tornados), F1/EF1 (six tornados), or unattributed (two tornados). (NCEI. 2019)

E3.3.2.6.3 Hurricanes

An average of approximately two tropical storms or hurricanes occur every five years within 100 nautical miles of the NAPS site (NAPS. 2020, Section 2.3.1.3.3). Hurricane and tropical storm classifications are generally downgraded once landfall occurs because the storm systems weaken over land. However, the storms may still result in significant rainfall events as they travel through the region (Dominion. 2006a, Section 2.7.3.4). Since 1878, when more complete weather recordkeeping began, through 2017, a total of 49 tropical cyclones, including tropical storms or hurricane centers, passed within 50 miles of the NAPS site (NCEI. 2019).

E3.3.2.7 Atmospheric Stability

Atmospheric stability is a meteorological parameter that describes the dispersion characteristics of the atmosphere. It can be determined by the difference in temperature between two heights. A seven-category atmospheric stability classification scheme (ranging from A for extremely unstable to G for extremely stable) based on temperature differences is set forth in the NRC's Regulatory Guide 1.23, Revision 1 (NRC. 2007). When the temperature decreases rapidly with height (typically during the day when the sun is heating the ground), the atmosphere is unstable and atmospheric dispersion is greater. Conversely, when temperature increases with height (typically during the night as a result of the radiative cooling of the ground), the atmosphere is stable and dispersion is more limited. The stability category between unstable and stable conditions is D (neutral), which would occur typically with higher wind speeds and/or higher cloud cover, irrespective of day or night. (NRC. 2013a, Section 2.9.1.4).

Based on a five-year average (2013–2017), onsite temperature difference data recorded at NAPS indicate that stable atmospheric conditions (E to G) occurred about 30.5% of the time and unstable conditions (A to C) occurred about 13.6% of the time. The remaining observations (about 56.0%) fell into the neutral (D) category. Stability class distributions at NAPS covering the period 2013–2017 are presented in Table E3.3-8.

E3.3.3 AIR QUALITY

E3.3.3.1 Clean Air Act Nonattainment Maintenance Areas

The Clean Air Act (CAA) was established in 1970 [42 USC § 7401 et seq.] to reduce air pollution nationwide. The EPA has developed primary and secondary national ambient air quality standards (NAAQS) under the provisions of the CAA. The EPA classifies air quality within an air quality control region (AQCR) according to whether the region meets or exceeds federal primary and secondary NAAQS. An AQCR or a portion of an AQCR may be classified as being in attainment or non-attainment, or it may be unclassified for each of the six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$, fine particulates; and PM_{10}, coarse particulates), ozone, and sulfur dioxide (SO_2).

Emissions from nonradiological air pollution sources, including the criteria pollutants, are controlled through compliance with federal, state, and local regulations. Attainment areas are areas where the ambient levels of criteria air pollutants are designated as being "better than," "unclassifiable/attainment," or "cannot be classified or better than national standards" (depending on the pollutant and other factors).

The NAPS site is in the Northeastern Intrastate AQCR [40 CFR 81.145]. NUREG-1437, Supplement 7, noted that the Commonwealth of Virginia was designated as a nonattainment area for the one-hour ozone standard at the time of the initial license renewal environmental review for NAPS (NRC. 2002a, Section 2.2.4). As of July 2018, all the counties (Charles City, Chesterfield, Dinwiddie, Goochland, Greensville, Hanover, Henrico, New Kent, Powhatan, Prince George, Surry, and Sussex) within the State Capital Intrastate AQCR are now in attainment of the NAAQSs [40 CFR 81.347]. The nearest nonattainment area in the Commonwealth of Virginia is the Washington, D.C., area (eight-hour ozone standards, 1997, 2008, and 2015) as illustrated in Figure E3.3-6. Louisa County, where the NAPS site is located, is in attainment. Within the Commonwealth of Virginia, the EPA has identified two areas where visibility is an important issue: James River Face Wilderness and Shenandoah National Park. The boundary of the Shenandoah National Park is on the west-northwest edge of the region and the James River Face Wilderness is west-southwest of NAPS, outside of the region [40 CFR 81.433].

E3.3.3.2 Air Emissions

NAPS holds an air emission permit to operate five emergency generators in accordance with the provisions of the Commonwealth of Virginia State Air Pollution Control Board's regulations for the control and abatement of air pollution.

Nonradioactive gaseous effluents result primarily from the testing of emergency generators and diesel pumps.

To protect Virginia's ambient air quality standards and ensure that impacts from facilities that generate air emissions are maintained at acceptable levels, the VDEQ governs the discharge of regulated pollutants by establishing specific conditions in the air permit. NAPS is permitted under a 2002 air permit No. 40726 (VDEQ. 2019b). Dominion is not aware of any issues that will significantly change the permit compliance of NAPS. Permitted emission sources and conditions established in air permit No. 40726 for NAPS are shown in Table E3.3-9. The emission unit numbers identified in Table E3.3-9 are those cited in the 2002 air permit (VDEQ. 2019b).

The permitted emission sources at NAPS are regulated by the applicable regulations cited in the emissions permit. In addition, the emissions reports submitted to the VDEQ each year contain tabular summary information related to each permitted emissions unit, and criteria pollutants and applicable hazardous air pollutants are summed and reported for each station in the annual update and emission statement submitted to the VDEQ. Annual emissions for the five years from 2014–2018 are shown in Table E3.3-10. (Dominion. 2014a; Dominion. 2015c; Dominion. 2016c; Dominion. 2017a; Dominion. 2018b)

As presented in Chapter E9.0, there have been no notices of violation or non-compliances associated with NAPS air emissions over the seven years from 2013–2019.

As presented in Section E2.3, no license renewal-related refurbishment or other license renewal-related construction activities have been identified. In addition, Dominion's review did not identify any future upgrade or replacement activities necessary for plant operations (e.g., diesel generators, diesel pumps) that would affect NAPS's current air emissions program. Therefore, no increase or decrease of air emissions is expected over the proposed SLR operating term.

Studies have shown that the amount of ozone generated by even the largest industry transmission lines in operation (765 kV) would be insignificant (NRC. 2013c, Section 4.3.1.1). As presented in Section E2.2.5, the in-scope transmission lines at NAPS are 34.5-kV and 500-kV. Therefore, the amount of ozone generated from in-scope transmission lines is anticipated to be minimal.

E3.3.4 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

No data exist for mobile emission sources at NAPS such as visitors and delivery vehicles. Therefore, Dominion calculated greenhouse gas (GHG) emissions on those direct (stationary and portable combustion sources in Table E3.3-9 reported in Dominion's annual updates and air emissions statements) and indirect (workforce commuting) plant activities where information was readily available.

GHG emissions generated at NAPS are presented in Table E3.3-11. Dominion uses mineral oil with oxidation inhibitors for efficient cooling and to promote fluid longevity in electrical equipment such as transformers, and has not purchased electrical equipment (e.g., transformers) filled with perfluorocarbon liquids for over five years. As presented in Section E9.5.2.3, Dominion maintains a program to manage stationary refrigeration appliances at NAPS to recycle, recapture, and reduce emissions of ozone-depleting substances and is in compliance with Section 608 of the CAA (Dominion. 2014b). Because the program is in compliance with Section 608 of the CAA, refrigerants are not expected to contribute to the GHG emissions listed in Table E3.3-11.

Table E3.3-1 Regional Wind Conditions, Richmond, Virginia

	Period of Record[(a)]	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Mean speed (mph)	34	8.3	8.5	9.1	9.0	7.8	7.4	6.9	6.4	6.8	6.9	7.5	7.5	7.7
Prevailing direction (degrees from)	42	210	360	210	200	200	210	200	200	010	010	360	210	200
Max three-second speed (mph)	22	54	63	61	58	63	70	58	70	72	46	47	64	72
Max speed year of occurrence		2013	2008	2011	2011	2009	2015	2016	2011	2003	1996	2011	2011	Sept. 2003

a) In years.

(NCDC. 2019)

Table E3.3-2 NAPS Wind Conditions

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Mean speed (mph)	5.5	6.0	6.4	6.3	5.5	4.9	4.5	4.5	5.1	4.9	5.3	5.3	5.4
Prevailing direction (degrees from)	210	210	210	210	210	210	210	200	0	200	210	210	210

Table E3.3-3 Regional Temperatures, Richmond, Virginia

	Period of Record[a]	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Mean daily maximum (^{o}F)	97	47.4	50.5	59.1	69.7	77.7	85.2	88.6	86.8	81.0	70.7	60.5	50.4	69.0
Highest daily maximum (^{o}F)	88	81	83	93	96	100	104	105	104	103	99	86	81	105
Year of occurrence		2002	1932	1938	1990	1941	1952	2010	2007	1954	1941	1993	1998	Jul 2010
Mean daily minimum (^{o}F)	97	28.5	29.9	36.9	45.8	55.1	63.8	68.4	67.0	60.4	48.2	38.7	31.2	47.8
Lowest daily minimum (^{o}F)	88	-12	-10	10	23	31	40	51	46	35	21	10	-1	-12
Year of occurrence		1940	1936	2009	1985	1956	1967	1965	1934	1974	1962	1933	1942	Jan 1940

a. In years.

(NCDC. 2019)

Table E3.3-4 NAPS Site Temperatures, 1988–2017

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Monthly average (°F)[(a)]	36.2	39.5	46.9	57.1	64.9	73.3	77.1	75.6	69	58.5	48.8	40.5	57.2
Highest daily maximum (°F)	79.1	79.89	87	91.6	93.9	98	99.8	99.6	93.4	88.7	80.5	78.4	99.8
Year of occurrence	2002	2017	1998	2002, 2009	2000	2012	1988	2007	1998	2007	1993, 2016	1998	1988
Lowest daily minimum (°F)	-1.6	-3.5	12.3	28.1	37.8	48.6	55	55.3	43.4	31.1	19.5	4.6	-3.5
Year of occurrence	1994	1996	2014	1992	2005	1988	1988	1992	1989	1992	2014	1989	1996

a. Calculated average of all temperature measurements for each month and of all measurements for the period 1988–2017.

Table E3.3-5 Regional Precipitation (inches), Richmond, Virginia

	Period of Record[a]	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Normal monthly precipitation	30	3.04	2.76	4.04	3.27	3.78	3.93	4.51	4.66	4.13	2.98	3.24	3.26	43.60
Maximum monthly precipitation	80	7.97	5.97	8.65	8.32	9.79	9.93	18.87	16.30	16.60	9.39	9.60	8.16	18.87
Year occurred		1978	1979	1984	2008	2016	2004	1945	2004	1999	1971	2009	2009	1945
Maximum 24-hour	80	3.31	2.67	3.43	3.54	3.40	4.61	5.73	8.79	6.52	6.50	4.07	3.16	8.79
Year occurred		1962	1979	1992	2008	2003	1963	1969	1955	1999	1961	1956	1958	1955
Minimum monthly precipitation	80	0.64	0.48	0.20	0.64	0.87	0.38	0.51	0.52	0.08	0.01	0.17	0.40	0.01
Year occurred		1981	1978	2006	1963	1965	1980	1983	1943	2005	2000	2001	1980	2000

a. In years.

(NCDC. 2019)

Table E3.3-6 NAPS Precipitation Records1988–2017

	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
Normal monthly precipitation (in.)	1.9	1.79	2.9	2.33	2.8	2.39	3.16	2.98	3.55	2.5	2.62	2.13	3.1
Maximum monthly precipitation (in.)	4.27	6.2	7.63	6.11	8.26	6.13	9.74	7.01	9.41	8.63	7.24	4.66	51.1
Year occurred	1998	1998	1994	1993	1990	2003	1994	2017	2003	1995	2009	2003	2003
Minimum monthly precipitation (in.)	0.00	0.13	0.05	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.03	0.30	15.4
Year occurred	2010	2009	2006	2009	2009	2009	2006, 2009	1995	2007	2000, 2007	2007	2009	2012

Table E3.3-7 Regional Thunderstorms, Richmond, Virginia

Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
0.3	0.3	1.5	2.4	5.0	6.3	8.2	6.0	2.7	0.8	0.6	0.2	34.3

(NCDC. 2019)

Table E3.3-8 NAPS Stability Class Distributions

Percent Frequency of Occurrence by Stability Class							
Year	Pasquill Stability Class[a]						
	A	B	C	D	E	F	G
2013	2.48	1.03	2.47	54.85	32.2	4.94	2.03
2014	0.91	1.12	3.08	58.33	29.16	4.48	2.56
2015	3.58	3.96	7.91	59.74	14.94	6.84	3.02
2016	6.34	4.8	7.11	58.68	14.39	5.89	2.79
2017	11.3	5.27	6.99	48.83	13.64	11.91	2.05
2013–2017	**4.92**	**3.2**	**5.46**	**55.96**	**21.07**	**6.93**	**2.47**

a. Classes are as follows (NRC. 2007):

Class A: Extremely unstable

Class B: Moderately unstable

Class C: Slightly unstable

Class D: Neutral

Class E: Slightly stable

Class F: Moderately stable

Class G: Extremely stable

Table E3.3-9 Permitted Air Emissions Sources

Emission Source[a]	Description	Capacity Rating	Permit Conditions[c]
ES-3[b]	Caterpillar 3600 Series diesel backup electric generator	36.6 mmBtu/hour	PM_{10}: 1.8 lbs/ hour, 1.0 tons/year SO_2: 18.5 lbs/ hour, 4.6 tons/year NO_2: 157.2 lns/ hour, 39.3 tons/year CO: 29.9 lbs/ hour, 10.4 tons/year VOC: 6.7 lbs/ hour, 1.7 tons/year Opacity: <20% except for one six-minute period of not more than 30% opacity
ES-4[b]	Fairbanks Morse	35.1 mmBtu/hour	NO_2: 112.4 lbs/hour/engine, 3.2 lbs/MMBtu/engine 56.2 tons/year for ES-4 through ES-7
ES-5[b]	Fairbanks Morse	35.1 mmBtu/hour	NO_2: 112.4 lbs/hour/engine, 3.2 lbs/MMBtu/engine 56.2 tons/year for ES-4 through ES-7
ES-6[b]	Fairbanks Morse	35.1 mmBtu/hour	NO_2: 112.4 lbs/hour/engine, 3.2 lbs/MMBtu/engine 56.2 tons/year for ES-4 through ES-7
ES-7[b]	Fairbanks Morse	35.1 mmBtu/hour	NO_2: 112.4 lbs/hour/engine, 3.2 lbs/MMBtu/engine 56.2 tons/year for ES-4 through ES-7
ES-8[b]	Security emergency generator (pre-2006)	235 HP	None
ES-9[b]	Diesel generator for dam (pre-2006)	235 HP	None
ES-10[b]	Fire pump emergency diesel generator (pre-2006)	360 HP	None
ES-11[b]	Fire pump emergency diesel generator (pre-2006)	360 HP	None
ES-12[b]	Spent fuel storage emergency generator (pre-2006)	136 HP	None

(VDEQ. 2019b)

a. Emission source unit reference is from VDEQ. 2019b.

b. Stationary combustion sources are also subject to 40 CFR Part 63, Subpart ZZZZ, National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines.

c. For a full discussion of air permit conditions, see VDEQ. 2019b, Permit No. 40726.

Note: Dominion annual updates and emissions statements from 2014–2018 group the four Fairbanks Morse emergency generators listed in the table above for reporting purposes.

Table E3.3-10 NAPS Reported Annual Air Emissions Summary, 2014–2018

NAPS Annual Emissions (tons/year)						
Year	SO_2	NO_x	CO	PM_{10}	VOCs	HAPs
2014	0.11	9.72	2.39	0.16	0.29	NA
2015	0.05	11.88	2.97	0.2	0.34	NA
2016	0.07	14.23	3.66	0.24	0.39	NA
2017	0.04	10.1	2.54	0.17	0.29	NA
2018	0.05	10.64	2.63	0.17	0.32	NA

(Dominion. 2015c; Dominion. 2016b; Dominion. 2017a; Dominion. 2018b; Dominion. 2019b)

Table E3.3-11 NAPS Annual Greenhouse Gas Emissions Inventory Summary, 2013–2017

Carbon Dioxide Equivalent (CO_2e) Emissions, Metric Tons[(a)]					
Emission Source	**2013**	**2014**	**2015**	**2016**	**2017**
Combustion sources	560.5709	390.0015	506.8063	628.9757	434.2937
Workforce commuting	4,070	4,070	4,070	4,070	4,070
TOTAL	4,630.57	4,460.00	4,576.81	4,698.98	4,504.29

(Dominion. 2014a; Dominion. 2015c; Dominion. 2016b; Dominion. 2017a; Dominion. 2018b)

a. GHG calculated emissions are based on the following:

- Fuel usage for combustion sources shown in Dominion annual updates and emissions statements for 2013–2017 indicated by the referenced sources of Table E3.3-10; EPA. 2018 Table 1 GHG Emission Factors for Greenhouse Gas Inventories – Distillate Fuel Oil No. 2; and 40 CFR 98 Table A-1 to Subpart A, Global Warming Potentials.

Workforce commuting calculations are based on:

1. Statistical information from U.S. Census Bureau indicates that 4.1% of Virginia workers in the transportation and warehouse and utilities industry carpool to work (USCB. 2019b). The number of NAPS employees as of January 2017 was 903. Utilizing the 4.1% USCB carpool statistic, a value of 866 passenger vehicles per day was utilized.
2. The EPA's greenhouse gas equivalencies calculator the CO_2e/year to be 4,070 metric tons for 866 vehicles (EPA. 2019a).
3. Carbon dioxide has a global warming potential (100-year time horizon) of "1" based on Table A-1 to Subpart A of 40 CFR Part 98.
4. 4,070 metric tons CO_2e/year × 1 (global warming potential).

Figure E3.3-1 2013 NAPS Wind Rose

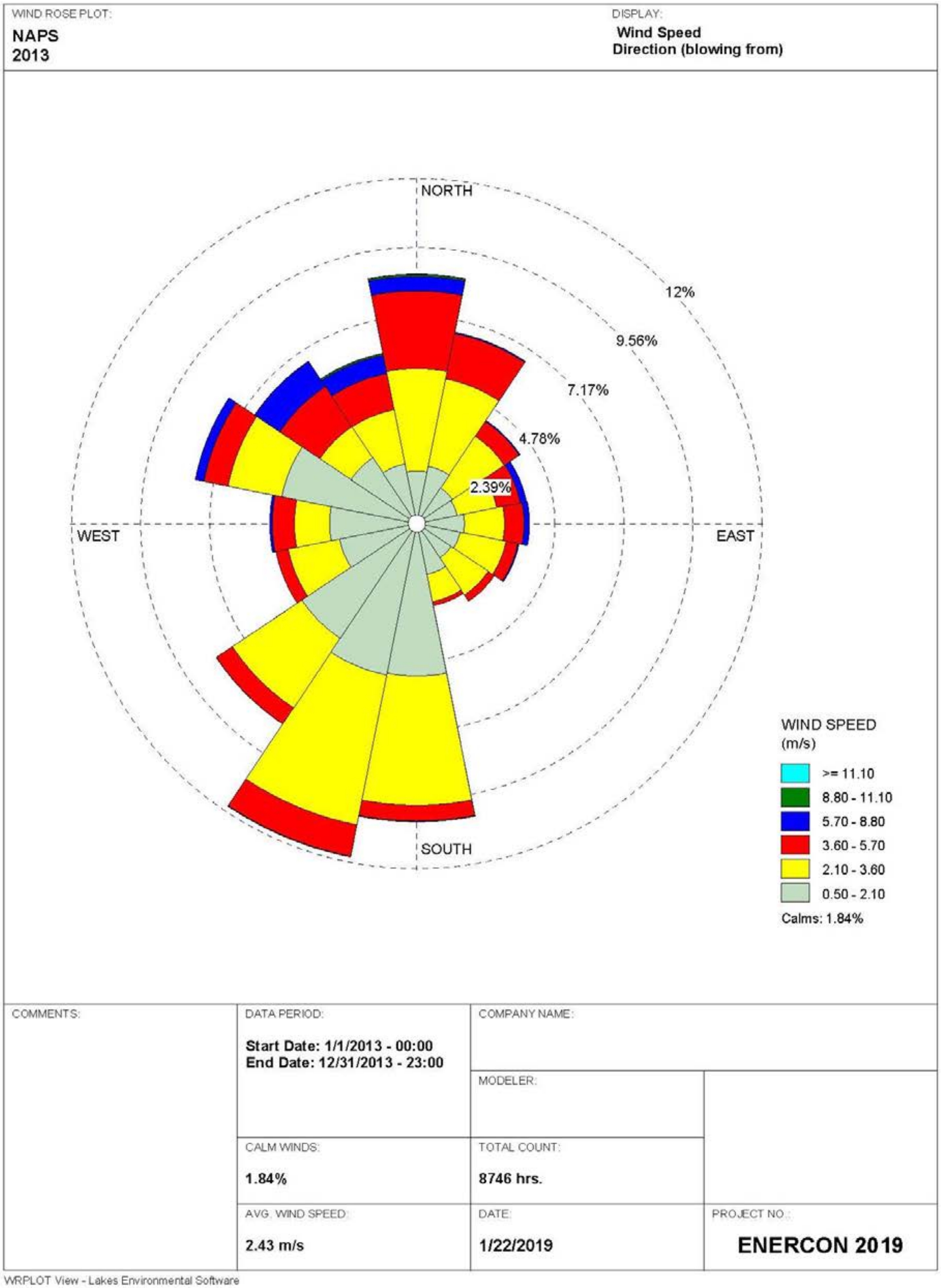


Figure E3.3-2 2014 NAPS Wind Rose

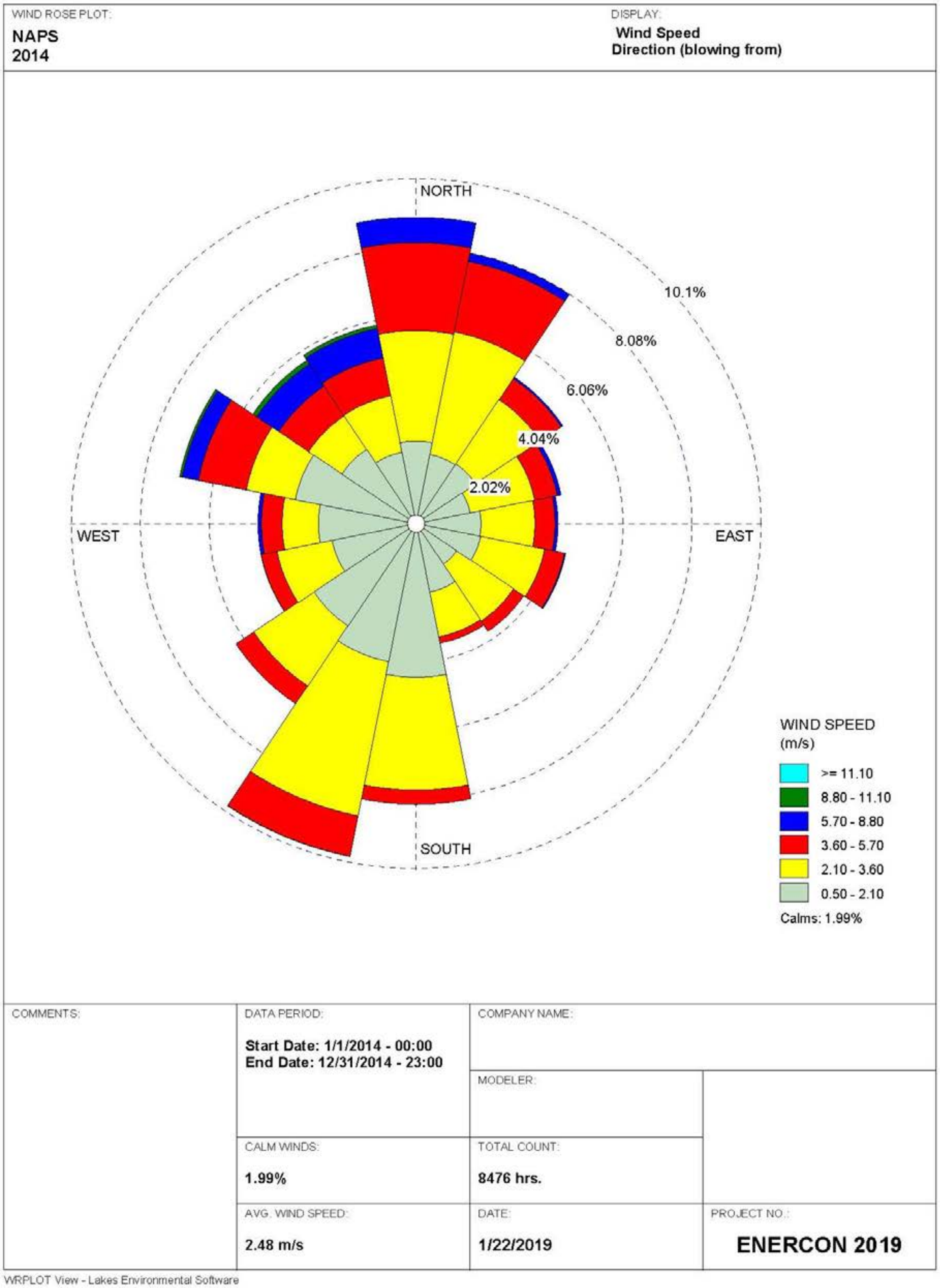
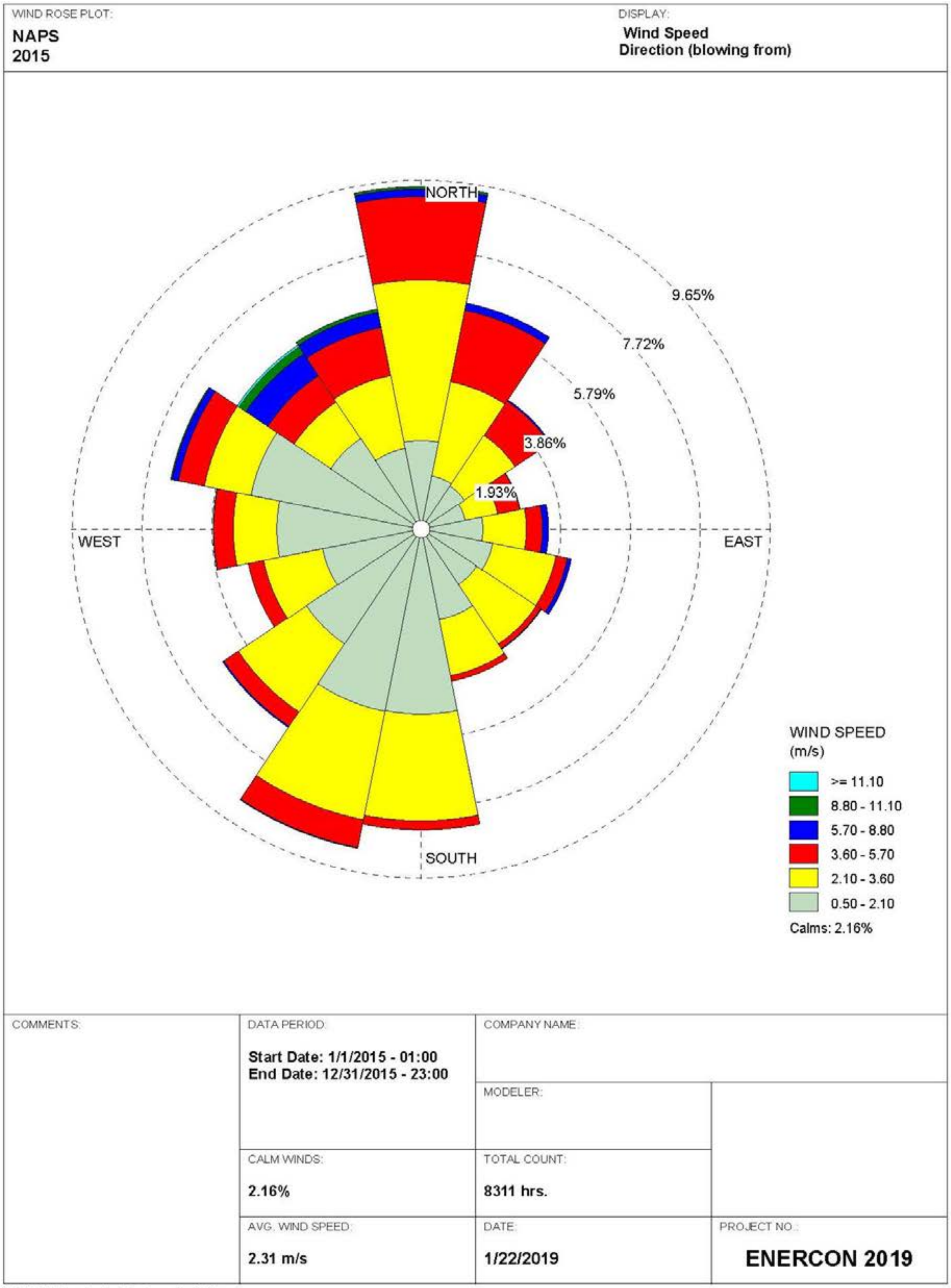


Figure E3.3-3 2015 NAPS Wind Rose



WRPLOT View - Lakes Environmental Software

Figure E3.3-4 2016 NAPS Wind Rose

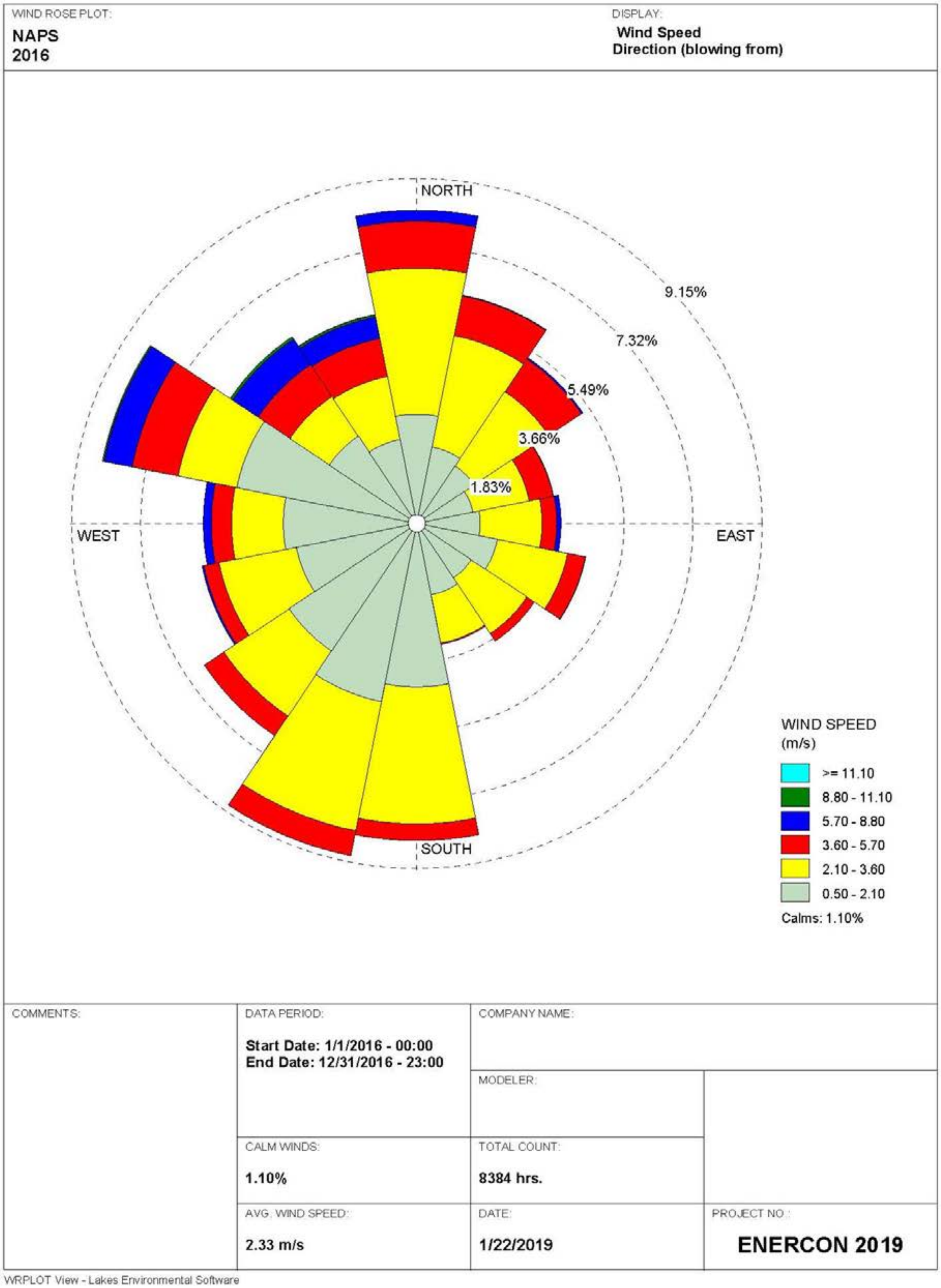
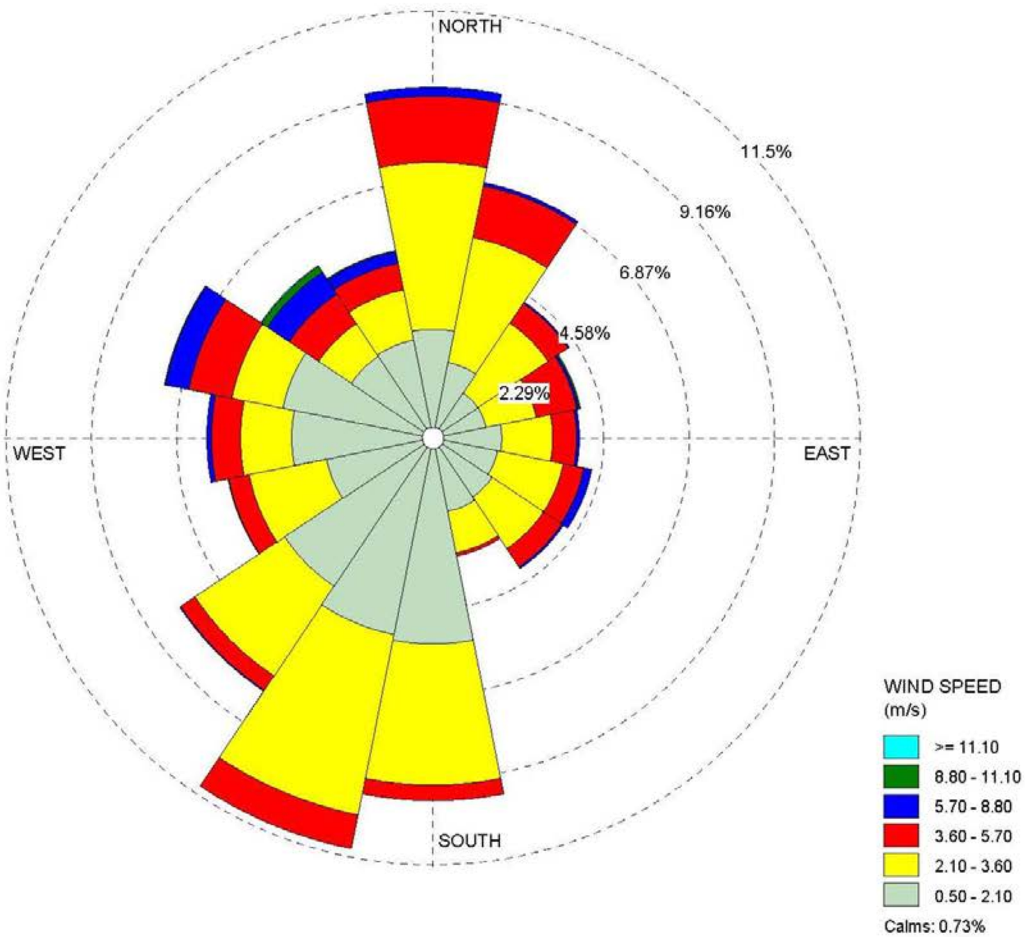


Figure E3.3-5 2017 NAPS Wind Rose

WIND ROSE PLOT:
NAPS
2017

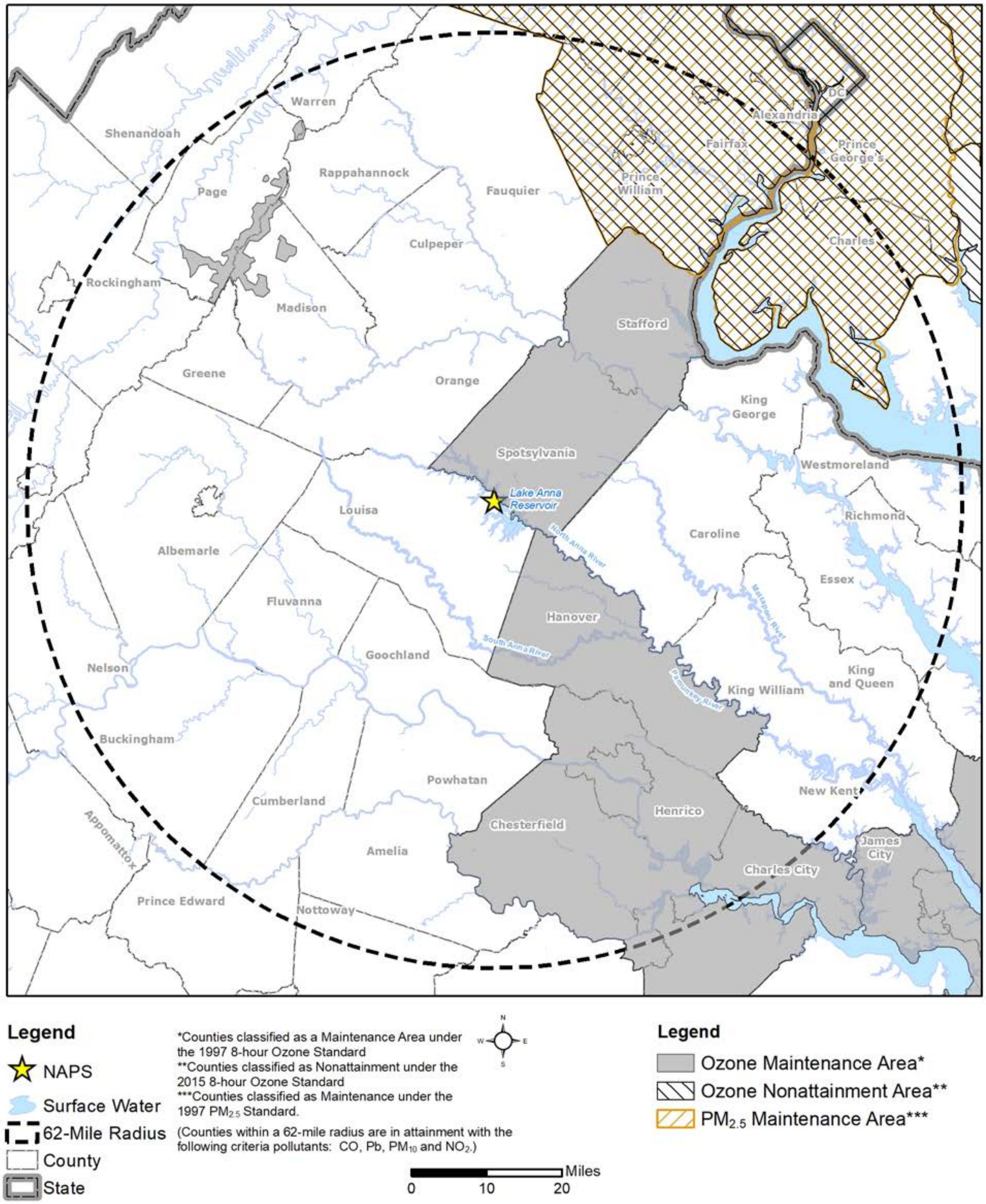
DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	Start Date: 1/1/2017 - 01:00 **End Date: 12/31/2017 - 23:00**	MODELER:	
	CALM WINDS: **0.73%**	TOTAL COUNT: **8740 hrs.**	
	AVG. WIND SPEED: **2.38 m/s**	DATE: **1/22/2019**	PROJECT NO.: **ENERCON 2019**

WRPLOT View - Lakes Environmental Software

Figure E3.3-6 Air Quality Non-Attainment Areas within a 62-Mile Radius of NAPS



E3.4 NOISE

Noise is produced at NAPS from industrial plant operations and site activities. NAPS has been granted an industrial land use designation by Louisa County and is regulated as an I-2 general industrial zoning district. Areas adjacent to NAPS are identified by the land use designations of agricultural (A1), general commercial (C2), industrial (IND), residential limited (R1), residential general (R2), and water. (Louisa County. 2019d)

The Louisa County noise ordinance identifies specific sound levels for the industrial zoning district of 75 dB as a daytime level and 65 dB as a nighttime level, measured at the property boundary on which the noise is generated, or at any point within the receiving property affected by the noise. The noise provisions do not apply to sirens operated in connection with NAPS. (Municode. 2018a) The Louisa County zoning ordinance also identifies yard regulations of general industrial land use of 100 feet adjacent to residential or agricultural districts and 10 feet adjacent to commercial or industrial districts. A 25-foot frontage is also required for industrial developments. (Municode. 2018b)

The county line between Louisa County and the adjacent Spotsylvania County runs through the middle of Lake Anna. The noise ordinance for Spotsylvania County is less restrictive than Louisa County for both daytime and nighttime levels. (Municode. 2019)

The nearest residences are located approximately 0.9 miles north-northeast and northeast from the center point of Unit 1 reactor containment (NAPS. 2019b). The distance exceeds all yard and buffer requirements.

Industrial background noise at NAPS is generally from turbine generators, transformers, loudspeakers, transmission lines, firing range, and the main steam safety valves. The loudest sound emitted from NAPS plant systems would be from a limited-duration steam release to the atmosphere through the main steam safety valves or steam generator power-operated relief valves. The steam safety valves and relief valves are located in the main steam valve houses adjacent to its unit's reactor containment building (NAPS. 2020, Section 9.5.1.3.1.10).

Sound from a main steam safety valve is observed only when steam pressure is released from the valve on an intermittent basis. NAPS Units 1 and 2 main steam valves are located approximately 4,363 feet and 4,660 feet, respectively, from the closest point of the site boundary in the northeast direction. The point of the site boundary closest to the firing range is approximately 2,223 feet southeast and is bordered by the WHTF and North Anna Reservoir (Figure E3.1-1).

Because the NAPS site is in a rural area (Louisa County. 2018b), it is unlikely that noise levels from NAPS would affect offsite residences. NAPS has received one noise complaint for the five-year period from 2013–2017. The noise complaint was due to a 24-hour emergency diesel generator (EDG) test run during an outage.

Depending on planned NAPS activity or potential noise generated (e.g., steam release), NAPS may make a public announcement to local media beforehand, so the public is aware of what is taking place at the plant. If an unplanned noise generation activity takes place and members of the public contact the plant, a station manager or department director would perform an outreach to the public and answer questions.

NAPS monitors noise at and around the plant site for occupational and ambient effects on an as-needed basis. This includes scheduled activities such as outages or systems testing. NAPS or its subcontractors perform noise surveys or monitoring for these scheduled activities. Noise levels at NAPS are anticipated to remain the same as under current operating conditions during the proposed SLR operating term.

E3.5 GEOLOGIC ENVIRONMENT

E3.5.1 REGIONAL GEOLOGY

The NAPS site lies within the Piedmont Plateau physiographic province (Figure E3.5-1). The Piedmont Plateau province is a rolling hilly area that extends from its boundary with the Coastal Plain province on the east to the Blue Ridge province on the west. Elevations range from about 800 to 1,500 feet along the western border of the province and slope eastward to elevations of about 200 feet at its eastern border. (Dominion. 2006a, Section 2.6.1.1)

The NAPS site is located within the Piedmont Upland section (referred to as sub-province in some publications) of the Piedmont Plateau province, approximately 15 miles west of the Atlantic Coastal Plain province (Figure E3.5-1). Topography in the vicinity of the NAPS site is characteristic of the Piedmont Upland section with a gently undulating surface varying in elevation from about 200 to 500 feet (Figure E3.1-2). The NAPS site is surrounded by forest and brushwood-covered land dissected by streams and interspersed with an occasional farm. Slopes in the region typically range from 2 to 5% with steeper slopes ranging from 7 to 10% along the lower tributaries of some of the larger streams. (Dominion. 2006a, Section 2.6.1.1)

E3.5.2 SITE GEOLOGY

The Piedmont Upland section is underlain by Late Precambrian and Paleozoic age crystalline rocks, which are overlain by Cenozoic age residual soils. The crystalline rocks consist of deformed and metamorphosed sedimentary, igneous, and volcanic rocks, intruded by mafic dikes and granitic plutons. The rocks belong to a number of northeast-trending lithotectonic belts, bounded by low-angle thrust faults (Paleozoic in age), and are interpreted to have formed along the shore and offshore of ancestral North America. The lithotectonic belts are the Goochland-Raleigh belt; the Carolina and Eastern Slate belts; the Charlotte, Milton and Chopawamsic belts; and the Western/Inner Piedmont belt. (Dominion. 2006a, Section 2.6.1.2)

The NAPS site is located in the Chopawamsic belt. The Chopawamsic belt is bounded on the west and east by the Chopawamsic and Spotsylvania thrust faults, respectively, and is interpreted to be a volcanic arc that was accreted to ancestral North America. The belt is comprised of the Chopawamsic Formation and the Ta River Metamorphic Suite, which are overlain unconformably by the Quantico Formation and intruded by rocks of the Falmouth Intrusive Suite (Figure E3.5-2 and Figure E3.5-3). The Chopawamsic Formation and Ta River Metamorphic Suite have been assigned to the Cambrian and/or Ordovician periods and the Quantico Formation and Falmouth Intrusive Suite have been assigned to the Ordovician and Carboniferous periods, respectively. (Dominion. 2006a, Section 2.6.1.2)

The NAPS site is underlain by rocks of the Ta River Metamorphic Suite, which extend thousands of feet below the ground surface. The main rock encountered in borings completed during previous subsurface investigations at the NAPS site and in borings completed as part of the Unit 3 ESP subsurface investigation is a gneiss. The gneiss is generally described as a gray to dark gray (Dominion. 2006a, Section 2.6.1.2):

- Quartz gneiss with some biotite quartz gneiss; and
- Hornblende gneiss, biotite quartz gneiss, and quartz gneiss.

The gneiss is moderately to intensely jointed and contains layers of quartz, pegmatite, chlorite, and clay. The upper part of the gneiss (averaging about 30 feet thick) is highly weathered and fractured, becoming less weathered and fractured with increasing depth. (Dominion. 2006a, Section 2.6.1.2)

E3.5.3 SOILS

E3.5.3.1 Onsite Soils and Geology

Residual soil overlying the gneiss consists predominantly of saprolite. The saprolite is derived from weathering of the underlying bedrock and retains many of the structural and mineralogical features of the bedrock. The saprolite extends to the top of the rock from which it was derived, but the contact between the saprolite and sound rock may be gradational and not well defined. The saprolite at the site generally consists of micaceous clayey, silty, fine to coarse sand with some to many relict rock fragments. In some areas of the site, it extends to a depth of about 100 feet below the ground surface. (Dominion. 2006a, Section 2.6.1.2)

Soil units that occur within the NAPS property boundary are described in detail in Table E3.5-1 and shown in Figure E3.5-4, and they include the following (USDA. 2018b):

<u>Louisa County</u>

- Abell fine sandy loam, 2-7% slopes
- Appling sandy loam, 2-7% slopes, moderately eroded
- Appling sandy loam, 7-15% slopes, moderately eroded
- Appling-Wedowee sandy clay loams, 7-15% slopes, severely eroded
- Ashlar sandy loam, 2-7% slopes
- Ashlar sandy loam, 7-15% slopes
- Ashlar sandy loam, 15-25% slopes
- Cecil sandy loam, 2-7% slopes, eroded
- Cut and fill land
- Colfax fine sandy loam, 2-7% slopes

- Durham fine sandy loam, 2-5% slopes
- Iredell sandy loam, 2-7% slopes
- Iredell sandy loam, 2-7% slopes, eroded
- Iredell sandy loam, 7-15% slopes, eroded
- Madison sandy loam, 2-7% slopes, eroded
- Masada fine sandy loam, 2-7% slopes, eroded
- Pacolet-Cecil sandy loams, 2-7% slopes, eroded
- Pacolet-Cecil sandy loams, 7-15% slopes, eroded
- Sekil sandy loam, 2-7% slopes
- Sekil sandy loam, 7-15% slopes
- Wedowee-Appling sandy loams, 2-7% slopes, eroded
- Wedowee-Appling sandy loams, 7-15% slopes, eroded
- Wehadkee-Chewacla complex
- Worsham fine sandy loam, 2-7% slopes

Spotsylvania County

- Abell fine sandy loam, 2-7% slopes
- Appling-Wedowee sandy loams, 7-15% slopes, eroded
- Cecil-Pacolet complex, 7-15% slopes, eroded
- Louisburg sandy loam, 15-25% slopes

E3.5.3.2 Erosion Potential

Because NAPS has been operational since the early 1970s, stabilization measures are already in place to prevent erosion and sedimentation impacts to the site and vicinity. Based on information from the U.S. Department of Agriculture (USDA), all soil units listed in Table E3.5-1 that are subject to erosion have a slight to moderate erosion potential with the exception of the Ashlar sandy loam (7-15% and 15-25% slopes), Iredell sandy loam (7-15% slopes, eroded), Pacolet-Cecil sandy loams (7-15% slopes, eroded), Sekil sandy loam (7-15% slopes), Wedowee-Appling sandy loams (7-15% slopes, eroded), and Louisburg sandy loam (15-25% slopes) which were rated severe for slope erodibility (USDA. 2018b). These soils are in areas of steep to moderate slopes along waterways and drainage features surrounding the plant industrial area and do not extend beneath any plant structures.

NAPS maintains and implements a stormwater pollution prevention plan (SWPPP) that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater, such as erosion, and identifies best management practices (BMPs) used to prevent or reduce the pollutants in stormwater discharges (NAPS. 2015a).

These practices, as they relate to erosion, include nonstructural preventative measures and source controls, as well as structural controls to prevent erosion or treat stormwater containing pollutants caused by erosion. In addition, any ground disturbance of one or more acres requires a construction stormwater permit to be obtained from the VDEQ. The construction stormwater permit specifies BMPs to reduce erosion caused by stormwater runoff, therefore minimizing the risk of pollution from soil erosion and sediment, and potentially from other pollutants that the stormwater may contact. Although no license renewal-related construction activities are planned or anticipated, any construction activities would continue to be managed in adherence to the NAPS SWPPP.

E3.5.3.3 Prime Farmland Soils

USDA Natural Resources Conservation Service maps show areas of prime farmland surrounding and within the developed portion of the NAPS property. With the exception of the developed portion of the NAPS property and small areas along waterways and drainage ways, all locations are designated as prime farmlands or farmlands of statewide importance. (USDA. 2018b) Even though these areas of the property are designated prime farmland or farmlands of statewide importance, NAPS would not be subject to the Farmland Protection Policy Act (FPPA) because the FPPA does not include federal permitting or licensing for activities on private or nonfederal lands. Soil units designated as prime farmland are identified in Table E3.5-1.

E3.5.4 SEISMIC HISTORY

Seismic activity in the Piedmont Plateau province is generally considered to originate in the North American basement. Geologic structures considered responsible for earthquake activity in the province are the basal decollement and associated thrust structures and the normal faults and intrusions associated with rifting that occurred during Mesozoic time. (Dominion. 2006a, Section 2.6.2.2)

The 200-mile radius site region encompasses two areas of elevated seismic activity. These seismically active areas, which had previously been considered seismic source zones, consist of the Central Virginia Seismic Zone (CVSZ) and the Giles County Seismic Zone. (Dominion. 2006a, Section 2.6.2.2.1)

The CVSZ is an area of persistent, low-level seismicity in the Piedmont Plateau province. The zone extends about 75 miles in a north-south direction and about 90 miles in an east-west direction from Richmond to Lynchburg. (Dominion. 2006a, Section 2.5.1.1.4.d.1) The NAPS site is located near the northern boundary of the CVSZ (Dominion. 2006a, Section 2.6.2.2.1).

The Giles County Seismic Zone is located in Giles County, southwestern Virginia, near the border with West Virginia (Dominion. 2006a, Section 2.6.2.2.1). Prior to the August 23, 2011, CVSZ event, the largest known earthquake to occur in Virginia and the second largest earthquake in the entire southeastern United States was the 1897 body wave magnitude (mb) 5.8 Giles County event. This earthquake would have produced a Modified Mercalli intensity (MMI) VIII in the epicentral area and MMI V at the NAPS site. (Dominion. 2006a, Section 2.5.1.1.4.d.2)

The upper-bound maximum earthquake magnitude estimate, developed for the CVSZ and Giles County Seismic Zone, ranges from mb 6.6 to 7.2. Prior to the August 23, 2011, CVSZ event, the two largest earthquakes to occur in the NAPS site region were the 1875 Goochland County and 1897 Giles County earthquakes with intensities of MMI VII and VIII, respectively. There is no physical evidence at the site, such as fissuring, liquefaction, landsliding, or lurching to suggest that the surficial sediments or the underlying bedrock were disturbed by ground shaking during these events. (Dominion. 2006a, Section 2.6.4.2.1)

The August 23, 2011, moment magnitude (M) 5.8 Mineral, Virginia, earthquake was the largest historical seismic event in the CVSZ, surpassing an earthquake that occurred in Goochland County, Virginia, in 1875 that had an estimated magnitude of about M 4.8 based on felt reports and damage. The largest known earthquake to occur in the Giles County Seismic Zone was the May 31, 1897, M 5.9 Giles County event. (Dominion. 2006a, Section 2.6.2.2.1)

The magnitude of the Mineral earthquake mainshock has been reported as both M 5.8 and M 5.7. The Mineral earthquake resulted from reverse faulting at a relatively shallow depth, approximately 4.7 miles (7.5 kilometers), in central Virginia. Seismicity in this region is attributed to the CVSZ, as described above. (NAPS. 2016a, Section 2.5.1.1.4.d.1)

NAPS was shut down immediately following the Mineral earthquake event. The plant underwent extensive inspections, examinations, testing, and a series of surveillances and evaluations per the guidance in EPRI NP-6695 prior to restart in November 2011. As part of the long-term evaluations following the restart, analyses were performed for SSCs as required by RG 1.167 and EPRI NP-6695. (NAPS. 2020, Section 3.7.8) Dominion implemented a long-term seismic margin management plan (SMMP) to address the impact of the Mineral earthquake. The SMMP provides additional assurance that NAPS can operate safely in the long term and is capable of withstanding another earthquake. (NAPS. 2020, Section 3.7.7)

Listed in Table E3.5-2 and shown in Figure E3.5-5 are the epicentral locations of earthquakes greater than M 3.0 from 1973 through June 2019 within a 200-mile radius of NAPS (Dominion. 2006a, Table 2.5-4; USGS. 2018a; USGS. 2020a).

There have been eight earthquake epicentral locations (greater than M 3) within a 20-mile radius of the site. All the noted earthquakes are aftershocks located in the general vicinity of the above-mentioned Mineral earthquake. The aftershocks ranged from M 4.5 on August 23, 2011, to

M 3.0 on March 25, 2012, with generally lower intensities with time after the mainshock. (USGS. 2018a)

The U.S. Geological Survey's (USGS's) national seismic hazard map shows that the NAPS site is in a region that has a 2% in 50 years (once in 2,500 years) probability of exceeding a peak ground acceleration between 0.2 and 0.28 acceleration of gravity (g) (USGS. 2015, Figure 1).

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[a]	Soil Unit Name	Description	Farmland Designation
Louisa County			
AbB	Abell fine sandy loam 2-7% slopes	The Abell component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 33 inches during January, February, March, December. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 2w. This soil does not meet hydric criteria. The Worsham component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on depressions. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 5w. This soil meets hydric criteria.	All areas are prime farmland
AnB2	Appling sandy loam 2-7% slopes moderately eroded	The Appling component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on interfluves on uplands. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 85%. Below this thin organic horizon, the organic matter content is about 2%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.	All areas are prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[a]	Soil Unit Name	Description	Farmland Designation
AnC2	Appling sandy loam 7-15% slopes moderately eroded	The Appling component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on interfluves on uplands. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 85%. Below this thin organic horizon, the organic matter content is about 2%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.	Farmland of statewide importance
ArC3	Appling-Wedowee sandy clay loams, 7-15% slopes, severely eroded	The Appling component makes up 40% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria. The Wedowee component makes up 35% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria.	Not prime farmland
AsB	Ashlar sandy loam 2-7% slopes	The Ashlar component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer, bedrock (lithic), is 24 to 42 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria.	Not prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
AsC	Ashlar sandy loam 7-15% slopes	The Ashlar component makes up 85% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer, bedrock (lithic), is 24 to 42 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria.	Not prime farmland
AsD	Ashlar sandy loam 15-25% slopes	The Ashlar component makes up 85% of the map unit. Slopes are 15 to 25%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer, bedrock (lithic), is 24 to 42 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 6e. This soil does not meet hydric criteria.	Not prime farmland
CcB2	Cecil sandy loam 2-7% slopes eroded	The Cecil component makes up 90% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.	All areas are prime farmland
CfL	Cut and fill land	Cut and fill land consists of small areas where the natural soils have been removed or mixed. Some areas have been leveled for commercial construction, for parking lots, and for school construction. Other areas have been excavated, filled, or shaped for various reasons. Some areas have been paved. Texture of the soil material is quite variable. (USDA. 1976)	Not prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[a]	Soil Unit Name	Description	Farmland Designation
ClB	Colfax fine sandy loam 2-7% slopes	The Colfax component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer, fragipan, is 25 to 36 inches (USDA. 1976). The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 13 inches during January, February, March, April, May, June, November, December. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 3w. This soil does not meet hydric criteria. The Worsham component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on depressions. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 5w. This soil meets hydric criteria.	Not prime farmland
DuB	Durham fine sandy loam 2-5% slopes	The Durham component makes up 85% of the map unit. Slopes are 2 to 5%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.	All areas are prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[a]	Soil Unit Name	Description	Farmland Designation
IdB	Iredell sandy loam 2-7% slopes	The Iredell component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of mixed mafic residuum. Depth to a root restrictive layer, bedrock (paralithic), is 42 to 72 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is very high. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 16 inches during January, February, March, April. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria. The Worsham component makes up 5% of the map unit. Slopes are 2 to 7%. This component is on depressions. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 5w. This soil meets hydric criteria.	Farmland of statewide importance
IdB2	Iredell sandy loam 2-7% slopes eroded	The Iredell component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of mixed mafic residuum. Depth to a root restrictive layer, bedrock (paralithic), is 42 to 72 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is very high. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 16 inches during January. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria.	Farmland of statewide importance
IdC2	Iredell sandy loam 7-15% slopes eroded	The Iredell component makes up 85% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of mixed mafic residuum. Depth to a root restrictive layer, bedrock (paralithic), is 42 to 72 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is very high. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 16 inches during January. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria.	Farmland of statewide importance

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[a]	Soil Unit Name	Description	Farmland Designation
MaB2	Madison sandy loam 2-7% slopes eroded	The Madison component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from schist. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.	All areas are prime farmland
MsB2	Masada fine sandy loam 2-7% slopes eroded	The Masada component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on terraces on piedmonts. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.	All areas are prime farmland
PaB2	Pacolet-Cecil sandy loams 2-7% slopes eroded	The Pacolet component makes up 45% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria. The Cecil component makes up 40% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.	All areas are prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
PaC2	Pacolet-Cecil sandy loams 7-15% slopes eroded	The Pacolet component makes up 45% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria. The Cecil component makes up 35% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria.	Farmland of statewide importance
SeB	Sekil sandy loam 2-7% slopes	The Sekil component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of mixed mafic residuum. Depth to a root restrictive layer, bedrock (lithic), is 24 to 42 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria.	Not prime farmland
SeC	Sekil sandy loam 7-15% slopes	The Sekil component makes up 95% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of mixed mafic residuum. Depth to a root restrictive layer, bedrock (lithic), is 24 to 42 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria.	Not prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[a]	Soil Unit Name	Description	Farmland Designation
WaB2	Wedowee-Appling sandy loams 2-7% slopes eroded	The Wedowee component makes up 50% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria. The Appling component makes up 40% of the map unit. Slopes are 2 to 7%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria.	All areas are prime farmland
WaC2	Wedowee-Appling sandy loams 7-15% slopes eroded	The Wedowee component makes up 45% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria. The Appling component makes up 40% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 3e. This soil does not meet hydric criteria.	Farmland of statewide importance

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[a]	Soil Unit Name	Description	Farmland Designation
WH	Wehadkee-Chewacla complex	The Wehadkee component makes up 45% of the map unit. Slopes are 0 to 2%. This component is on flood plains on piedmonts. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 4%. Non-irrigated land capability classification is 4w. This soil meets hydric criteria. The Chewacla component makes up 35% of the map unit. Slopes are 0 to 2%. This component is on flood plains on piedmonts. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 18 inches during January, February, March, April, November, December. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 4w. This soil meets hydric criteria.	Not prime farmland
WoB	Worsham fine sandy loam 2-7% slopes	The Worsham component makes up 85% of the map unit. Slopes are 2 to 7%. This component is on depressions. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 5w. This soil meets hydric criteria.	Not prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
Spotsylvania County			
1B	Abell sandy loam 2-7% slopes	The Abell component makes up 80% of the map unit. Slopes are 2 to 7%. This component is on drainageways on piedmonts. The parent material consists of local alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 33 inches during January, February, March, December. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 2e. This soil does not meet hydric criteria. The Partlow component makes up 80% of the map unit. Slopes are 0 to 7%. This component is on drainageways on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is frequently flooded. It is frequently ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 5w. This soil meets hydric criteria.	All areas are prime farmland

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
4C2	Appling-Wedowee sandy loams, 7-15% slopes, eroded	The Appling component makes up 50% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria. The Wedowee component makes up 35% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria. The Partlow component makes up 80% of the map unit. Slopes are 0 to 7%. This component is on drainageways on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is frequently flooded. It is frequently ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 5w. This soil meets hydric criteria.	Farmland of statewide importance

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
13C2	Cecil-Pacolet complex, 7-15% slopes, eroded	The Cecil component makes up 45% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria. The Pacolet component makes up 35% of the map unit. Slopes are 7 to 15%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 4e. This soil does not meet hydric criteria. The Partlow component makes up 80% of the map unit. Slopes are 0 to 7%. This component is on drainageways on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is frequently flooded. It is frequently ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 5w. This soil meets hydric criteria.	Farmland of statewide importance

Table E3.5-1 Onsite Soil Unit Descriptions

Map Unit Symbol[(a)]	Soil Unit Name	Description	Farmland Designation
		The Fluvaquents component makes up 55% of the map unit. Slopes are 0 to 2%. This component is on flood plains on coastal plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, June, November, December. Organic matter content in the surface horizon is about 4%. Non-irrigated land capability classification is 6w. This soil meets hydric criteria	
27D	Louisburg sandy loam, 15-25% slopes	The Louisburg component makes up 75% of the map unit. Slopes are 15 to 25%. This component is on hillslopes on piedmonts. The parent material consists of residuum weathered from granite and gneiss. Depth to a root restrictive layer, bedrock (paralithic), is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1%. Non-irrigated land capability classification is 7e. This soil does not meet hydric criteria. The Toddstav component makes up 85% of the map unit. Slopes are 0 to 4%. This component is on drainageways on coastal plains. The parent material consists of alluvium. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is high. Shrink-swell potential is moderate. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 2%. Non-irrigated land capability classification is 4w. This soil meets hydric criteria.	Not prime farmland

(USDA. 1976; USDA. 2018b)

a. See Figure E3.5-4 for map unit symbols.

Table E3.5-2 Historic Earthquakes (1973–2019) within a 200-Mile Radius of NAPS

Date	Latitude (N)	Longitude (W)	Depth (km)	mb	Location	Distance from Site (miles)
2/28/1973	39.7180	-75.4410	14.00	3.80	New Jersey	171
5/30/1974	37.3820	-80.4190	8.00	3.60	West Virginia	152
11/11/1975	37.1930	-80.8390	15.00	3.20	West Virginia	178
9/13/1976	36.6040	-80.8100	5.00	3.30	Virginia-North Carolina border region	195
4/26/1978	39.6970	-78.2370	15.00	3.10	Potomac-Shenandoah region	115
7/16/1978	39.9240	-76.2640	5.00	3.10	Pennsylvania	153
10/6/1978	39.9740	-76.5140	5.00	3.00	Pennsylvania	149
4/18/1984	39.9230	-76.3160	5.00	3.00	Pennsylvania	151
4/22/1984	39.9210	-76.3550	5.00	4.20	Pennsylvania	150
8/17/1984	37.8680	-78.3240	8.20	4.20	Virginia	32
6/10/1985	37.2480	-80.4850	11.10	3.30	—	158
3/26/1986	37.2450	-80.4940	11.90	3.30	—	159
12/3/1986	37.5800	-77.4580	1.60	3.30	—	38
12/10/1986	37.5850	-77.4680	1.20	3.50	—	37
12/24/1986	37.5830	-77.4580	1.00	3.30	—	38
1/13/1987	37.5840	-77.4650	2.50	3.30	—	37
8/27/1988	37.7180	-77.7750	14.30	3.30	—	24
1/13/1990	39.3660	-76.8510	4.10	3.50	—	103
10/22/1990	39.5120	-75.5060	10.00	3.20	New Jersey	159
3/15/1991	37.7460	-77.9090	15.50	3.80	—	23
3/15/1991	37.7460	-77.9160	17.50	3.80	Virginia	23
4/21/1991	37.9410	-80.2070	14.70	3.50	West Virginia	132
4/22/1991	37.9420	-80.2050	14.80	3.50	—	132
6/28/1991	38.2310	-81.3350	7.00	3.00	—	194
8/15/1991	40.7860	-77.6570	1.00	3.00	Pennsylvania	188
3/10/1993	39.2330	-76.8820	5.00	3.30	—	95
3/15/1993	39.1970	-76.8700	0.90	3.50	—	93
7/12/1993	36.0350	-79.8230	5.00	3.30	—	179

Table E3.5-2 Historic Earthquakes (1973–2019) within a 200-Mile Radius of NAPS

Date	Latitude (N)	Longitude (W)	Depth (km)	mb	Location	Distance from Site (miles)
10/28/1993	39.2500	-76.7700	—	3.30	—	99
10/28/1993	39.2500	-76.7700	—	3.30	—	99
1/15/1994	40.3270	-76.0070	5.00	4.20	Pennsylvania	183
1/15/1994	40.3300	-76.0370	5.00	4.60	Pennsylvania	183
1/16/1994	40.3270	-76.0070	5.00	4.20	—	183
1/16/1994	40.3300	-76.0370	5.00	4.60	—	183
11/13/1997	40.1460	-76.2520	5.00	3.00	Pennsylvania	166
11/14/1997	40.1460	-76.2520	5.00	3.00	—	166
11/14/1997	40.7410	-76.5490	0.00	3.00	—	196
10/21/1998	37.4220	-78.4390	12.60	3.80	—	57
10/21/1998	37.3810	-78.3670	13.40	3.80	Virginia	57
9/22/2001	38.0260	-78.3960	2.00	3.20	Virginia	33
12/4/2001	37.7260	-80.7520	8.50	3.10	—	164
5/5/2003	37.6257	-77.9552	12.50	3.60	8 km SW of Goochland, Virginia	31
8/26/2003	40.6063	-75.1055	2.91	3.10	New Jersey	227
12/9/2003	37.7740	-78.1000	10.00	4.50	16 km E of Weber City, Virginia	26
12/27/2008	40.1142	-76.4025	3.61	3.37	Pennsylvania	160
5/16/2009	37.2485	-80.0020	12.89	3.00	2 km NNE of Cave Spring, Virginia	134
4/4/2010	38.5990	-80.9162	0.02	3.40	19 km WSW of Sutton, West Virginia	174
6/3/2010	40.0863	-76.9737	1.50	3.05	Pennsylvania	146
7/16/2010	39.2607	-77.4103	7.03	3.60	1 km NW of Germantown, Maryland	85
10/2/2010	37.8532	-77.5187	19.20	3.00	10 km NNW of Ashland, Virginia	21
8/23/2011	37.9097	-77.9363	6.00	5.80	14 km SSE of Louisa, Virginia	13
8/23/2011	37.9147	-77.9545	0.00	4.20	13 km SSE of Louisa, Virginia	13
8/23/2011	37.8252	-77.9480	0.05	3.40	16 km NNW of Goochland, Virginia	18
8/25/2011	37.9468	-77.9672	6.81	4.50	9 km SSE of Louisa, Virginia	12
9/1/2011	37.9502	-77.9320	3.42	3.40	10 km SE of Louisa, Virginia	11
10/12/2011	37.9402	-77.9830	4.01	3.00	9 km S of Louisa, Virginia	13

Table E3.5-2 Historic Earthquakes (1973–2019) within a 200-Mile Radius of NAPS

Date	Latitude (N)	Longitude (W)	Depth (km)	mb	Location	Distance from Site (miles)
1/30/2012	37.9453	-77.9830	3.18	3.10	9 km SSE of Louisa, Virginia	13
3/25/2012	37.9063	-77.9878	8.65	3.00	13 km S of Louisa, Virginia	15
3/31/2013	38.6450	-80.8332	8.02	3.40	11 km WSW of Sutton, West Virginia	170
5/21/2014	37.5298	-78.0702	9.86	3.10	13 km W of Powhatan, Virginia	40
1/17/2016	39.3193	-77.8283	4.74	3.03	3 km NE of Ranson, West Virginia	87
9/13/2017	37.4728	-80.7030	17.77	3.20	16 km N of Pearisburg, Virginia	165
11/30/2017	39.1977	-75.4325	9.87	4.10	9 km ENE of Dover, Delaware	150
6/13/2019	40.4218	-77.5057	—	3.44	19 km SSW of Mifflintown, Pennsylvania	161

(Dominion. 2006a; USGS. 2018a; USGS. 2020a)

— = Not available.

Figure E3.5-1 Physiographic Provinces Associated with the NAPS Site

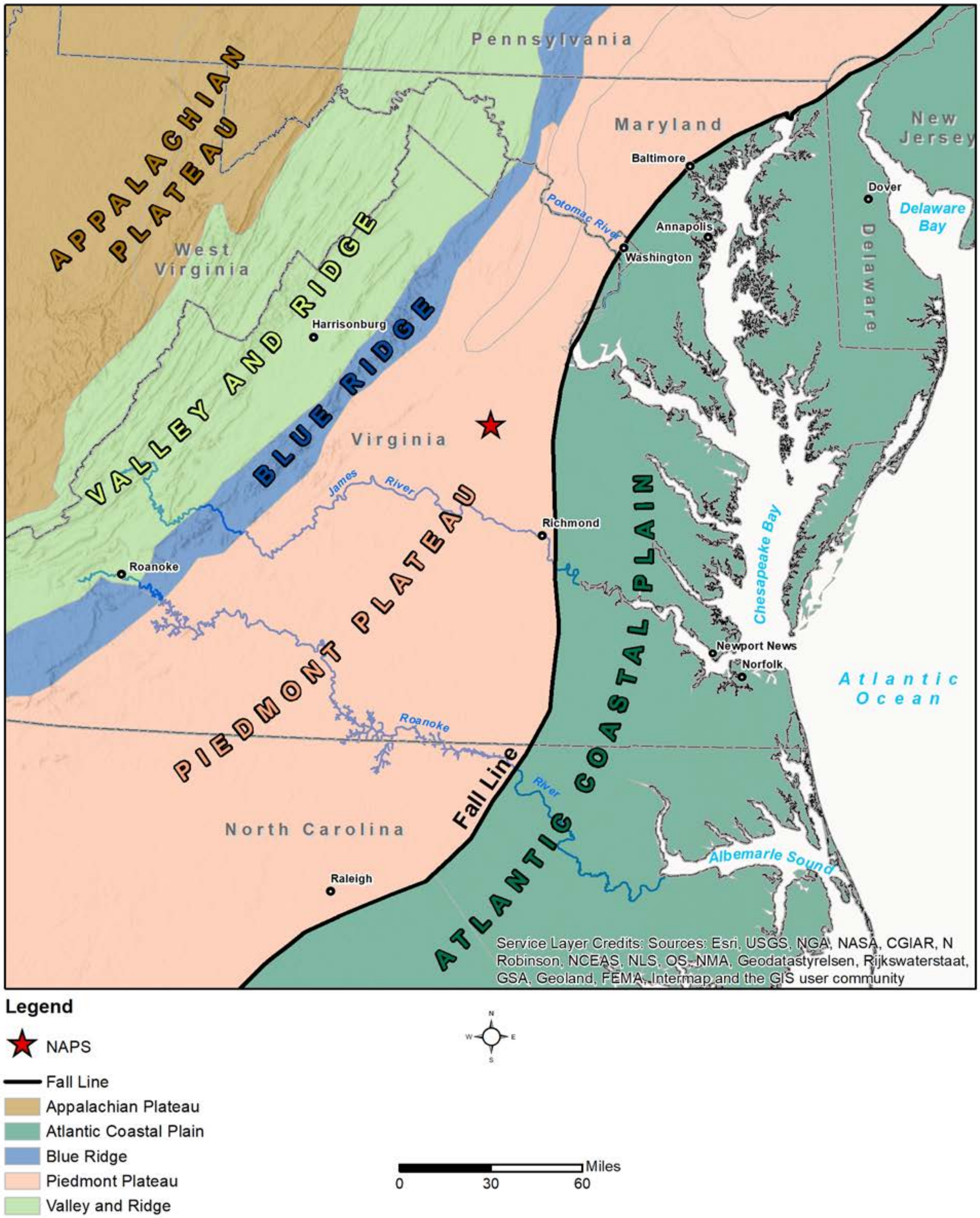
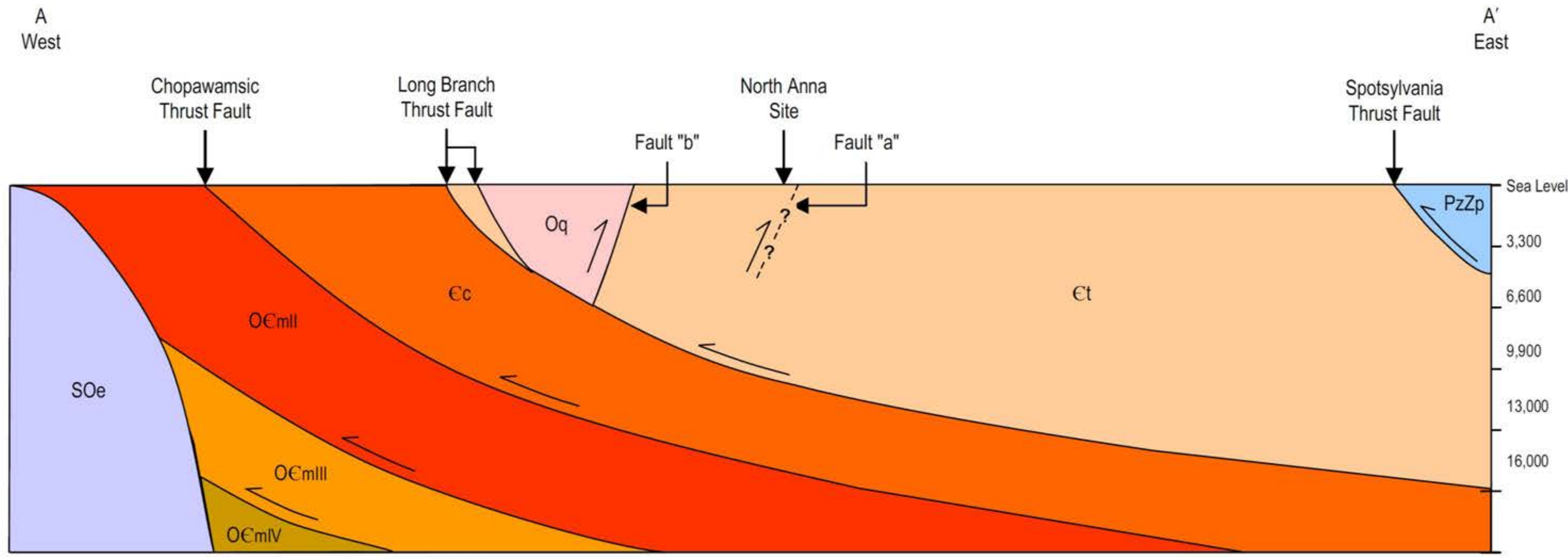
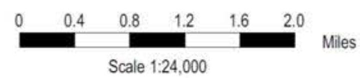


Figure E3.5-2a Columnar Geologic Section, NAPS Site Area



PzZp	Po River Metamorphic Suite (Late Pre-cambrian to early Paleozoic)
Єt	Ta River Metamorphic Suite (Cambrian and/or Ordovician)
Єc	Chopawamsic Formation (Cambrian and/or Ordovician)
OЄmII	Melange Zone II (Cambrian and/or Ordovician)
OЄmIII	Melange Zone III (Cambrian and/or Ordovician)
OЄmIV	Melange Zone IV (Cambrian and/or Ordovician)
Oq	Quantico Formation (Ordovician)
SOe	Ellisville Pluton (Silurian)



See Figure 3.5-2b for Cross Section A-A′ Location

Figure E3.5-2b Columnar Geologic Section Location Map, NAPS Site Area

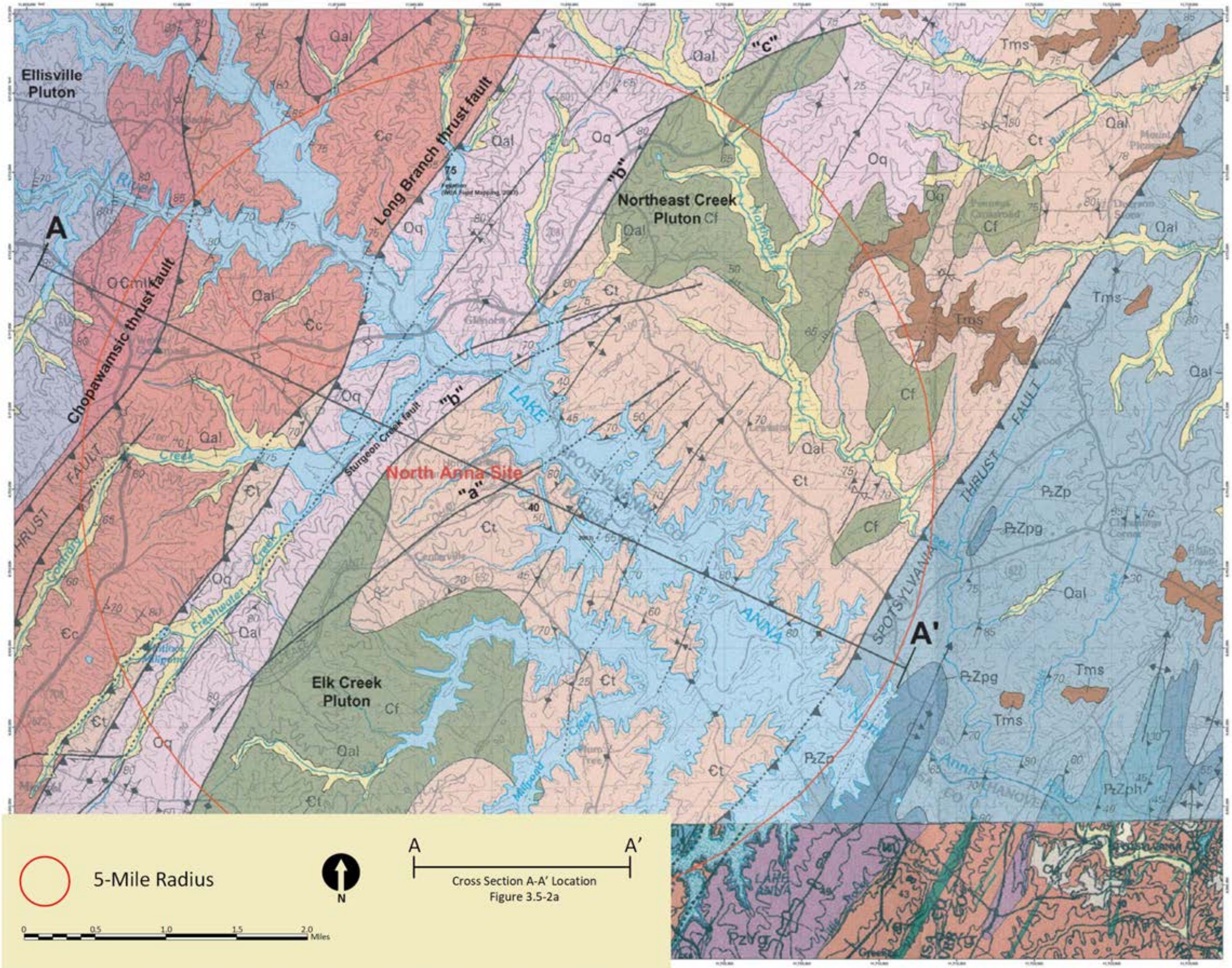


Figure E3.5-3 Surficial Geology Map, NAPS Site

Figure E3.5-4 Distribution of Soil Units, NAPS Site

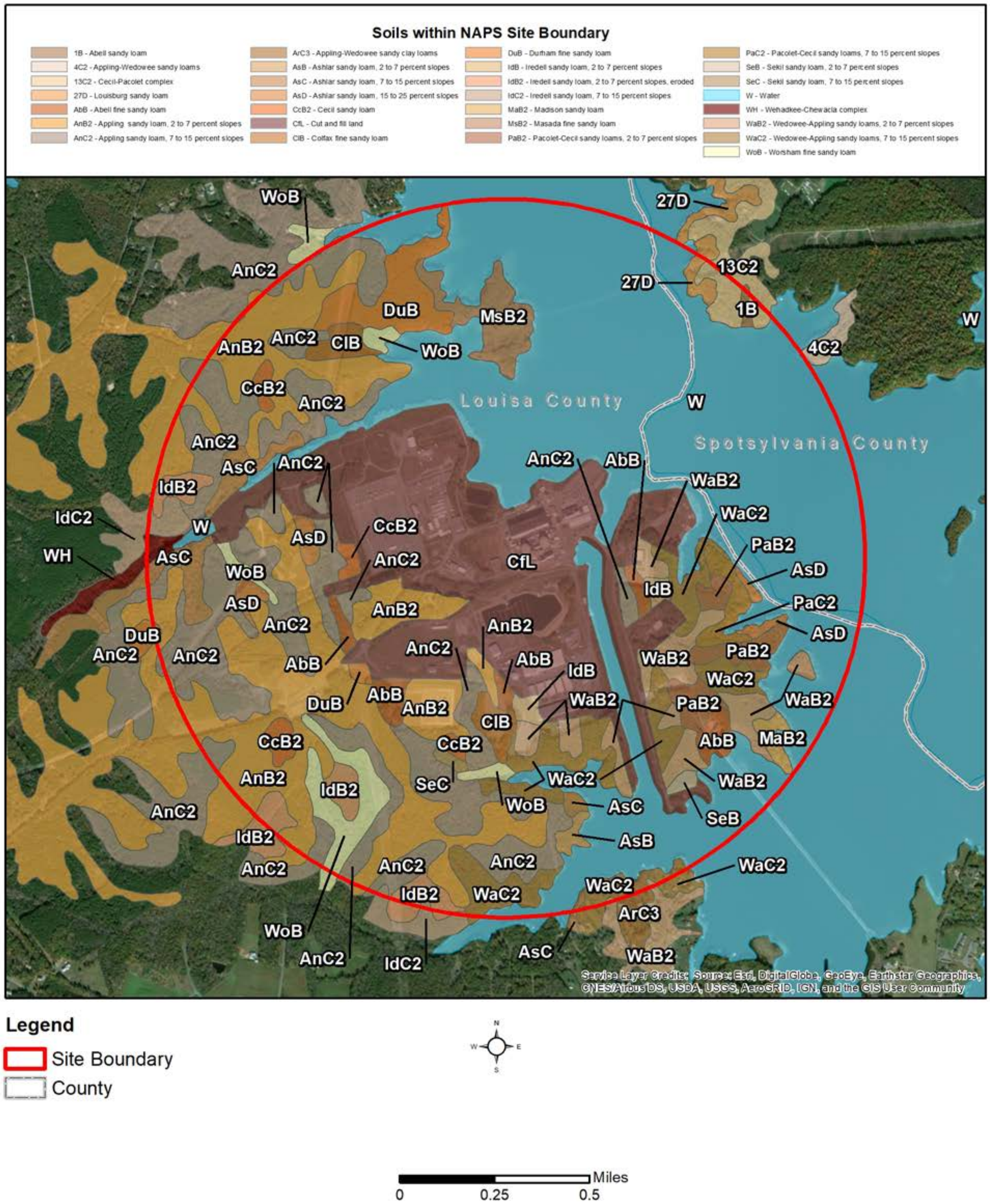
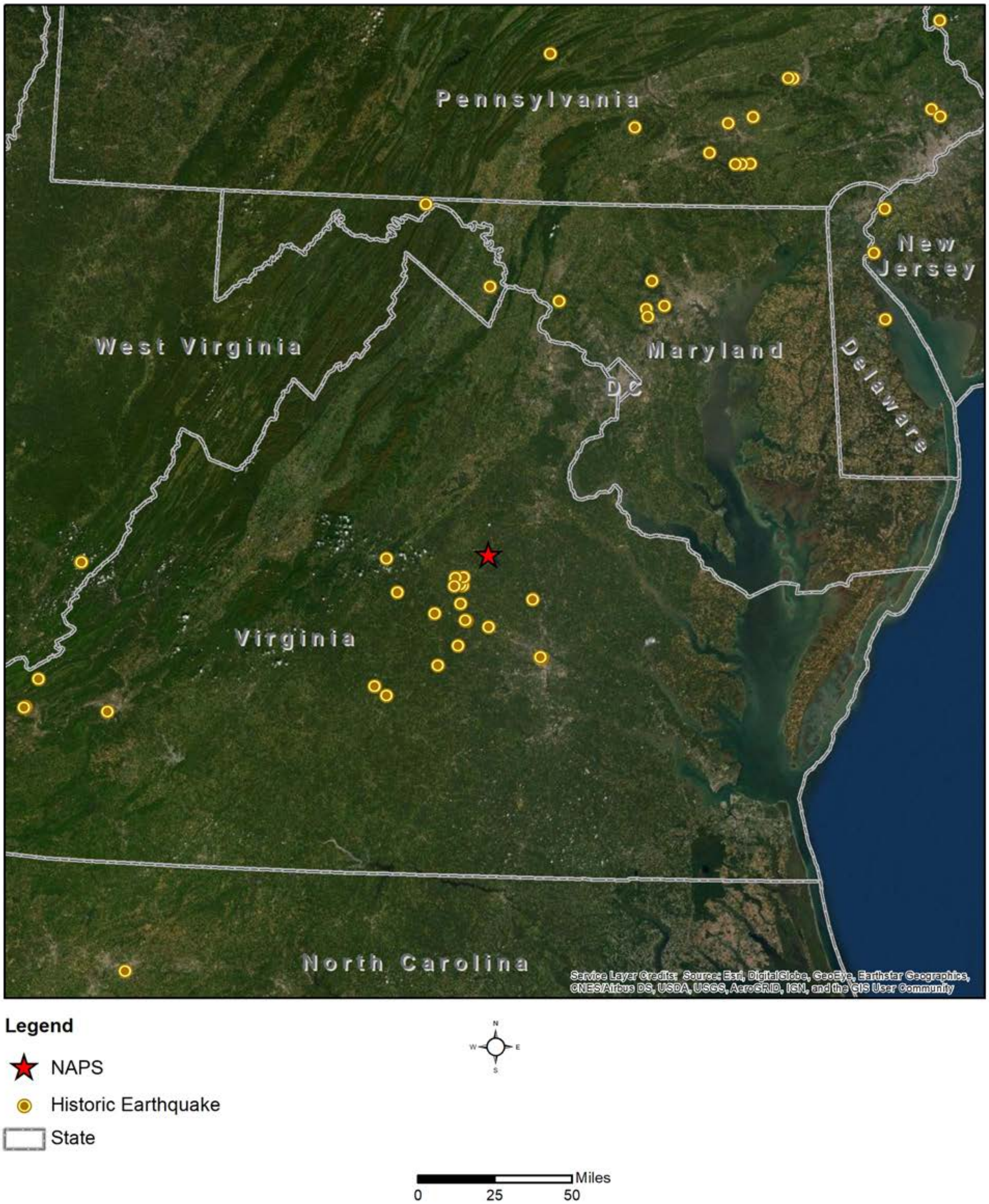


Figure E3.5-5 Historic Earthquakes, 1973–2019 within a 200-Mile Radius of NAPS



E3.6 WATER RESOURCES

E3.6.1 SURFACE WATER RESOURCES

The NAPS site is located on the southern shore of Lake Anna, approximately 8 km (5 miles) upstream of the North Anna Dam. Lake Anna was created by constructing a dam across the North Anna River as part of the overall development of the NAPS site. The North Anna Reservoir was created for the specific purpose of providing the water source for NAPS, which uses an open-cycle cooling system to dissipate heat from the turbine condensers. (Dominion. 2006a, Part 3: Section 2.3.1.1)

The North Anna River rises in the eastern slopes of the Southwestern Mountains in the Appalachian Range near Gordonsville, Virginia, and flows along a southeasterly course to its confluence with the South Anna River five miles northeast of Ashland, Virginia, where the Pamunkey River is formed. The Pamunkey continues on a general southeasterly course to West Point, Virginia, where it is joined by the Mattaponi River to form the York River. The York River flows into the Chesapeake Bay about 15 miles north of Hampton, Virginia. The North Anna River drains a watershed of 343 square miles above the dam, which is located about four miles north of Bumpass, Virginia, and about 0.5 mile upstream of Virginia Route 601. (Dominion. 2006a, Part 3: Section 2.3.1.1)

As shown in Figure E3.6-1, Lake Anna is about 17 miles long and inundates several small tributaries, thereby resulting in an irregular shape with a shoreline length of over 200 miles. To provide optimum thermal performance for NAPS Units 1 and 2, Lake Anna is separated into two sections by three dikes. The larger section of about 9,600 acres, termed the North Anna Reservoir, is a storage impoundment for plant cooling water. The smaller section, the WHTF, has an area of about 3,400 acres and functions as a heat exchanger to transfer most of the units' heat rejection to the atmosphere. (Dominion. 2006a, Part 3: Section 2.3.1.1) All three lagoons are interconnected by canals. The third dike has a weir regulating the outflow allowing water to exit the WHTF into the North Anna Reservoir. Fish can move between the two bodies of water at the weir. (NRC. 2006, Section 2.7.2)

Lake Anna lies within the lower Chesapeake basin [hydrologic unit code (HUC)] 020801 in the Pamunkey sub-basin (HUC 02080106) and in the Lake Anna watershed. NAPS lies within two sub-watersheds. The northern portion of NAPS, including the intake, is located in HUC 0208010602. The discharge canal and WHTF are located in HUC 0208010603. In the Virginia River basin system, the Pamunkey sub-basin is within the York River basin (YO). NAPS is in the YO20 and the WHTF is in YO21. (VDCR. 2018a; VDEQ. 2018a)

When both units are operating, eight circulating water pumps draw water from the North Anna Reservoir at a rate of 4,246 cfs, circulate it through the condensers, and discharge it to the WHTF.

Water moves through the three lagoons of the WHTF and back into the North Anna Reservoir at Dike 3 (Figure E3.6-1). (Dominion. 2006a, Part 3: Section 2.3.1.1)

The North Anna Dam is an earth-filled structure about 5,000 feet long and 90 feet high, with a central concrete spillway about 200 feet long. The dam crest is at elevation 265 feet msl and has a width of 30 feet. The concrete spillway contains three radial crest gates, each 40 feet wide by 35 feet high, separated by concrete piers 10 feet wide. The crest of the spillway ogee is at elevation 219 feet msl. Two adjustable skimmer gates measuring 8.5 feet by 8.5 feet are provided for regulating small releases. A concrete apron downstream from the spillway provides energy dissipation for releases from the North Anna Dam. (Dominion. 2006a, Part 3: Section 2.3.1.1)

The North Anna Dam also incorporates at its base a small hydroelectric power plant (North Anna Hydro Power Station) of 855-kW capacity owned and operated by Dominion and inspected by the Commonwealth of Virginia. A Federal Energy Regulatory Commission (FERC) permit is not required for operation of the North Anna Hydro Power Station. The hydroelectric facility consists of two separate generating units (Units 5A and 5B), each unit possessing a single-state, open runner-type vertical turbine. Peak operational efficiency is at a flow of 40 cfs for Unit 5A and 133 cfs for Unit 5B. Water for the hydroelectric facility is withdrawn from near the surface of Lake Anna (depth of less than seven feet). It comes through a skimmer gate and associated sluice pipe that is connected to a five-foot diameter penstock. Water is then directed by a bifurcation piece through 24- and 48-inch conduits to Units 5A and 5B, respectively. After passing through the turbines, water is discharged into the North Anna River just downstream of the dam's spillway. (Dominion. 2006a, Part 3: Section 2.3.1.1)

The normal pool level for the North Anna Reservoir is maintained at elevation 250 feet msl. The Commonwealth of Virginia requires a minimum discharge of 40 cfs from the North Anna Dam, except under drought conditions. These minimum flow requirements are established to maintain instream flows and water quality in the North Anna River below the dam, and in the Pamunkey and York rivers further downstream. (Dominion. 2006a, Part 3: Section 2.3.1.1) Should Lake Anna water surface elevations fall below 248 feet msl, releases are reduced below 40 cfs in accordance with Part I.D.4 of the VPDES permit (Attachment B). A flood surcharge of 15 feet above the normal pool level is provided for flood storage. The total Lake Anna volume of 550,000 acre-feet is allocated as described in Table E3.6-1. (Dominion. 2006a, Part 3: Section 2.3.1.1)

E3.6.1.1 Potential for Flooding

The site is relatively flat, and no concentration of runoff is expected on the flat areas. The drainage area that will contribute to runoff on the site is not much larger than the site. The area west of the site will receive runoff from approximately 35 acres; the drainage facilities in this area have been designed for a 50-year storm. The site is graded to cause surface runoff to flow away from the turbine buildings, reactor containments, and any safety-related facilities. (NAPS. 2020, Section 2.4.2.2)

The design of Lake Anna precludes any possibility of the flooding of the station because its maximum high-water level, including wave run-up, is below ground grade at the station site and the crest of the flood-protection dike to the west. Static and dynamic consequences of various types of flooding were considered, but had no bearing or effect on the design of safety-related station structures except to the extent that groundwater elevations may be influenced by variations in Lake Anna's level. (NAPS. 2020, Section 2.4.10)

Based on Federal Emergency Management Agency (FEMA) data, the majority of the NAPS property is located outside the 0.2% annual chance floodplain (100-year flood level). Small areas along the shores and canals have been designated as within the 0.2% annual chance floodplain with base flood elevations of 255 feet (NAVD88) (Figure E3.6-2). (FEMA. 2019)

Seismic Class I structures and systems of the station are designed to withstand a flood condition equal to or greater than the 296,000 cfs runoff and water surface elevation of 267.3 feet associated with the probable maximum flood. (NAPS. 2020, Section 2.4.3.4)

The North Anna Dam and power station, including all safety-related facilities, were designed to operate safely through the occurrence of the probable maximum flood. The technical requirements manual requires the station to be shut down in the event the lake level exceeds 256 feet msl. The station is designed to withstand flooding in the turbine building up to an elevation of 257 feet msl. (NAPS. 2020, Section 2.4.14)

E3.6.1.2 Surface Water Discharges

E3.6.1.2.1 VPDES-Permitted Outfalls

Condensers at NAPS are equipped with an Amertap system that circulates sponge rubber balls through the condenser tubes to prevent the accumulation of deposits (such as biofouling organisms). Amertap balls are slightly larger than the inside diameter of the condenser tubes; they are collected from the outlet stream and reused. No chemical biocides are used in the circulating water system (Dominion. 2001, Section 3.1.2.1).

Chemical additives approved by the VDEQ are used to control pH, scale, corrosion, and biofouling of various plant equipment. Process wastewaters are monitored and discharged either directly to the North Anna Reservoir or to the North Anna Reservoir via the WHTF and VPDES Outfall 001 at Dike 3 in accordance with the NAPS VPDES Permit No. VA00052451. The current VPDES permit authorizes discharges from 10 external outfalls (seven industrial process wastewater and three stormwater) and 18 internal outfalls (16 industrial process wastewater and two stormwater).

The industrial process wastewater outfalls are depicted in Figure E3.6-3, and their associated effluent limits are listed in Table E3.6-2. (Attachment B)

E3.6.1.2.2 Stormwater Runoff

Stormwater discharges associated with industrial activities at NAPS are regulated and controlled through VPDES Permit No. VA00052451 issued by the VDEQ. NAPS performs quarterly visual examinations of stormwater runoff samples (when there is a flow) at VPDES Outfalls 014, 022, 024, 025, and 027, which receive runoff from the entire industrial area and surrounding areas, and evaluates the samples as specified in the permit. NAPS also maintains and implements a SWPPP that identifies potential sources of pollution, such as erosion, that would reasonably be expected to affect the quality of stormwater, and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges. (Attachment B, Section F.1.a)

E3.6.1.2.3 Sanitary Wastewaters

The sewage treatment facility at NAPS originally consisted of three small package secondary treatment plants. In 1997, these plants were consolidated into the existing 30,000 gallon-per-day extended aeration sewage treatment plant. Disinfection in the sewage treatment facility reduces coliform bacteria (and other microorganisms) to levels that meet state water quality standards. Discharge from the facility is via Outfall 111 in accordance with VPDES Permit No. VA0052451 (Attachment B)

E3.6.1.2.4 Dredging

Dredging is not performed by Dominion in the North Anna Reservoir, the WHTF, the intake area, or the discharge canal; however private dredging has been performed in the WHTF by adjacent landowners after they obtained the required permits.

E3.6.1.2.5 Compliance History

As presented in Section E9.3, during the seven years from 2013–2019, there have been no notices of violation or noncompliance associated with NAPS wastewater discharges to receiving surface waters.

E3.6.1.2.6 Lake Anna Water Temperatures Reporting

Lake water temperatures are measured hourly at ten continuous monitoring stations located in the North Anna Reservoir and the WHTF. Water temperature data at the NAPS intake and discharge (end of discharge canal) are measured at stations NALINT and NADISC1, respectively. Monitoring station raw data (measured every hour) were averaged for each month during the years

2013–2017. The averaged values for each year between 2013 and 2017 are plotted in Figures E3.6-4a and E3.6-4b.

E3.6.2 GROUNDWATER RESOURCES

E3.6.2.1 Groundwater Aquifers

The NAPS site lies within the Piedmont Plateau physiographic province. Three types of groundwater aquifers are present within the consolidated rocks of the Piedmont Plateau, along with a surficial aquifer system in the overlying unconsolidated sediments. The three consolidated-rock aquifers consist of (Dominion. 2006a, Section 2.3.1.2):

- Crystalline and undifferentiated sedimentary rocks
- Carbonate rocks
- Early Mesozoic age rift-basin sedimentary and igneous rocks

The unconsolidated sediments are likely to consist of residual soil, saprolite (bedrock that has been weathered to a soil but that retains the rock structure), or alluvial deposits along stream channels. Although crystalline rocks form the predominant aquifers in the Piedmont Plateau province, carbonate rocks, which are primarily found in the portion of the Piedmont Plateau that extends from Maryland northward, form the most productive aquifers. (Dominion. 2006a, Section 2.3.1.2)

Recharge to aquifers in the Piedmont Plateau occurs largely as infiltration of local precipitation in interstream areas. That portion of the precipitation that does not migrate laterally through the unconsolidated surficial materials for discharge to nearby streams or low areas percolates vertically downward to the bedrock, where it enters water-bearing openings in the rock. The average recharge to aquifers from precipitation in the Virginia Piedmont is estimated to be about 8 to 10 inches per year. Although an intricate network of rivers and streams that follow a dendritic drainage pattern generally dissects the Piedmont Plateau province, some of the drainages (or portions thereof) follow nearly straight courses that are controlled by joint or fault systems in the underlying bedrock. Those streams passing through the area from other geologic provinces provide a secondary source of recharge to the groundwater. The Piedmont Plateau province of Virginia is estimated to have as much as 1.5 billion gallons of water per square mile held in storage in the consolidated and unconsolidated aquifers. This volume of water is considered suitable for domestic and other small supply requirements. (Dominion. 2006a, Section 2.3.1.2)

In the area around the NAPS site, the bedrock consists of Precambrian to Paleozoic age crystalline metamorphic and igneous rocks, while the overlying unconsolidated material is largely a weathering product (residual soil or saprolite) of the underlying bedrock. Groundwater in the crystalline rocks is stored and transmitted through joints and fractures in the rocks, while the main body of the rock between the joints and fractures is essentially impermeable. The number and extent of the joints/fractures, and the width of the openings between their surfaces, generally decrease with depth, limiting the significance of the water-transmitting capability of the bedrock to its upper few hundred feet. (Dominion. 2006a, Section 2.3.1.2)

Saprolite at the NAPS site is generally exposed at the ground surface or underlies a thin layer of residual soil or fill. The saprolite extends to the top of the rock from which it was derived; but the contact between the saprolite and sound rock may be gradational and not well defined. The saprolite is reported to range in thickness from about 2 to 125 feet and is of variable lithology, depending on the type of parent material from which it was derived. Borings drilled at the ESP site as part of the ESP subsurface investigation program penetrated saprolite to depths ranging from about 6 to 35 feet. The saprolite penetrated by these borings is classified as a micaceous, silty-clayey, fine-to-coarse sand or sandy silt, with occasional rock fragments. (Dominion. 2006a, Section 2.3.1.2)

Bedrock beneath the saprolite belongs to the Ta River Metamorphic Suite. In the site area, these rocks are predominantly biotite gneiss and schist with smaller amounts of amphibolite gneiss. The results of borings at the NAPS site indicate the main rock type to be gneiss. The gneiss is generally described as quartz gneiss with some biotite quartz gneiss; and quartz gneiss, biotite quartz gneiss, and hornblende gneiss. The rock exhibits a variable weathering profile and joint/fracture presence. The degree of jointing and fracturing is the controlling factor for groundwater movement through the rock. (Dominion. 2006a, Section 2.3.1.2)

E3.6.2.2 Hydraulic Properties

Thirteen groundwater observation wells installed at the site as part of the ESP and Unit 3 subsurface investigation programs were tested using the slug test method to determine hydraulic conductivity values for the saprolite and underlying shallow bedrock. In addition, borehole packer tests were conducted in the bedrock at selected Unit 3 observation well locations as an alternate method for determining hydraulic conductivity in the bedrock. Tests in only one well boring (OW-949) produced flow results at all pressures. Hydraulic conductivities calculated for the saprolite, based on tests in eleven wells, range from 0.076 to 3.017 m/day (0.25 to 9.9 feet/day), with a geometric mean of 0.53 m/day (1.74 feet/day). The hydraulic conductivity of the shallow bedrock, as determined from tests in two wells, is estimated to range from 0.152 to 1.920 m/day (0.5 to 6.3 feet/day) with a geometric mean of 0.625 m/day (2.05 feet/day). (NAPS. 2016a, Section 2.4.12.1.2)

Laboratory tests to determine the moisture content of saprolite samples indicate a median moisture content of about 17 percent. Laboratory tests to determine the specific gravity of saprolite samples indicate a median specific gravity of 2.65. Using the median moisture content of 17 percent and a value of 2.65 for the specific gravity of the saprolite, the void ratio of the saprolite is estimated to be about 0.45. Using a void ratio of 0.45 for the saprolite, the total porosity is estimated to be about

31 percent. The porosity is defined as the ratio of the volume of the voids to the total volume of the soil. Using a total porosity of 0.31, an effective porosity of about 25 percent is estimated based on 80 percent of the total porosity. (NAPS. 2016a, Section 2.4.12.1.2)

Based on the estimated hydraulic gradient, hydraulic conductivity, and effective porosity indicated above, groundwater beneath the NAPS site is expected to flow toward Lake Anna at a rate of about 0.35 feet/day. (NAPS. 2016a, Section 2.4.12.1.2)

E3.6.2.3 Potentiometric Surfaces

Groundwater at the NAPS site occurs in unconfined conditions in both the saprolite and underlying bedrock. The results of previous investigations at the NAPS site indicate that a hydrologic connection exists between the saprolite and the bedrock. (Dominion. 2006a, Section 2.3.1.2)

Figure E3.6-5 shows locations of onsite groundwater monitoring wells with construction details presented in Table E3.6-3. A contour map of the shallow groundwater based on water level data collected in 2013 and 2015 (as part of the Nuclear Energy Institute's (NEI) groundwater protection initiative [GPI] program) is provided as Figures E3.6-6a and E3.6-6b, respectively.

Groundwater within the protected area is hydraulically controlled by the geology, plant structures, and mat sumps with most of the water captured by the containment mat sumps. However, there are other preferred pathways for groundwater flow such that a component of the groundwater flow travels north of the turbine building towards Lake Anna. Shallow, silty soils near the Unit 1 rad waste storage tank have a very low hydraulic conductivity, whereas the weathered materials at the bedrock/soil interface have a high hydraulic conductivity. This deeper zone forms the primary pathway for groundwater flow. (Haley and Aldrich, Inc. 2015, Section 7)

E3.6.2.4 Groundwater Protection Program

In May 2006, the NEI approved the GPI, an industry-wide voluntary effort to enhance nuclear power plant operators' management of groundwater protection. In August 2007, NEI published updated guidance on implementing the GPI as NEI 07-07, Industry Ground Water Protection Initiative—Final Guidance Document (NEI. 2007).

Industry implementation of the GPI identifies actions to improve utilities' management and response to instances where the inadvertent release of radioactive substances may result in detectable levels of plant-related materials in subsurface soils and water, and describes communication of those instances to external stakeholders. Aspects addressed by the initiative include site hydrology and geology, site risk assessment, onsite groundwater monitoring, and remediation. (NEI. 2007) The goal of the GPI is to identify any leaks of licensed material as soon as possible.

In conjunction with the GPI and 10 CFR 20.1501, NAPS performs groundwater monitoring for potential radioactive releases to groundwater from 23 monitor wells and three piezometers in accordance with site procedures (NAPS. 2018b, Attachment 8). Additionally, NAPS implemented and maintains an underground piping and tank integrity program to provide a broad based and comprehensive program to reduce the probability and consequences of pipe and tank failure to an acceptable level. The scope of the Underground Piping and Tank Integrity Initiative includes all buried and underground piping and tanks that are outside of a building and below grade (whether or NOT they are in direct contact with the soil) if they are: a) safety-related; or b) contain licensed material or are known to be contaminated with licensed material; or c) contain environmentally hazardous material.

E3.6.2.5 Sole Source Aquifers

A sole source aquifer (SSA), as defined by the EPA, is an aquifer which supplies at least 50% of the drinking water consumed by the area overlying the aquifer, and there is no reasonably available alternative drinking water source should the aquifer become contaminated.

The SSA program was created by the U.S. Congress as part of the Safe Drinking Water Act and allows for the protection of these resources. (EPA. 2019b)

NAPS is located in EPA Region 3, which has oversight responsibilities for the public water supply in Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia. The EPA has designated six aquifers in EPA Region 3 as SSAs, two of which (Columbia and Yorktown-Eastover multi-aquifer system and Prospect Hill aquifer) are located in the Commonwealth of Virginia. (EPA. 2019b)

No aquifers in the Piedmont Plateau province of Virginia have been designated as sole source by the EPA. The aquifer (designated as sole source) nearest the NAPS site is about 120 miles to the southeast, at the southern end of the Delmarva Peninsula in Accomack and North Hampton counties, Virginia, within the coastal plain province. An area southeast of the site has been designated as the Eastern Virginia Ground Water Management Area by the VDEQ. Groundwater withdrawal in this area is permitted based on need and an evaluation by the VDEQ of the impacts of proposed withdrawals. The area, comprised of several counties or portions thereof in southeastern Virginia, lies entirely within the coastal plain province. (Dominion. 2006a, Section 2.3.1.2)

E3.6.3 WATER USE

E3.6.3.1 Surface Water Use

Surface water bodies within a 10-km (6.2-mile) radius of the NAPS site include Lake Anna and some of its tributaries, as illustrated on Figure E3.6-1. Non-consumptive water use of these surface water bodies is primarily recreational. Public use of the North Anna Reservoir includes fishing, boating, swimming, and water skiing. Public access is provided via Lake Anna State Park, which is on the Spotsylvania County side of the lake, and several commercially operated marinas and launch sites throughout the lake. Public fishing access is available at Dike 3. Access to the WHTF is limited to adjacent property owners. Recreational use of Lake Anna is seasonal with higher usage rates in the summer months. Future non-consumptive water use of the lake is expected to continue to be primarily recreational at usage rates comparable to current levels. (Dominion. 2006a, Section 2.3.2.1)

NAPS uses water from the North Anna Reservoir for main condenser cooling and for other auxiliary water systems such as makeup for the service water system. (NRC. 2002a, Section 2.1.3) The average surface water withdrawal rate by NAPS in 2019 was reported as 1,817.99 million gallons per day (MGD) and averaged 1,836.07 MGD between 2013 and 2019 (Table E3.6-4a). A summary of monthly surface water withdrawals reported by NAPS between 2013 and 2019 is included as Table E3.6-4b.

The 2019 withdrawal amount represents about 2% of the conservation and active storage volume (Table E3.6-1) of the North Anna Reservoir. Water use by NAPS is primarily non-consumptive; therefore, after passing through the condensers and the service water system, most of the water is returned to the North Anna Reservoir via the WHTF at Dike 3. (Dominion. 2006a, Section 2.3.2.1)

In 2015, total surface water withdrawals in Louisa County were reported as 1,926.66 MGD, of which 1,926.10 MGD was used for power generation. No surface water power-generation uses were reported for Spotsylvania County. The total surface water withdrawals in Spotsylvania County were reported as 11.36 MGD, of which 10.810 MGD was used for public supply with no reported power generation uses. Excluding power generation, surface water use for Louisa County in 2015 was reported as 0.56 MGD. (USGS. 2018b) A summary of surface water use in Louisa and Spotsylvania counties is presented in Table E3.6-5.

No known future surface water withdrawals from the affected hydrologic system are planned for Louisa County, even though the county population and water supply demand are projected to increase. The surface water sources anticipated to supply the future demand, such as Northeast Creek Reservoir and Lake Gordonsville, are located outside the Lake Anna watershed and the affected hydrologic system. (Dominion. 2006a, Section 2.3.2.1)

The Commonwealth of Virginia's Surface Water Management Act of 1989 and associated regulations (9 VAC 25-220-10 et seq.) impose legal restrictions on surface water withdrawals where surface water resources have a history of low flow conditions that threaten important in-stream and off-stream uses. The purposes of these regulations are to maintain surface water flow at minimum levels during periods of drought, ensure assimilation of treated wastewater, and support aquatic and other water-dependent wildlife. In areas designated by the State Water Control Board as surface water management areas, a surface water withdrawal permit is required for water withdrawals of 300,000 gallons per month or more. Permits and certificates must include a conservation plan that is activated during low-flow surface water conditions. As of January 2019, the Virginia State Water Control Board had not designated any surface water management areas in the state. (VDEQ. 2019c).

E3.6.3.2 Groundwater Use

Groundwater for use at and in the vicinity of the NAPS site is obtained from springs and wells in either the saprolite or underlying crystalline bedrock. Most wells completed in the saprolite have been excavated either by hand digging or auguring. These wells are susceptible to going dry due to seasonal fluctuations in the water table. Drilled wells generally extend through the saprolite to depths of up to several hundred feet in the underlying bedrock. These wells are cased from the ground surface to the top of bedrock. The production of groundwater in the vicinity of the NAPS site is generally not enough to satisfy large water demands because of the relatively low yield of the aquifers. The majority of groundwater development in the area is for domestic and agricultural use, with some public, light industrial, and commercial use. (Dominion. 2006a, Section 2.3.2.2)

In 2015, groundwater withdrawals within Louisa and Spotsylvania counties were reported as 2.24 MGD and 3.72 MGD, respectively. No groundwater usage for power generation was reported. Domestic, self-supplied water use was the largest consumer of groundwater in both Louisa (1.87 MGD) and Spotsylvania (3.45 MGD) counties. The remaining water use was for public supply, industrial, irrigation, and livestock supply purposes. (USGS. 2018b) A summary of groundwater use in Louisa and Spotsylvania counties is presented in Table E3.6-6.

No registered water wells or municipal water supply wells were located within a two-mile band around the NAPS property boundary. (USGS. 2020b)

Groundwater withdrawal for use by NAPS Units 1 and 2 is accomplished from three water supply wells permitted for public use by the VDH. These three wells (Nos. 6, 7, and 8) comprise a single water supply system at the site (VDH. 2014). A separately permitted well (NANIC) provides the water supply for the NANIC (VDH. 1991). Three small wells (metrology well, security training building well, and SS-1) do not require permits at the NAPS site and provide minor additional water for plant use. The locations of these wells are shown on Figure E3.6-5 and the wells are described in Table E3.6-3.

As a condition of the well permits, Dominion is required to report monthly groundwater withdrawals to the VDH and submit an annual report of water withdrawals (surface and groundwater) for the previous year to the VDEQ by January 31st of every year. The average groundwater withdrawal rate by NAPS in 2019 was reported as 7,969.86 gpd and averaged 8,059.80 gpd between 2013 and 2019 (Table E3.6-7a). Table E3.6-7b shows the monthly withdrawal quantities reported between 2013 and 2019.

E3.6.4 WATER QUALITY

E3.6.4.1 Surface Water Quality

The aquatic resources of Lake Anna are managed cooperatively by Dominion, the Virginia Department of Game and Inland Fisheries (VDGIF), and the Virginia Department of Conservation and Recreation (VDCR) (NRC. 2006, Section 2.7.2).

Lake Anna has multiple monitoring stations to allow the VDEQ to assess water quality. The water quality for the portion of Lake Anna where the NAPS operating units are located southward to the WHTF's second dike is rated as fully supporting for aquatic life, recreation, and wildlife, and impaired for fish consumption due to PCBs. The more southward portion of the lake is rated as fully supporting for aquatic life, recreation, and wildlife, but impaired for fish consumption due to PCBs and mercury. (VDEQ. 2018a)

Lake Anna and several tributaries to Lake Anna appear on the VDEQ's Virginia Water Quality Assessment 305(b)/303(d) Integrated Report 303(d) list of impaired waters:

- Lake Anna – *e. Coli,* polychlorinated biphenyls (PCBs), and mercury in fish tissue
- Contrary Creek – PCBs in fish tissue, heavy metals, pH, water temperature
- Christopher Creek – *e. Coli*
- Duckinghoe Creek – *e. Coli*
- Pamunkey Creek – Benthic-macroinvertebrate bioassessments
- Plentiful Creek – *e. Coli*
- Terrys Run – PCBs and mercury in fish tissue, *e. Coli*
- Goldmine Creek – PCBs in fish tissue, polyromantic hydrocarbons (PAHs), *e. Coli*

Development of total maximum daily load (TMDL) implementation plans for Goldmine Creek, Pamunkey Creek, Plentiful Creek, and Terrys Run were initiated in 2011 and completed in 2013. (VDEQ. 2018a)

Pre-existing environmental stresses on the water quality of Lake Anna are described in the CWA 316(a) demonstration report. One known impact is associated with acid mine drainage into Contrary Creek due to the historical mining of the Contrary Creek watershed for pyrite and gold ore (Dominion. 2006a, Section 2.3.3.1; SCDT. 2018). The land inundated to become Lake Anna was formerly called "Gold Hill" and was the location of the Goodwin Mine, the third-largest gold mine in the United States from 1830–1849 (SCDT. 2018). This drainage produced higher concentrations of metals and an acidic pH in the Contrary Creek arm of Lake Anna relative to the rest of the lake. (Dominion. 2006a, Section 2.3.3.1)

Prior to impoundment, the North Anna River wildlife and river structure upriver from Contrary Creek were typical for the piedmont of Virginia. Downriver from Contrary Creek, the density and diversity of fish and benthic macroinvertebrates were markedly reduced. The impoundment allowed the acid-tainted water to be diluted to mitigate the effects of the Contrary Creek pollutants (NRC. 2002a, Section 2.2.5).

Other known lake water impacts include elevated concentrations of nutrients associated with the application of fertilizers for crop production in the watershed. With declining agricultural activity in recent years, however, nutrient concentrations have decreased and stabilized since inundation. Compared to other regional lakes, there does not appear to be an excess of nutrients. (Dominion. 2006a, Section 2.3.3.1)

The known permitted discharges to Lake Anna are limited to those from NAPS Units 1 and 2. These sources and permitted discharge limits are described in the VPDES permit. (Dominion. 2006a, Section 2.3.3.1) NAPS is in compliance with its VPDES permit, as presented in Section E3.6.1.2, and does not contribute to these impairments.

Tables E3.6-8a and E3.6-8b summarizes temperature data collected at the intake and discharge between 2014 and 2018. Table E3.6-8c displays surface water quality data collected in the vicinity of Outfall 001 discharge between 2014 and 2018. These tables provide the maximum value reported for each constituent during the monitoring period. Surface water quality parameters were not collected for the intake between 2014 and 2017; however, Table E3.6-8d provides a comparison of the surface water quality parameters collected from the intake and Outfall 001 discharge on March 8, 2018.

E3.6.4.2 Groundwater Quality

Groundwater at the NAPS site occurs under water table conditions at depths ranging from about 6 to 58 feet in the saprolite and underlying metamorphic bedrock. The most dependable supplies of groundwater are obtained by wells drilled into the lower part of the weathered zone and the upper part of the underlying fractured bedrock. NAPS obtains potable water from wells in these zones. Regionally, this aquifer can be considered a Piedmont crystalline aquifer. This aquifer is the primary groundwater aquifer that could affect plant water use and effluent disposal, or be affected by construction activities, operation, or decommissioning of units at the NAPS site. (Dominion. 2006a, Section 2.3.3.2)

A number of studies have been conducted to characterize the water quality of the Piedmont crystalline aquifers in the region. Data published in these studies are consistent with the water quality data reported during 2016 and 2017 sampling events for water supply wells 6, 7, and 8 (Table E3.6-9a). Table E3.6-9b summarizes these regional data. (Dominion. 2006a, Section 2.3.3.2)

Based on the Louisa County water testing program undertaken in 1992, there is evidence of groundwater quality degradation near the NAPS site due to coliform contamination. Of the 119 wells tested for the program by Louisa County in 1992, 29 wells were in the Lake Anna watershed. Of those 29, 18 were residential, 10 were on farms, and one was at a quarry. Sixteen of the 29 wells were in the lakeside area. All wells in the Louisa County water testing program were tested for pH, total and fecal coliforms, metals, anions, and total organic carbon. Of the 29 wells in the Lake Anna watershed, total and fecal coliforms were present in 41% and 31% of the wells, respectively. Sources of this coliform contamination likely include the septic systems typically used by the residential developments and farms surrounding Lake Anna. Of the remaining parameters for which tests were conducted, only manganese and nitrate were found at elevated levels in the Louisa County portion of the Lake Anna watershed. Four of the 29 wells had manganese present at concentrations in excess of the secondary maximum contaminant level of 0.05 mg/l. One well, located on a farm, had nitrate present at a concentration in excess the maximum contaminant level of 10 mg/l. (Dominion. 2006a, Section 2.3.3.2)

As part of the NAPS radiological groundwater monitoring program, groundwater samples are collected from selected onsite monitoring wells and analyzed for radionuclides to detect potential impacts to groundwater from inadvertent leaks or spills. Samples are collected on a quarterly or monthly basis based on contamination risk potential. In 2010, elevated tritium levels, above the GPI guidance, were identified in PZ-3 with voluntary notification communicated to state and local governments. Additional investigations were conducted in 2011 to identify the source, including installation of GWP-6. Elevated tritium levels were identified in GWP-6 at that time and inspections were conducted of the Unit 1 RWST, Unit 1 casing cooling tank, and buried piping in the vicinity of GWP-6 to identify the source of tritium. In 2012, a 30-day voluntary groundwater report was submitted to the NRC (GWP-6 activity of 48,500 pCi/L). Inspections were completed with liner repairs of the Unit 1 and Unit 2 circulating water discharge tunnels (PZ-3). Additional investigations and well installations were performed in 2014. In 2016, cleanout and restoration of the Unit 1 and Unit 2 containment mat sumps was conducted. Based on periodic sample results, the actions taken to mitigate potential tritium pathways to ground in the area of GWP-6 have been effective.

Tritium concentrations in all onsite monitoring wells have been below the State of Virginia groundwater standard for tritium (20,000 pCi/L) (VAC. 2020) since 2014. In 2019, detected tritium concentrations ranged from 825 (GWP-3) to 12,930 (GWP-18) picocuries per liter. Actions are ongoing to investigate and mitigate potential tritium pathways to ground in the area of GWP-18.

Industrial practices at NAPS that involve the use of chemicals are those activities typically associated with painting, cleaning of parts/equipment, refueling of onsite vehicles/generators, fuel oil and gasoline storage, and the storage and use of water treatment additives. The use and storage of chemicals at NAPS are controlled in accordance with Dominion's fleet chemical control procedure and site-specific spill prevention plans. In addition, nonradioactive waste is managed in accordance with Dominion's waste management procedure, which contains preparedness and prevention control measures.

E3.6.4.2.1 History of Radioactive Releases

No unplanned radioactive liquid releases were reported between 2012 and 2019 (NAPS. 2013; NAPS. 2014a; NAPS. 2015b; NAPS. 2016b; NAPS. 2017a; NAPS. 2018b). One unplanned gaseous release was reported in 2014 (NAPS. 2015b).

On March 2, 2014, a high alarm was received on Vent Valve A (VVA) radiation monitor 1-VG-RM-179 and Vent Valve B (VVB) radiation monitor 1-VG-RM-180, while chemistry personnel were attempting to obtain a sample of the Unit 1 volume control tank (VCT) gas space. Per station procedure, when chemistry obtains a VCT gas space sample, they purge the sample line to the gas strippers to obtain a representative sample. In this instance, the purge header drain valve, 1-SS-56, was found to be in the open position versus its normally closed position. This open valve position allowed gas being purged to go directly to the chemistry sample sink hood, which is ventilated by VVA, instead of following the normal flow path to the gas strippers, leading to an unplanned release. The chemistry sample sink release pathway is normally through VVA exclusively. However, because auxiliary building central exhaust was aligned to pass through the charcoal filter banks for this release, damper leaks within the iodine filtration system caused a release to and subsequent alarm from both release pathways, VVA and VVB. Peak total release rate was 3.19E-3 Ci/sec. (NAPS. 2015b). The resulting dose calculated in accordance with the offsite dose calculation manual (ODCM) was a fraction (approximately 5.1%) of the allowable limit established in the ODCM.

E3.6.4.2.2 History of Nonradioactive Releases

Based on the review of site records from the seven years from 2013–2019, there has been no inadvertent nonradioactive release that would not be classified as an incidental spill as defined by OSHA (i.e. other than "a release of a hazardous substance which does not pose a significant safety or health hazard to employees in the immediate vicinity or to the worker cleaning it up, nor does it have the potential to become an emergency.")

Table E3.6-1 Lake Anna Storage Allocation

Purpose	Volume	
	Acre-Feet	MG
Minimum recreational pool and inactive storage below 246 feet msl	255,000	83,092
Conservation and active storage, 246 to 250 feet msl	50,000	16,293
Flood control storage, 250 to 265 feet msl	245,000	79,833
Total storage	**550,000**	**179,218**

(Dominion. 2006b; Table 2.3-1)
MG = millions of gallons

Table E3.6-2 VPDES Water Quality Monitoring Program

Outfall	Description	Parameter	Permit Requirement	Frequency
001	Discharge of Condenser Cooling Water from Waste Heat Treatment Facility at Dike 3	Flow	No limit, monitor and report	1/week
		pH	6.0–9.0 standard units (SU)	1/week
		Total Residual Chlorine (TRC)	0.011 mg/L monthly average, daily maximum 0.011 mg/L	1/month
		Temperature	No limitation	1/week
		Total Nitrogen	No limitation; semi-annual monitoring and reporting required	1/6 months
		Total Kjeldahl Nitrogen (TKN)	No limitation; semi-annual monitoring and reporting required	1/6 months
		Nitrate + Nitrite (NO_2+NO_3)	No limitation; semi-annual monitoring and reporting required	1/6 months
		Total Phosphorus	No limitation; semi-annual monitoring and reporting required	1/6 months
		Chronic Toxicity *C. dubia* and *P. promelas*	No limit, monitor and report	1/year
009	Settling Pond	Flow	No limit, monitor and report	2/month
		pH	6.0–9.0 SU	2/month
		Oil and Grease (O&G)	15 mg/L monthly average, daily maximum 20 mg/L	1/3 months
		Total Suspended Solids (TSS)	30 mg/L monthly average, daily maximum 100 mg/L	1/3 months
013	Turbine Building Sumps - #1 and #2 (same as Outfall 104)	Flow	No limit, monitor and report	1/month
		pH	6.0–9.0 SU	1/month
		O&G	15 mg/L monthly average, daily maximum 20 mg/L	1/month
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/month
016	Intake Screen Wash Water	Flow	No limit, monitor and report	1/year

Table E3.6-2 VPDES Water Quality Monitoring Program

Outfall	Description	Parameter	Permit Requirement	Frequency
020	Reverse Osmosis Reject (pre NAPS Unit 3 construction)	Flow	No limit, monitor and report	2/month
		pH	6.0–9.0 SU	2/month
		TRC	4.0 mg/L daily maximum	2/month
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/3 months
021	Reverse Osmosis Drain Line	Flow	No limit, monitor and report	1/3 months
028	Beyond Design Basis Pumps / Portable Emergency Water Supply Pumps	Flow	No limit, monitor and report	1/3 months
101	Condenser Cooling Water	Flow	No limit, monitor and report	1/day
		Temperature – Inlet Condenser Waterbox	No limit, monitor and report	1/day
		Temperature – Outlet Condenser Waterbox	No limit, monitor and report	1/day
		Heat Rejection	13.54×10^9 BTU/hr	1/day
103	Process Water Clarifier	Flow	No limit, monitor and report	1/year
		pH	6.0–9.0 SU	1/year
		O&G	15 mg/L monthly average, daily maximum 20 mg/L	1/year
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/year
104	Turbine Building Sumps – 1, 2, and 3	Flow	No limit, monitor and report	1/year
		pH	6.0–9.0 SU	1/year
		O&G	15 mg/L monthly average, daily maximum 20 mg/L	1/year
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/year

Table E3.6-2 VPDES Water Quality Monitoring Program

Outfall	Description	Parameter	Permit Requirement	Frequency
105	Bearing Cooling Tower Blowdown	Flow	No limit, monitor and report	1/month
		pH	6.0–9.0 SU	1/month
		Free Available Chlorine	0.2 mg/L monthly average, daily maximum 0.5 mg/L	1/month
		Total Chromium	0.2 mg/L monthly average, daily maximum 0.2 mg/L	1/3month
		Total Zinc	1.0 mg/L monthly average, daily maximum 1.0 mg/L	1/3month
		126 Priority Pollutants	Non-detectable	1/3month
107	Bearing Cooling Tower and Strainer Blowdown	Flow	No limit, monitor and report	1/year
		TRC	Daily maximum 4.0 mg/L	1/year
108	Service Water Overflow	Flow	No limit, monitor and report	1/year
		pH	6.0–9.0 SU	1/year
		O&G	15 mg/L monthly average, daily maximum 20 mg/L	1/year
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/year
109	Hot Well Drain (Unit 1)	Flow	No limit, monitor and report	1/year
		pH	6.0–9.0 SU	1/year
		O&G	15 mg/L monthly average, daily maximum 20 mg/L	1/year
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/year
110	Hot Well Drain (Unit 2)	Flow	No limit, monitor and report	1/year
		pH	6.0–9.0 SU	1/year
		O&G	15 mg/L monthly average, daily maximum 20 mg/L	1/year
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/year

Table E3.6-2 VPDES Water Quality Monitoring Program

Outfall	Description	Parameter	Permit Requirement	Frequency
111	Sewage Treatment Plant (0.030 MGD)	Flow	No limit, monitor and report	1/day
		pH	6.0–9.0 SU	1/month
		Biochemical Oxygen Demand (BOD)	30 mg/L monthly average, weekly average 45 mg/L	1/month
		TSS	30 mg/L monthly average, weekly average 45 mg/L	1/month
		TRC (after contact tank)	1.0 mg/L minimum	1/day
		Influent BOD_5	No limit, monitor and report	1/year
		Influent TSS	No limit, monitor and report	1/year
112	Steam Generator Blowdown (Unit 1)	Flow	No limit, monitor and report	1/year
		pH	6.0–9.0 SU	1/year
		O&G	15 mg/L monthly average, daily maximum 20 mg/L	1/year
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/year
113	Steam Generator Blowdown (Unit 2)	Flow	No limit, monitor and report	1/year
		pH	6.0–9.0 SU	1/year
		O&G	15 mg/L monthly average, daily maximum 20 mg/L	1/year
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/year
114	Service Water Tie-On Vault Drain	Flow	No limit, monitor and report	1/year
		pH	6.0–9.0 SU	1/year
		O&G	15 mg/L monthly average, daily maximum 20 mg/L	1/year
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/year

Table E3.6-2 VPDES Water Quality Monitoring Program

Outfall	Description	Parameter	Permit Requirement	Frequency
115	Service Water High Capacity Blowdown (same as Outfall 108)	Flow	No limit, monitor and report	1/year
		pH	6.0–9.0 SU	1/year
		O&G	15 mg/L monthly average, daily maximum 20 mg/L	1/year
		TSS	30 mg/L monthly average, daily maximum 100 mg/L	1/year
116	Vacuum Priming Pump	Flow	No limit, monitor and report	1/6 months
117	Salt Storage Pond	Flow	No limit, monitor and report	1/year contingent on storm events
118	Beyond Design Basis Pumps / Portable Emergency Water Supply Pumps	Flow	No limit, monitor and report	1/3 months

(Attachment B)

Table E3.6-3 NAPS Groundwater Monitor Well and Water Supply Well Details (2020)

Well	Installation Date	Approximate Location (NAD83)		Well Diameter (inches)	Elevations (feet NAVD88)				Well Construction Material
		Latitude	Longitude		Top of Casing	Ground Surface	Top of Screen (approx.)	Bottom of Well (approx.)	
Monitor Wells and Piezometers									
GWP-3	2/22/2011	38.060925	-77.789481	1	271.87	272.24	256.74	241.74	Sch 40 PVC screen and riser
GWP-4	2/23/2011	38.060958	-77.789372	1	272.02	272.24	255.04	240.04	Sch 40 PVC screen and riser
GWP-5A	3/2/2011	38.060983	-77.789278	1	272.03	272.23	256.23	246.23	Sch 40 PVC screen and riser
GWP-6	1/26/2015	38.060954	-77.789269	4	270.55	270.83	255.83	245.83	Sch 40 PVC screen and riser
GWP-7	2/17/2011	38.060993	-77.789199	1	271.93	272.18	255.53	245.53	Sch 40 PVC screen and riser
GWP-8	2/23/2011	38.061043	-77.789073	1	272.15	272.36	255.36	250.36	Sch 40 PVC screen and riser
GWP-9	2/24/2011	38.061278	-77.788943	1	272.12	272.33	259.33	249.33	Sch 40 PVC screen and riser
GWP-13	8/15/2013	38.060863	-77.789089	1	271.00	271.39	251.39	241.39	Sch 40 PVC screen and riser
GWP-14	8/14/2013	38.060663	-77.789121	2	271.53	271.78	249.78	240.08	Sch 40 PVC screen and riser
GWP-15R	6/12/2018	38.060499	-77.790761	2	—	—	19.5 bgs	34.5 bgs	Sch 40 PVC screen and riser
GWP-16	8/13/2013	38.060196	-77.791047	2	270.95	271.25	248.25	238.55	Sch 40 PVC screen and riser
GWP-17	8/16/2013	38.060053	-77.790380	2	271.29	271.62	249.62	239.92	Sch 40 PVC screen and riser
GWP-18	8/20/2013	38.060117	-77.789627	2	271.13	271.67	251.17	241.47	Sch 40 PVC screen and riser

Table E3.6-3 NAPS Groundwater Monitor Well and Water Supply Well Details (2020)

Well	Installation Date	Approximate Location (NAD83)		Well Diameter (inches)	Elevations (feet NAVD88)				Well Construction Material
		Latitude	Longitude		Top of Casing	Ground Surface	Top of Screen (approx.)	Bottom of Well (approx.)	
GWP-19	12/3/2014	38.060919	-77.789353	2	270.46	270.88	251.08	241.08	—
GWP-20	12/8/2014	38.060939	-77.789300	2	270.69	270.90	247.50	237.50	—
GWP-21	1/22/2015	38.060953	-77.789213	2	270.62	270.86	248.86	238.86	—
GWP-22	1/26/2015	38.060978	-77.789167	2	270.83	271.07	251.07	241.07	—
GWP-23	1/27/2015	38.060876	-77.789126	2	270.81	271.83	265.33	260.33	—
OW-841	12/2002	38.060734	-77.791882	2	251.62	250.12	228.10	218.40	—
OW-842	12/2002	38.056590	-77.797669	—	336.74	335.24	297.80	288.20	—
OW-843	12/2002	38.058488	-77.797971	—	320.58	319.08	282.10	272.40	—
OW-844	12/2002	38.058960	-77.792643	—	271.51	270.01	257.60	248.00	—
OW-845	12/2002	38.058840	-77.795591	—	297.31	295.81	253.00	243.30	—
OW-846	12/2002	38.058803	-77.795659	—	297.27	295.77	273.50	263.70	—
OW-847	12/2002	38.056318	-77.793161	—	319.72	318.22	280.60	271.00	—
OW-848	12/2002	38.061561	-77.793719	—	284.51	283.01	240.80	235.80	—
OW-849	12/2002	38.061408	-77.799075	—	298.54	296.14	259.40	249.70	—
OW-901	11/2006	38.058600	-77.794981	—	311.30	309.60	214.60	204.60	—
OW-945	11/2006	38.059643	-77.802349	—	283.10	281.58	240.10	230.10	—
OW-946	11/2006	38.055939	-77.802281	—	335.60	334.06	303.60	293.60	—
OW-947	11/2006	38.058061	-77.793408	—	315.10	313.32	268.30	258.30	—
OW-949	11/2006	38.056564	-77.797654	—	336.90	335.66	243.20	233.20	—
OW-950	11/2006	38.061530	-77.793677	—	284.50	282.99	203.00	193.00	—
OW-951	11/2006	38.060639	-77.791945	—	250.70	249.71	194.60	184.60	—
P-10	1998	38.057513	-77.788440	2	286.40	284.00	267.00	261.50	Sch 40 PVC screen and riser

Table E3.6-3 NAPS Groundwater Monitor Well and Water Supply Well Details (2020)

Well	Installation Date	Approximate Location (NAD83)		Well Diameter (inches)	Elevations (feet NAVD88)				Well Construction Material
		Latitude	Longitude		Top of Casing	Ground Surface	Top of Screen (approx.)	Bottom of Well (approx.)	
P-14	1993	38.058641	-77.789346	2	327.10	324.00	272.10	267.10	Sch 40 PVC screen and riser
P-18	1993	38.058382	-77.791091	2	329.00	326.00	274.00	269.00	Sch 40 PVC screen and riser
P-19	1990	38.058286	-77.791402	2	322.30	320.00	266.50	261.50	Sch 40 PVC screen and riser
P-20	1990	38.058640	-77.790027	2	320.60	320.00	264.00	259.00	Sch 40 PVC screen and riser
P-21	1990	38.057985	-77.788460	2	319.20	320.00	264.00	261.50	Sch 40 PVC screen and riser
P-22	1990	38.057179	-77.789475	2	320.50	320.00	265.00	260.00	Sch 40 PVC screen and riser
P-23	1998	38.057877	-77.788211	2	296.40	294.00	258.70	253.20	Sch 40 PVC screen and riser
P-24	1998	38.056964	-77.789324	2	293.40	291.00	271.30	266.10	Sch 40 PVC screen and riser
PZ-1	unknown	38.060898	-77.789480	2	271.06	—	—	—	—
PZ-2	unknown	38.060889-	-77.789520	2	274.15	—	—	—	—
PZ-3	unknown	38.060954	-77.789384	2	271.86	272.29	—	—	Sch 40 PVC screen and riser
BTW-1	7/19/2007	38.063294	-77.786606	2	271.42	268.53	253.53	233.53	Sch 40 PVC screen and riser
BTW-2	7/12/2007	38.062836	-77.789462	2	256.06	261.93	248.43	233.43	Sch 40 PVC screen and riser
BTW-4	7/16/2007	38.059613	-77.787724	2	273.14	270.30	257.80	245.30	Sch 40 PVC screen and riser
TTW-2	5/23/2008	38.061167	-77.788184	2	270.17	269.17	256.67	241.67	Sch 40 PVC screen and riser

Table E3.6-3 NAPS Groundwater Monitor Well and Water Supply Well Details (2020)

Well	Installation Date	Approximate Location (NAD83)		Well Diameter (inches)	Elevations (feet NAVD88)				Well Construction Material
		Latitude	Longitude		Top of Casing	Ground Surface	Top of Screen (approx.)	Bottom of Well (approx.)	
TTW-3	7/18/2007	38.061851	-77.786801	2	265.00	265.47	254.47	230.37	Sch 40 PVC screen and riser
TTW-5	5/22/2008	38.059503	-77.789221	2	289.36	286.90	266.90	246.90	Sch 40 PVC screen and riser
WP-3	unknown	38.053622	-77.795653	—	309.90	—	266.50	261.50	—
Water Wells									
Well No. 6	10/21/1981	38.057918	-77.793167	6	—	—	142 bgs	375 bgs	6" steel to 142' bgs, open hole to 375'
Well No. 7	12/16/2003	38.055386	-77.791628	8	—	—	130 bgs	730 bgs	8" steel to 103' bgs, open hole to 730'
Well No. 8	5/24/2012	38.055616	-77.796848	8	333.68	331.68	237.68	-561.32	8" sch 40 steel to 94' bgs, open hole to 893'
NANIC Well	1991	38.054024	-77.799660	8	—	—	72 bgs	260 bgs	8" steel to 72' bgs, open hole to 260'
SS-1	9/24/2013	38.060496	-77.795646	8	284.56	283.06	182.31	-116.94	8" sch 40 steel to 100.75' bgs, open hole to 400'
Metrology Lab Well	unknown	38.053530	-77.781134	—	—	—	—	—	—
Security Training Bldg Well	unknown	38.054953	-77.783864	—	—	—	—	—	—

(Haley and Aldrich, Inc. 2015; NAPS. 2016c, Table 2.4-15R; NOAA. 2017)

bgs = below ground surface

"—" = data not available

Table E3.6-4a NAPS Yearly Surface Water Withdrawal Summary

Year	Monthly Maximum		Monthly Average		Monthly Minimum		Yearly Total	
	MGM	gpm_a	MGM	gpm_a	MGM	gpm_a	MGY	MGD
2013	72,660.00	1,641,690	52,411.09	1,195,242	32,126.04	743,658	628,933.06	1,723.10
2014	70,673.16	1,620,139	54,202.22	1,236,203	35,213.93	788,843	650,426.58	1,781.99
2015	74,653.18	1,672,338	58,585.48	1,335,992	28,967.94	648,923	703,025.72	1,926.10
2016	72,322.78	1,620,134	54,398.38	1,238,244	29,400.40	658,611	652,780.50	1,783.55
2017	72,173.30	1,644,485	58,903.97	1,342,638	39,259.60	959,142	706,847.64	1,936.57
2018	73,911.56	1,655,725	57,280.28	1,304,044	30,499.88	683,241	687,363.36	1,883.19
2019	73,456.01	1,645,520	55,297.26	1,260,686	23,479.88	525,983	663,567.07	1,817.99
2013-2019	74,653.18	1,672,338	55,868.38	1,273,293	23,479.88	525,983	670,420.56	1,836.07

MGY = millions of gallons per year

MGM = millions of gallons per month

gpm_a - average gallons per minute for the month (rounded to nearest gpm)

Table E3.6-4b NAPS Monthly Surface Water Withdrawal Summary

Month	Surface Water Withdrawals (MGM)					Total	
	North Anna Dam	Lake Anna Unit #1	Lake Anna Unit #2	NA3 CW	Mini-SY CW	MGM	gpm_a
January-13	675.66	22,729.00	21,181.00	0.000	(a)	44,585.66	998,782.71
February-13	1,704.91	20,256.00	19,461.00	0.034	(a)	41,421.94	1,027,329.95
March-13	2,314.05	22,910.00	22,209.00	0.010	(a)	47,433.06	1,062,568.54
April-13	2,223.03	25,400.00	4,503.00	0.008	(a)	32,126.04	743,658.30
May-13	0.00	32,549.00	12,128.00	0.013	(a)	44,677.01	1,000,829.14
June-13	0.00	35,665.00	35,256.00	0.007	(a)	70,921.01	1,641,689.97
July-13	0.00	37,022.00	35,638.00	0.000	(a)	72,660.00	1,627,688.17
August-13	105.03	36,867.00	35,495.00	0.000	(a)	72,467.03	1,623,365.37
September-13	1,288.31	8,612.00	35,191.00	0.008	(a)	45,091.32	1,043,780.51
October-13	0.00	21,984.00	34,797.00	0.000	(a)	56,781.00	1,271,975.81
November-13	241.56	29,077.00	29,420.00	0.000	(a)	58,738.56	1,359,688.89
December-13	1,799.43	20,333.00	19,898.00	0.000	(a)	42,030.43	941,541.89
January-14	2,541.06	19,997.00	19,682.00	0.000	(a)	42,220.06	945,789.87
February-14	3,071.84	18,852.00	18,181.00	0.000	(a)	40,104.84	994,663.69
March-14	3,396.88	21,632.00	19,588.00	0.000	(a)	44,616.88	999,482.08
April-14	3,154.24	27,273.00	26,070.00	0.000	(a)	56,497.24	1,307,806.48
May-14	0.00	34,572.00	33,472.00	0.000	(a)	68,044.00	1,524,283.15
June-14	0.00	34,635.00	35,355.00	0.000	(a)	69,990.00	1,620,138.89
July-14	0.00	34,855.00	35,395.00	0.000	(a)	70,250.00	1,573,700.72
August-14	693.16	34,680.00	35,300.00	0.000	(a)	70,673.16	1,583,180.11
September-14	730.32	35,857.00	7,029.00	0.000	(a)	43,616.32	1,009,637.04
October-14	242.36	34,000.00	20,484.00	0.000	(a)	54,726.36	1,225,948.92
November-14	778.79	28,070.00	25,625.00	0.000	(a)	54,473.79	1,260,967.36
December-14	783.93	14,664.00	19,766.00	0.000	(a)	35,213.93	788,842.52

Table E3.6-4b NAPS Monthly Surface Water Withdrawal Summary

Month	Surface Water Withdrawals (MGM)					Total	
	North Anna Dam	Lake Anna Unit #1	Lake Anna Unit #2	NA3 CW	Mini-SY CW	MGM	gpm_a
January-15	1,649.96	20,959.00	19,468.00	0.000	(a)	42,076.96	942,584.23
February-15	2,352.56	18,695.00	18,365.00	0.000	(a)	39,412.56	977,494.05
March-15	1,687.94	7,406.00	19,874.00	0.000	(a)	28,967.94	648,923.39
April-15	1,196.21	23,347.00	24,211.00	0.000	(a)	48,754.21	1,128,569.68
May-15	2,367.63	34,403.00	34,650.00	0.000	(a)	71,420.63	1,599,924.51
June-15	713.90	34,792.00	34,352.00	0.000	(a)	69,857.90	1,617,081.02
July-15	1939.18	36572.00	36142.00	0.000	(a)	74,653.18	1,672,338.26
August-15	640.91	34684.00	34973.00	0.000	(a)	70,297.91	1,574,773.97
September-15	799.25	35040.00	35206.00	0.000	(a)	71,045.25	1,644,565.97
October-15	1241.44	32696.00	34275.00	0.000	(a)	68,212.44	1,528,056.45
November-15	1897.71	28029.00	32893.00	0.000	(a)	62,819.71	1,454,159.95
December-15	3406.03	26168.00	25933.00	0.000	(a)	55,507.03	1,243,437.05
January-16	3545.63	21474.00	20154.00	0.000	(a)	45,173.63	1,011,954.08
February-16	3221.24	20325.00	18534.00	0.000	(a)	42,080.24	1,007,668.58
March-16	3562.40	22074.00	3764.00	0.000	(a)	29,400.40	658,611.11
April-16	1741.34	27098.00	19671.00	0.000	(a)	48,510.34	1,122,924.54
May-16	3485.78	34978.00	33859.00	0.000	(a)	72,322.78	1,620,133.96
June-16	1307.17	32894.00	34460.00	0.000	(a)	68,661.17	1,589,378.94
July-16	1675.80	36109.00	33665.00	0.000	(a)	71,449.80	1,600,577.96
August-16	965.03	34797.00	32529.00	0.000	(a)	68,291.03	1,529,816.98
September-16	854.50	11689.00	35111.00	0.000	(a)	47,654.50	1,103,113.43
October-16	1475.13	17239.00	34205.00	0.000	(a)	52,919.13	1,185,464.38
November-16	681.67	31286.00	31806.00	0.000	(a)	63,773.67	1,476,242.36
December-16	1322.81	20958.00	20263.00	0.000	(a)	42,543.81	953,042.34

Table E3.6-4b NAPS Monthly Surface Water Withdrawal Summary

Month	Surface Water Withdrawals (MGM)					Total	
	North Anna Dam	Lake Anna Unit #1	Lake Anna Unit #2	NA3 CW	Mini-SY CW	MGM	gpm_a
January-17	2964.11	20207.00	19645.00	0.000	(a)	42,816.11	959,142.25
February-17	1742.60	19120.00	18397.00	0.000	(a)	39,259.60	973,700.40
March-17	1958.56	27501.00	27961.00	0.000	(a)	57,420.56	1,286,302.87
April-17	2199.87	28787.00	32038.00	0.000	(a)	63,024.87	1,458,909.03
May-17	3389.30	32959.00	35825.00	0.000	(a)	72,173.30	1,616,785.39
June-17	918.74	35024.00	35099.00	0.000	(a)	71,041.74	1,644,484.72
July-17	387.00	36447.00	33665.00	0.000	(a)	70,499.00	1,579,278.67
August-17	786.13	35209.00	35144.00	0.000	(a)	71,139.13	1,593,618.50
September-17	864.76	35419.00	11524.00	0.000	(a)	47,807.76	1,106,661.11
October-17	526.57	34783.00	27596.00	0.000	(a)	62,905.57	1,409,174.96
November-17	0.00	31709.00	31530.00	0.000	(a)	63,239.00	1,463,865.74
December-17	0.00	24202.00	21319.00	0.000	(a)	45,521.00	1,019,735.66
January-18	0.00	19986.00	18824.00	0.000	(a)	38,810.00	869,400
February-18	1914.91	18727.00	18476.00	0.000	(a)	39,117.91	936,732
March-18	2115.88	7392.00	20992.00	0.000	(a)	30,499.88	683,241
April-18	3527.39	22535.00	25912.00	0.000	(a)	51,974.39	1,203,111
May-18	2322.56	35691.00	35898.00	0.000	(a)	73,911.56	1,655,725
June-18	0.00	35244.00	35234.00	0.000	(a)	70,478.00	1,631,435
July-18	0.00	36657.00	33665.00	0.000	(a)	70,322.00	1,575,314
August-18	0.00	35317.00	35018.00	0.000	(a)	70,335.00	1,575,605
September-18	0.00	35277.00	34923.00	0.000	(a)	70,200.00	1,625,000
October-18	0.00	34598.00	34288.00	0.000	(a)	68,886.00	1,543,145
November-18	0.00	31070.00	30952.00	0.000	(a)	62,022.00	1,435,694
December-18	1478.62	19764.00	19564.00	0.000	(a)	40,806.62	914,127

Table E3.6-4b NAPS Monthly Surface Water Withdrawal Summary

Month	Surface Water Withdrawals (MGM)					Total	
	North Anna Dam	Lake Anna Unit #1	Lake Anna Unit #2	NA3 CW	Mini-SY CW	MGM	gpm_a
January-19	2831.74	19374.00	19073.00	0.000	(a)	41,278.74	924,703
February-19	2235.64	18482.00	17641.00	0.000	(a)	38,358.64	951,355
March-19	257.88	21977.00	1245.00	0.000	(a)	23,479.88	525,983
April-19	0.00	27651.00	25236.00	0.000	0.000	52,887.00	1,224,236
May-19	0.00	34142.00	35923.00	0.000	0.000	70,065.00	1,569,556
June-19	0.00	34905.00	35058.00	0.000	0.000	69,963.00	1,619,514
July-19	0.00	36634.00	36620.00	0.000	0.009	73,254.01	1,640,995
August-19	0.00	37043.00	36413.00	0.000	0.006	73,456.01	1,645,520
September-19	0.00	9347.00	35112.00	0.000	0.000	44,459.00	1,029,144
October-19	0.00	35423.00	35494.00	0.000	0.005	70,917.00	1,588,643
November-19	0.00	31029.00	31081.00	0.000	0.000	62,110.00	1,437,731
December-19	421.79	21996.00	20921.00	0.000	0.000	43,338.79	970,851

a. Mini-switchyard construction water withdrawals began in spring 2019.

NA3 CW = North Anna Unit 3 Construction Water; Mini-SY CW = Mini-Switchyard Construction Water

MG = millions of gallons; MGM = millions of gallons per month; gpm_a = average gallons per minute for the month

Table E3.6-5 Surface Water Usage Summary in MGD, 2015

Category	Louisa County	Spotsylvania County
Public Supply	0.26	10.81
Domestic, Self-Supplied	0.00	0.00
Industrial	0.00	0.00
Irrigation	0.15	0.20
Livestock	0.15	0.13
Aquaculture	0.00	0.00
Mining	0.00	0.22
Power Generation	1926.10	0.00
Total	**1926.66**	**11.36**

(USGS. 2018b)

Table E3.6-6 Ground Water Usage Summary in MGD, 2015

Category	Louisa County	Spotsylvania County
Public Supply	0.27	0.24
Domestic, Self-Supplied	1.87	3.45
Industrial	0.05	0.00
Irrigation	0.03	0.02
Livestock	0.02	0.01
Aquaculture	0.00	0.00
Mining	0.00	0.00
Power Generation	0.00	0.00
Total	**2.24**	**3.72**

(USGS. 2018b)

Table E3.6-7a NAPS Yearly Groundwater Withdrawal Summary

Year	Monthly Maximum		Monthly Average		Monthly Minimum		Yearly Total	
	MGM	gpm_a	MGM	gpm_a	MGM	gpm_a	MGY	MGD
2013	0.50	11.57	0.34	7.70	0.15	3.41	4.04	11,075.32
2014	0.46	10.65	0.25	5.59	0.14	3.16	2.94	8,058.80
2015	0.40	8.96	0.22	5.06	0.05	1.16	2.67	7,309.78
2016	0.49	10.93	0.23	5.22	0.11	2.46	2.76	7,537.03
2017	0.39	9.03	0.23	5.13	0.10	2.51	2.70	7,399.25
2018	0.32	7.10	0.22	4.90	0.14	3.22	2.58	7,068.58
2019	0.47	10.95	0.24	5.54	0.10	2.28	2.91	7,969.86
2013–2019	0.50	11.57	0.25	5.59	0.05	1.16	2.94	8,059.80

MGY = millions of gallons

MGM = millions of gallons per month

gpd = gallons per day

gpm_a = average gallons per minute for the month

Table E3.6-7b NAPS Monthly Groundwater Withdrawal Summary

Month	Groundwater Wells (MGM)					Monthly Total	
	NANIC	#4	#6	#7	#8	MGM	gpm[a]
January-13	0.006	0.290	0.000	0.020	0.000	0.316	7.079
February-13	0.010	0.250	0.000	0.000	0.000	0.294	7.279
March-13	0.020	0.310	0.000	0.001	0.000	0.341	7.632
April-13	0.010	0.490	0.000	0.000	0.000	0.508	11.769
May-13	0.010	0.390	0.000	0.000	0.000	0.413	9.250
June-13	0.010	0.300	0.000	0.000	0.000	0.317	7.331
July-13	0.010	0.340	0.000	0.000	0.000	0.350	7.844
August-13	0.010	0.400	0.000	0.003	0.000	0.413	9.252
September-13	0.010	0.050	0.000	0.320	0.000	0.388	8.984
October-13	0.000	0.000	0.000	0.220	0.000	0.220	4.929
November-13	0.260	(a)	0.000	0.150	0.000	0.410	9.491
December-13	0.010	(a)	0.002	0.120	0.020	0.152	3.405
January-14	0.010	(a)	0.000	0.130	0.001	0.141	3.159
February-14	0.010	(a)	0.000	0.140	0.000	0.150	3.724
March-14	0.020	(a)	0.010	0.120	0.000	0.150	3.367
April-14	0.010	(a)	0.140	0.020	0.000	0.170	3.935
May-14	0.010	(a)	0.200	0.000	0.020	0.230	5.152
June-14	0.010	(a)	0.050	0.040	0.220	0.320	7.407
July-14	0.010	(a)	0.140	0.190	0.000	0.340	7.616
August-14	0.020	(a)	0.180	0.180	0.000	0.380	8.513
September-14	0.010	(a)	0.260	0.190	0.000	0.460	10.648
October-14	0.020	(a)	0.160	0.110	0.000	0.290	6.496
November-14	0.010	(a)	0.080	0.070	0.000	0.160	3.704
December-14	0.010	(a)	0.070	0.070	0.000	0.150	3.360
January-15	0.010	(a)	0.030	0.010	0.002	0.052	1.165
February-15	0.010	(a)	0.110	0.040	0.000	0.160	3.968
March-15	0.010	(a)	0.290	0.030	0.000	0.330	7.392
April-15	0.010	(a)	0.100	0.050	0.000	0.160	3.704
May-15	0.010	(a)	0.060	0.120	0.008	0.198	4.435
June-15	0.030	(a)	0.050	0.160	0.030	0.270	6.250
July-15	0.010	(a)	0.030	0.030	0.330	0.400	8.961
August-15	0.010	(a)	0.000	0.000	0.330	0.340	7.618
September-15	0.010	(a)	0.000	0.000	0.280	0.290	6.713
October-15	0.010	(a)	0.000	0.030	0.170	0.210	4.704

Table E3.6-7b NAPS Monthly Groundwater Withdrawal Summary

Month	Groundwater Wells (MGM)					Monthly Total	
	NANIC	#4	#6	#7	#8	MGM	gpm[a]
November-15	0.010	(a)	0.008	0.100	0.000	0.118	2.731
December-15	0.010	(a)	0.040	0.090	0.000	0.140	3.136
January-16	0.010	(a)	0.060	0.070	0.000	0.140	3.136
February-16	0.010	(a)	0.110	0.050	0.000	0.170	4.071
March-16	0.010	(a)	0.320	0.090	0.000	0.420	9.409
April-16	0.010	(a)	0.110	0.120	0.000	0.240	5.556
May-16	0.010	(a)	0.000	0.140	0.000	0.150	3.365
June-16	0.010	(a)	0.000	0.180	0.000	0.190	4.398
July-16	0.010	(a)	0.000	0.220	0.000	0.230	5.159
August-16	0.010	(a)	0.008	0.400	0.070	0.488	10.932
September-16	0.010	(a)	0.000	0.250	0.000	0.260	6.019
October-16	0.010	(a)	0.000	0.220	0.000	0.230	5.152
November-16	0.010	(a)	0.000	0.120	0.000	0.130	3.010
December-16	0.010	(a)	0.000	0.100	0.000	0.110	2.464
January-17	0.010	(a)	0.000	0.110	0.000	0.120	2.688
February-17	0.010	(a)	0.001	0.090	0.000	0.101	2.505
March-17	0.010	(a)	0.000	0.090	0.060	0.160	3.584
April-17	0.020	(a)	0.000	0.001	0.240	0.261	6.042
May-17	0.010	(a)	0.060	0.003	0.190	0.263	5.892
June-17	0.010	(a)	0.260	0.001	0.002	0.273	6.310
July-17	0.010	(a)	0.300	0.000	0.000	0.310	6.944
August-17	0.010	(a)	0.270	0.000	0.000	0.280	6.272
September-17	0.010	(a)	0.380	0.000	0.000	0.390	9.032
October-17	0.010	(a)	0.220	0.000	0.000	0.230	5.152
November-17	0.010	(a)	0.130	0.000	0.000	0.140	3.241
December-17	0.002	(a)	0.170	0.001	0.000	0.173	3.873
January-18	0.005	(a)	0.153	0.000	0.000	0.158	3.539
February-18	0.000	(a)	0.152	0.000	0.000	0.152	3.770
March-18	0.000	(a)	0.317	0.000	0.000	0.317	7.101
April-18	0.000	(a)	0.207	0.000	0.000	0.207	4.799
May-18	0.000	(a)	0.143	0.000	0.001	0.144	3.224
June-18	0.003	(a)	0.190	0.000	0.068	0.261	6.032
July-18	0.012	(a)	0.133	0.000	0.125	0.270	6.048
August-18	0.014	(a)	0.105	0.000	0.137	0.256	5.739

Table E3.6-7b NAPS Monthly Groundwater Withdrawal Summary

Month	Groundwater Wells (MGM)					Monthly Total	
	NANIC	#4	#6	#7	#8	MGM	gpm_a
September-18	0.011	(a)	0.101	0.000	0.119	0.231	5.347
October-18	0.008	(a)	0.193	0.000	0.070	0.271	6.078
November-18	0.028	(a)	0.080	0.000	0.032	0.140	3.248
December-18	0.053	(a)	0.104	0.015	0.000	0.172	3.862
January-19	0.046	(a)	0.143	0.005	0.000	0.194	4.346
February-19	0.045	(a)	0.160	0.003	0.000	0.208	5.159
March-19	0.052	(a)	0.331	0.000	0.000	0.383	8.580
April-19	0.049	(a)	0.155	0.000	0.000	0.204	4.722
May-19	0.050	(a)	0.172	0.003	0.007	0.232	5.197
June-19	0.049	(a)	0.181	0.001	0.000	0.231	5.347
July-19	0.048	(a)	0.200	0.002	0.006	0.256	5.735
August-19	0.049	(a)	0.001	0.000	0.288	0.338	7.572
September-19	0.017	(a)	0.019	0.000	0.437	0.473	10.949
October-19	0.013	(a)	0.118	0.004	0.032	0.167	3.741
November-19	0.012	(a)	0.082	0.027	0.000	0.121	2.801
December-19	0.012	(a)	0.040	0.050	0.000	0.102	2.285

a. Well #4 was abandoned in November 2013.

NANIC = North Anna Nuclear Information Center

MG = millions of gallons; MGM = millions of gallons per month

gpm_a = average gallons per minute for the month

Table E3.6-8a NAPS Intake Temperature Summary (°F), 2014–2018

Month		2014	2015	2016	2017	2018
January	Max	46.42	47.15	57.30	50.16	46.37
	Ave	43.06	43.75	48.82	47.05	42.15
	Min	38.51	41.73	42.94	43.68	39.64
February	Max	43.71	42.94	46.87	55.52	53.40
	Ave	40.95	40.53	44.34	49.56	47.38
	Min	38.76	37.61	42.34	46.42	43.48
March	Max	48.46	49.77	58.23	59.79	53.14
	Ave	45.69	44.25	53.51	53.63	48.67
	Min	42.87	38.43	45.92	50.44	46.94
April	Max	62.94	63.80	67.38	72.75	62.24
	Ave	58.39	58.13	60.49	64.33	55.57
	Min	48.55	48.97	55.10	58.38	50.77
May	Max	78.58	80.06	77.22	76.53	79.05
	Ave	71.04	73.74	69.12	71.43	73.33
	Min	60.76	63.72	64.90	67.75	62.11
June	Max	85.24	86.57	83.19	83.17	85.86
	Ave	81.27	82.13	80.43	80.26	81.61
	Min	74.69	75.92	78.84	75.76	78.72
July	Max	85.38	88.09	90.42	88.52	89.52
	Ave	83.61	85.18	86.71	85.92	85.47
	Min	81.79	82.74	81.24	82.22	82.50
August	Max	84.03	87.02	89.35	85.96	87.58
	Ave	82.58	84.53	87.51	83.97	85.42
	Min	81.48	82.95	84.93	80.79	83.11
September	Max	84.87	85.16	87.34	81.17	88.64
	Ave	79.45	81.56	82.52	78.63	82.54
	Min	74.09	76.48	77.14	76.16	77.82
October	Max	74.26	75.67	76.73	76.64	79.85
	Ave	69.45	69.84	71.28	73.18	73.38
	Min	65.63	65.61	66.81	67.79	64.24
November	Max	64.63	68.52	67.70	68.14	65.39
	Ave	57.71	63.32	62.42	61.17	58.87
	Min	51.56	58.92	57.12	56.39	51.60

Table E3.6-8a NAPS Intake Temperature Summary (°F), 2014–2018

Month		2014	2015	2016	2017	2018
December	Max	59.96	59.96	58.51	57.15	52.51
	Ave	57.95	57.95	51.62	51.68	48.93
	Min	55.65	55.65	47.99	45.18	47.23
Year	Max	85.38	88.09	90.42	88.52	89.52
	Ave	63.65	65.55	66.68	66.83	65.38
	Min	38.51	37.61	42.34	43.68	39.64

Table E3.6-8b NAPS Discharge Temperature Summary (°F), 2014–2018

Month/Year		2014	2015	2016	2017	2018
January	Max	70.88	72.04	79.96	73.92	70.37
	Ave	67.32	67.26	71.51	71.27	66.28
	Min	63.19	64.23	66.08	68.30	63.61
February	Max	67.83	66.26	69.54	78.30	75.99
	Ave	64.96	62.91	67.65	72.66	71.00
	Min	56.24	53.02	65.79	62.10	68.01
March	Max	71.67	73.18	77.88	75.38	76.07
	Ave	68.96	65.90	74.10	70.50	70.74
	Min	66.43	54.76	63.29	67.55	62.70
April	Max	78.54	83.64	83.82	85.62	75.63
	Ave	76.46	77.79	77.12	79.85	71.22
	Min	71.94	66.28	67.86	75.09	63.28
May	Max	90.27	92.99	89.07	89.21	93.12
	Ave	84.44	86.82	82.77	86.07	86.47
	Min	76.47	80.61	79.95	83.59	76.02
June	Max	98.52	99.90	96.69	97.76	97.98
	Ave	94.90	95.27	93.85	94.58	95.29
	Min	89.16	89.87	90.28	89.58	93.18
July	Max	99.31	100.57	103.98	103.42	100.87
	Ave	98.26	98.81	100.18	100.84	98.66
	Min	96.61	96.81	95.59	97.17	94.62
August	Max	98.00	100.52	102.81	101.01	100.58
	Ave	97.01	98.40	101.20	99.18	99.09
	Min	96.32	96.86	98.14	96.27	97.29
September	Max	98.90	98.74	101.74	96.33	102.21
	Ave	93.32	94.87	96.27	92.58	96.46
	Min	88.26	90.46	91.12	86.56	91.95
October [(a)]	Max	88.30	89.52	90.69	89.70	93.73
	Ave	83.62	83.78	83.68	86.12	87.33
	Min	80.32	80.65	78.94	81.60	78.23
November	Max	80.16	83.10	81.54	81.74	79.21
	Ave	76.35	78.44	77.52	75.92	73.84
	Min	71.69	74.01	74.37	72.04	68.61

Table E3.6-8b NAPS Discharge Temperature Summary (°F), 2014–2018

Month/Year		2014	2015	2016	2017	2018
December	Max	76.32	81.43	81.24	74.26	76.69
	Ave	71.22	76.00	75.68	71.41	73.16
	Min	63.39	72.13	72.96	62.48	71.25
Year	Max	99.31	100.57	103.98	103.42	102.21
	Ave	81.50	82.30	83.31	83.48	82.54
	Min	56.24	53.02	63.29	62.10	62.70

a. Data not provided for October 10-19, 2016.

Table E3.6-8c Outfall 001 Water Quality Criteria Monitoring Results 2015–2018

Parameter	Results (mg/l)					
	2015	2016	2017	2018	Maximum	Average
Antimony, dissolved	ND	ND	ND	0.0002	0.03	0.01505
Arsenic, dissolved	ND	ND	ND	0.00083	0.01	0.0074575
Cadmium, dissolved	ND	ND	ND	0.0002	0.0002	0.000175
Chromium III, dissolved	ND	ND	ND	0.01	0.01	0.0085
Chromium VI, dissolved	ND	ND	ND	0.003	0.005	0.0035
Copper, dissolved	0.000994	0.000751	0.000742	0.00139	0.00139	0.00096925
Lead, dissolved	ND	ND	ND	0.0002	0.0002	0.000175
Mercury, dissolved	ND	ND	ND	0.000000608	0.000000608	0.000000152
Nickel, dissolved	ND	ND	ND	0.000436	0.000436	0.000109
Silver, dissolved	ND	0.0000167	ND	0.00001	0.0000167	0.0000025
Thallium, dissolved	ND	ND	ND	0.000637	0.000637	0.00015925
Zinc, dissolved	ND	ND	ND	0.00238	0.00238	0.000595
Aldrin	ND	ND	ND	0.000005	0.000005	0.000005
Chlordane	ND	ND	ND	0.0002	0.000208	0.0002035
Chlorpyrifos (synonym = Dursban)	ND	ND	ND	0.0002	0.0002	0.0002
DDD	ND	ND	ND	0.000005	0.000005	0.000005
DDE	ND	ND	ND	0.000005	0.000005	0.000005
DDT	ND	ND	ND	0.000005	0.000005	0.000005
Demeton	ND	ND	ND	0.0004	0.001	0.00085
Diazinon	ND	ND	ND	0.0002	0.001	0.0008
Dieldrin	ND	ND	ND	0.000005	0.000005	0.000005
Alpha-Endosulfan	ND	ND	ND	0.000005	0.000005	0.000005
Beta-Endosulfan	ND	ND	ND	0.000005	0.000005	0.000005
Endosulfan Sulfate	ND	ND	ND	0.000005	0.000005	0.000005
Endrin	ND	ND	ND	0.000005	0.000005	0.000005

Table E3.6-8c Outfall 001 Water Quality Criteria Monitoring Results 2015–2018

Parameter	Results (mg/l)					
	2015	2016	2017	2018	Maximum	Average
Endrin Aldehyde	ND	ND	ND	0.000005	0.000005	0.000005
Guthion	ND	ND	ND	0.0002	0.001	0.0008
Heptachlor	ND	ND	ND	0.000005	0.000005	0.000005
Heptachlor Epoxide	ND	ND	ND	0.000005	0.000005	0.000005
Hexachlorocyclohexane Alpha-BHC	ND	ND	ND	0.000005	0.000005	0.000005
Hexachlorocyclohexane Beta-BHC	ND	ND	ND	0.00002	0.00002	0.00000875
Hexachlorocyclohexane Gamma-BHC or Lindane	ND	ND	ND	0.000005	0.000005	0.000005
Kepone	ND	ND	ND	0.00208	0.00213	0.001619
Malathion	ND	ND	ND	0.0002	0.001	0.0008
Methoxychlor	ND	ND	ND	0.000005	0.000005	0.000005
Mirex	ND	ND	ND	0.000005	0.000005	0.00000275
Parathion	ND	ND	ND	0.0002	0.001	0.0008
PCB 1260	ND	ND	ND	0.00003	0.0005	0.0001525
PCB 1254	ND	ND	ND	0.00004	0.0005	0.000155
PCB 1248	ND	ND	ND	0.00005	0.0005	0.0001625
PCB 1242	ND	ND	ND	0.00004	0.0005	0.000155
PCB 1232	ND	ND	ND	0.00002	0.0005	0.00014
PCB 1221	ND	ND	ND	0.0002	0.0005	0.000275
PCB 1016	ND	ND	ND	0.00003	0.0005	0.0001475
PCB Total	ND	ND	ND	0.005	0.005	0.00228
Toxaphene	ND	ND	ND	0.0002	0.000208	0.0002035
Acenaphthene	ND	ND	ND	0.00104	0.0103	0.0033575
Anthracene	ND	ND	ND	0.00104	0.0103	0.0033575
Benzidine	ND	ND	ND	0.0521	0.0532	0.052075
Benzo (a) anthracene	ND	ND	ND	0.00833	0.0103	0.00936

Table E3.6-8c Outfall 001 Water Quality Criteria Monitoring Results 2015–2018

Parameter	Results (mg/l)					
	2015	2016	2017	2018	Maximum	Average
Benzo (b) fluoranthene	ND	ND	ND	0.00104	0.00106	0.00104
Benzo (k) fluoranthene	ND	ND	ND	0.00104	0.00106	0.00104
Benzo (a) pyrene	ND	ND	ND	0.00104	0.00106	0.00104
Bis 2-Chloroethyl Ether	ND	ND	ND	0.00104	0.00106	0.00104
Bis 2-Chloroisopropyl Ether	ND	ND	ND	0.00104	0.00106	0.00104
Bis-2-ethylhexyl phthalate	ND	ND	ND	0.00104	0.00106	0.00104
Butyl benzyl phthalate	ND	ND	ND	0.00104	0.00106	0.00104
2-Chloronaphthalene	ND	ND	ND	0.00104	0.00106	0.00104
Chrysene	ND	ND	ND	0.00104	0.00106	0.00104
Dibenz (a,h) anthracene	ND	ND	ND	0.00104	0.00106	0.00104
Dibutyl phthalate (synonym = Di-n-Butyl Phthalate)	ND	ND	ND	0.00208	0.00213	0.0020825
1,2-Dichlorobenzene	ND	ND	ND	0.002	0.002	0.00125
1,3-Dichlorobenzene	ND	ND	ND	0.0015	0.0015	0.001125
1,4-Dichlorobenzene	ND	ND	ND	0.002	0.002	0.00125
3,3-Dichlorobenzidine	ND	ND	ND	0.00417	0.00426	0.0041875
Diethyl phthalate	ND	ND	ND	0.00104	0.00106	0.00104
Dimethyl phthalate	ND	ND	ND	0.00104	0.00106	0.00104
2,4-Dinitrotoluene	ND	ND	ND	0.00104	0.00106	0.00104
1,2-Diphenylhydrazine	ND	ND	ND	0.00833	0.0103	0.00936
Fluoranthene	ND	ND	ND	0.00104	0.00106	0.00104
Fluorene	ND	ND	ND	0.00104	0.00106	0.00104
Hexachlorobenzene	ND	ND	ND	0.0026	0.00266	0.002605
Hexachlorobutadiene	ND	ND	ND	0.00104	0.00106	0.00104
Hexachlorocyclopentadiene	ND	ND	ND	0.00104	0.00106	0.00104

Table E3.6-8c Outfall 001 Water Quality Criteria Monitoring Results 2015–2018

Parameter	Results (mg/l)					
	2015	2016	2017	2018	Maximum	Average
Hexachloroethane	ND	ND	ND	0.00104	0.00106	0.00104
Indeno (1,2,3-cd) pyrene	ND	ND	ND	0.00104	0.00106	0.00104
Isophorone	ND	ND	ND	0.00104	0.00106	0.00104
Nitrobenzene	ND	ND	ND	0.00833	0.0103	0.00936
N-Nitrosodimethylamine	ND	ND	ND	0.00208	0.00213	0.0020825
N-Nitrosodi-n-propylamine	ND	ND	ND	0.00208	0.00213	0.0020825
N-Nitrosodiphenylamine	ND	ND	ND	0.00833	0.0103	0.00936
Pyrene	ND	ND	ND	0.00833	0.0103	0.00936
1,2,4-Trichlorobenzene	ND	ND	ND	0.00208	0.00213	0.0020825
Acrolein	ND	ND	ND	0.03	0.03	0.021525
Acrylonitrile	ND	ND	ND	0.0085	0.0085	0.0068
Benzene	ND	ND	ND	0.002	0.002	0.00105
Bromoform	ND	ND	ND	0.002	0.002	0.001325
Carbon Tetrachloride	ND	ND	ND	0.0025	0.0025	0.001175
Chlorobenzene (synonym = monochlorobenzene)	ND	ND	ND	0.002	0.002	0.000775
Chlorodibromomethane	ND	ND	ND	0.00175	0.00175	0.0009875
Chloroform	ND	ND	ND	0.0025	0.0025	0.001175
Dichloromethane (synonym = methylene chloride)	ND	ND	ND	0.005	0.005	0.003775
Dichlorobromomethane	ND	ND	ND	0.002	0.002	0.00105
1,2-Dichloroethane	ND	ND	ND	0.0035	0.0035	0.0017
1,1-Dichloroethylene	ND	ND	ND	0.0035	0.0035	0.001425
1,2-trans-dichloroethylene	ND	ND	ND	0.003	0.003	0.0013
1,2-Dichloropropane	ND	ND	ND	0.002	0.002	0.001325
1,3-Dichloropropene	ND	ND	ND	0.005	0.005	0.001825

Table E3.6-8c Outfall 001 Water Quality Criteria Monitoring Results 2015–2018

Parameter	Results (mg/l)					
	2015	2016	2017	2018	Maximum	Average
Ethylbenzene	ND	ND	ND	0.002	0.002	0.000775
Methyl Bromide (synonym = Bromomethane)	ND	ND	ND	0.004	0.004	0.00155
1,1,2,2-Tetrachloroethane	ND	ND	ND	0.0015	0.0015	0.0012
Tetrachloroethylene	ND	ND	ND	0.002	0.002	0.00105
Toluene	ND	ND	ND	0.0025	0.0025	0.000977
1,1,2-Trichloroethane	ND	ND	ND	0.0025	0.0025	0.001175
Trichloroethylene	ND	ND	ND	0.002	0.002	0.00085
Vinyl Chloride	ND	ND	ND	0.0025	0.0025	0.000975
2-Chlorophenol	ND	ND	ND	0.00104	0.00106	0.00104
2,4 Dichlorophenol	ND	ND	ND	0.00104	0.00106	0.00104
2,4 Dimethylphenol	ND	ND	ND	0.00052	0.00053	0.0005225
2,4-Dinitrophenol	ND	ND	ND	0.00052	0.00053	0.0005225
2-Methyl-4,6-Dinitrophenol	ND	ND	ND	0.00104	0.00106	0.00104
Nonylphenol	ND	0.00491	ND	0.00269	0.005	0.0038075
Pentachlorophenol	ND	ND	ND	0.0104	0.0106	0.0079
Phenol	ND	ND	ND	0.00833	0.0103	0.00936
2,4,6-Trichlorophenol	ND	ND	ND	0.00104	0.00106	0.00104
Cyanide, Free	ND	ND	ND	0.01	0.01	0.01
Hydrogen Sulfide	ND	ND	ND	0.1	1	0.55
Hardness (mg/L as CaCO3)	0.0181	0.0192	0.0156	0.0151	19.2	17

ND = below laboratory detection limit

Table E3.6-8d NAPS Intake and Outfall 001 Water Quality Criteria Monitoring Results, March 8, 2018

Parameter	Units	Intake	Outfall 001
1,1,1-Trichloroethane	ug/L	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	ND	ND
1,1,2-Trichloroethane	ug/L	ND	ND
1,1-Dichloroethane	ug/L	ND	ND
1,1-Dichloroethylene	ug/L	ND	ND
1,2,4-Trichlorobenzene	ug/L	ND	ND
1,2-Dichlorobenzene	ug/L	ND	ND
1,2-Dichloroethane	ug/L	ND	ND
1,2-Dichloropropane	ug/L	ND	ND
1,2-Diphenylhydrazine	ug/L	ND	ND
1,2-trans-Dichloroethylene	ug/L	ND	ND
1,3-Dichlorobenzene	ug/L	ND	ND
1,3-Dichloropropene, Total	ug/L	ND	ND
1,4-Dichlorobenzene	ug/L	ND	ND
2,4,5-TP (Silvex)	ug/L	ND	ND
2,4,6-Trichlorophenol	ug/L	ND	ND
2,4-D	ug/L	ND	ND
2,4-Dichlorophenol	ug/L	ND	ND
2,4-Dimethylphenol	ug/L	ND	ND
2,4-Dinitrophenol	ug/L	ND	ND
2,4-Dinitrotoluene	ug/L	ND	ND
2,6-Dinitrotoluene	ug/L	ND	ND
2-Chloroethyl vinyl ether	ug/L	ND	ND
2-Chloronaphthalene	ug/L	ND	ND
2-Chlorophenol	ug/L	ND	ND
2-Nitrophenol	ug/L	ND	ND
3,3'-Dichlorobenzidine	ug/L	ND	ND
3,4-Benzofluoranthene	ug/L	ND	ND
4,4'-DDD	ug/L	ND	ND
4,4'-DDE	ug/L	ND	ND
4,4'-DDT	ug/L	ND	ND
4,6-Dinitro-o-cresol	ug/L	ND	ND
4-Bromophenyl phenyl ether	ug/L	ND	ND
4-Chlorophenyl phenyl ether	ug/L	ND	ND
4-Nitrophenol	ug/L	ND	ND
Acenaphthene	ug/L	ND	ND
Acenaphthylene	ug/L	ND	ND

Table E3.6-8d NAPS Intake and Outfall 001 Water Quality Criteria Monitoring Results, March 8, 2018

Parameter	Units	Intake	Outfall 001
Acrolein	ug/L	ND	ND
Acrylonitrile	ug/L	ND	ND
Aldrin	ug/L	ND	ND
alpha-BHC	ug/L	ND	ND
Aluminum	ug/L	45.3	28.1
Ammonia as N	mg/L	ND	ND
Anthracene	ug/L	ND	ND
Antimony, Total	ug/L	ND	ND
Antimony, Dissolved	ug/L	ND	ND
Arsenic, Total	ug/L	ND	ND
Arsenic, Dissolved	ug/L	ND	ND
Barium, Total	ug/L	18.2	17.9
Barium, Dissolved	ug/L	15.1	17.8
Benzene	ug/L	ND	ND
Benzidine	ug/L	ND	ND
Benzo (a) anthracene	ug/L	ND	ND
Benzo (a) pyrene	ug/L	ND	ND
Benzo (g,h,i) perylene	ug/L	ND	ND
Benzo (k) fluoranthene	ug/L	ND	ND
Beryllium, Total	ug/L	ND	ND
beta-BHC	ug/L	ND	ND
bis (2-Chloroethoxy) methane	ug/L	ND	ND
bis (2-Chloroethyl) ether	ug/L	ND	ND
bis (2-chloroisopropyl) ether	ug/L	ND	ND
bis (2-Ethylhexyl) phthalate	ug/L	ND	ND
BOD	mg/L	ND	ND
Boron	ug/L	53	ND
Bromide	mg/L	0.023	0.022
Bromoform	ug/L	ND	ND
Butyl benzyl phthalate	ug/L	ND	ND
Cadmium, Total	ug/L	ND	ND
Cadmium, Dissolved	ug/L	ND	ND
Calcium	mg/L	1.71	1.85
Carbon tetrachloride	ug/L	ND	ND
Chlordane (5)	ug/L	ND	ND
Chloride	ug/L	6400	6900
Chlorobenzene	ug/L	ND	ND

Table E3.6-8d NAPS Intake and Outfall 001 Water Quality Criteria Monitoring Results, March 8, 2018

Parameter	Units	Intake	Outfall 001
Chlorodibromomethane	ug/L	ND	ND
Chloroethane	ug/L	ND	ND
Chloroform	ug/L	ND	ND
Chlorpyrifos	ug/L	ND	ND
Chromium	ug/L	ND	ND
Chromium, Dissolved	ug/L	ND	ND
Chromium, Hexavalent, Dissolved	mg/L	ND	ND
Chromium, Trivalent, Dissolved	mg/L	ND	ND
Chrysene	ug/L	ND	ND
cis-1,3-Dichloropropene	ug/L	ND	ND
Cobalt	ug/L	ND	ND
COD	mg/L	ND	11
Color	pcu	7.7	8.5
Copper	ug/L	1.6	1.61
Copper, Dissolved	ug/L	1.24	1.39
Cyanide	mg/L	ND	ND
delta-BHC	ug/L	ND	ND
Demeton, o+s	ug/L	ND	ND
Diazinon	ug/L	ND	ND
Dibenz (a,h) anthracene	ug/L	ND	ND
Dichlorobromomethane	ug/L	ND	ND
Dieldrin	ug/L	ND	ND
Diethyl phthalate	ug/L	ND	ND
Dimethyl phthalate	ug/L	ND	ND
Di-n-butyl phthalate	ug/L	ND	ND
Di-n-octyl phthalate	ug/L	ND	ND
E. Coli (MPN)	MPN/100 mL	1	1
Endosulfan I	ug/L	ND	ND
Endosulfan II	ug/L	ND	ND
Endosulfan sulfate	ug/L	ND	ND
Endrin	ug/L	ND	ND
Endrin aldehyde	ug/L	ND	ND
Enterococci	MPN/100 mL	ND	ND
Ethylbenzene	ug/L	ND	ND
Fluoranthene	ug/L	ND	ND
Fluorene	ug/L	ND	ND
Fluoride	ug/L	ND	ND

Table E3.6-8d NAPS Intake and Outfall 001 Water Quality Criteria Monitoring Results, March 8, 2018

Parameter	Units	Intake	Outfall 001
gamma-BHC (Lindane)	ug/L	ND	ND
Guthion	ug/L	ND	ND
Hardness as CaCO3	mg/L	14.7	15.1
Heptachlor	ug/L	ND	ND
Heptachlor epoxide	ug/L	ND	ND
Hexachlorobenzene	ug/L	ND	ND
Hexachlorobutadiene	ug/L	ND	ND
Hexachlorocyclopentadiene	ug/L	ND	ND
Hexachloroethane	ug/L	ND	ND
Hydrogen Sulfide	mg/L	ND	ND
Indeno (1,2,3-cd) pyrene	ug/L	ND	ND
Iron, Total	ug/L	83.1	62.9
Iron, Dissolved	ug/L	25.9	37.1
Isophorone	ug/L	ND	ND
Kepone	ug/L	ND	ND
Lead, Total	ug/L	ND	0.295
Lead, Dissolved	ug/L	ND	ND
Magnesium	ug/L	2530	2550
Malathion [2C]	ug/L	ND	ND
Manganese	ug/L	12.4	12.3
Manganese, Dissolved	ug/L	1.61	1.94
MBAS	mg/L	ND	ND
Methoxychlor	ug/L	ND	ND
Methyl bromide	ug/L	ND	ND
Methyl chloride	ug/L	ND	ND
Methylene chloride	ug/L	ND	ND
Mirex	ug/L	ND	ND
Molybdenum	ug/L	7.57	8.71
Naphthalene	ug/L	ND	ND
Nickel, Total	ug/L	ND	ND
Nickel, Dissolved	ug/L	1.08	0.436
Nitrate as N	ug/L	120	110
Nitrate+Nitrite as N	mg/L	0.13	NR
Nitrobenzene	ug/L	ND	ND
Nitrogen, Organic	mg/L	ND	ND
n-Nitrosodiethylamine	ug/L	ND	ND
n-Nitrosodi-n-propylamine	ug/L	ND	ND

Table E3.6-8d NAPS Intake and Outfall 001 Water Quality Criteria Monitoring Results, March 8, 2018

Parameter	Units	Intake	Outfall 001
n-Nitrosodiphenylamine	ug/L	ND	ND
Nonylphenol	ug/L	ND	ND
Oil and Grease	mg/L	ND	ND
Parathion	ug/L	ND	ND
PCB as Aroclor 1016	ug/L	ND	ND
PCB as Aroclor 1221	ug/L	ND	ND
PCB as Aroclor 1232	ug/L	ND	ND
PCB as Aroclor 1242	ug/L	ND	ND
PCB as Aroclor 1248	ug/L	ND	ND
PCB as Aroclor 1254	ug/L	ND	ND
PCB as Aroclor 1260	ug/L	ND	ND
PCBs, Total	ug/L	ND	ND
p-Chloro-m-cresol	ug/L	ND	ND
Pentachlorophenol	ug/L	ND	ND
pH	SU	7	6.9
Phenanthrene	ug/L	ND	ND
Phenol	ug/L	ND	ND
Phosphorus, Total	mg/L	0.023	NR
Pyrene	ug/L	ND	ND
Selenium, Total	ug/L	ND	ND
Selenium, Dissolved	ug/L	ND	ND
Silver, Total	ug/L	ND	ND
Silver, Dissolved	ug/L	ND	ND
Sulfate	ug/L	5900	5900
TDS	mg/L	61	54
Temperature	°C	22	21
Tetrachloroethylene (PCE)	ug/L	ND	ND
Thallium, Total	ug/L	ND	ND
Thallium, Dissolved	ug/L	ND	0.637
Tin	ug/L	ND	ND
Titanium	ug/L	ND	ND
TKN as N	mg/L	ND	ND
TOC	mg/L	3.7	3.9
Toluene	ug/L	ND	ND
Total Recoverable Phenolics	mg/L	ND	ND
Toxaphene	ug/L	ND	ND
trans-1,3-Dichloropropene	ug/L	ND	ND

Table E3.6-8d NAPS Intake and Outfall 001 Water Quality Criteria Monitoring Results, March 8, 2018

Parameter	Units	Intake	Outfall 001
Trichloroethylene	ug/L	ND	ND
Trichlorofluoromethane	ug/L	ND	ND
TSS	mg/L	ND	1.38
Vinyl chloride	ug/L	ND	ND
Zinc, Total	ug/L	1.9	3.41
Zinc, Dissolved	ug/L	1.4	2.38

ND = below laboratory detection limit; NR = not reported

Table E3.6-9a Water Quality Data for NAPS Water Supply Wells 6, 7, and 8 (2016 and 2017)

Parameter	Well 6 2/17/16	Well 7 3/22/17	Well 8 3/22/17
Total Dissolved Solids (mg/l)	164	218	168
Hardness (mg/l as $CaCO_3$)	91	135	88
Fluoride (mg/l)	< 0.2	< 0.2	< 0.2
Chloride (mg/l)	14.6	25	18.4
Sulfate (mg/l)	7.4	6.4	< 5
Calcium Hardness (mg/l)	59	83	54
Alkalinity, Total (mg/l)	87.5	118	89.4
Arsenic (mg/l)	< 0.002	< 0.002	< 0.002
Barium (mg/l)	< 0.01	0.14	0.01
Cadmium (mg/l)	< 0.002	< 0.002	< 0.002
Chromium (mg/l)	< 0.01	< 0.01	< 0.01
Copper (mg/l)	< 0.01	< 0.01	< 0.01
Iron (mg/l)	0.075	0.95	2.86
Lead (mg/l)	< 0.002	< 0.002	< 0.002
Manganese (mg/l)	0.066	0.101	0.096
Mercury (mg/l)	< 0.0002	< 0.0002	< 0.0002
Selenium (mg/l)	< 0.01	< 0.01	< 0.01
Silver (mg/l)	< 0.01	< 0.01	< 0.01
Sodium (mg/l)	8.14	9.03	7.56
Zinc (mg/l)	0.016	0.535	0.79
pH	6.1	6.26	6.1

Table E3.6-9b Water Quality Data for the Piedmont Crystalline Aquifers

Parameter	Average	Maximum	Minimum
Total Dissolved Solids (mg/l)	70-150	250	40
Hardness (mg/l as CaCO3)	10-70	100	10
Nitrate (mg/l as N)	0.05	20	< 0.01
Chloride (mg/l)	1-20	40	1
Sulfate (mg/l)	1-40	100	1
Calcium (mg/l)	5-20	60	5
Magnesium (mg/l)	5-20	60	5
Silica (mg/l)	20-35	45	15
Iron (mg/l)	< 0.3	600	< 10
Bicarbonate (mg/l as HCO3)	30-100	150	15
pH	5.5-6.8	7.5	5.5

(Dominion. 2006a, Table 2.3-14)

Figure E3.6-1 Hydrologic Features in the Vicinity of NAPS

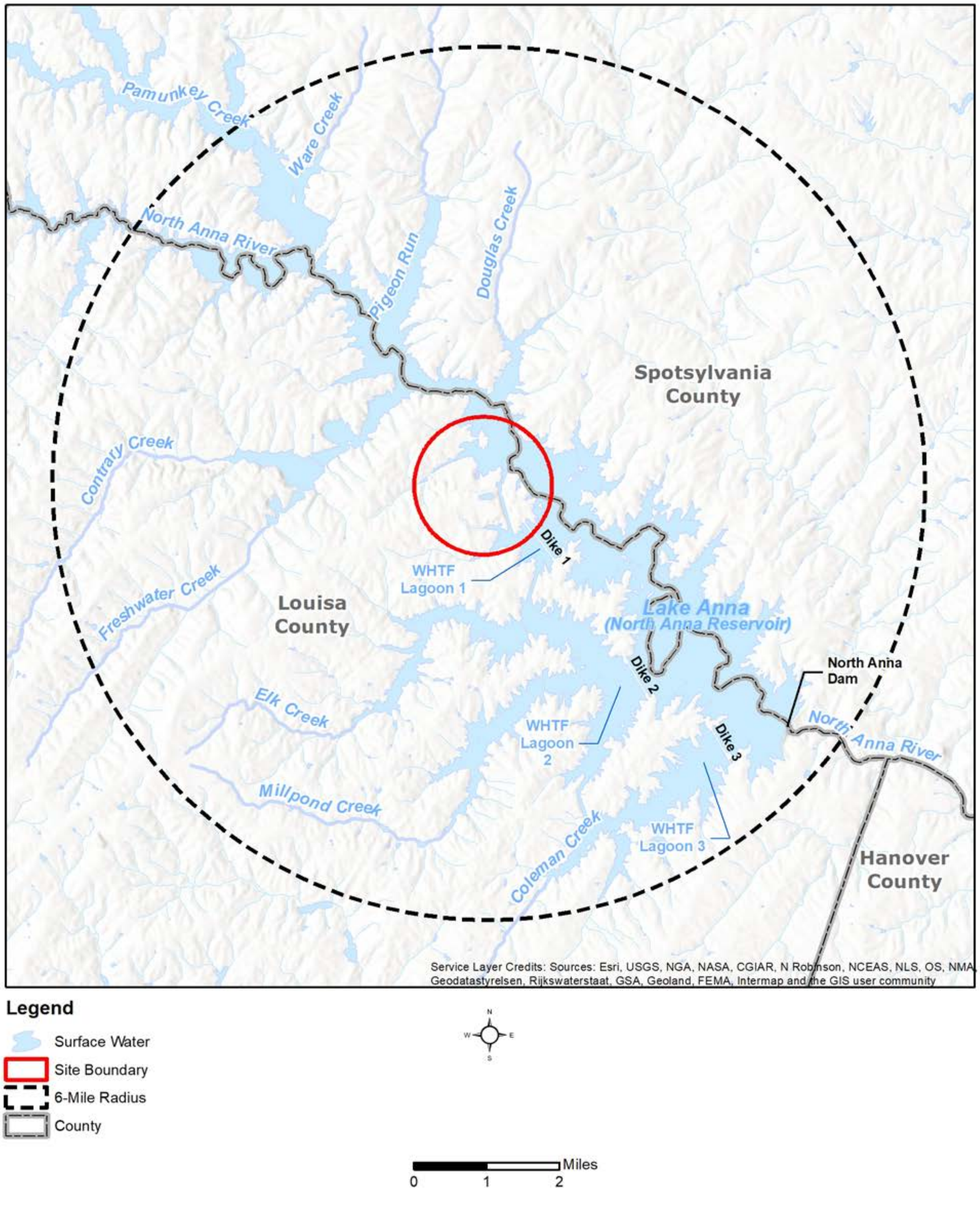


Figure E3.6-2 FEMA Flood Zones, NAPS Site

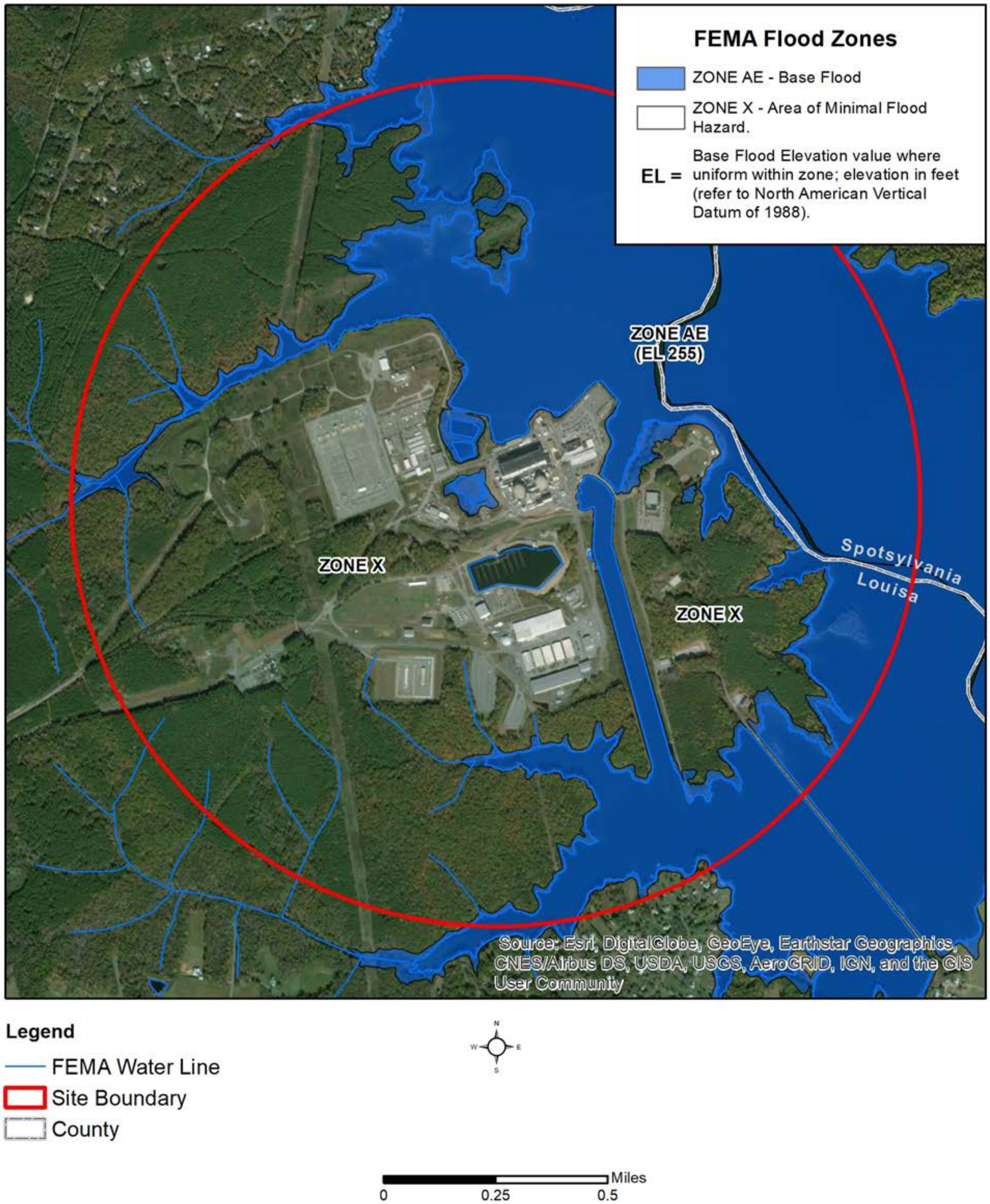


Figure E3.6-3 VPDES-Permitted Outfalls and Temperature Monitoring Locations

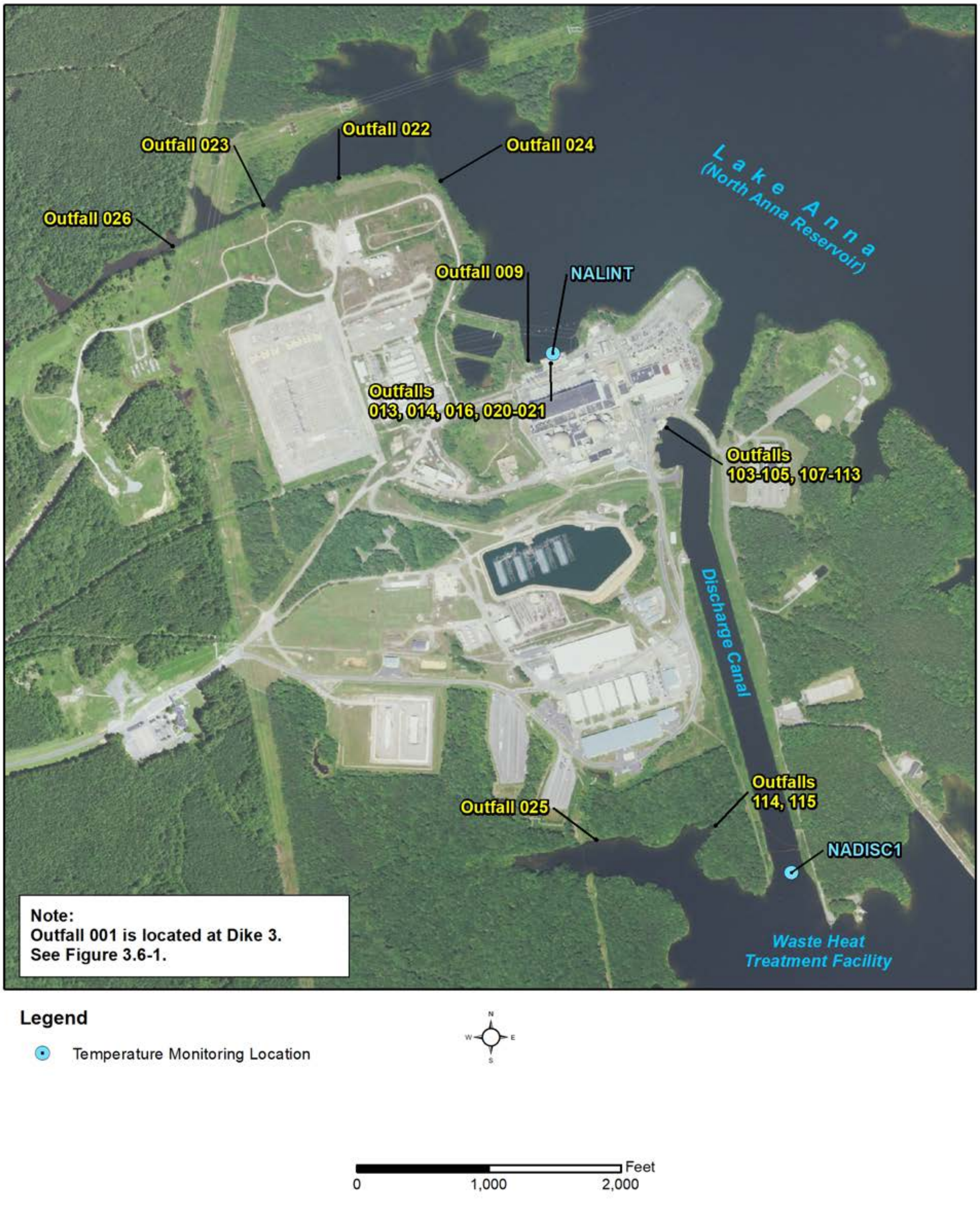


Figure E3.6-4a Intake Temperature at Sensor NALINT

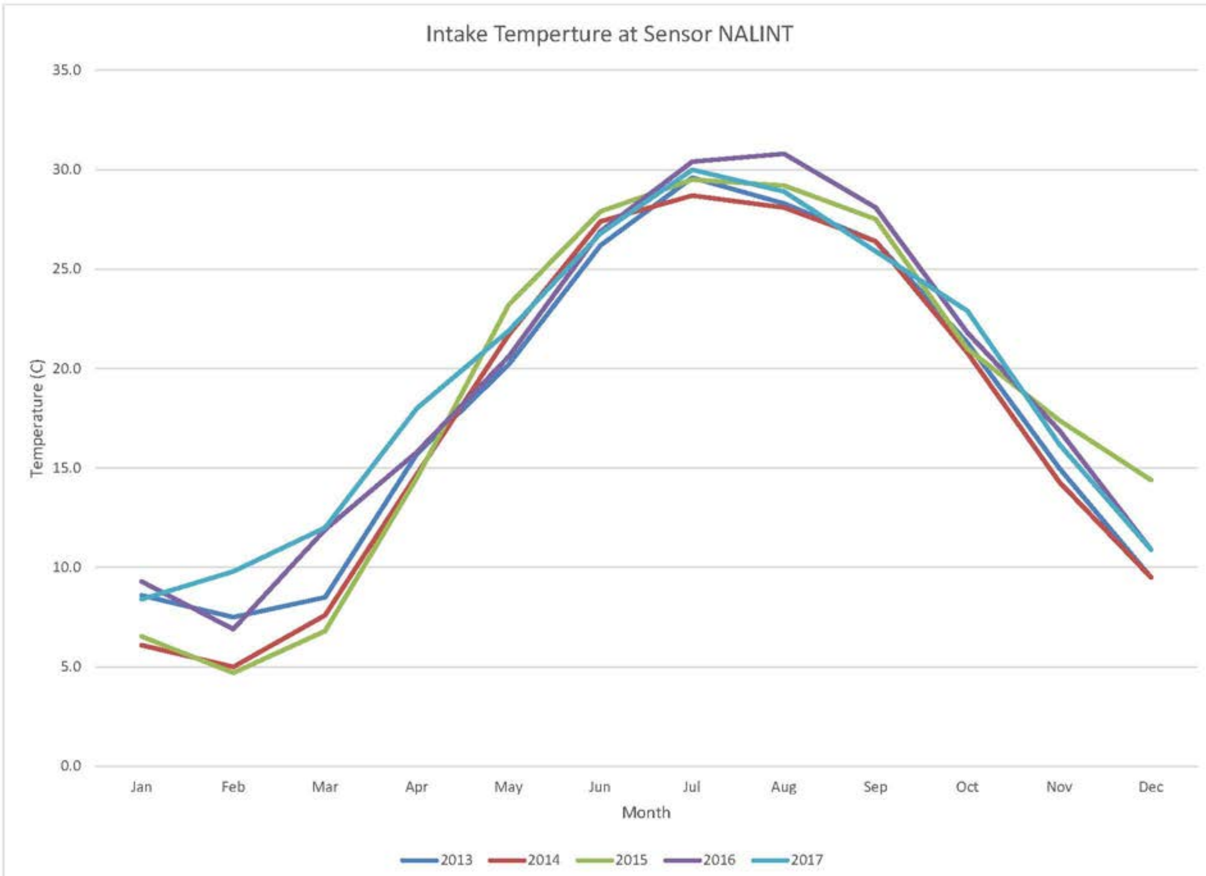


Figure E3.6-4b Discharge Temperature at Sensor NADISC1

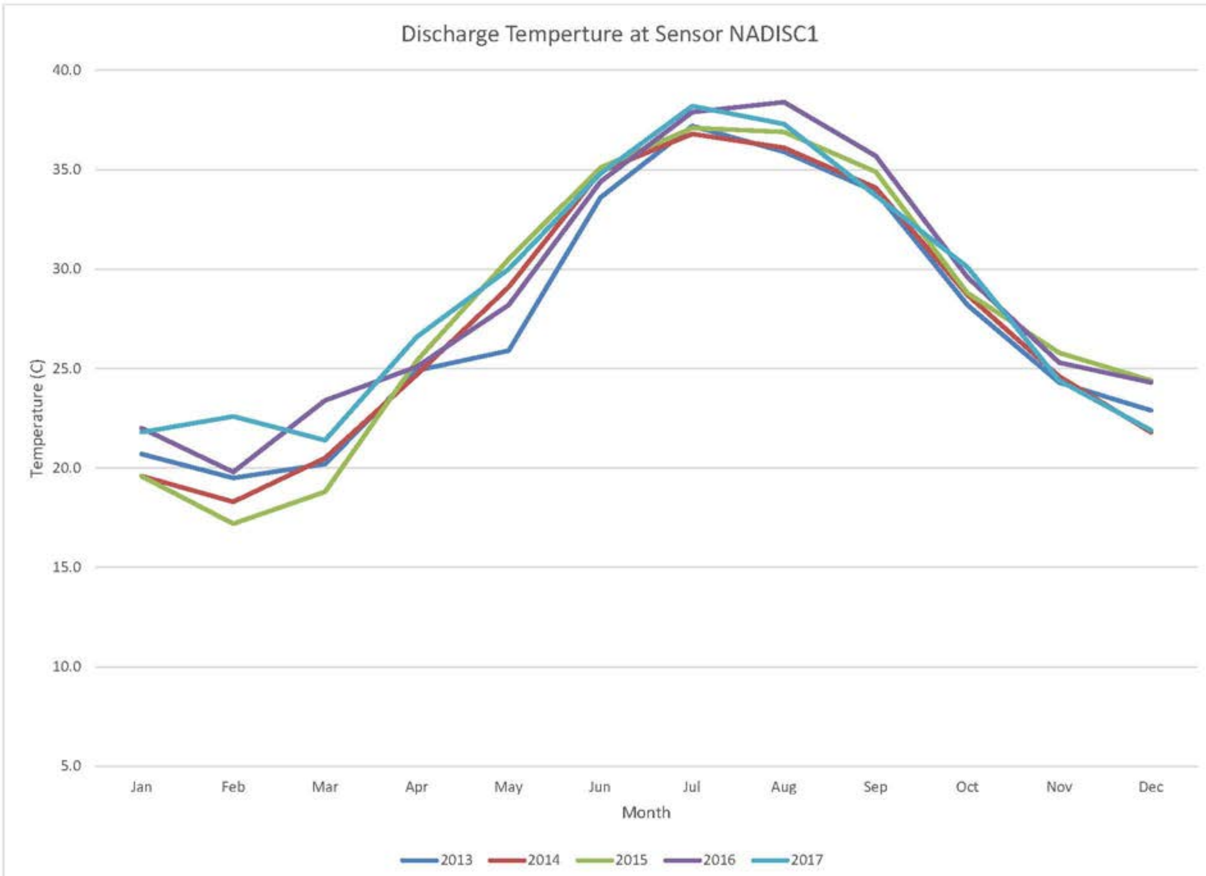


Figure E3.6-5 Onsite Monitoring and Groundwater Wells (2020)

Figure E3.6-6a 2013 Potentiometric Surface

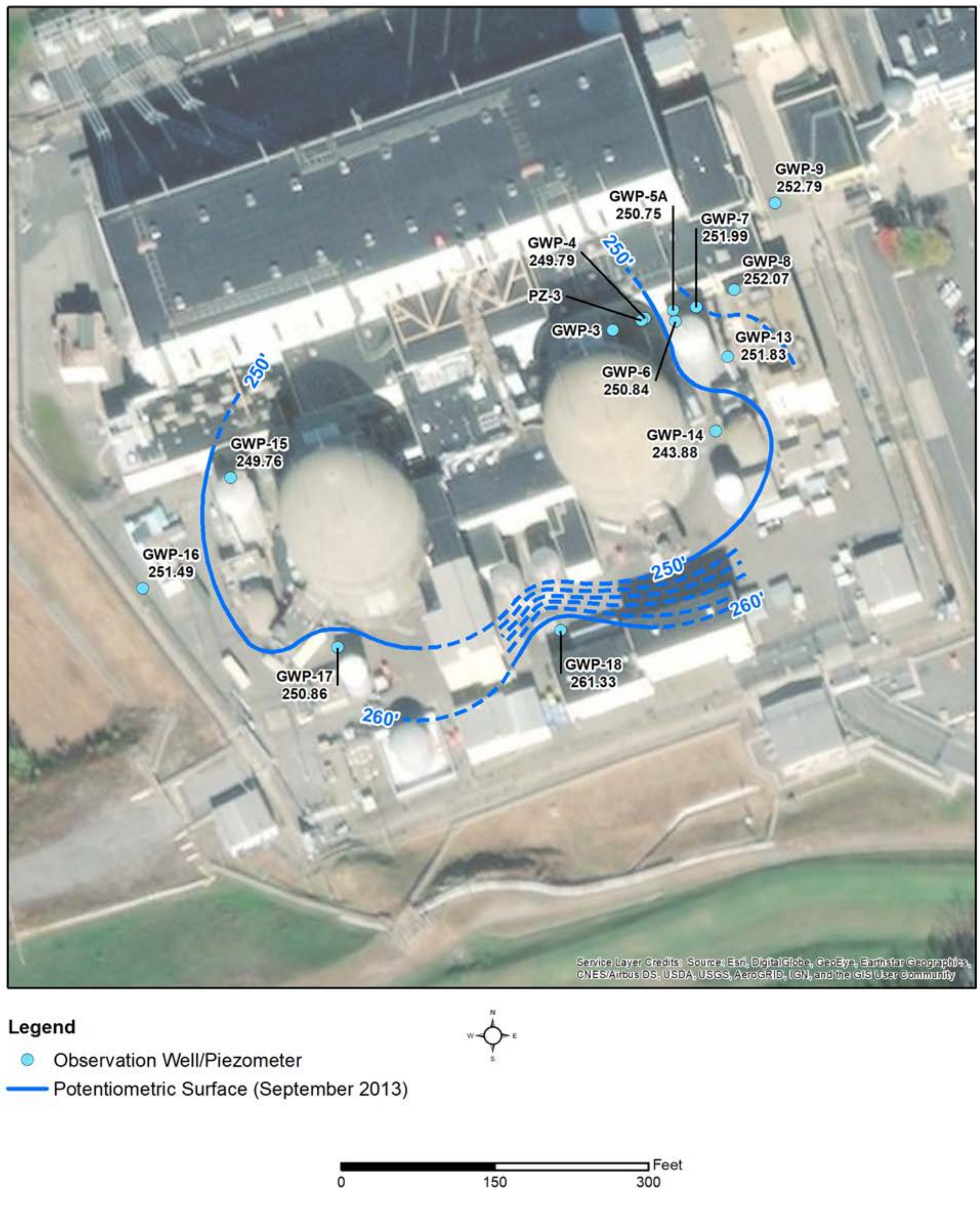
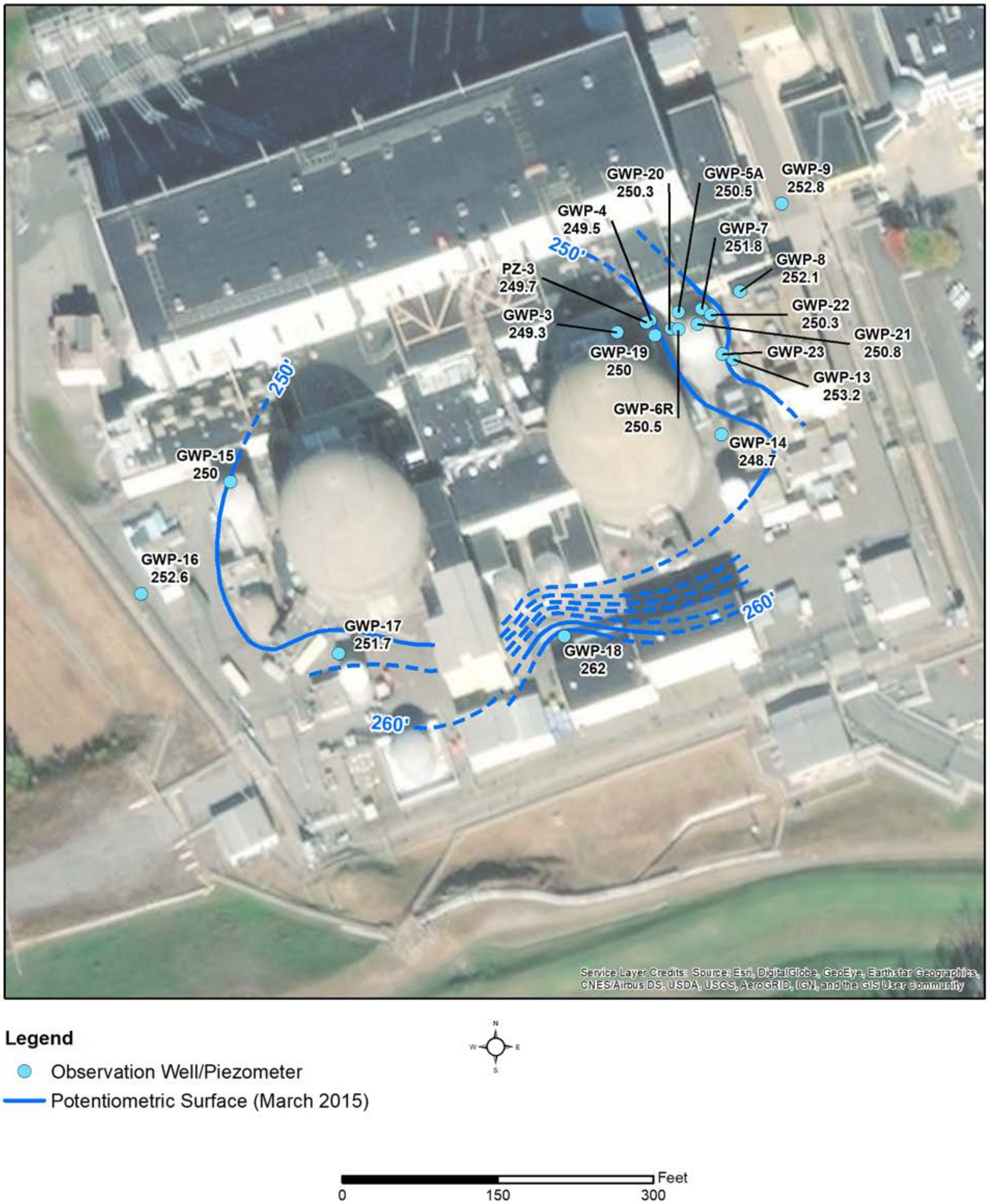


Figure E3.6-6b 2015 Potentiometric Surface



E3.7 ECOLOGICAL RESOURCES

Regional ecology is greatly influenced by the geomorphic and physiographic characteristics of the region. Soils determine the basic fertility of the region which, in turn, determines the types of plants that may grow. The plants that are present greatly influence the types and number of animals that reside in the region. Soil types also greatly influence the basic fertility of aquatic ecosystems and the species present. Climatological factors, such as temperature and precipitation, further refine the plants and animals that may live in a locale.

E3.7.1 AQUATIC COMMUNITIES

The aquatic resources in the vicinity of the NAPS site are associated with the North Anna Reservoir, the WHTF, and the North Anna River. The following sections discuss the biological communities of each of the waterbodies.

E3.7.1.1 Biological Communities of Lake Anna

Lake Anna is typical of many shallow reservoirs found in the southern and mid-Atlantic states. Since impoundment, Lake Anna has gone through the typical succession of lakes. The initial biotic community was highly productive because initial nutrient levels were high. Productivity subsequently decreased and ultimately stabilized. Aquatic communities in Lake Anna experienced gradual post-impoundment changes from riverine to lake communities. Some of these communities had stabilized in Lake Anna by 1975, and others by 1985. (NRC. 2006, Section 2.7.2.1) The VDGIF describes the lake in 2016 as having three trophic conditions. The upper portion of the lake is eutrophic, the lower portion is oligotrophic, and the middle is a blend of these two extremes. (VDEQ. 2016)

Lake Anna contains numerous phytoplankton, zooplankton, and benthic macroinvertebrate communities. Based on earlier studies, these communities were described in the 2001 license renewal ER. Seventy-seven genera of phytoplankton have been identified (NRC. 2006, Section 2.7.2.1). The four dominant phytoplankton groups identified in the Clean Water Act (CWA) Section 316(a) demonstration study in Lake Anna for the operational years 1978–1985 were diatom (Bacillariophyta), green algae (Chlorophyta), blue-green algae (Cyanophyta), and dinoflagellates (Pyrrhophyta) (Virginia Power. 1986, Section 4.1). The zooplankton community found in the lake during the operational years 1978–1985 in CWA 316(a) demonstration study samples is presented in Table E3.7-1. Three small-bodied zooplankton genera, Polyarthra (a common rotifer with feather-like “wings”); Keratella (a common rotifer with a shell and spines); and Bosmina (a small, common cladoceran) were particularly abundant. The benthic community is characteristic of a reservoir rather than riverine conditions, and is dominated by lacustrine species. A total of 124 benthic taxa have been identified from Lake Anna. Three bivalve species, *Elliptio complanatus*, *Ellipito productus*, and *Sphaerium striatum* were collected in the North Anna basin prior to impoundment. (Dominion. 2001) In more recent years, the introduced Asiatic clam (*Corbicula* spp.) has dominated collections from both Lake Anna and the lower North Anna River. Asiatic clams are present throughout Lake Anna. (NRC. 2006, Section 2.7.2.1) The average number of clams collected in surveys from 1991–2013 ranges from a high of 201 collected in 2011 to a low of 37 collected in 1993 (Dominion. 2013b). See Section E3.7.5 for additional information on how Dominion attempts to control Asiatic clams.

In studies conducted prior to the initial license renewal, small numbers of unionid mussels (*Elliptio* spp.) and fingernail clams (family Sphaeriidae) were collected in Lake Anna. (NRC. 2006, Section 2.7.2.1) A mussel survey of 22 sites across Lake Anna was conducted in 2008. Eight sites were classed as having a moderate or higher abundance of mussels. Three common mussel species were found: the eastern elliptio (*Elliptio complanata*), the eastern floater (*Pyganodon cataracta*), and the pond papershell (*Utterbackia imbecilis*). All species were found as shell and live specimens, although the distribution and abundance were highly variable. No federally or state-listed specimens of freshwater mussels were found at any of the sites examined. In addition, the Asian clam (*Corbicula fluminea*) was found throughout the survey area. (Dominion. 2008, Appendix 1)

VDGIF manages the fisheries of Lake Anna. Thirty-two species of fish have been reported in Lake Anna. The fish species and their mean abundance results from VDGIF sampling 2003–2015 are listed in Table E3.7-2 (VDGIF. 2016). Species include those historically found in the North Anna River, those that had been in local farm ponds inundated by the new reservoir, and those introduced by VDGIF (NRC. 2006, Section 2.7.2.1). Recreational species include largemouth bass (*Micropterus salmoides*), striped bass (*Morone saxatilis*), bluegill (*Lepomis macrochirus*), yellow perch (*Perca flavescens*), black crappie (*Pomoxis nigromaculatus*), white perch (*M. americana*), pumpkinseed (*L. gibbosus*), redear sunfish (*L. microlophus*), redbreast sunfish (*L. auritus*), channel catfish (*Ictalurus punctatus*), and white catfish (*Ameiurus catus*). Forage species include threadfin shad (*Dorosoma petenense*), gizzard shad (*D. cepedianum*), and blueback herring (*Alosa aestivalis*).

Fish stocking began in 1972 with introductions of largemouth bass, bluegill, redear sunfish, and channel catfish. Subsequent stockings of redear sunfish, channel catfish, walleye, striped bass, and largemouth bass (both Florida and northern subspecies) were made. Threadfin shad and blueback herring were successfully introduced in the 1980s. Striped bass is stocked annually by VDGIF and hybrid striped bass was experimentally stocked in 2014. VDGIF stocked the lake with walleye annually until 2006 and stocked the lake with a walleye-sauger hybrid beginning in 2013. Sterile triploid herbivorous grass carp (*Ctenopharyngodon idella*) was stocked in the WHTF in 1994 by Dominion to control the growth of the nuisance submersed aquatic plant hydrilla (*Hydrilla verticillata*). (VDGIF. 2016) The Lake Anna Civic Association stocked grass carp (521 fish) in the North Anna Reservoir and the WHTF in May 2016. Lake Anna's fish community structure has been influenced over the years due to (1) normal population fluctuations; (2) reservoir aging; (3) the introduction of forage species and competing predators; (4) the installation of fish attraction structures and artificial habitat; and (5) the increase in Asiatic clam densities (NRC. 2006, Section 2.7.2.1). For the 2003–2015 period, VDGIF evaluated the community structure for fish in Lake Anna with gill netting. Results indicate Lake Anna is home to many species, including recreationally important species such as largemouth bass, striped bass, and black crappie, and forage species. From gill net sampling, the VDGIF identified 32 species. The species abundance varied year-to-year over the 2003 to 2015 period. (VDGIF. 2016).

E3.7.1.1.1 Commercially Important Fisheries of Lake Anna

There is no commercial fishing on Lake Anna or the North Anna River. Professional fishing guides regularly take clients for recreational fishing.

E3.7.1.1.2 Recreationally Important Fisheries of Lake Anna

Lake Anna is a popular destination for anglers. A VDGIF survey in 2010 estimated annual fishing pressure at 13.7 hours/acre (131,482 boat angler hours), which is moderate for a large reservoir and was similar to the 2005 estimate of 12.8 hours/acre. The species sought by anglers as documented in the 2010 survey were, in order of preference, largemouth bass, striped bass, black crappie, and catfish. The dominant species harvested in 2010 were black crappie (8,085 or 64%), striped bass (2,782 or 22%), and catfish (1,407 or 11%). The composition of anglers and their harvests appeared to change little at Lake Anna between 2000 and 2015. (VDGIF. 2016)

The mean abundance of these recreationally important fish is presented in Table E3.7-2. The VDGIF monitors the abundance of fish species through annual electrofishing or net sampling. The abundance of largemouth bass from 2003–2015 has ranged from 0.7 to 2.6 fish caught per hour of electrofishing. Striped bass are an anadromous species, not indigenous to Lake Anna or the North Anna River. Because the conditions of the North Anna River and other streams flowing into Lake Anna are not suitable for striped bass spawning, striped bass cannot reproduce in Lake Anna. Striped bass were stocked annually at variable rates in an effort to determine an optimum stocking rate for Lake Anna. Striped bass stocking rate averaged 18 fish per acre from 2001–2015. Relative abundance of striped bass in Lake Anna was estimated by the number of striped bass caught per net night of effort. The catch per unit of effort (CPUE) has ranged from 3.1 to 9.6. Black crappie were evaluated with experimental gill nets from 1997–2015. Crappie were the third most abundant fish in nets, behind white perch and gizzard shad. Despite equal effort, most crappie (93%) were caught in the upper portion of the lake in a familiar pattern likely based purely on productivity and habitat. CPUE ranged from 6.3 to 13.2. Channel catfish ranked fourth in abundance in gill nets with CPUE ranging from 4.0 to 7.7. White catfish was the next most abundant catfish population and had a CPUE ranging from 2.0 to 4.9. (VDGIF. 2016)

The forage fish at Lake Anna include gizzard shad, threadfin shad, and blueback herring. Most of the forage biomass is composed of gizzard shad. Estimates of gizzard shad biomass gill net CPUE ranged from 4.9 to 22.5. Gizzard shad abundance has also been cyclic, with low catch rates typically followed within a year or two by high catch rates. Catch rate of gizzard shad in 2015 (13.8 per net night) was above average, and most shad (90% of 496 fish) were caught in the upper lake. Threadfin shad abundance, based on gill net catch rate, remained below average since a record catch in 2010. Blueback herring, a favorite live bait of striper anglers, were finally above average in 2015 net samples after a four-year stretch of low catches (prior peak was also 2010). (VDGIF. 2016)

Lake Anna is home to many other species, some of various recreational importance including redear sunfish and white perch, and others important ecologically, such as creek chubsucker (*Erimyzon oblongus*) and white sucker (*Catostomus commersoni*). Net surveys in 2015 produced the highest white perch catch rate since study began (over 24 fish per net night), and it seems abundance of this species is trending higher. (VDGIF. 2016)

Since 1987 Dominion biologists have performed various annual biological studies on the North Anna Reservoir as well as the WHTF and the North Anna River downstream from the North Anna Dam. The studies are designed to address the requirements of the NAPS VPDES permit and continue to support the 316(a) demonstration for the station that the operation of the power station has not resulted in significant harm to the biological community. The study plans are subject to VDEQ and VDGIF approval. Quarterly gillnet and electrofishing are conducted in the North Anna Reservoir and WHTF. The dominant species from gillnet sampling are gizzard shad, channel catfish, threadfin shad, white perch, largemouth bass, and white catfish as the dominant species caught. A total of 18 species of fish representing seven families were collected by gillnets in the lake in 2018. Numerically dominant fish taxa collected by quarterly electrofishing surveys in the lake and WHTF are Centrarchids (sunfishes, including largemouth bass). A total of 21 species of fish representing seven families were collected by electrofishing in the lake in 2018. The 2018 gill netting and boat electrofishing results demonstrate a balanced indigenous fish community exists in the North Anna Reservoir and the WHTF. (Dominion. 2018d)

E3.7.1.2 Biological Communities of the WHTF

The WHTF is the body of water into which waste heat from NAPS Units 1 and 2 is discharged via the canal. It is separated from the North Anna Reservoir by a series of dikes. A weir at Dike 3 allows water to flow from the WHTF to the North Anna Reservoir. The same aquatic communities occur in the WHTF and the North Anna Reservoir. Fish can swim from the North Anna Reservoir into the WHTF and back. Section E3.7.1.1 summarizes the results of various annual biological studies at Lake Anna inclusive of the North Anna Reservoir and the WHTF. The 2018 results for the WHTF as well as the North Anna Reservoir (see Section E3.7.1.1.2) demonstrate a balanced indigenous fish community exists. The dominant species from gillnet sampling are gizzard shad, channel catfish, white perch, largemouth bass, and white catfish. A total of 14 species of fish representing six families were collected by gillnets in the WHTF in 2018. Numerically dominant fish taxa collected by quarterly electrofishing surveys in the North Anna Reservoir and the WHTF are Centrarchids (sunfishes, including largemouth bass). A total of 10 species of fish representing two families were collected by electrofishing in the WHTF in 2018. (Dominion. 2018d)

E3.7.1.3 Biological Communities of the North Anna River

Before the North Anna River was impounded, the fish community of the river downstream of the Contrary Creek inflow was dominated by pollution-tolerant species. In the years following impoundment (and partial reclamation of the Contrary Creek mine sites), there was a steady increase in measures of abundance and diversity of fish in the river.

The lower North Anna River downstream from the North Anna Dam is small, approximately 75-150 feet wide, but supports a diverse assemblage of stream fish. There is no commercial fishing in the North Anna River, but recreational fishing is popular. (NRC. 2006, Section 2.7.2.2)

In the North Anna River downstream of the dam, the periphyton community (single-celled, filamentous or colonial algae, and associated microfauna attached to underwater surfaces) is dominated by diatoms, as are many southeastern streams. Caddisflies (family Trichoptera) that feed on seston (living and dead plankton, plus particulate matter) from Lake Anna dominate the benthic macroinvertebrate community. Farther downstream, macroinvertebrate communities show more diversity and are similar to those of the South Anna River. (NRC. 2006, Section 2.7.2.2)

The VDGIF periodically surveys the fish of the lower North Anna River and monitors the condition of the recreational fishery. The most recent study was conducted in 2006 (VDGIF. 2008). The species found during the 2006 study are listed in Table E3.7-2 along with their relative abundance. The redbreast sunfish and smallmouth bass populations in the lower river are the species most often sought by anglers.

As stated in Section E3.7.1.1, Biological Communities of Lake Anna, since 1987, Dominion biologists have conducted biological studies in the North Anna River. Abundance and species composition data for the North Anna River fish assemblage were collected using electrofishing surveys at four sample locations. Sample frequency for electrofishing is typically once per month each year in May, July, and September. This provides for a total of 24 river electrofishing collections for a typical sample year (May, July and September; 12 electric seine and 12 backpack). Thirty species of fish representing eight families were collected by electrofishing in the North Anna River in 2018. Historically, (1997–2017), species richness (number of species present in the sample) in the North Anna River has remained high with a mean of 26 species. (Dominion. 2018d) The most abundant species collected during annual sampling events in 2013–2018 were the redbreast sunfish, the satinfin shiner (*Cyprinella analostana*), American eel (*Anguilla rostrata*), the rosyface shiner (*Notropis rubellus*), and the rosefin shiner (*Lythrurus ardens*), respectively (Dominion. 2013b; Dominion. 2014c; Dominion. 2015d; Dominion. 2016d; Dominion. 2017b; Dominion. 2018d). Shannon's diversity index and Pielou's evenness index scores were calculated for the years 1998–2018 for the North Anna River. Diversity scores have stayed fairly consistent, ranging from 1.96-2.5 with an average score of 2.26. Evenness scores have also been fairly consistent, ranging from 0.6-0.8 with an average score of 0.7. (Dominion. 2018d)

E3.7.2 TERRESTRIAL AND WETLAND COMMUNITIES

Approximately 30% of the NAPS site consists of generation and maintenance facilities, parking lots, roads, cleared areas, and mowed grass. Hardwood forests and planted pines exist on the approximately 70% of the site that has not been cleared for the construction or operation of NAPS Units 1 and 2. These wooded areas are remnants of forests used for timber production prior to acquisition by Dominion and are dominated by a variety of oaks (*Quercus* spp.), yellow poplar (*Liriodendron tulipifera*), sweet gum (*Liquidambar styraciflua*), and red maple (*Acer rubrum*) trees. (NRC. 2006, Section 2.7.1.1) Scattered loblolly pines (*Pinus taeda*) and Virginia pines (*P. virginiana*) exist in some wooded areas.

E3.7.2.1 Physiographic Province

The NAPS site is located in the Piedmont Plateau physiographic province of Virginia. The Piedmont Plateau is Virginia's largest physiographic province, making up about 39% of the state. It extends north to south from the Blue Ridge peaks and plateaus in the west to the fall line in the east. Approximately 61% of the province is forested. Over most of the Piedmont Plateau, dry, nutrient-poor soils support oak/heath forests, while more mesic and basic upland soils usually support oak-hickory forests. Approximately 3% of the Piedmont Plateau is classified as palustrine wetlands. About 8% of the Piedmont Plateau is developed, including large urban areas around Washington, D.C., Fredericksburg, Richmond, and Lynchburg. (VDCR. 2016)

The vegetation of the Piedmont Plateau has been severely altered by a long history of clearing, agriculture, logging, and other anthropogenic disturbances. Only 9% of the province consists of unfragmented blocks of natural lands with very high to outstanding ecological integrity. Because it has less topographic variation than the Appalachian region and many fewer wetlands than the coastal plain, the Piedmont Plateau physiographic province has relatively low vegetation diversity and limited habitats supporting rare vegetation assemblages. (VDCR. 2016)

E3.7.2.2 Ecoregion

Ecoregions reflect broad ecological patterns occurring on the landscape. In general, each ecoregion has a distinctive composition and pattern of plant and animal species distribution. Abiotic factors, such as climate, landform, soil, and hydrology are important in the development of ecosystems, and thus help define ecoregions. Lake Anna and the surrounding land lies within the Piedmont ecoregion. The Piedmont ecoregion is further divided into two subregions, and Lake Anna stretches across both. The two arms of Lake Anna on the northwestern end of the lake are within the northern inner Piedmont subregion and the remainder, including the NAPS site inclusive of the WHTF, lie within the northern outer Piedmont subregion. (Woods, et al. 2003) Brief descriptions of these sub-regional ecosystems are provided below.

E3.7.2.2.1 Northern Inner Piedmont Subregion

The northern inner Piedmont subregion is a dissected upland composed of hills, irregular plains, and isolated ridges and mountains. Monadnocks are far more common than in the northern outer Piedmont subregion. General elevations become higher towards the western boundary and to the Roanoke River in the south, where the land rises to become a broad, hilly upland. Elevations typically range from 200 to 1,000 feet, but higher elevations of up to 2,000 feet occur on scattered monadnocks. Local relief is typically 100 to 400 feet, but on monadnocks can be as much as 1,100 feet. In general, relief is markedly greater than in the northern outer Piedmont subregion, but less than in the Blue Ridge Mountains to the west. (Woods, et al. 1999)

The northern inner Piedmont subregion is characteristically underlain by highly deformed and deeply weathered Cambrian and Proterozoic feldspathic gneiss, schist, and melange. It is intruded by plutons and is veneered by clay-rich weathering products (i.e. saprolite). Ultisols occur widely and have developed from residuum; they are typically clay-rich, acid, and relatively low in base saturation. Higher, more westerly soils have a mesic temperature regime; they contrast with the thermic soils of the Carolina slate belt, outer Piedmont, and Triassic uplands. (Woods, et al. 1999)

Piedmont fish habitats strongly reflect stream gradient which, in turn, mirrors local relief. Low and moderate gradient streams characteristically occur in the Piedmont; moderate gradient streams are concentrated especially in the hillier areas of the northern inner Piedmont. Moderate gradient Piedmont streams resemble larger streams in the valley and ridge province, but generally are siltier and sandier. (Woods, et al. 1999)

E3.7.2.2.2 Northern Outer Piedmont Subregion

The northern outer Piedmont subregion is an irregular plain with low rounded ridges and shallow ravines; ranges of low hills are scattered but monadnocks are much rarer than in the inner Piedmont. An area of rapids, cascades, waterfalls, and islands (the fall zone) occurs along the eastern boundary and contains urban and industrial areas. Elevations range from 200-675 feet and relief varies from 100-250 feet; maximum relief and elevation are less than in the northern inner Piedmont subregion to the west and greater than in the middle Atlantic coastal plain to the east. (Woods, et al. 1999)

The northern outer Piedmont subregion is underlain mostly by deformed, deeply weathered gneissic rock that is intruded by plutons and veneered with saprolite. It is lithologically distinct from the Carolina slate belt and the sedimentary rock of the southeastern plains and Triassic uplands. Ultisols are common and have developed from residuum; they are commonly clay-rich, acid, and relatively low in base saturation. Soils have a thermic temperature regime and contrast with the mesic soils found in higher portions of the northern inner Piedmont subregion. (Woods, et al. 1999)

Channel gradients generally reflect the surrounding terrain and considerably affect fish habitat. Channel gradients and flow velocities are usually in between those of the sluggish streams of the middle Atlantic coastal plain and those of the northern inner Piedmont; stream flow velocity tends to be moderately slow, both runs and riffles are short and infrequent, and substrates are chiefly composed of sand, silt, clay, and detritus. In the fall zone, there are a variety of aquatic habitats including pools, swampy streams, rapids, cascades, and waterfalls; here rapids are more common and better developed than in the adjacent ecoregions. Some cascades and waterfalls can deter or prevent upstream fish movement especially during low water. (Woods, et al. 1999)

Potential natural vegetation is mapped as oak-hickory-pine forest, dominated by hickory (*Carya* spp.), shortleaf pine, loblolly pine, white oak (*Quercus alba*), and post oak (*Quercus stellata*). Loblolly-shortleaf pine forests are common. Dominant land uses are forestry and agricultural activity. (Woods, et al. 1999)

E3.7.2.3 Wetlands

The USFWS maintains the National Wetlands Inventory (NWI), which integrates digital map data along with other resource information to produce current information on the status, extent, characteristics and functions of wetlands, riparian, and deep water habitats in the United States.

Based on a review of USFWS NWI maps of the site vicinity (USFWS. 2018a), there are approximately 19,000 acres of wetlands within a six-mile radius of NAPS composed of the following types (Figure E3.7-1):

Freshwater emergent wetlands covering approximately 180 acres (1% of total wetland habitat).

Freshwater forested/scrub shrub wetlands covering approximately 2,500 acres (13 % of total wetland habitat).

- Freshwater pond covering approximately 200 acres (1.1 % of total wetland habitat).
- Lake covering approximately 13,000 acres (69 % of total wetland habitat).
- Riverine covering approximately 3,000 acres (16% of total wetland habitat).

The NAPS property is circular in shape and includes a portion of Lake Anna and the tip of land at the lake’s eastern shoreline opposite of the plant. Based on NWI data (Figure E3.7-2;

USFWS. 2018a), a total of approximately 650 acres of wetland, lake, and riverine waters are located on the NAPS site.

The following wetland and water types are located on the NAPS site (USFWS. 2018a):

- Freshwater/forested wetlands covering approximately 5.6 acres (0.9% of total onsite wetland habitat).
- Freshwater pond covering approximately 16 acres (2.4% of total onsite wetland habitat).
- Lake covering approximately 630 acres (97% of total onsite wetland habitat).
- Riverine covering approximately 1.3 acres (0.2% of total onsite wetland habitat).

E3.7.2.4 Terrestrial Animal Communities

Wildlife species found in the forested portions of the NAPS site are those typically found in upland Piedmont forests of northeastern Virginia. Frequently observed mammals, such as the white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), gray squirrel (*Sciurus carolinensis*), and gray fox (*Urocyon cinereoagenteus*) exist at the site, as do smaller mammals such as moles (Talpidae), shrews (Soricidae), and a variety of mice (Muridae) and voles (*Microtus* spp.). Groundhogs (*Marmota monax*) live in the grassy areas near forest edges at the site, and beavers (*Castor canadensis*) occur in Lake Anna and its tributaries. Various birds and herpifauna (e.g., snakes, turtles, lizards, and toads) live in the uplands and along the edge of Lake Anna. (NRC. 2006, Section 2.7.1.1) Table E3.7-3 provides a list of the terrestrial fauna found in the vicinity of NAPS.

Dominion cooperates with the National Audubon Society in conducting periodic Christmas bird counts during December or January. Common bird species recorded in upland areas on and near the NAPS site during these surveys for years 2013 through 2017 include the American crow (*Corvus brachyrhynchos*), blue jay (*Cyanocitta cristata*), Carolina chickadee (*Poecile carolinensis*), mourning dove (*Zenaida macroura*), black vulture (*Coragyps atratus*), turkey vulture (*Cathartes aura*), European starling (*Sturnus vulgaris*), white-throated sparrow (*Zonotrichia albicollis*), dark-eyed junco (*Junco hyemalis*), tufted titmouse (*Baeolophus bicolor*), cedar waxwing (*Bombycilla cedrorum*), yellow-rumped warbler (*Setophaga coronata coronate*), and American goldfinch (*Spinus tristis*). (ANS. 2018)

Several species of residential and migratory wading birds and waterfowl use Lake Anna. Numerous gulls, ducks, and geese were noted during Christmas bird counts (ANS. 2018), as were great blue herons (*Ardea herodias*). Dominion biologists have documented breeding at Lake Anna by mallards (*Anas platyrhynchos*), wood ducks (*Aix sponsa*), and Canada geese (*Branta canadensis*). Belted kingfishers (*Ceryle alcyon*) and great blue herons, are present at Lake Anna throughout the year, and kingfishers presumably nest on or near the Lake Anna shoreline. Great blue herons typically nest in rookeries, and because there are no known rookeries on or adjacent to Lake Anna, it is unlikely that great blue herons nest on the lake. Waterfowl are typically most abundant at Lake Anna during the winter. Lake Anna provides important habitat for migratory waterfowl on the Atlantic flyway, especially during extremely cold winters when the elevated water temperature from station operation maintains a large ice-free body of water. (NRC. 2006, Section 2.7.1.1) The most common waterfowl observed during Christmas bird counts 2013–2017 are mallard, bufflehead (*Bucephala albeola*), hooded merganser (*Lophodytes cucullatus),* pied-billed grebe (*Podilymbus podiceps*), and the common loon (*Gavia immer*). The Canada goose, ringed-billed gull (*Larus delawarensis*), and herring gull (*L. argentatus*) are also abundant on Lake Anna during the winter. (ANS. 2018)

There are four known bald eagle (*Haliaeetus leucocephalus*) nests adjacent to Lake Anna. One nest is located on a transmission tower on the NAPS site. All four nests were occupied and produced young in 2019.

E3.7.2.5 Transmission Lines

Except for unusual circumstances, transmission corridors are maintained on a three-year cycle. Mechanical mowing and selective herbicide application (i.e., an integrated vegetation management program) are the predominate methods for corridor maintenance. In areas where mowing is impractical or undesirable (e.g., densely vegetated areas), hand-cutting and/or non-restricted use herbicides are used. Selective hand-cutting is sometimes used in sensitive areas, such as wetlands. Dominion has partnered with the VDCR Natural Heritage Division to protect areas of rare, threatened, and endangered plant species along the transmission ROWs.

Locations of rare or sensitive plant species are marked on the cutting sketches that Dominion maintains for all its transmission lines. These cutting sketches, along with specifications regarding herbicide use and brush control, are provided to corridor maintenance contractors so that adverse impacts on rare and sensitive species and habitats can be avoided (Dominion. 2013c). Dominion has partnered with the VDGIF under the Wildlife Habitat Improvement Program to support landowners in implementing wildlife habitat improvements under transmission lines. Dominion supports these efforts through cost-sharing. (Dominion. 2018c)

E3.7.3 POTENTIALLY AFFECTED WATER BODIES

In accordance with Dominion’s lake level contingency plan, should drought conditions occur and Lake Anna surface water levels fall to 248 feet above msl, Dominion will begin reducing releases below the 40 cfs level incrementally until reaching the minimum discharge of 20 cfs. If Lake Anna reaches 242 feet msl, NAPS must shut down. (Dominion. 2016b)

Prior to impoundment, water quality in the North Anna River was degraded by sedimentation and acid mine drainage from Contrary Creek. Land adjacent to Contrary Creek had been the site of extensive iron pyrite mining operations during the late 19th and early 20th centuries. When the mine was abandoned (circa 1920), mine shafts and tailings piles were left exposed to the weather. Runoff from the mine area was acidic, with high concentrations of metals. Virtually no aquatic life was found in Contrary Creek downstream of the mine site. (Dominion. 2001, Section 2.2)

Also prior to impoundment, the density and diversity of fish and benthic macroinvertebrates had been markedly reduced in the North Anna River immediately downstream of its confluence with Contrary Creek. More subtle changes were evident as far as 15 miles downstream, although water quality was generally satisfactory. The creation of Lake Anna mitigated other water quality impacts from Contrary Creek area runoff. Low-pH creek water is neutralized as it mixes with higher-pH reservoir water. Heavy metals are removed from the water column by adsorption to clay particles and the subsequent settling of these particles. Chemical precipitation (and co-precipitation with iron) may also remove zinc and copper ions from Contrary Creek water when it mixes with Lake Anna water. In addition, in 1976 the Virginia State Water Control Board, in association with the EPA, implemented a reclamation project to reduce erosion and sedimentation in the area. (Dominion. 2001, Section 2.2)

Since its creation, Lake Anna has developed three distinct ecological zones: upper lake, mid-lake, and lower lake. The upper lake is essentially riverine, shallow (average depth of 13 feet), and shows some evidence of stratification in summer. The mid-lake is deeper and stratifies in summer. It receives waters from Contrary Creek that, because of years of mining in its floodplain, are sometimes low in pH and high in metals. The lower lake is deeper (average depth of 36 feet), clearer (with more light penetration), and shows pronounced annual patterns of winter mixing and summer stratification. The epilimnion (warm layer above the thermocline) was generally eight feet deep during pre-operational years, and 26 to 33 feet deep during operational years. The increase in depth of the epilimnion appears to be related to the heated discharge entering the North Anna Reservoir from Dike 3 (see Figure E3.6-1) and the withdrawal of cooler, deeper water at the NAPS intake. The heated discharge (and attendant mixing) and withdrawal have also increased the depth of oxygenation, with the layer of water holding at least 5 milligrams per liter of dissolved oxygen increasing from 16 feet (pre-operational) to 30 feet (operational). (Dominion. 2001, Section 2.2)

A two-year entrainment study was conducted at NAPS to support entrainment-related determinations required by CWA Section 316(b). Entrainment samples were collected twice a month for 5.5 consecutive months from April 2016 through September 2016, and 6.5 consecutive months from March 2017 to September 2017. During the first year of entrainment sampling, and excluding non-viable eggs (NVE), a total of 522 organisms distributed among 12 distinct taxa were collected at NAPS. During the second year of entrainment sampling, a total of 760 organisms (excluding NVE) distributed among 10 distinct taxa were collected. Finfish comprised 100% of the total entrainment sample collection for both years of the study. The species lists were consistent during the two years of sampling with slight differences. Post yolk sac larvae dominated the entrainment sample collections, accounting for 83.3% of the Year 1 total and 95.8% of the Year 2 total. The yolk sac larvae life stage comprised only 5.9% of the sample collection for Year 1 and 1.6% of the sample collection for Year 2. (HDR. 2018)

Herrings (Clupeidae, which includes blueback herring), shad (Clupeidae, which includes threadfin shad and gizzard shad), and common sunfish (*Lepomis* spp.) dominated the entrainment sample collection accounting for 43%, 7%, and 34% of the total number of organisms during Year 1 and 69%, 16%, and 9% during Year 2, respectively. White perch accounted for 5% and 2% of the total sample collection in Year 1 and Year 2, respectively. All remaining taxa contributed no more than 1% of the finfish collection. No endangered or threatened species were collected. (HDR. 2018)

The highest monthly depth-averaged densities occurred in May, June, and July of both years. Overall, the entrainment composition collected in 2016–2017 compares well with the entrainment study data conducted from March 1978 through July 1983, with the dominant taxa for both studies consisting of gizzard shad, white perch, and sunfish. (HDR. 2018)

A single discharge canal is located 200 feet south of the cooling water intake structure (CWIS). The 3,600-foot long canal discharges into the first of the WHTF lagoons, which allows the discharged water to flow in series through the three lagoons before the water is returned to the North Anna Reservoir (HDR. 2018). A comprehensive study of Lake Anna's water quality and aquatic communities was conducted in support of a CWA Section 316(a) demonstration for NAPS. This evaluation was based on five years (1973–1977) of pre-operational studies and eight years (1978–1985) of operational studies. Water quality, water temperature, and biological monitoring were conducted in upper, middle, and lower portions of the lake, and in the North Anna River below the reservoir. (Dominion. 2001, Section 2.2)

Dominion began monitoring Lake Anna water temperatures in 1973, but made sufficient study plan changes in 1975 that pre- and post-1975 data are not directly comparable. Dominion monitored water temperatures at seven Lake Anna stations from 1975 through 1985 as part of a CWA Section 316(a) demonstration for NAPS. Temperatures were recorded hourly at most of these locations. The highest (hourly average) temperatures recorded in June, July, and August over this period were 91.8ºF (at an upper lake station in 1984); 92.7ºF (at an upper lake station in 1977); and 91.6ºF (at a lower lake station in 1980). The highest (hourly average) water temperature was measured on July 19, 1977, at the northernmost station (Pamunkey Creek arm), before NAPS began operating. (Dominion. 2001, Section 2.2)

As part of a larger post-316(a) demonstration environmental monitoring effort that includes fish population studies, Dominion has continued to monitor Lake Anna water temperatures, using fixed temperature recorders at seven stations. Temperatures in Lake Anna are reported by monitoring station as monthly maximum, mean, and minimum temperatures, to permit direct comparisons with historical data. The range of temperatures and between-station temperature trends recorded over 2013–2018 were within the range of previously reported minimum and maximum lake temperatures. The maximum hourly average temperature reported for Lake Anna for years 2013–2018 was 91.4ºF, 88.9ºF, 91.2ºF, 93.7ºF, 91.0ºF, and 91.4ºF, respectively. (Dominion. 2013b; Dominion. 2014c; Dominion. 2015d; Dominion. 2016d; Dominion. 2017b; Dominion. 2018d) In the 2001 LRA, the highest (hourly average) water temperature for an operational year was stated as 92.3ºF, recorded in July 1983 (Dominion. 2001, Section 2.2). These temperature data do not indicate an overall long-term warming trend in the reservoir. Dominion submits annual reports to the VDEQ on water temperatures and fisheries monitoring in Lake Anna and the lower North Anna River.

Water quality in Lake Anna is also studied by the VDEQ via multiple monitoring stations that allow the VDEQ to assess water quality. The portion of the North Anna Reservoir where the NAPS operating units are located southward to the WHTF's second dike is fully supporting for aquatic life, recreation, and wildlife, but impaired for fish consumption due to polychlorinated biphenyls (PCBs). The more southward portion of the lake is fully supporting for aquatic life, recreation, and wildlife, but impaired for fish consumption due to PCBs and mercury. (VDGIF. 2018b)

The Commonwealth of Virginia requires a 40 cfs minimum discharge of water from the North Anna Dam except under drought conditions. These minimum flow requirements are established to maintain instream flows and water quality in the North Anna River below the dam and in the Pamunkey and York rivers, which are further downstream. (Dominion. 2001, Section 2.2) As stated in Section E3.7.1.1, Biological Communities of Lake Anna, Dominion biologists have conducted biological studies in the North Anna River since 1987. Abundance and species composition data for the North Anna River fish assemblage were collected using electrofishing surveys at four sample locations. Thirty species of fish representing eight families were collected by electrofishing in the North Anna River in 2018. Historically, (1997–2017), species richness (number of species present in the sample) in the North Anna River has remained high with a mean of 26 species. (Dominion. 2018d) The most abundant species collected during annual sampling events in 2013–2018 were the redbreast sunfish, satinfin shiner, American eel, rosyface shiner, and the rosefin shiner, respectively (Dominion. 2013b; Dominion. 2014c; Dominion. 2015d; Dominion. 2016d; Dominion. 2017b; Dominion. 2018d). Shannon's diversity index and Pielou's evenness index scores were calculated for the years 1998–2018 for the North Anna River. Diversity scores have stayed consistent through years, ranging from 1.96-2.56 with an average score of 2.26. Evenness scores have also been consistent over the years, ranging from 0.6-0.8 with an average score of 0.7. (Dominion. 2018d)

Since surveys and/or samples can be missed due to high flows, comparison of total fish numbers among surveys and years can be misleading. Therefore, a method to calculate the average number of fish caught per sampling station was developed and shows gear type, survey and year to represent CPUE to better compare fish numbers over time. The most recent five years are summarized in Table E3.7-4 along with the historical mean. When comparing the current year's results with the cumulative mean, Dominion's biologists have not identified adverse trends in the CPUE results (Dominion. 2013b; Dominion. 2014c; Dominion. 2015d; Dominion. 2016d; Dominion. 2017b; Dominion. 2018d) and in 2018 concluded that species richness, diversity, and evenness have remained high in the North Anna River samples, indicating the river is able to support a diverse fishery (Dominion. 2018d).

The monitoring plan for the North Anna River includes a smallmouth bass (*Micropterus dolomieu)* young-of-year study to assess the potential effects of water temperature and river discharge on spawning success of smallmouth bass in the North Anna River below the dam. The data indicate that flow may have a greater impact than temperature on spawning success. Temperature may be the variable that triggers spawning in the North Anna River, but periods of high flow may reduce spawning success by washing out the beds. According to the data, spawning seems most successful after the last high flow event for the season or during years where extreme flows were absent. A second smallmouth bass study looked at distribution of length classes. Data for adult and juvenile smallmouth bass caught in 2018 indicate that the length classes were normally distributed. (Dominion. 2018d)

Dominion also monitors temperature at a station approximately 0.6 miles below the North Anna dam. Temperature is recorded hourly. The maximum hourly average temperature reported for years 2014–2018 was 89.4ºF, 90.4ºF, 92.8ºF, 91.9ºF, and 90.9ºF, respectively. (Dominion. 2014c; Dominion. 2015d; Dominion. 2016d; Dominion. 2017b; Dominion. 2018d)

E3.7.4 PLACES AND ENTITIES OF SPECIAL ECOLOGICAL INTEREST

Within the vicinity of NAPS, there are two natural community types identified within the VDCR rare and natural communities database (VDCR. 2018b). These two communities are described below.

E3.7.4.1 Piedmont Central Appalachian Mixed Oak/Hardwood Forest Natural Community

The Piedmont Central Appalachian mixed oak/hardwood forest natural community was identified as occurring with the York River basin sub-units YO18 and YO20. These sub-units are found on the Louisa and Spotsylvania counties' sides of Lake Anna and encompass Lake Anna State Park. (VDCR. 2018b)

This group of oak-dominated forests is prevalent on xeric, infertile upland sites. Habitats are variable, ranging from sterile, low-elevation "flatwoods" to steep, rocky mountainsides. All have strongly acidic soils with low base cation levels and relatively high levels of iron. Regionally varying mixtures of white oak, chestnut oak (*Quercus montana*, *Quercus prinus*), scarlet oak (*Quercus coccinea*), black oak (*Quercus velutina*), northern red oak (*Quercus rubra*), southern red oak (*Quercus falcata*), and post oak compose the overstories of these forests. Bigtooth aspen (*Populus grandidentata*) and pines, including pitch pine (*Pinus rigida*) in the mountains, shortleaf and Virginia pines (*Pinus echinata* and *Pinus virginiana*) in the Piedmont, and loblolly pine in the coastal plain, are common associates that usually indicate past disturbance. Hickories are generally unimportant and, when present, mostly restricted to the understory. (VDCR. 2017)

Flame azalea (*Rhododendron calendulaceum*) is a locally prevalent member of the ericaceous shrub complex in the mountains, while dangleberry (*Gaylussacia frondosa*) is a prominent ericad in the coastal plain. The ericaceous sub-shrubs trailing arbutus (*Epigaea repens*) and wintergreen (*Gaultheria procumbens*) may also be abundant, especially in the mountains. The density of ericaceous species may be closely tied to land-use and disturbance history. True herbaceous species are sparse, but may include scattered individuals or colonies of xerophytes such as galax (*Galax urceolata*), yellow wild indigo (*Baptisia tinctoria*), pink lady's-slipper (*Cypripedium acaule*), dwarf iris (*Iris verna*), large whorled pogonia (*Isotria verticillata*), cancer-root (*Orobanche uniflora*), gaywings (*Polygala paucifolia*), eastern bracken fern (*Pteridium aquilinum* ssp. *latiusculum*), and Virginia goat's-rue (*Tephrosia virginiana*). (VDCR. 2017)

E3.7.4.2 Coastal Plain/Outer Piedmont Acidic Seepage Swamp

The coastal plain/outer Piedmont acidic seepage swamp was identified as occurring within the York River basin sub-unit YO20 (VDCR. 2018b). This group contains forested vegetation of braided headwaters stream bottoms and seeping toe-slopes saturated by abundant groundwater discharge. Classified units in the group separate along a gradient of soil fertility and groundwater chemistry, which range from extremely acidic and nutrient-poor to highly calcareous. Despite the wide variation in substrate status, the communities in the group share hydrologically and topographically similar habitats, as well as many wetland species that tolerate a wide range of soil conditions. Dominant overstory species are red maple and blackgum (*Nyssa sylvatica*), with tulip-tree (*Liriodendron tulipifera*) and loblolly pine also locally important. Common small trees and shrubs are sweetbay magnolia (*Magnolia virginiana*), sweet pepperbush (*Cethra alnifolia*), highbush blueberries (*Vaccinium* spp.), swamp azalea (*Rhododendron viscosum*), smooth winterberry (*Ilex laevigata*), and southern wild raisin (*Viburnum nudum*). Compact dodder (*Cuscuta compacta*) is often abundantly attached to the stems of shrubs in these swamps. Common herbaceous species include cinnamon fern (*Osmundastrum cinnamomeum var. cinnamomeum*), netted chain fern (*Woodwardia areolata*), and the sedges *Carex lonchocarpa* and *Carex seorsa*. (VDCR. 2017)

E3.7.5 INVASIVE SPECIES

Dominion maintains a management plan for invasive species found at their plants (Dominion. 2016e). Those invasive species applicable to NAPS and vicinity are presented below. In addition, foresters and biologists have identified the emerald ash borer (*Agrilus planipennis*) as an emerging concern for the Lake Anna sub-watershed (VDEQ. 2018c). This invasive species is also presented below. Finally, an invasive species found at many power plants is the zebra mussel

(*Dreissena polymorpha*). In the course of monitoring Asiatic clam populations, Dominion also looks for evidence that the zebra mussel has invaded Lake Anna. As of October 2018, no zebra mussels have been found in the North Anna Reservoir or the WHTF. If a zebra mussel is found, Dominion staff are required to contact their environmental staff and Dominion Environmental Biology immediately and provide the location. Dominion would then develop a site-specific control and management strategy of a combination of chemical, physical, and biological measures (e.g., chemical applications, thermal control, and introduction of biological control agents), taking care to minimize environmental impacts.

E3.7.5.1 Aquatic Plants

E3.7.5.1.1 Hydrilla

Hydrilla, an exotic aquatic weed, became established in Lake Anna during the late 1980s. It occurs in still or slow-moving fresh water and can tolerate a wide range of conditions, including those that other plants find unfavorable such as low light intensity, a high level of suspended sediments, high conductivity, drawdown periods, and warm temperatures. (VDCR. 2018c) The species abundance increased from 96 acres in 1990 to 832 acres in 1994. Triploid (sterile) grass carp were stocked in the WHTF in 1994 by Dominion with the approval of the VDGIF to control the growth of hydrilla. (VDGIF. 2016) Dominion has worked with local stakeholders, including LACA and VDGIF, to develop a hydrilla management plan. This plan includes a citizen-led monitoring program, grass carp stockings, and herbicide application. Hydrilla in the North Anna Reservoir and the WHTF is minimal and no action was needed for control in 2019.

Other Dominion control measures include herbicides and biological control. Herbicide treatment on smaller areas of infestation is an option by licensed/certified herbicide applicators. Spread of this species can be limited through the practice of cleaning boats and trailers prior to re-launching in another water body. (Dominion. 2016e)

E3.7.5.2 Aquatic Animals

E3.7.5.2.1 Northern Snakehead

Northern snakeheads (*Channa argus*) were discovered in Virginia in 2004 in the Potomac River. They have since been found in other Virginia river basins. Snakeheads were found to be self-sustaining in Lake Anna (York drainage) in 2017. A Dominion biologist collected a snakehead in the August 2019 electrofishing survey at Lake Anna. The fish was collected in the North Anna arm of the lake. It was killed and reported to the VDGIF. The VDGIF has also reported the collection of snakeheads in Lake Anna.

Snakeheads do not have an immediate effect on power station operations; however, Dominion has established practices regarding snakeheads in alignment with VDGIF requirements (Dominion. 2016e; VDGIF. 2018b). If a snakehead is caught, the fish must be killed and reported, along with the location of the catch, to Dominion Environmental Biology. Dominion biologists will report the catch to the appropriate state and/or federal agencies. The fish may be killed by removing the head, separating the gill arches from the body, or by removing the internal organs. If a snakehead is caught and the angler wants to keep the fish, the fish must be killed by one of the methods above and the angler's name, date of catch, location of catch and size of the fish must be reported to Dominion Environmental Biology. (Dominion. 2016e)

E3.7.5.2.2 Asian Clam

Since the introduction of the Asian clam to the United States in 1938, it has spread into many major waterways. The most prominent effect of the introduction of the Asian clam into the United States has been biofouling, especially of complex power plant and industrial water systems. It has also been documented to cause problems in irrigation canals, pipes, and drinking water supplies. It alters benthic substrates and competes with native species for limited resources (Foster, et al. 2016).

Although found near several Dominion facilities, including NAPS, Asiatic clams have not been found in water systems at levels that would merit control measures (low-level chlorination, biocide application). Dominion initiated a semi-annual sampling program in the fall 1990 to monitor Asiatic clams at NAPS. In grab sample surveys of two locations in the North Anna Reservoir and two in the WHTF from 1991 to 2019, the average number of clams collected ranged from a high of 201 collected in 2011 to a low of 22 collected in 2019. Historically, Asiatic clam abundance in Lake Anna has not caused a biofouling concern at NAPS. The data for Asiatic clam show highly variable catches from year to year, but sampling results indicate a reduced risk for biofouling. (Dominion. 2013b)

When any small mussels or clams are found in water systems, station personnel save specimens and notify their environmental staff and Dominion Environmental Biology. Prior to implementing any control measures to NAPS water systems, Dominion Environmental Services should be contacted to assist in choosing the most appropriate method and to resolve any permitting issues. Because boats and boat trailers can be major vectors for the introduction of aquatic invasive species—such as clams—to new waterbodies, Dominion's boat and trailer disinfection procedures are required to be followed to prevent spread. In addition to this procedure, station personnel must be sure to follow any local, state, or federal boat and trailer disinfection guidelines. (Dominion. 2016e)

E3.7.5.3 Terrestrial Plants

E3.7.5.3.1 Kudzu *(Pueraria montana)*

Kudzu (*Pueraria montana*) is a well-known invasive plant intentionally introduced to the United States from its native Japan for use in soil stabilization. Kudzu rapidly grows up and over all other vegetation and creates a dense canopy with its large leaves. It starves other plant species of sunlight and quickly reduces complex natural communities. (VISC. 2005)

Dominion practices for kudzu control include manual removal of smaller plants, ensuring the entire plant is removed, especially all of the root system, and for larger plants cutting the stem two inches above the ground and applying an herbicide containing glyphosate. Larger plants can also be treated by digging out and cutting the root crown and applying a 50% glyphosate solution to the cut root. Chemical treatments should be applied by certified personnel only. (Dominion. 2016e)

E3.7.5.3.2 Autumn Olive

Autumn olive (*Elaeagnus umbellata*) grows as a deciduous shrub or small tree with a dense crown. It commonly bears sharp thorns in the form of spur branches. Dominion practices for autumn olive control include manually removing young shoots and trees ensuring the entire plant (including all roots) is removed and cutting larger trees. After trees are cut, the stumps should be treated with an herbicide 5-20 minutes after being cut. The herbicide should be applied to the entire stump, but especially the outer edge so the herbicide can move to the roots of the plant. Chemical treatments should be applied by certified personnel only. Larger trees can be cut, but the cutting of plants that have fruit would cause the seeds to disperse and new plants to grow. (Dominion. 2016e)

E3.7.5.3.3 Tree-of-Heaven

Tree-of-heaven (*Ailanthus altissima*) is non-native tree species which has deciduous, lanceolate leaves and smooth bark that is grey or brown in color. Tree-of-heaven flowers from April-June with large clusters of yellowish-green flowers. Male and female flowers occur on separate trees. Female trees produce a tan winged fruit which is spread by wind and water. Although tree-of-heaven does not directly pose a threat to Dominion operations on electric transmission rights-of-way (ROWs), state agencies have asked for company participation in eradication of this pervasive nuisance species. Tree-of-heaven spreads aggressively by seed and root sprouts and re-grows rapidly after being cut.

Dominion control practices include manual removal, cutting, and herbicide application. Young shoots and trees can be manually removed, ensuring the entire plant (including all roots) is removed. Larger trees can be cut, but the cutting of plants that have fruit would cause the seeds to disperse and new plants to grow. After trees are cut, the stumps should be treated with an herbicide 5-20 minutes after being cut. The herbicide should be applied to the entire stump including the outer edge so the herbicide can move to the roots of the plant. Staff should contact Transmission Forestry for the current herbicide being used to treat tree-of-heaven. Chemical treatments should be applied by certified personnel only. (Dominion. 2016e)

E3.7.5.4 Terrestrial Species

E3.7.5.4.1 Emerald Ash Borer

Emerald ash borer is a small beetle discovered in Michigan in 2002. A native of China, Korea, Taiwan, and Japan, its larvae have killed 8 to 10 million ash trees (*Fraxinus spp.*) in Michigan, Ohio, and Indiana. The U.S. Forest Service (USFS) is conducting coordinated programs of research, eradication by means of tree removal, and quarantines to prevent further infestations. (VISC. 2005). The 2018 distribution map for the emerald ash borer indicates occurrences in Spotsylvania County (USDA. 2018c) and foresters and biologists have identified the species as an emerging concern for the Lake Anna sub-watershed (VDEQ. 2018c). Currently, there are no Dominion-specific practices for this species.

E3.7.5.4.2 Rock Dove or Pigeon

Rock doves or pigeons (*Columba livia*) were introduced into the United States in the 1800s and are now widely distributed throughout North America. They have adapted well to urban and industrialized environments, often nesting in artificial structures and forming dense colonies. Pigeons can be a nuisance to personnel; nests and nesting materials can pose fire hazards; and accumulation of pigeon feces can be a problem where pigeons roost and nest. Pigeon feces can pose problems with corrosion, present slipping hazards, are unattractive, and are associated with various diseases in humans. (Dominion. 2016e)

Pigeons are not protected by the Migratory Bird Treaty Act of 1918 (MBTA). NAPS staff are asked to notify their environmental staff concerning any problems with pigeons. Management and control measures that could be used include removal by a certified nuisance wildlife control operator and exclusion measures and habitat modifications where appropriate. In general, physical exclusion devices such as bird control spikes or netting are most effective. Visual and audio deterrents (i.e. playing predatory bird calls), while having some immediate effect, have generally been proven ineffective over time. In addition to exclusion, reducing the food supply of pigeons can reduce the number of pigeons in an area. This can be achieved by securing access to garbage and prohibiting personnel and visitors from feeding pigeons. (Dominion. 2016e)

E3.7.5.4.3 European Starling

The European starling was introduced to the United States in the 1890s. Since their introduction, starlings have spread rapidly and are distributed widely throughout North America. Starlings prefer urban and suburban environments and often nest in artificial structures. They present several threats to Dominion equipment and operations, as they nest in transformers or other electrical equipment (particularly in winter due to heat generated by the devices) and pose fire hazards. Starlings also form large roosts on power lines, and their corrosive feces can damage equipment, pose safety risks such as slipping hazards, and present potential disease risks. (Dominion. 2016e)

The European starling is not protected by the MBTA. Before proceeding with any bird control methods for starlings, care must be taken to properly identify the birds correctly and ensure no harm is done to birds protected under the MBTA. NAPS staff are asked to notify their environmental staff concerning European starlings. Starling management should include removal by certified nuisance wildlife control operators and exclusion to prevent further problems. In addition to the removal of birds, nests should be removed to prevent any fire hazard. Exclusion methods for starlings are similar to those for pigeons. In general, the most effective means of exclusion will be those that physically limit starling access to nesting and roosting areas. This includes bird control spikes, netting, and other modifications of potential nesting areas. Visual and audio deterrents (i.e. playing predatory bird calls), while having some immediate effect, have generally been proven ineffective over time. In addition to exclusion, reducing the food supply of starlings can reduce the number of starlings in an area. This can be achieved by securing access to garbage and prohibiting personnel and visitors from feeding starlings. (Dominion. 2016e)

E3.7.6 PROCEDURES AND PROTOCOLS

This section contains a description of how the NAPS site adheres to any applicable wildlife management plans and uses applicable or required (by permit) best management practices, including, but not limited to, when applying pesticides and herbicides or when performing routine ground-disturbing and other activities to maintain the site and in-scope transmission lines.

Dominion relies on administrative controls and other regulatory programs to ensure that changes in plant operations (e.g., water withdrawal increase, new NPDES discharge point, wastewater discharge increase, air emissions increase), or ground-disturbing activities are planned to identify and minimize any potential impacts to habitats and wildlife. Administrative controls, as presented in Section E9.5, involve reviewing the change, identifying effects, if any, on the environmental resource area (i.e., habitat and wildlife), establishing BMPs, modifying existing permits, or acquiring new permits as needed to minimize impacts.

Dominion has issued guidance on the review of proposed construction and changes to existing equipment or processes. The guidance is designed to prompt review of proposed construction and changes for environmental implications and the need for permits or permit modifications, ensuring Virginia's regulatory programs are complied with. Federal and state environmental regulatory programs ensure that habitats and wildlife are protected. The guidance includes a series of questions on the proposed construction or change regarding the potential for air emissions, water use, new or changed wastewater discharges, waste generation, land disturbance, encroachment on wetlands, etcetera. Dominion has established specific procedures and guidance to address ground-disturbing activities to ensure compliance with regulations and permit requirements for erosion and sediment control, stormwater, and wetlands and wetland buffers. The VDEQ requires implementation of BMPs to prevent and control sedimentation and silting of waterways and wetlands, stabilization of soils, and stormwater management and controls. Dominion procedures address air emission permitting and surface and groundwater withdrawal permitting. Dominion also has spill control and prevention plans and periodic reviews to ensure the control and practices are in place to minimize any potential impacts to aquatic and terrestrial habitats and species from inadvertent spills and releases.

As presented in Section E3.7.5, Invasive Species, Dominion has invasive species control guidance that includes requirements for selection of appropriate and approved herbicides and pesticides. Dominion also maintains procedures on the use of herbicides and pesticides for transmission line ROWs (see Section E3.7.2.5, Transmission Lines).

Existing regulatory programs that the site is subject to, as presented in Section E9.0, also ensure that any potential impacts to habitats and wildlife are minimized. These programs are related to the following: stormwater management for controlling the runoff of pollution sources such as sediment, metals, or chemicals; spill prevention to ensure that BMPs and structural controls are in place to minimize the potential for a chemical release to the environment; and management of herbicide applications to ensure that the intended use will not adversely affect the environment.

E3.7.7 STUDIES AND MONITORING

Dominion performs terrestrial ecological monitoring as required for permitting and permit compliance. Dominion also cooperates with private organizations such as the local chapter of the National Audubon Society to allow informal monitoring of selected resources at and near NAPS, and has worked with the VDCR Natural Heritage Program to conduct rare plant surveys in transmission line ROWs.

Since 1987, Dominion biologists have performed various annual biological studies on the North Anna Reservoir as well as the WHTF and the North Anna River below the North Anna Dam. The studies are designed to address the requirements of the NAPS VPDES permit and support the 316(a) demonstration for the station showing that the operation of NAPS has not resulted in significant harm to the biological community. The study plans are subject to VDEQ and VDGIF approval. Quarterly gillnet and electrofishing are conducted in the North Anna Reservoir and the WHTF. Abundance and species composition data for the North Anna River fish assemblage is collected using electrofishing surveys at four sample locations. Sample frequency for electrofishing is typically once a month each year in May, July, and September. In addition, smallmouth bass studies are conducted annually in the North Anna River.

In response to the NRC's generic letter 89-13, Dominion initiated a semi-annual sampling program in the fall 1990 to monitor Asiatic clams in the reservoir. Dominion continues to collect replicate samples at two North Anna Reservoir stations (i.e., intake and mid-lake) and two WHTF stations. They report the total number and density of clams at the stations and discuss population trends in semiannual reports. In the course of monitoring Asiatic clam populations, Dominion assesses the micro-fouling potential of Asiatic clams and looks for evidence that the zebra mussel has invaded the reservoir. As of October 2018, Dominion had observed no zebra mussels in the reservoir.

When warranted, an aerial and ground-based monitoring program focused on identifying the presence of hydrilla is conducted. Hydrilla abundance is low in both the WHTF and the North Anna Reservoir, but increasing. (VDGIF. 2016)

The VDGIF also conducts aquatic ecology monitoring as part of its management responsibilities for the fisheries of Lake Anna. VDGIF district biologists monitor and research the fish of Lake Anna annually, focusing primarily on striped bass. Other species, such as black crappie, walleye, channel catfish, and gizzard and threadfin shad, are also monitored by the VDGIF. (VDGIF. 2016)

E3.7.7.1 Entrainment and Impingement Monitoring

As presented in the SEIS for the first license renewal (NRC. 2002a, Sections 4.1.1 and 4.1.2), impingement and entrainment studies were conducted at NAPS from 1978 to 1983. The results of these studies were documented in a CWA Section 316(b) demonstration submitted to the Virginia State Water Control Board in May 1985. Based on the demonstration and other input, the Board issued NPDES Permit No. VA0052451 for North Anna in 2001.

In response to new CWA 316(b) regulations, Dominion conducted a two-year entrainment study at NAPS in 2016–2017 to support entrainment-related determinations required by CWA Section 316(b). Entrainment samples were collected twice a month for 5.5 consecutive months from April 2016 through September 2016, and 6.5 consecutive months from March 2017 to September 2017. The results are described in Sections E3.7.3.

E3.7.7.2 Avian Monitoring

The Center for Conservation Biology (CCB) at the College of William and Mary conducts annual aerial surveys for rookeries and eagle and osprey (*Pandion haliaetus*) nests. These data are publicly available in an online mapping tool. Breeding eagles have been surveyed annually in the lower Chesapeake Bay since 1956. Each year CCB biologists fly a nest survey in February and March to map eagle nests and determine their activity status. This survey is followed in late April and May by a productivity survey where chicks are counted in each nest. The survey covers all tributaries of the lower Chesapeake Bay, as well as other prominent bodies of water, and requires more than 100 hours of flight time in a high-wing Cessna. Biologists survey all known nest structures to determine their activity status and search for newly established nests (CCB. 2018).

These data are utilized by NAPS when coordinating with state and federal agencies to ensure compliance with the Bald and Golden Eagle Protection Act (BGEPA) and the MBTA. There are four known bald eagle nests adjacent to Lake Anna, one of which is located on the NAPS site. All four nests were occupied and produced young in 2019. Typically, one osprey nest is located onsite near the switchyard.

E3.7.7.3 Bat Monitoring

Dominion contracted for a bat survey in 2016 for forested portions of the site where licensed NAPS Unit 3 would be located if built. Mist net surveys were used, based on the current protocols of USFWS. A total of 29 bats, representing two species, were captured in 84 complete net nights, including 23 eastern red bats (*Lasiurus borealis*) and six silver-haired bats (*Lasionycteris noctivagans*). No listed bats were captured. (GAI Consultants. 2016)

Dominion has a commitment in its CWA Section 404 permit for construction and operation of NAPS Unit 3 (Permit 10-V1256/NAO-2008-2534) for biennial surveys for the northern long-eared bat (*Myotis septentrionalis*) and other threatened and endangered species. Requests to waive these surveys have been made and granted, due to the fact that there is no current plan to start construction. The most recent waiver from the U.S. Army Corps of Engineers (USACE) was granted in 2018 (USACE. 2018).

E3.7.7.4 Rare and Endangered Plant Monitoring

Plant-specific identification surveys conducted on the site during the 2010 and 2012 flowering seasons determined that the small whorled pogonia (*Isotria medeoloides*) was not present. The VDCR reviewed the 2010 survey report and concurred with the methodology and findings (Dominion. 2016b, Section 2.4.1.6). Dominion has a commitment in its CWA Section 404 permit for construction and operation of NAPS Unit 3 (Permit 10-V1256/NAO-2008-2534) for biennial surveys for small whorled pogonia and other threatened and endangered species. Requests to waive these surveys have been made and granted, due to the fact that there is no current plant to start construction. The most recent waiver from the USACE was granted in 2018 (USACE. 2018).

Monitoring of rare and endangered plant species along transmission ROWs generally occurs annually for selected sites. Locations of rare or sensitive plant species are maintained in cutting sketches and a geospatial database that Dominion maintains for all its transmission lines. These data, along with specifications regarding herbicide use and brush control, are provided to corridor maintenance contractors so adverse impacts on rare and sensitive species and habitats can be avoided. Further, Dominion coordinates with the VDCR–NH to ensure its practices and procedures are consistent with agency guidelines and directives (Dominion. 2013c).

E3.7.7.5 As-Needed Monitoring

Studies and monitoring at NAPS occur as needed to comply with federal, state, and local regulatory requirements, as directed by the agencies, generally prior to new projects. Any monitoring that occurs is consistent with agency policies and procedure, and is performed under the guidance of the coordinating agency.

E3.7.8 THREATENED, ENDANGERED, AND PROTECTED SPECIES, AND ESSENTIAL FISH HABITAT

The USFWS maintains current lists of threatened or endangered species on its website (USFWS. 2020a). The VDGIF and the VDCR also maintain lists of state-protected species on their websites (VDGIF-FWIS. 2020; VDCR. 2020). In 2015, the VDGIF finalized the updated state wildlife action plan (WAP) a required plan under the federal state and tribal wildlife grants program, identifying species in the Commonwealth of Virginia as critically imperiled or in decline, and strategies to conserve and restore these species. The Virginia WAP designates a conservation status listing for each identified species (VDGIF. 2015).

Species listed as threatened or endangered by these agencies, or candidates for federal listing, potentially occurring near the NAPS site, or in counties within a six-mile radius of the site, are listed in Table E3.7-5. Consultation letters with state and federal agencies are included in Attachment C.

E3.7.8.1 Federally Listed Species

The USFWS and National Marine Fisheries Service (NMFS) listing of federally protected species were reviewed. A total of six species in Louisa County and adjacent Spotsylvania County are listed as federally endangered, threatened, under review, or species identified as in recovery.

The northern long-eared bat, the dwarf wedge mussel (*Alasmidonta heterodon*), the yellow lance (*Elliptio lanceolate*), the green floater (*Lasmigona subviridis*), and the small whorled pogonia are listed as potentially occurring in Louisa County and/or Spotsylvania County within the vicinity of NAPS (USFWS. 2020a; VDGIF-FWIS. 2020; VDCR. 2020; 83 FR 14189). The ecological requirements for these species are summarized below. No federally and/or state-listed endangered or threatened terrestrial animals are known to exist at the NAPS site or along the transmission line rights-of-way.

E3.7.8.1.1 Northern Long-eared Bat

This species is federally and state listed as threatened.[1] It has been designated as Tier I in the Virginia WAP for critical conservation need (VDGIF-FWIS. 2020). There is no designated critical habitat for this species (USFWS. 2018b).

The northern long-eared bat is a medium-sized bat with a body length of 3 to 3.7 inches but a wingspan of 9 to 10 inches. Fur color can be medium to dark brown on the back and tawny to pale-brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, Myotis. (USFWS. 2015)

Northern long-eared bats spend the winter hibernating in caves and mines, called hibernacula. During the summer, they roost singly or in colonies underneath bark, in cavities, or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat has been found roosting in structures, like barns and sheds, but this is rare. Breeding season is late summer or early fall, when males begin to swarm near hibernacula (USFWS. 2015).

The northern long-eared bat's range includes much of the eastern and north-central United States, as well as much of Canada. The major threat to the species is related to the disease white-nose syndrome, rather than habitat degradation. If this disease had not emerged, it is unlikely the northern long-eared bat would be experiencing such a dramatic population decline. Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly in the United States from the northeast to the Midwest and southeast, an area that includes the core of the northern long-eared bat's range where it was most common before this disease. Numbers of northern long-eared bats (from hibernacula counts) have declined by up to 99% in the northeast. (USFWS. 2015)

Preferred habitat for the northern long-eared bat is not located on the portions of the NAPS site utilized for energy production. While substandard habitat for this species may be located on the forested, unutilized portions of the site, continued operations of NAPS are not likely to impact northern long-eared bats utilizing these areas. Further, the VDGIF maintains an interactive map depicting the locations of northern long-eared bat maternity roosts (summer habitat) and hibernacula. The closest known site to NAPS is approximately 70 miles northwest of NAPS and is not likely to be affected by the continued operations at NAPS. (VDGIF. 2018c) Dominion contracted for a bat survey in 2016 for forested portions of the site where licensed NAPS Unit 3 would be located if built. No listed bats were captured. (GAI Consultants. 2016)

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1. On January 28, 2020, the U.S. District Court for the District of Columbia remanded the federal listing decision to the USFWS to make a new decision whether the northern long-eared bat should be listed as endangered. Center for Biological Diversity v. Everson, No. 15-477 (D.D.C. Jan 28, 2020). However, the "threatened" listing currently remains in effect.

Actions requiring the removal of trees by Dominion would require adherence to the USFWS 4(d) Rule which sets guidelines for incidental take, and consultation with federal wildlife agencies, to ensure that no impacts to this species occur from any future activities. The 4(d) Rule restricts tree removal within 0.25 mile of a known hibernaculum and within a 150-foot radius of a known occupied maternity roost tree during June and July (USFWS. 2018c). Dominion's compliance with federal, state, and local laws and regulations will prevent impacts to this species.

E3.7.8.1.2 Dwarf Wedge Mussel

This species is federally and state listed as endangered. (USFWS. 2020a; VDCR. 2020). There is no designated critical habitat for this species (USFWS. 2018b).

The dwarf wedge mussel is a small freshwater mussel that rarely exceeds 1.5 inches long. It is brown or yellowish-brown in color. Adult mussels are filter feeders, feeding on algae and other small suspended particles. They spend most of their time buried almost completely in the bottom of streams and river. (NYDEC. 2018a)

The dwarf wedge mussel is found at 17 sites in seven Atlantic Coast drainages from New Hampshire to North Carolina. A review of the VDGIF FWIS species observation yielded a result of no observations for this species within six miles of the NAPS site. Historically, it was found at 70 sites in 15 major Atlantic Coast drainages. Its numbers have declined drastically; populations that remain number in the 100s with two exceptions in New York and North Carolina. Water pollution, including sediments and chemicals from agriculture and other development projects such as golf courses, have been implicated in the mussel's decline. Impoundments and channelization also may have eliminated the mussel by destroying its habitat. (NYDEC. 2018a)

Typical habitat for this mussel includes running waters of all sizes, from small brooks to large rivers. Bottom substrates include silt, sand, and gravel, which may be distributed in relatively small patches behind larger cobbles and boulders. The river velocity is usually slow to moderate. The dwarf wedge mussel appears to live about 10 years, which is substantially less than many other mussels. Adults must therefore be constantly replaced to maintain a viable population. (NYDEC. 2018a)

E3.7.8.1.3 Green Floater

This species is under federal review and is state listed as threatened. (USFWS. 2020a; VDCR. 2020). There is no designated critical habitat for this species (USFWS. 2018b).

The green floater is a small mussel, usually less than two inches long. The shell is thin, and the mussel has a subovate or trapezoidal shape. The color varies from a dull yellow to green with many dark green rays visible, especially in young individuals.

The green floater is found from New York south to Georgia and west to Tennessee. The species inhabits small creeks, large rivers, and occasionally canals that are hydrologically stable streams and not prone to flooding or drying. This species is intolerant of strong currents and occurs in pools and other calm water areas. Preferred substrate is gravel and sand in water depths of one to four feet. Good water quality is also important for this mussel species.

Decline in the abundance of this species could be due to stream transport of their preferred habitat, as well as increases in pollutants. The introductions of zebra mussels and Asian clams have also negatively impacted abundance of this species in surveys. (PNHP. 2020)

A review of the VDGIF FWIS species observation yielded one possible observation [Biota of Virginia (BOVA) observation number 060081]. This potential observation point is in the North Anna River, upstream of the NAPS site. (VDGIF-FWIS. 2020)

E3.7.8.1.4 Yellow Lance

This species is federally listed as threatened and currently has no state listing status. (USFWS. 2020a; VDCR. 2020). There is no designated critical habitat for this species (USFWS. 2018b); however, the USFWS intends to propose a critical habitat (83 FR 14189).

The yellow lance is a bright yellow mussel about three inches long. The longer end of the shell from where the siphons extend (the posterior) is distinctly rounded. The yellow lance is often found buried deep in clean, coarse to medium sand, although it can sometimes be found in gravel substrates. Yellow lances are often moved with shifting sand and eventually settle in sand at the downstream end of stable sand and gravel bars. This species depends on clean, moderate flowing water with high dissolved oxygen, and is found in medium-sized rivers to smaller streams. (USFWS. 2017)

The life cycle of the yellow lance is complex, relying on host fish for successful reproduction. Two species of minnow are confirmed to host yellow lance development in a laboratory setting, the white shiners (*Luxilus albeolu*s) and pinewoods shiners (*Lythrurus matuntinus*). (USFWS. 2017)

Historically, the yellow lance ranged from the Patuxent River basin in Maryland, to the Potomac River basin in Maryland/Virginia, the Rappahannock, York, James, and Chowan river basins in Virginia, and the Tar and Neuse river basins in North Carolina. The yellow lance is still found in these river basins, with exception of the Potomac. (USFWS. 2017)

Adult mussels are easily harmed by toxins and declines in water quality from pollution. Pollutants can cause changes in water chemistry that seriously impact aquatic species by reducing water quality and may directly kill mussels, reduce the ability of surviving mussels to have young, or result in poor health or disappearance of host fish. Other conditions that can contribute to population decline includes sediment deposition and accumulation and dams. Dams affect both upstream and downstream mussel populations by disrupting natural flow patterns, scouring river bottoms, changing water temperatures, eliminating habitat, restricting movement of host fish. (USFWS. 2017)

A March 2020 review of the VDGIF FWIS species observation yielded a result of no observations for this species within six miles of the NAPS site.

E3.7.8.1.5 Fish

No federally protected fish species are known to inhabit Lake Anna or the aquatic communities within the six-mile vicinity. The federally endangered Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus)* is known within the York River with an estimated population of 300 individuals (NOAA. 2018). The designated critical habitat area for the Atlantic sturgeon extends upstream from the York River into the Pamunkey River to the Nelson's Bridge Road (Route 615) bridge located in Hanover County northeast of Richmond, Virginia (82 FR 39160). This location is more than 50 miles downstream from the North Anna Dam.

E3.7.8.1.6 Small Whorled Pogonia

This species is federally listed as threatened and state listed as endangered (VDCR. 2020; USFWS. 2020a). There is no designated critical habitat for this species (USFWS. 2018b).

This species is a member of the orchid family. The plant is named for the whorl of five or six leaves near the top of the stem and beneath the flower. The plant flowers in May or June with a single or pair of small (0.5 to 1 inch) greenish-yellow flowers with flowering lasting a few days to a week. The leaves are grayish-green, somewhat oblong and 1 to 3.5 inches long. The plant generally stands 10 inches tall when in flower and about 14 inches when bearing fruit. (USFWS. 2016)

This species grows in older hardwood stands of beech, birch, maple, oak, and hickory that have an open understory. Sometimes it grows in stands of softwoods such as hemlock. It prefers acidic soils with a thick layer of dead leaves, often on slopes near small streams. Although widely distributed, the small whorled pogonia is rare. It is found in 18 eastern states and Ontario, Canada. Populations are typically small with fewer than 20 plants. It has been extirpated from Missouri, Vermont, and Maryland. The primary threat to the small whorled pogonia is the continuing loss of populations when their habitat is destroyed for urban expansion. Some forestry practices also eliminate habitat, and habitat may be degraded or individual plants lost because of recreational activities and trampling. (USFWS. 2016)

Plant-specific identification surveys conducted on the NAPS site during the 2010 and 2012 flowering seasons determined that the small whorled pogonia was not present. VDCR reviewed the 2010 survey report and concurred with the methodology and findings (Dominion. 2016b Section 2.4.1.6).

E3.7.8.2 State-Listed Species

In addition to the species with federal status presented above, five state-listed species occur in Louisa County or Spotsylvania County. These are presented in Table E3.7-5 and include the loggerhead shrike (*Lanius ludovicianus*), little brown bat (*Myotis lucifugus*), Rafinesque's eastern big-eared bat (*Corynorhinus rafinesquii*), tri-colored bat (*Perimyotis subflavus*), and the Virginia piedmont water boatman (*Sigara depressa*) (VDGIF-FWIS. 2020; VDCR. 2020 Species by county report). The ecological requirements for these species are summarized below.

E3.7.8.2.1 Loggerhead Shrike

This species is state listed as threatened. It has been designated as Tier I in the Virginia WAP for critical conservation need (VDGIF-FWIS. 2020). The species is also protected under the MBTA (78 FR 65844).

The loggerhead shrike is 8 to 10 inches long with a wing spread of 12.5 to 13 inches. Its coloration is gray above and white below, and is distinguished by a characteristic black facial mask that meets over the base of the bill. Other features are a heavy hooked bill, black wings with white wing patches, and a slim black tail with white outer tail feathers. The loggerhead perches alone, usually in treetops or on telephone wires in open country. (NYDEC. 2018b)

The loggerhead shrike ranges throughout most of North America from southern Canada to southern Mexico. Its former range was from Maine through New England, south to Virginia, Pennsylvania and West Virginia. It winters from Virginia to Florida. (NYDEC. 2018b)

The population level of the loggerhead shrike is extremely low, though the reasons for its steady decline are not clear (NYDEC. 2018b). A March 2020 review of the VDGIF FWIS species observation yielded one possible observation (BOVA observation number 040293). This potential observation point is near Mineral, Virginia, southwest of the NAPS property.

E3.7.8.2.2 Little Brown Bat

This species is state listed as endangered. It has been designated as Tier I in the Virginia WAP for critical conservation need (VDGIF-FWIS. 2020).

This is a small to medium-sized (3 to 4 inches long) bat, with glossy fur that is a dark yellow-brown to olive brown. The face, ears, and membranes are dark, with the membranes sparsely or not furred. This species mates primarily in the fall, and there is delayed fertilization until spring ovulation after departing from the hibernacula. Nursery colonies of several to 1,000 or more females form in late April-May in warm, dark locations. The summer colony may disperse to several hibernacula, and the hibernating colony may come from many summer colonies. When not hibernating, these bats emerge to forage at late dusk, and often repeat hunting flight patterns. They may use waterways, escarpments, or even highways for orientation.

Historically, the little brown bat was abundant throughout forested areas of the United States and Canada. The species is in decline due to white-nose syndrome. Once abundant throughout eastern North America, the species is now uncommon throughout much of its eastern range. (BCI. 2018a)

Little brown bats will roost in caves, buildings, rocks and trees, under bridges, in mines, and in tunnels. They also may dwell in man-made structures. This is one of the most abundant insectivorous bats in Virginia. They are found in all forested regions. (VDGIF. 2018d) A March 2020 review of the VDGIF FWIS species observation yielded a result of no observations for this species within six miles of the NAPS site. VDGIF mapped winter habitat and roost buffer areas for the species, with the nearest occurrences more than 50 miles away from Lake Anna (VDGIF. 2018e). Dominion contracted for a bat survey in 2016 for forested portions of the site where licensed NAPS Unit 3 would be located if built. No listed bats were captured. (GAI Consultants. 2016)

E3.7.8.2.3 Rafinesque's Eastern Big-eared Bat

This species is state listed as endangered. It has been designated as Tier I in the Virginia WAP for critical conservation need (VDGIF-FWIS. 2020).

Adults grow to just over 3 to 4.5 inches long and have dorsal hair gray-brown with black bases, and the ventral hair whitish-yellowish with black bases. The fur is long and shaggy, and the bat has huge ears up to twice the length of the head connected across the forehead. There is a glandular mass on either side of the muzzle, and elongated nostril openings. Mating is in the fall and winter, and single naked young are born in the nursery colony in May or June. This species roosts singly, in small clusters, or groups to 100 or more in hollow trees, under loose bark, houses, unoccupied buildings, and culverts. It hibernates in the northern part of its range. The ears are coiled back like ram's horns. They may need a variety of roosts to adjust for seasonal temperature and food fluctuations. This bat is a slower flier than most bats, but is agile and can hover. (VDGIF-FWIS. 2020)

Rafinesque's eastern big-eared bat is incidental in Virginia because it has adapted to temperate, arboreal zones found only in the extreme southeastern portion of the state. This species is most often found in houses, or sometimes in hollow trees, behind loose bark, in culverts, or in caves and mines. (VDGIF-FWIS. 2020) A March 2020 review of the VDGIF FWIS species observation yielded a result of no observations for this species within six miles of the NAPS site. Preferred habitat for this species is not located on the portions of the NAPS site utilized for energy production. Dominion contracted for a bat survey in 2016 for forested portions of the site where licensed NAPS Unit 3 would be located if built. No listed bats were captured. (GAI Consultants. 2016)

E3.7.8.2.4 Tri-colored Bat

This species is state listed as endangered. It has been designated as Tier I in the Virginia WAP for critical conservation need (VDGIF-FWIS. 2020).

The tri-colored bat is a medium-sized bat with tri-colored pelage on its back that ranges from dark grey at the base, to yellowish in the middle, and brown at the tip.

Tri-colored bats over-winter in humid areas deep within caves and mines. They are occasionally observed in caves during the summer and have been known to form maternity colonies in barns, and in clusters of dead leaves in oaks or pines. Tri-colored bats may roost in habitats including open woods near water and they may select roosts in buildings, crevices of cliffs and rocks, or in or below the canopy of live or recently dead trees that retain some dead or live leaves. Forage preference is wooded riparian areas and forested areas. They also forage over early successional and open habitats. (NYNHP. 2018)

Historically, the tri-colored bat was one of the most common species of bats found throughout the eastern forests of the United States and Canada and south throughout the east coast of Mexico into northern Central America. This species is also impacted by white-nose syndrome and populations are declining. (BCI. 2018b) Bats may be particularly sensitive to environmental toxins, including those found in herbicides and pesticides. Extensive applications of insecticides and other insect control methods could pose an indirect risk to tri-colored bats by reducing availability of prey. (NYNHP. 2018)

A March 2020 review of the VDGIF FWIS species observation yielded a result of no observations for this species within six miles of the NAPS site. Preferred habitat for this species is not located on the portions of the NAPS site utilized for energy production. The VDGIF mapped winter habitat and roost buffer areas for the species, with the nearest occurrences more than 50 miles away from Lake Anna (VDGIF. 2018e). Dominion contracted for a bat survey in 2016 for forested portions of the site where licensed NAPS Unit 3 would be located if built. No listed bats were captured. (GAI Consultants. 2016)

E3.7.8.2.5 Virginia Piedmont Water Boatman

This species is state listed as endangered (VDCR. 2020) and federally identified as a species of concern (USFWS. 2020a).

The Virginia Piedmont water-boatman is a poorly known species that is apparently endemic to Virginia. Its historical distribution includes only four sites, all of which are small streams in Virginia's Piedmont province (Caroline, Fluvanna, Hanover, and Prince William counties). Adults overwinter in backwater pools of small streams and become active by March. It can be distinguished from other local species of *Sigara* by its color pattern and characteristics of the male pala and claspers. (Hobson, et al. 1998)

A March 2020 review of the VDGIF FWIS species observation yielded a result of no observations for this species within six miles of the NAPS site. Preferred habitat for this species is not located on the portions of the NAPS site utilized for energy production.

E3.7.8.3 Species Protected under the Bald and Golden Eagle Protection Act

Bald eagles are protected under the BGEPA. Current and future bald eagle nests located on the NAPS site would be subject to all protections under this act.

Enacted in 1940, the BGEPA (16 U.S.C. 668-668c) prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The BGEPA provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

"Disturb" means: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

In addition to immediate impacts, this definition also covers impacts resulting from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

There are currently no BGEPA permitting requirements associated with any NAPS operations.

E3.7.8.4 Species Protected under the Migratory Bird Treaty Act

In addition to the bald eagle and loggerhead shrike, several bird species that may visit the NAPS site are protected under the MBTA. The MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter or offer for sale, or purchase or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to federal regulations. Other bird species that occur within the six-mile vicinity protected under the MBTA that are also identified as Category I (critical conservation need) or II (very high conservation need) in the Virginia WAP include: American black duck (*Anas rubripes*), American woodcock (*Scolopax minor*), cerulean warbler (*Dendroica cerulean*), common tern (*Sterna hirundo*), and northern saw-whet owl (*Aegolius acadicus*) (78 FR 65844; VDGIF. 2015; VDGIF-FWIS. 2020).

Dominion has an internal guidance document for compliance with MBTA. This guidance enumerates staff responsibilities to comply with bird protections provided by federal law and regulation. Attachments to this guidance provide more detailed reference tools and protocols. This guidance provides procedures on how Dominion employees must respond to bird nests, dead or injured birds, nuisance birds, and how to specifically comply with bald eagle protections.

Dominion's avian protection plan describes the company's practices to avoid bird mortality; ranging from corporate policy to specific construction recommendations for company structures.

Currently, Dominion maintains a depredation permit authorizing take of a maximum of 70 black vultures, 20 turkey vultures, 40 Canada geese, and 25 herring gulls and destruction of nests and eggs of 10 herring gull nests and five osprey nests at Dominion-owned properties in Maryland, North Carolina, Virginia, and West Virginia. (USFWS. 2018d)

E3.7.8.5 Essential Fish Habitat

A review of the National Oceanic and Atmospheric Administration's (NOAA's) essential fish habitat (EFH) data inventory was conducted to determine the locations of EFH. The data inventory and EFH mapper indicated no EFH exists at Lake Anna or the North Anna River below the North Anna dam (NOAA. 2018). The North Anna River ends approximately 34 river miles below the dam, where its confluence with the South Anna River forms the Pamunkey River (EA. 2007).

Table E3.7-1 Zooplankton Taxa Collected from 1978–1985 Sampling Events in Lake Anna

Alona	Alonella
Anuraeopsis	Ascomorpha
Asplanchna	Bosmina
Brachionus	Calanoida
Cephalodella	Ceriodaphnia
Chromogaster	Chydorus
Collotheca	Colurella
Conochilus C	Copepod nauplii
Cyclopoida	Daphnia
Diaphanosoma	Euchlanis
Filinia	Gastropus
Hexarthra	Holopedium
Kellicottia	Keratella
Lecane	Lepadella
Leydigia	Limnias
Macrochaetus	Monostyla
Philodina	Platyias
Ploesoma	Polyarthra
Pompholyx	Ptygura
Rotaria	Sida
Simocephalus	Synchaeta
Testudinella	Trichocerca
Trichotria	Trochosphaera

(Virginia Power. 1986, Table 4.2-3)

Table E3.7-2 Fish Reported in Lake Anna (2003–2015) and North Anna River (2006)

Family	Scientific Name	Common Name	Lake Anna Mean Abundance[a] 2003–2015	North Anna River 2006 Sampling Abundance[b]
Amiidae	*Amia calva*	Bowfin	—	2
Anguillidae	*Anguilla rostrata*	American eel	—	678
Clupeidae	*Dorosoma cepedianum*	Gizzard shad	12.7	—
	D.petenense	Threadfin shad	4.3	—
	Alosa aestivalis	Blueback herring	1.1	—
Catostomidae	*Catostomus commersoni*	White sucker	0.5	—
	Carpiodes cyprinus	Quillback	0.1	—
	Erimyzon oblongus creek	Chubsucker	0.1	9
	Moxostoma macrolepidotum	Shorthead redhorse	0.2	—
	Hypentelium nigricans	Northern hog sucker	0.1	103
Centrarchidae	*Micropterus dolomieu*	Smallmouth bass[c]	—	85
Cephalaspidomorphi	*Lethenteron appendix*	American brook lamprey	—	37
Esocidae	*Esox niger*	Chain pickerel	0.1	2
Cyprinidae	*Ctenopharyngodon idelle*	Grass carp	0.1	—
	Cyprinus carpio	Common carp	0.2	4
	Lythrurus ardens	Rosefin shiner	—	57
	Nocomis leptocephalus	Bluehead chub	—	188
	N. micropogon	River chub	—	9
	Notemigonus crysoleucas	Golden shiner	0.1	—
	Notropis amoenus	Comely shiner	—	90
	N. analostanus	Satinfin shiner	—	91
	N. chalybaeus	Ironcolor shiner	—	7
	N. procne	Swallowtail shiner	—	15
	N. hudsonius	Spot tail shiner	0.2	—
	N. rubellus	Rosyface shiner	—	133
	Semotilus corporalis	Fallfish	0.1	105

Table E3.7-2 Fish Reported in Lake Anna (2003–2015) and North Anna River (2006)

Family	Scientific Name	Common Name	Lake Anna Mean Abundance[a] 2003–2015	North Anna River 2006 Sampling Abundance[b]
Ictaluridae	*Ictalurus furcatus*	Blue catfish[c]	0.1	—
	I. nebulosus	Brown bullhead	0.2	—
	I. natalis	Yellow bullhead	0.1	—
	I. punctatus	Channel catfish[c]	5.7	—
	Noturus insignis	Margined madtom	—	166
	Ameiurus catus	White catfish[c]	3.1	—
	Lepomis auritus	Redbreast sunfish[c]	0.1	1107
	L. cyanellus	Green sunfish	0.1	2
	L. gibbosus	Pumpkinseed[c]	—	2
	L. gulosus	Warmouth	0.1	
	L. macrochirus	Bluegill[c]	0.5	7
	L. microlophus	Redear sunfish[c]	0.4	2
	Micropterus salmoides	Largemouth bass[c]	1.5	39
	Pomoxis nigromaculatus	Black crappie[c]	8.6	—
Percidae	*Perca flavescens*	Yellow perch[c]	0.1	—
	Percina peltata	Shield darter	—	61
	Sander vitreus	Walleye[c]	Stocked 2003–2006	—
	Etheostoma nigrum	Johnny darter	—	136
	E. vitreum	Glassy darter	—	31
	Stizostedion vitreum x S. canadense	Saugeye[c]	Stocked 2013–2015	—
Petromyzontidae	*Lampetra aepyptera*	Least brook lamprey	—	13

Table E3.7-2 Fish Reported in Lake Anna (2003–2015) and North Anna River (2006)

Family	Scientific Name	Common Name	Lake Anna Mean Abundance[a] 2003–2015	North Anna River 2006 Sampling Abundance[b]
Moronidae	*Morone americana*	White perch[c]	12.0	—
	M. saxatilis	Striped bass[c]	5.2	—
	M. chrysops x M. saxatilis	Striped bass hybrid[c]	Stocked 2014	—

(VDGIF. 2008; VDGIF. 2016)

Notes:

— = Not reported.

a. Fish per net, per night.

b. Fish per kilometer.

c. Recreational species.

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Amphibians	
Bullfrog, American	*Lithobates catesbeianus*
Frog, Brimley's chorus	*Pseudacris brimleyi*
Frog, carpenter	*Lithobates virgatipes*
Frog, coastal plains leopard	*Lithobates sphenocephalus utricularius*
Frog, eastern cricket	*Acris crepitans*
Frog, green	*Lithobates clamitans*
Frog, pickerel	*Lithobates palustris*
Frog, upland chorus	*Pseudacris feriarum*
Frog, wood	*Lithobates sylvaticus*
Newt, red-spotted	*Notophthalmus viridescens viridescens*
Peeper, spring	*Pseudacris crucifer*
Salamander, eastern mud	*Pseudotriton montanus montanus*
Salamander, eastern red-backed	*Plethodon cinereus*
Salamander, four-toed	*Hemidactylium scutatum*
Salamander, marbled	*Ambystoma opacum*
Salamander, northern dusky	*Desmognathus fuscus*
Salamander, northern red	*Pseudotriton ruber ruber*
Salamander, southern two-lined	*Eurycea cirrigera*
Salamander, spotted	*Ambystoma maculatum*
Salamander, three-lined	*Eurycea guttolineata*
Salamander, white-spotted slimy	*Plethodon cylindraceus*
Siren, greater	*Siren lacertina*
Spadefoot, eastern	*Scaphiopus holbrookii*
Toad, eastern American	*Anaxyrus americanus americanus*
Toad, eastern narrow-mouthed	*Gastrophryne carolinensis*
Toad, Fowler's	*Anaxyrus fowleri*
Treefrog, Cope's gray	*Hyla chrysoscelis*
Treefrog, gray	*Hyla versicolor*
Treefrog, green	*Hyla cinerea*
Birds	
Avocet, American	*Recurvirostra americana*
Blackbird, Brewer's	*Euphagus cyanocephalus*
Blackbird, red-winged	*Agelaius phoeniceus*

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Blackbird, rusty	*Euphagus carolinus*
Bluebird, eastern	*Sialia sialis*
Bobwhite, northern	*Colinus virginianus*
Bufflehead	*Bucephala albeola*
Bunting, indigo	*Passerina cyanea*
Bunting, snow	*Plectrophenax nivalis nivalis*
Canvasback	*Aythya valisineria*
Cardinal, northern	*Cardinalis cardinalis*
Catbird, gray	*Dumetella carolinensis*
Chat, yellow-breasted	*Icteria virens virens*
Chickadee, Carolina	*Poecile carolinensis*
Chuck-will's-widow	*Antrostomus carolinensis*
Cormorant, double-crested	*Phalacrocorax auritus*
Coot, American	*Fulica americana*
Cowbird, brown-headed	*Molothrus ater*
Creeper, brown	*Certhia americana*
Crossbill, white-winged	*Loxia leucoptera*
Crow, American	*Corvus brachyrhynchos*
Crow, fish	*Corvus ossifragus*
Cuckoo, black-billed	*Coccyzus erythropthalmus*
Cuckoo, yellow-billed	*Coccyzus americanus*
Dickcissel	*Spiza americana*
Dove, mourning	*Zenaida macroura carolinensis*
Dowitcher, short-billed	*Limnodromus griseus*
Duck, American black	*Anas rubripes*
Duck, long-tailed	*Clangula hyemalis*
Duck, ruddy	*Oxyura jamaicensis*
Duck, wood	*Aix sponsa*
Dunlin	*Calidris alpina hudsonia*
Eagle, bald	*Haliaeetus leucocephalus*
Egret, great	*Ardea alba egretta*
Finch, house	*Haemorhous mexicanus*
Finch, purple	*Haemorhous purpureus*
Flicker, northern	*Colaptes auratus*

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Flycatcher, Acadian	*Empidonax virescens*
Flycatcher, great crested	*Myiarchus crinitus*
Flycatcher, willow	*Empidonax traillii*
Gadwall	*Anas strepera*
Gnatcatcher, blue-gray	*Polioptila caerulea*
Goldeneye, common	*Bucephala clangula americana*
Goldfinch, American	*Spinus tristis*
Goose, Canada	*Branta canadensis*
Goose, greater white-fronted	*Anser albifrons flavirostris*
Goose, lesser snow	*Chen caerulescens caerulescens*
Goose, snow	*Chen caerulescens*
Grackle, common	*Quiscalus quiscula*
Grebe, pied-billed	*Podilymbus podiceps*
Grosbeak, blue	*Guiraca caerulea caerulea*
Grosbeak, evening	*Coccothraustes vespertinus*
Grosbeak, rose-breasted	*Pheucticus ludovicianus*
Grouse, ruffed	*Bonasa umbellus*
Harrier, northern	*Circus cyaneus*
Hawk, broad-winged	*Buteo platypterus*
Hawk, Cooper's	*Accipiter cooperii*
Hawk, red-shouldered	*Buteo lineatus lineatus*
Hawk, red-tailed	*Buteo jamaicensis*
Hawk, rough-legged	*Buteo lagopus johannis*
Hawk, sharp-shinned	*Accipiter striatus velox*
Heron, great blue	*Ardea herodias herodias*
Heron, green	*Butorides virescens*
Heron, tricolored	*Egretta tricolor*
Hummingbird, ruby-throated	*Archilochus colubris*
Jay, blue	*Cyanocitta cristata*
Junco, dark-eyed	*Junco hyemalis*
Kestrel, American	*Falco sparverius sparverius*
Killdeer	*Charadrius vociferus*
Kingbird, eastern	*Tyrannus tyrannus*
Kingfisher, belted	*Ceryle alcyon*

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Kinglet, golden-crowned	*Regulus satrapa*
Kinglet, ruby-crowned	*Regulus calendula*
Lark, horned	*Eremophila alpestris*
Loon, common	*Gavia immer*
Mallard	*Anas platyrhynchos*
Martin, purple	*Progne subis*
Meadowlark, eastern	*Sturnella magna*
Merganser, hooded	*Lophodytes cucullatus*
Merganser, red-breasted	*Mergus serrator serrator*
Mockingbird, northern	*Mimus polyglottos*
Moorhen, common	*Gallinula chloropus cachinnans*
Nighthawk, common	*Chordeiles minor*
Night-heron, yellow-crowned	*Nyctanassa violacea violacea*
Nuthatch, red-breasted	*Sitta canadensis*
Nuthatch, white-breasted	*Sitta carolinensis*
Oriole, Baltimore	*Icterus galbula*
Oriole, orchard	*Icterus spurius*
Osprey	*Pandion haliaetus carolinensis*
Ovenbird	*Seiurus aurocapilla*
Owl, barn	*Tyto alba pratincola*
Owl, barred	*Strix varia*
Owl, great horned	*Bubo virginianus*
Owl, northern saw-whet	*Aegolius acadicus*
Owl, short-eared	*Asio flammeus*
Parula, northern	*Setophaga americana*
Pewee, eastern wood	*Contopus virens*
Pheasant, ring-necked	*Phasianus colchicus*
Phoebe, eastern	*Sayornis phoebe*
Pigeon, rock	*Columba livia*
Pipit, American	*Anthus rubescens*
Rail, king	*Rallus elegans*
Rail, Virginia	*Rallus limicola*
Raven, common	*Corvus corax*
Redhead	*Aythya americana*

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Redstart, American	*Setophaga ruticilla*
Robin, American	*Turdus migratorius*
Sandpiper, pectoral	*Calidris melanotos*
Sandpiper, solitary	*Tringa solitaria*
Sandpiper, spotted	*Actitis macularia*
Sandpiper, upland	*Bartramia longicauda*
Sapsucker, yellow-bellied	*Sphyrapicus varius*
Scaup, greater	*Aythya marila*
Scaup, lesser	*Aythya affinis*
Scoter, black	*Melanitta nigra americana*
Scoter, white-winged	*Melanitta fusca deglandi*
Screech-owl, eastern	*Megascops asio*
Siskin, pine	*Spinus pinus*
Snipe, Wilson's	*Gallinago delicata*
Sparrow, chipping	*Spizella passerina*
Sparrow, field	*Spizella pusilla*
Sparrow, fox	*Passerella iliaca*
Sparrow, grasshopper	*Ammodramus savannarum pratensis*
Sparrow, house	*Passer domesticus*
Sparrow, Lincoln's	*Melospiza lincolnii*
Sparrow, savannah	*Passerculus sandwichensis*
Sparrow, song	*Melospiza melodia*
Sparrow, swamp	*Melospiza georgiana*
Sparrow, vesper	*Pooecetes gramineus*
Sparrow, white-crowned	*Zonotrichia leucophrys*
Sparrow, white-throated	*Zonotrichia albicollis*
Starling, European	*Sturnus vulgaris*
Swallow, bank	*Riparia riparia*
Swallow, barn	*Hirundo rustica*
Swallow, cliff	*Petrochelidon pyrrhonota pyrrhonota*
Swallow, northern rough-winged	*Stelgidopteryx serripennis*
Swallow, tree	*Tachycineta bicolor*
Swift, chimney	*Chaetura pelagica*
Tanager, scarlet	*Piranga olivacea*

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Tanager, summer	*Piranga rubra*
Teal, blue-winged	*Anas discors orphna*
Teal, green-winged	*Anas crecca carolinensis*
Tern, Caspian	*Sterna caspia*
Tern, common	*Sterna hirundo*
Tern, Forster's	*Sterna forsteri*
Thrasher, brown	*Toxostoma rufum*
Thrush, hermit	*Catharus guttatus*
Thrush, wood	*Hylocichla mustelina*
Titmouse, tufted	*Baeolophus bicolor*
Towhee, eastern	*Pipilo erythrophthalmus*
Turkey, wild	*Meleagris gallopavo silvestris*
Veery	*Catharus fuscescens*
Vireo, red-eyed	*Vireo olivaceus*
Vireo, warbling	*Vireo gilvus gilvus*
Vireo, white-eyed	*Vireo griseus*
Vireo, yellow-throated	*Vireo flavifrons*
Vulture, black	*Coragyps atratus*
Vulture, turkey	*Cathartes aura*
Warbler, black-and-white	*Mniotilta varia*
Warbler, black-throated blue	*Setophaga caerulescens*
Warbler, black-throated green	*Setophaga virens*
Warbler, blackpoll	*Setophaga striata*
Warbler, blue-winged	*Vermivora cyanoptera*
Warbler, Canada	*Cardellina canadensis*
Warbler, cerulean	*Setophaga cerulea*
Warbler, chestnut-sided	*Setophaga pensylvanica*
Warbler, hooded	*Setophaga citrina*
Warbler, Kentucky	*Geothlypis formosa*
Warbler, magnolia	*Setophaga magnolia*
Warbler, Nashville	*Oreothlypis ruficapilla*
Warbler, palm	*Setophaga palmarum*
Warbler, pine	*Setophaga pinus*
Warbler, prairie	*Setophaga discolor*

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Warbler, prothonotary	*Protonotaria citrea*
Warbler, worm-eating	*Helmitheros vermivorus*
Warbler, yellow	*Setophaga petechia*
Warbler, yellow-rumped	*Setophaga coronata*
Warbler, yellow-throated	*Setophaga dominica*
Waterthrush, Louisiana	*Parkesia motacilla*
Waterthrush, northern	*Parkesia noveboracensis*
Waxwing, cedar	*Bombycilla cedrorum*
Whip-poor-will, eastern	*Antrostomus vociferus*
Wigeon, American	*Anas americana*
Wigeon, Eurasian	*Anas penelope*
Woodcock, American	*Scolopax minor*
Woodpecker, downy	*Picoides pubescens medianus*
Woodpecker, hairy	*Picoides villosus*
Woodpecker, pileated	*Dryocopus pileatus*
Woodpecker, red-bellied	*Melanerpes carolinus*
Woodpecker, red-headed	*Melanerpes erythrocephalus*
Wren, Carolina	*Thryothorus ludovicianus*
Wren, house	*Troglodytes aedon*
Wren, winter	*Troglodytes troglodytes*
Yellowthroat, common	*Geothlypis trichas*
Invertebrates	
Borer, European corn	*Ostrinia nubilatis*
Butterfly, American lady	*Vanessa virginiensis*
Butterfly, Appalachian brown	*Satyrodes appalachia*
Butterfly, black swallowtail	*Papilio polyxenes asterius*
Butterfly, brown elfin	*Callophrys augustinus*
Butterfly, cabbage white	*Pieris rapae*
Butterfly, carus skipper	*Polites carus*
Butterfly, clouded sulphur	*Colias philodice*
Butterfly, cobweb skipper	*Hesperia metea*
Butterfly, confused cloudywing	*Thorybes confusis*
Butterfly, crossline skipper	*Polites origenes*
Butterfly, dreamy duskywing	*Erynnis icelus*

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Butterfly, eastern pine elfin	*Callophrys niphon*
Butterfly, eastern tailed-blue	*Everes comyntas*
Butterfly, eastern tiger swallowtail	*Papilio glaucus*
Butterfly, falcate orangetip	*Anthocharis midea*
Butterfly, fiery skipper	*Hylephila phyleus*
Butterfly, gray hairstreak	*Strymon melinus*
Butterfly, great spangled fritillary	*Speyeria cybele*
Butterfly, Hayhurst's scallopwing	*Staphylus hayhurstii*
Butterfly, Henry's elfin	*Callophrys henrici*
Butterfly, Horace's duskywing	*Erynnis horatius*
Butterfly, Juvenal's duskywing	*Erynnis juvenalis*
Butterfly, least skipper	*Ancyloxypha numitor*
Butterfly, Leonard's skipper	*Hesperia leonardus*
Butterfly, monarch	*Danaus plexippus*
Butterfly, mourning cloak	*Nymphalis antiopa*
Butterfly, olive juniper hairstreak	*Callophrys gryneus gryneus*
Butterfly, orange sulphur	*Colias eurytheme*
Butterfly, painted lady	*Vanessa cardui*
Butterfly, pearl crescent	*Phyciodes tharos*
Butterfly, Peck's skipper	*Polites peckius*
Butterfly, pipevine swallowtail	*Battus philenor*
Butterfly, sachem	*Atalopedes campestris*
Butterfly, silver-spotted skipper	*Epargyreus clarus*
Butterfly, sleepy duskywing	*Erynnis brizo*
Butterfly, southern cloudywing	*Thorybes bathyllus*
Butterfly, spring azure	*Celastrina ladon*
Butterfly, tawny emperor	*Asterocampa clyton*
Fritillary, regal	*Speyeria idalia idalia*
Moth, codling	*Cydia pomonella*
Moth, gypsy	*Lymantria dispar*
Moth, polyphemus	*Antheraea polyphemus*
Mammals	
Bat, big brown	*Eptesicus fuscus*
Bat, eastern red	*Lasiurus borealis*

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Bat, evening	*Nycticeius humeralis*
Bat, hoary	*Lasiurus cinereus*
Bat, silver-haired	*Lasionycteris noctivagans*
Bear, American black	*Ursus americanus*
Beaver, American	*Castor canadensis*
Bobcat	*Lynx rufus rufus*
Chipmunk, common eastern	*Tamias striatus striatus*
Chipmunk, Fisher's eastern	*Tamias striatus fisheri*
Cottontail, eastern	*Sylvilagus floridanus mallurus*
Coyote	*Canis latrans*
Deer, white-tailed	*Odocoileus virginianus*
Fox, common gray	*Urocyon cinereoargenteus cinereoargenteus*
Fox, red	*Vulpes vulpes fulva*
Mink, common	*Neovison vison mink*
Mole, eastern	*Scalopus aquaticus aquaticus*
Mouse, common white-footed	*Peromyscus leucopus leucopus*
Mouse, eastern harvest	*Reithrodontomys humulis humulis*
Mouse, eastern harvest	*Reithrodontomys humulis virginianus*
Mouse, house	*Mus musculus musculus*
Mouse, Lewis' golden	*Ochrotomys nuttalli nuttalli*
Mouse, meadow jumping	*Zapus hudsonius americanus*
Mouse, northern white-footed	*Peromyscus leucopus noveboracensis*
Muskrat, large-toothed	*Ondatra zibethicus macrodon*
Opossum, Virginia	*Didelphis virginiana virginiana*
Otter, northern river	*Lontra canadensis lataxina*
Raccoon, eastern	*Procyon lotor lotor*
Raccoon, coastal marsh	*Procyon lotor maritimus*
Rat, marsh rice	*Oryzomys palustris palustris*
Rat, Norway	*Rattus norvegicus norvegicus*
Shrew, American pygmy	*Sorex hoyi*
Shrew, least	*Cryptotis parva*
Shrew, northern short-tailed	*Blarina brevicauda kirtlandi*
Shrew, southeastern	*Sorex longirostris longirostris*
Skunk, Canada	*Mephitis mephitis mephitis*

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Skunk, eastern	*Mephitis mephitis nigra*
Squirrel, eastern gray	*Sciurus carolinensis carolinensis*
Squirrel, northern gray	*Sciurus carolinensis pennsylvanicus*
Squirrel, southern flying	*Glaucomys volans volans*
Squirrel, talkative red	*Tamiasciurus hudsonicus loquax*
Vole, meadow	*Microtus pennsylvanicus pennsylvanicus*
Vole, pine	*Microtus pinetorum scalopsoides*
Vole, southern red-backed	*Myodes gapperi*
Weasel, long-tailed	*Mustela frenata noveboracensis*
Woodchuck	*Marmota monax monax*
Reptiles	
Cooter, eastern river	*Pseudemys concinna concinna*
Cooter, northern red-bellied	*Pseudemys rubriventris*
Copperhead, northern	*Agkistrodon contortrix mokasen*
Cornsnake, red	*Pantherophis guttatus*
Earthsnake, eastern smooth	*Virginia valeriae valeriae*
Greensnake, northern rough	*Opheodrys aestivus aestivus*
Gartersnake, eastern	*Thamnophis sirtalis sirtalis*
Kingsnake, eastern	*Lampropeltis getula*
Kingsnake, northern mole	*Lampropeltis calligaster rhombomaculata*
Lizard, eastern fence	*Sceloporus undulatus*
Lizard, eastern slender glass	*Ophisaurus attenuatus longicaudus*
Milksnake, eastern	*Lampropeltis triangulum*
Racer, northern black	*Coluber constrictor constrictor*
Racerunner, eastern six-lined	*Aspidoscelis sexlineata sexlineata*
Ratsnake, eastern	*Pantherophis alleghaniensis*
Ribbonsnake, common	*Thamnophis sauritus sauritus*
Scarletsnake, northern	*Cemophora coccinea copei*
Skink, broad-headed	*Plestiodon laticeps*
Skink, common five-lined	*Plestiodon fasciatus*
Skink, little brown	*Scincella lateralis*
Skink, southeastern five-lined	*Plestiodon inexpectatus*
Snake, common rainbow	*Farancia erytrogramma erytrogramma*
Snake, eastern hog-nosed	*Heterodon platirhinos*

Table E3.7-3 Terrestrial Species Likely to be Observed Within a 6-mile Radius of NAPS

Common Name	Scientific Name
Snake, northern brown	*Storeria dekayi dekayi*
Snake, northern red-bellied	*Storeria occipitomaculata occipitomaculata*
Snake, northern ring-necked	*Diadophis punctatus edwardsii*
Snake, queen	*Regina septemvittata*
Turtle, common snapping	*Chelydra serpentina*
Turtle, eastern musk	*Sternotherus odoratus*
Turtle, eastern painted	*Chrysemys picta picta*
Turtle, southeastern mud	*Kinosternon subrubrum subrubrum*
Turtle, woodland box	*Terrapene carolina carolina*
Watersnake, northern	*Nerodia sipedon sipedon*
Wormsnake, eastern	*Carphophis amoenus amoenus*

(VDGIF-FWIS. 2020)

Table E3.7-4 Catch per Unit of Effort Summary for North Anna River Sampling

Method	No.	CPUE					
		Mean 1990–2012	2014	2015	2016	2017	2018
Electric seine surveys[a]	1	126.5	NA	NA	NA	NA	NA
	2	82.7	233.5	196.5	108.0	239.0	328.0
	3	110.3	164.0	234.8	180.3	209.8	168.0
Backpack surveys	1	32.5	NA	NA	NA	NA	NA
	2	30.4	14.3	20.8	27.8	26.3	47.0
	3	35.2	21.8	30.3	35.0	48.0	27.7

a. Use of the DC electric seine began with Survey 3 in 2012.

NA = Survey missed or information not available.

(Dominion. 2014c; Dominion. 2015d; Dominion. 2016d; Dominion. 2017b; Dominion. 2018d)

Table E3.7-5 Federally and State Listed Threatened and Endangered Species for Louisa and Spotsylvania Counties, Virginia, Potentially Occurring in the NAPS Vicinity

Common Name	Scientific Name	Federal Legal Status	State Legal Status
Birds			
Bald eagle	*Haliaeetus leucocephalus*	DL	None
Loggerhead shrike	*Lanius ludovicianus*	--	ST
Bivalvia (mussels)[(a)]			
Dwarf wedgemussel	*Alasmidonta heterodon*	FE	SE
Green floater	*Lasmigona subviridis*	UR	ST
Yellow lance	*Elliptio lanceolata*	FT	None
Heteroptera (true bugs)			
Virginia Piedmont water boatman	*Sigara depressa*	--	SE
Mammals			
Little brown bat	*Myotis lucifugus*	--	SE
Northern long-eared bat	*Myotis septentrionalis*	FT	ST
Rafinesque's eastern big-eared bat	*Corynorhinus rafinesquii macrotis*	--	SE
Tri-colored bat	*Perimyotis subflavus*	--	SE
Vascular Plants[(b)]			
Small whorled pogonia	*Isotria medeoloides*	FT	SE

(83 FR 14189; USFWS. 2020a; USFWS. 2020b; VDCR. 2020; VDGIF-FWIS. 2020)

FE= federally endangered; FT = federally threatened; DL = delisted; UR = under review

SE = state endangered; ST = state threatened

a. The USFWS identifies James spinymussel (*Pleurobema collina*) for Louisa County; however, the species was not identified by the VDGIF-FWIS as occurring within the NAPS vicinity and its range does not include Lake Anna (USFWS. 2020a, VDGIF-FWIS. 2020). It is found in the James River basin in Virginia and West Virginia and the Dan River basin in North Carolina and Virginia (USFWS. 2011).

b. The USFWS identifies the federally threatened sensitive joint-vetch (*Aeschynomene virginica*) and swamp pink (*Helonias bullata*) as occurring in Spotsylvania County; however, these species were not identified by the VDCR as occurring in Spotsylvania County and a non-consultation review search with the USFWS IPaC did not indicate these species occur in the NAPS vicinity. Further, these species were not identified as occurring on the NAPS site during the environmental review for construction of the NAPS Unit 3 (NRC. 2010, Section 2.7.1.3)

Figure E3.7-1 NWI Wetlands within a 6-Mile Radius of NAPS

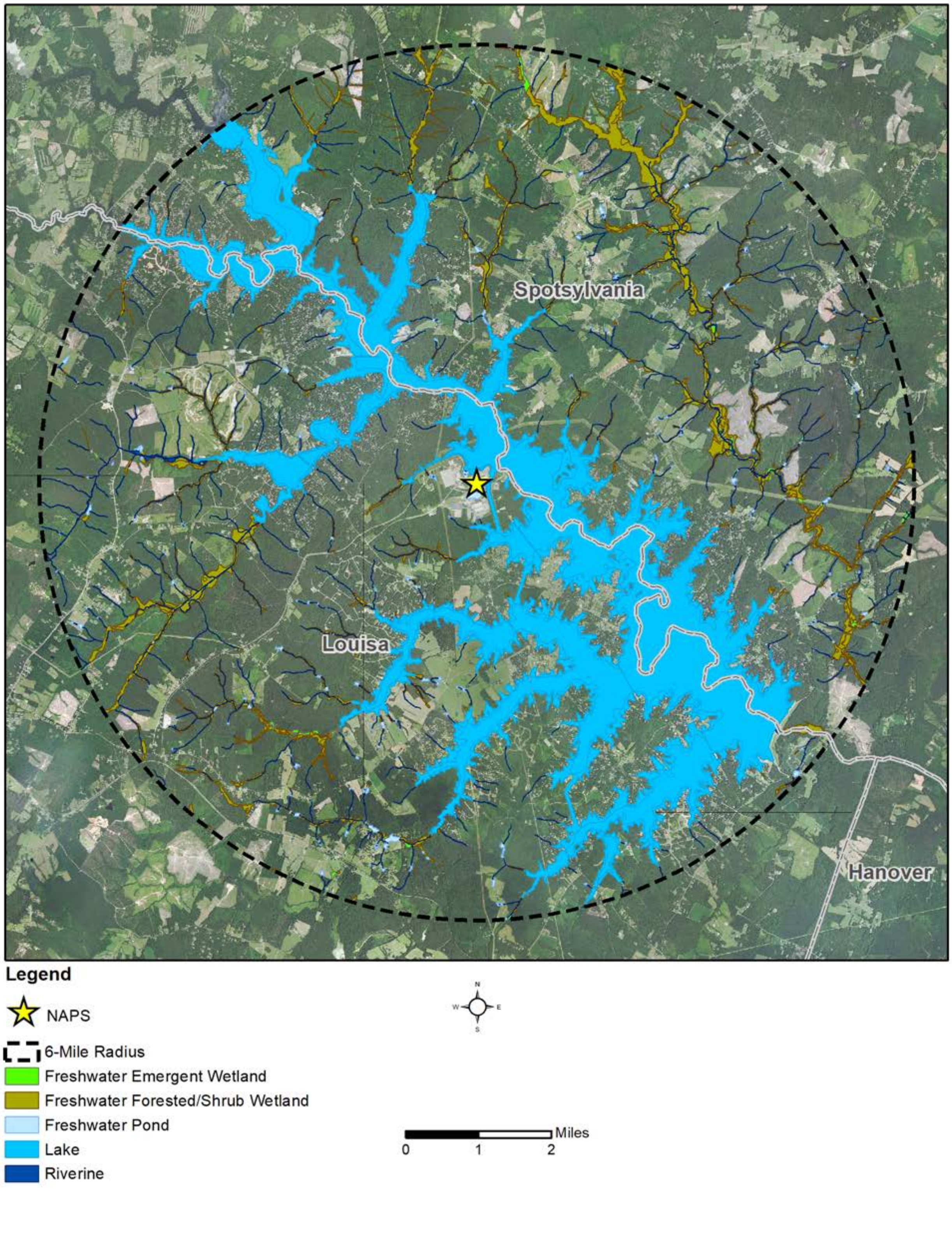
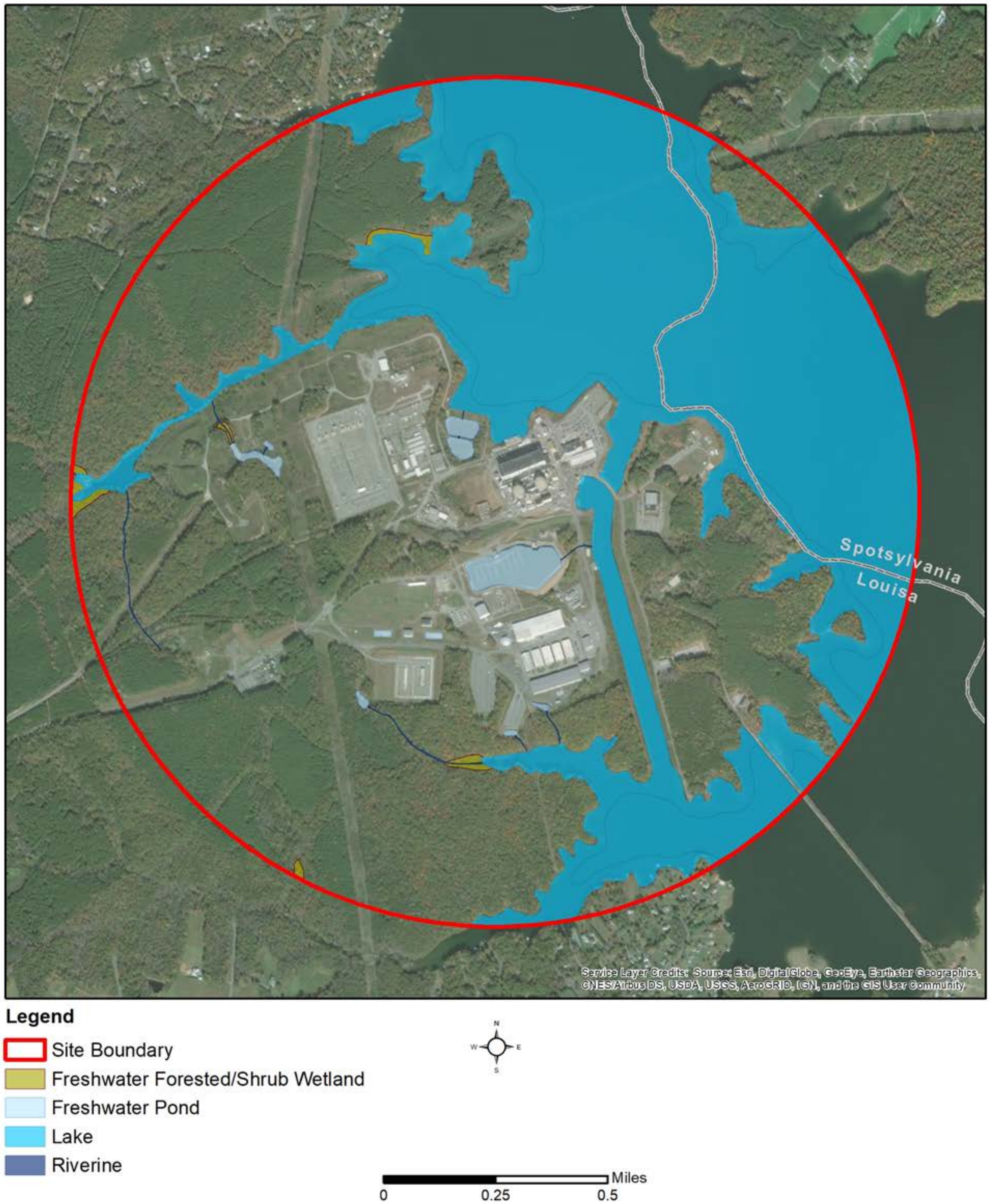


Figure E3.7-2 NWI Wetlands on the NAPS Site



E3.8 HISTORIC AND CULTURAL RESOURCES

Cultural resources include prehistoric era and historic era archaeological sites and objects, architectural properties and districts, and traditional cultural properties, which are defined as significant objects or places important to Native American tribes for maintaining their culture (USDOI. 1998). Of particular concern are those cultural resources that may be considered eligible for listing on the National Register of Historic Places (NRHP). Any cultural resources listed on or eligible for the NRHP are considered historic properties under the National Historic Preservation Act (NHPA) [16 USC 470].

Prior to taking any action to implement an undertaking, Section 106 of the NHPA requires the NRC as a federal agency to do the following:

- Take into account the effects of an undertaking (including issuance of a license) on historic properties, including any district, site, building, structure, or object included in or eligible for inclusion in the NRHP.
- Afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertaking.

To provide early consultation for the Section 106 process, Dominion contacted the Virginia Department of Historic Resources (DHR) for informal consultation concerning the NAPS Units 1 and 2 SLR and potential effects on cultural resources within the approximately 1,800-acre NAPS site and on historic properties within a six-mile radius of the NAPS Units 1 and 2 (Attachment D). Native American groups recognized as potential stakeholders were also consulted by Dominion with the opportunity for comment (Attachment D).

This ER identifies all known archaeological sites within a six-mile radius of NAPS Units 1 and 2, as well as properties listed on the NRHP within that same radius. The approximately 1,800-acre NAPS property consists primarily of forest, grassland, wetlands, open water, and developed areas. The land within a six-mile radius is primarily forest, grassland, wetlands, developed areas, and agricultural fields adjacent and near Lake Anna. For the purpose of SLR, the aboveground area of potential effects (APE) is defined as the area associated with the NAPS property within the site boundary. Within a six-mile radius of NAPS, the visual integrity of historical properties is also considered in relation to the continued operation of NAPS Units 1 and 2. The archaeological APE is considered bounded by the approximately 1,800 acres, where ground disturbance, though unanticipated during NAPS Units 1 and 2 operations throughout the proposed subsequent license renewal term, might compromise the physical integrity of archaeological data.

No ground disturbance associated with the NAPS Units 1 and 2 is considered within the scope of the 10 CFR Part 51 evaluation. Although construction of the existing NAPS Units 1 and 2 facility itself would have impacted any archaeological resources that may have been located within its footprint, much of the surrounding area remains largely undisturbed. There are five cultural resource sites that have been recorded within the NAPS Units 1 and 2 site boundaries. The Collins Cemetery Site (054-5024) has been recorded in the eastern portion of the NAPS Units 1 and 2 property. The cemetery includes a dry-laid stone wall and nine marked graves associated with the late 19th century Beech Hill home of John Lewis Collins. The NRHP status of the site has not been determined. A second cemetery (44LS0221) is located in the western portion of the NAPS Units 1 and 2 property. The cemetery includes eight headstones and footstones and five shallow depressions, with an overall inference of 12 possible human interments. The NRHP status was classified as potentially eligible by the Virginia State Historic Preservation Office (SHPO). A third cemetery (44LS0227) is also located in the western portion of the NAPS Units 1 and 2 property. The cemetery includes 30 possible human interments which are enclosed by a tall chain link fence. The NRHP status was classified as not evaluated by the SHPO. The fourth cemetery (44LS0222) is also located in the western portion of the NAPS Units 1 and 2 property. This cemetery includes seven possible interments and is surrounded by a tall chain link fence. The NRHP status was classified as potentially eligible by the SHPO. A single dwelling (44LS0226) is located in the western portion of the NAPS Units 1 and 2 property and includes the remains of several stone walls and a chimney, as well as an artifact scatter. The NRHP status was classified as not evaluated by the SHPO. No other archaeological sites have been recorded in the approximately 1,800-acre NAPS Units 1 and 2 property, but the entire site has not been subjected to archaeological survey. (VDHR. 2019)

Louis Berger Group, Inc. (LBGI. 2001a) prepared for Dominion a cultural resource assessment for the approximately 1,800-acre NAPS property for the initial license renewal. This investigation included a field inspection and a literature and document review to assess the likelihood for archaeological deposits throughout the property and resulted in identifying one previously recorded archaeological site. Although the property has not been fully surveyed for cultural resources, the background research, field inspections, and previous research was used to determine areas of no potential, low potential, and moderate-to-high potential for archaeological deposits (Figure E3.8-1).

The literature review conducted for previously recorded archaeological sites included the APE and the area within a six-mile radius of NAPS Units 1 and 2. The purpose of the literature review was to inventory all previously and newly recorded archaeological sites on the approximately 1,800-acre NAPS property and within a six-mile radius of NAPS Units 1 and 2, regardless of NRHP status, to help develop an understanding of the local context. The NAPS property is located within an area of high site density associated with the North Anna River and mining.

The results of the cultural resource assessment and previous assessments show that within the approximately 1,800-acre APE and six-mile radius, 56 archaeological resources and 129 architectural resources have been recorded respectively. However, two of the resources have been recorded as both architectural and archaeological sites, resulting in a total of 183 cultural resources recorded within the six-mile radius of NAPS Units 1 and 2. The sites include three that are NRHP listed, four that have been determined to be NRHP eligible by the SHPO, seven that are listed as potentially NRHP eligible by the SHPO, 46 that have been determined by the SHPO to be not NRHP eligible, five that are no longer extant, two that were not evaluated for NRHP by the SHPO but are submerged under Lake Anna, and 116 that have not been evaluated for NRHP eligibility by the SHPO (Table E3.8-1). No traditional cultural properties have been suggested to date by research or by potentially interested parties for the NAPS property or within a six-mile radius of NAPS Units 1 and 2. No structures within the NAPS site boundary have been documented through the Historic American Buildings Survey (HABS) or Historic American Engineering Record (HAER) programs. (VDHR. 2019)

E3.8.1 LAND USE HISTORY

The land use history for NAPS and the surrounding region was developed as part of a 2001 and 2009 Phase 1A literature review and archaeological sensitivity assessment of the NAPS property and is summarized here. Section E3.8.2 provides a more detailed discussion of historical land use as part of the cultural history. Early maps suggest the area within the NAPS site boundaries did not have significant habitation in the 19th century, but by 1942, 12 structures are depicted within the site boundary (Figures E3.8-2; E3.8-3; E3.8-4; E3.8-5; and E3.8-6). These 12 structures are no longer depicted on the 1968 USGS map (Figure E3.8-8). The 1975 USGS map shows the earliest NAPS structures with additional structures shown on the 1977 and 1978 editions (Figures E3.8-9; E3.8-10, and E3.8-11). The property boundary depicted in Figures E3.8-1; E3.8-6; E3.8-7; E3.8-8; E3.8-9; and E3.8-10 represents the direct area of potential effect (APE). At the time of construction, vegetation within the NAPS site was removed and the area was mechanically leveled (Figures E3.8-12 and E3.8-13). To construct the facility, the soil was completely removed and the excavation continued to bedrock, removing all potential cultural deposits (Figure E3.8-14).

The NAPS property and the surrounding region hold evidence of both prehistoric and historic occupation by Native Americans and Euro-Americans. Archaeological records suggest that the property and the surrounding area were potentially occupied by Native American populations during the Paleoindian Period (prior to 8000 BC), the Archaic Period (ca. 8000 BC to 1200 BC), and the Woodland Period (ca. 1200 BC to AD 1600). (LBGI. 2001a)

The U.S. Department of Housing and Urban Development (HUD) tribal directory assessment tool was developed by the Office of Environment and Energy (OEE) to identify tribes that have an interest in locations nationwide and provides tribal contact information to assist with initiating Section 106 consultation under the NHPA. Two tribes (Catawba Indian Nation, Delaware Nation, Oklahoma) are federally recognized and have interest in cultural resources identified in Louisa and Spotsylvania counties, Virginia (HUD. 2019).

E3.8.2 CULTURAL HISTORY

E3.8.2.1 Paleoindian Period (Prior to 8000 BC)

The Paleoindian Period is the earliest substantiated cultural adaptation in Virginia (VDHR. 2001). Due to lower global temperatures, more water was trapped in glaciers resulting in a greater amount of the continental shelf being exposed. Our current view of Paleoindian peoples is that they tended to live in small bands and traveled seasonally within set territories for food sources that included hunting megafauna, caribou, elk, and deer (LBGI. 2001a). Many of these bands likely lived along large rivers for access to higher resource areas. These same resource areas commonly have lithic resources suitable for tool manufacture. The material culture is characterized by large, fluted points such as the Clovis and the Middle Paleo Point. Later point types, such as Hardaway Side Notched, Hardaway Blade, and Hardaway-Dalton no longer exhibit fluting, but retain a high level of technical sophistication that is indicative of Paleoindian tools. Subsistence of Paleoindian peoples focused on large game as well as small game, fishing, and foraging. A more diversified view of the Paleoindian economy is becoming accepted as a result of recent research, in contrast to the previous view emphasizing a heavy reliance on the exploitation of megafauna. Paleoindian sites are primarily located in lowland areas near southeastern Virginia, which due to subsequent sea level rise are located in wetlands or underwater (LBGI. 2009).

E3.8.2.2 Archaic (8000 to 1200 BC)

The Archaic Period is marked by changes in subsistence and settlement patterns likely associated with rising sea levels related to glacial melt. This period is divided into the Early, Middle, and Late Archaic and is characterized by the exploitation of a larger variety of plant and animal resources with an overall greater diversity in material culture. The transition to the Early Archaic Period is inferred to include a less mobile and more localized lifestyle than the preceding Paleoindian Period. Projectile points no longer exemplified the intricate work characteristic of Paleoindian tools (LBGI. 2009). Early Archaic tools such as spear points, knives, drills, scrappers, and gravers were still used, but varied in size and shape and were often fashioned with side or corner notches to allow for hafting. (LBGI. 2009)

By the Middle Archaic, the "tool kit" is inferred to have expanded to include atlatls for hunting as well as mortars and pestles for food processing. Stone axes became common for obtaining wood for structures and fire, suggesting a greater level of sedentism. The occurrence of steatite and soapstone bowls also suggests longer term occupations and more intense resource exploitation. The occurrence of soapstone across Virginia, in addition to quartzite and rhyolite knives and large points in both Virginia and Maryland, suggests the use of trade and exchange networks. Also, by the Late Archaic, estuarine resources were exploited as a food source as well as native plants such as sunflowers, amaranth, and gourds (VDHR. 2019). Overall the exploitation strategy during the

Archaic Period appears to have been a mostly mobile population conducting hunting and foraging activities.

E3.8.2.3 Woodland (1200 BC to AD 1600)

The Woodland Period is primarily marked by the emergence of pottery and other technological changes occurred in the material culture of the prehistoric inhabitants of the region, which is the basis for determining the transition from the Archaic Period to the Woodland Period. Pottery and subterranean storage pits are found at sites dating to the Early Woodland Period, which similar to Archaic Period sites are predominantly located in riverine locations (LBGI. 2001a). Pottery was used for cooking and as a method to store perishable items.

By the Middle Woodland, trade and exchange networks had greatly expanded based on the presence of nonlocal artifacts. This is evident in the large amount of exotic items and materials in grave goods such as pendants and copper beads. The diet continued to include aquatic and game resources, but began to include more plants such as Chenopodium. The carbohydrate-rich diet, evident in human bone analysis, suggests an increase in agriculture and less reliance on hunting and foraging. Smaller projectile points, resulting from the conversion from atlatls and darts to the bow and arrow and celts appear at this time (LBGI. 2001a; VDHR. 2001). Sedentism was common by this time, as seen in large base camps and increased reliance on agriculture in the archaeological record.

By the Late Woodland, political stratification was evident within permanent and semi-permanent large villages, some located within palisades, suggesting an increase in inter-community violence. Agriculture appears to increase in importance, with a reliance on corn, squash and beans. However, foraging and hunting was still important to survival (LBGI. 2001a). During this time local cultures, such as the Coastal Plain Indians, became evident which led to more specialized and stratified social and political roles. During the Late Woodland, Virginia appears to have been inhabited by Siouan groups and Eastern Algonquin groups. With an increase in trade networks and craft specialization, material culture diversified, particularly goods manufactured from bone such as needles and fishhooks. Ceremonial and status objects became commonplace as seen in elaborate burials for the elite (LBGI. 2001a). The material culture suggests that villages were organized into redistributive chiefdom-level societies (LBGI. 2001a).

E3.8.2.4 Historic Context, AD 1607 to 1950

Louisa County was formed in 1742 from a portion of Hanover County, which had been formed in 1654. The area was first populated by Europeans in the early eighteenth century to cultivate tobacco on the fertile lands along the North Anna River and South Anna River valleys. By 1836, farming practices had resulted in relatively unproductive soils and wheat and corn became the predominant agricultural crops. The population in 1810 included 6,430 slaves and 5,243 non-slaves which increased to 9,382 slaves and 6,464 non-slaves in 1830. Dwellings in the 1830s were generally one-story frame or log structures, with only approximately 20 brick structures. Gold was discovered in western Spotsylvania County in 1806, creating an industrial boom by 1832 in Louisa County. Most of the gold mines closed by 1865 after exhausting the most accessible deposits. Iron ore mining, which began in the county before the American Revolution, became a substantial industry in the mid-nineteenth century but Louisa County remained relatively rural and agricultural to the end of the nineteenth century. (LBGI. 2009)

During the French and Indian War, the American Revolution, and the Civil War, minor battles occurred in Louisa County, but much of the impact was indirect and related to the general economic hardship related to the confrontations and the post-war declines. Agriculture remained the main economic focal point through the mid-twentieth century, with timber mills becoming increasingly important. (LBGI. 2009)

E3.8.3 ONSITE CULTURAL RESOURCES

Onsite cultural resources are those located within the approximately 1,800-acre NAPS property. That property includes the entirety of the archaeological APE, which is also the onsite portion of the aboveground APE. There are no actions associated with SLR that could potentially affect historic properties. The VDHR reviewed the proposed project and determined that no historic properties will be affected due to the disturbed nature of the project area.

No NRHP-eligible cultural resources have been identified in the approximately 1,800-acre NAPS property.

Five cultural resource sites have been recorded within the NAPS site boundary (VDHR. 2019). The Collins Cemetery Site (054-5024) has been recorded in the eastern portion of the NAPS property. The cemetery includes a dry-laid stone wall and nine marked graves associated with the late 19^{th} century Beech Hill home of John Lewis Collins. The NRHP status of the site has not been determined.

A second cemetery (44LS0221) is located in the western portion of the NAPS Units 1 and 2 property. The cemetery includes eight headstones and footstones and five shallow depressions, with an overall inference of 12 possible human interments. The NRHP status was classified as potentially eligible by the SHPO.

A third cemetery (44LS0227) is also located in the western portion of the NAPS property. The cemetery includes 30 possible human interments which are enclosed by a tall chain link fence. The NRHP status was classified not evaluated by the SHPO. The fourth cemetery (44LS0222) is also located in the western portion of the NAPS property. This cemetery includes seven possible interments which are surrounded by a tall chain link fence. The NRHP status was classified as potentially eligible by the SHPO.

A single dwelling (44LS0226) is located in the western portion of the NAPS property and includes the remains of several stone walls and a chimney, as well as an artifact scatter. The NRHP status was classified as not evaluated by the SHPO.

No other archaeological sites have been recorded on the approximately 1,800-acre NAPS property, but the entire facility has not been subjected to archaeological survey. In its 2001 investigation, LBGI completed an archaeological sensitivity analysis based on previous archaeological investigations, a review of archival and secondary historical sources, topography, and a walkover of the property. As depicted in Figure E3.8-1, three zones of sensitivity were identified on the NAPS property: no potential (disturbed), low potential (disturbed location with greater than 15% slope and typically do not have sites), and moderate to high potential (undisturbed, relatively flat, typically have sites). (LBGI. 2001a)

E3.8.4 OFFSITE CULTURAL RESOURCES

Offsite cultural resources are those outside the approximately 1,800-acre NAPS property boundaries. Lists of known archaeological sites and historic properties within a six-mile radius of NAPS are presented in Table E3.8-1. There are 178 offsite resources within six-mile radius of NAPS (VDHR. 2019). Many of these resources are listed or potentially eligible for listing to the NRHP due to their association with early colonization of the area. There are three resources within the six-mile radius that are listed on the NRHP (Figure E3.8-15).

E3.8.5 CULTURAL RESOURCE SURVEYS

There is no documented cultural resources survey of the approximately 1,800-acre NAPS property prior to construction of NAPS Units 1 and 2. In 2001, LBGI conducted a cultural resource assessment of the NAPS site that included background research and a field inspection, but a systematic pedestrian survey was not undertaken. The assessment found no extant historic architectural resources located within the NAPS property. (LBGI. 2001a)

In 2001, LBGI conducted a cemetery reconnaissance survey of the approximately 1,800-acre NAPS property and produced an addendum to the earlier report. The reconnaissance survey resulted in recording five cemeteries, three of which were within the NAPS property. Documentation on the cemeteries was submitted to the VDHR. (LBGI. 2001b)

In 2003, LBGI conducted a field inspection of the areas near the NAPS Units 1 and 2 facilities. The field inspection resulted in supporting the 2001 probability assessment of the no potential and low potential areas. No additional cultural resources were identified. (LBGI. 2009)

LBGI conducted a cultural resources survey in 2006 of the existing power station facilities and undeveloped areas west and south of the existing facility. The survey included ten areas and totaled six acres. No additional cultural resources were identified, but two of the cemetery locations were re-identified using GPS technology. (LBGI. 2009)

Six survey areas were investigated in 2007 by LBGI which totaled 13 acres and were in the undeveloped areas of the NAPS property. This survey resulted in recording an additional cemetery (44LS0227) and the remnants of a domestic site (44LS0226). LBGI recommended 44LS0026 as eligible to the NRHP and additional research would be required to evaluate the NRHP eligibility of 44LS0227. (LBGI. 2009)

E3.8.6 PROCEDURES AND INTEGRATED CULTURAL RESOURCES MANAGEMENT PLAN

Cultural resources on the NAPS site are protected by Dominion's historic resources consultation guidance (Dominion. 2009b) and Dominion's cultural resources description process (CRDP), which is specifically applicable to SPS and NAPS. The guidance document and the CRDP ensure that cultural resource remains are not damaged and are protected from unauthorized removal, and that in the event ground disturbance is required in these areas, remains will be appropriately protected for their cultural resource information value. The guidance protects known cultural resources, as well as unknown cultural resources, by establishing a process for all activities that require a federal permit or use federal funding, or have the potential to impact historic resources.

The flowchart in Figure E3.8-16 illustrates the associated steps in the CRDP and meets the needs for regulatory requirements, supporting existing station operations, environmental stewardship, licensing proceedings, and SLR application content. The CRDP integrates the various Dominion policy statements, programs, procedures, and BMPs already being followed. As part of necessary actions for various project work, it calls out in one diagram applicable reference documents and steps to be followed should the question or need for assessment of historic or cultural resources be raised.

Table E3.8-1 Archaeological and Architectural Sites within Six-Mile Radius of the NAPS Units 1 and 2

VDHR ID#	Resource Name/Type	County	Quadrangle	NRHP Status
44LS0002	Prehistoric open air	Louisa	Lake Anna West	Not evaluated
44LS0009	Prehistoric open air	Louisa	Lake Anna West	Not evaluated
44LS0044	Prehistoric camp	Louisa	Lake Anna West	Not evaluated
44LS0102	19th century iron furnace	Louisa	Mineral	Not evaluated
44LS0108	20th century mine	Louisa	Lake Anna West	Not evaluated
44LS0109	19th century mine	Louisa	Lake Anna West	Not evaluated; submerged
44LS0110	19th century mine	Louisa	Lake Anna West	Not evaluated
44LS0111	19th century mine	Louisa	Lake Anna West	Not evaluated
44LS0112	20th century mine	Louisa	Mineral	Not evaluated
44LS0137	Prehistoric camp/19th century mine	Louisa	Mineral	Not evaluated
44LS0138	Prehistoric camp/19th century blacksmith shop	Louisa	Mineral	Not evaluated
44LS0139	Prehistoric camp/19th and 20th century mine	Louisa	Mineral	Not evaluated
44LS0140	Prehistoric camp	Louisa	Mineral	Not evaluated
44LS0141	19th century house	Louisa	Mineral	Not evaluated
44LS0142	Prehistoric camp/19th and 20th century house	Louisa	Mineral	Not evaluated
44LS0143	19th century house	Louisa	Mineral	Not evaluated
44LS0145	19th century church	Louisa	Mineral	Not evaluated
44LS0190	Victory Furnace/19th century iron furnace	Louisa	Mineral	Not evaluated
44LS0204	20th century mine	Louisa	Mineral	Not evaluated
44LS0205	19th and 20th century mine	Louisa	Mineral	Not evaluated
44LS0207	19th century mine	Louisa	Mineral	Not evaluated
44LS0208	19th and 20th century mine	Louisa	Mineral	Not evaluated
44LS0221[a]	Historic Period cemetery	Louisa	Lake Anna West	DHR: potentially eligible
44LS0222[a]	Historic Period cemetery	Louisa	Lake Anna West	DHR: potentially eligible
44LS0223	Historic Period cemetery	Louisa	Lake Anna East	Not evaluated

Table E3.8-1 Archaeological and Architectural Sites within Six-Mile Radius of the NAPS Units 1 and 2

VDHR ID#	Resource Name/Type	County	Quadrangle	NRHP Status
44LS0226[(a)]	19th and 20th century house	Louisa	Lake Anna West	Not evaluated
44LS0227[(a)]	Historic Period cemetery	Louisa	Lake Anna West	Not evaluated
44LS0229	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
44LS0230	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
44LS0231	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
44LS0232	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
44LS0233	19th and 20th century house	Louisa	Lake Anna West	DHR: potentially eligible
44LS0234	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
44LS0240	19th and 20th century artifact scatter	Louisa	Lake Anna West	DHR: not eligible
44SP0043/088-0086	18th century Fredericksville Iron Furnace	Spotsylvania	Lake Anna West	Not evaluated/submerged
44SP0044/088-0086	18th to 20th century Lacy's Mill	Spotsylvania	Lake Anna West	Not evaluated
44SP0047	Prehistoric camp	Spotsylvania	Lake Anna West	Not evaluated
44SP0048	Prehistoric camp	Spotsylvania	Lake Anna West	Not evaluated
44SP0092	Historic Period mine	Spotsylvania	Lake Anna West	Not evaluated
44SP0093	19th century mine	Spotsylvania	Lake Anna West	Not evaluated
44SP0093	19th century mine	Spotsylvania	Lake Anna West	Not evaluated
44SP0094	19th century mine	Spotsylvania	Lake Anna West	Not evaluated
44SP0304	Historic Period Cemetery	Spotsylvania	Lake Anna West	Not evaluated
44SP0305	Early 20th century house	Spotsylvania	Lake Anna West	Not evaluated
44SP0306	Historic Period Cemetery	Spotsylvania	Lake Anna West	Not evaluated
44SP0307	Historic Period Farmstead	Spotsylvania	Lake Anna West	Not evaluated
44SP0452	Prehistoric camp	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0453	Prehistoric camp	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0454	Prehistoric camp	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0455	Prehistoric and 19th century prospect pit	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0456	Early 20th century house	Spotsylvania	Lake Anna West	Not evaluated

Table E3.8-1 Archaeological and Architectural Sites within Six-Mile Radius of the NAPS Units 1 and 2

VDHR ID#	Resource Name/Type	County	Quadrangle	NRHP Status
44SP0457	Railroad bed	Spotsylvania	Lake Anna West	DHR: potentially eligible
44SP0458	Prehistoric camp	Spotsylvania	Lake Anna West	DHR: potentially eligible
44SP0459	Prehistoric camp	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0618	19th century house	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0675	Early 20th century Private Hairfield Cemetery	Spotsylvania	Lake Anna West	Not evaluated
44SP0676	20th century Brooks Cemetery	Spotsylvania	Belmont	Not evaluated
054-0020	19th century Elk Creek Baptist Church	Louisa	Lake Anna West	DHR: eligible
054-0021	Historic Period house	Louisa	Lake Anna West	Not evaluated
054-0025	Fredericks Hall	Louisa	Buckner	DHR: eligible
054-0045	18th to 19th century Jerdone Castle	Louisa	Lake Anna East, Lake Anna West	NRHP listed, VLR listed
054-0058	17th to 18th century house	Louisa	Buckner	Not evaluated
054-0078	18th century Woodlawn House	Louisa	Buckner	Not evaluated
054-0080	17th to 20th century Bear Castle	Louisa	Lake Anna West	DHR: eligible
054-0120	Historic Period Boxley House	Louisa	Mineral	Not evaluated
054-0123	17th to 18th century Newman-Mitchell House	Louisa	Lake Anna West	Not evaluated
054-0126	19th century Elk Creek House	Louisa	Lake Anna West	Not evaluated
054-0127	19th to 20th century Spring Garden House	Louisa	Lake Anna West	Not evaluated
054-0128	19th century Seclusion House	Louisa	Lake Anna West	Not evaluated
054-0129	17th to 18th century Serenity House	Louisa	Lake Anna West	Not evaluated
054-0131	Historic Period house	Louisa	Mineral	Not evaluated
054-0141	Historic Period Miners Chapel	Louisa	Mineral	Not evaluated
054-0144	18th to 19th century Laurel Hill House	Louisa	Lake Anna West	Not evaluated
054-0145	Historic Period Johnson House	Louisa	Lake Anna West	Not evaluated
054-0146	Historic Period house	Louisa	Lake Anna West	Not evaluated
054-0147	Historic Period Vaughan House	Louisa	Lake Anna West	Not evaluated
054-0148	Historic Period Plum Tree Store	Louisa	Lake Anna West	Not evaluated

Table E3.8-1 Archaeological and Architectural Sites within Six-Mile Radius of the NAPS Units 1 and 2

VDHR ID#	Resource Name/Type	County	Quadrangle	NRHP Status
054-0149	18^{th} to 20^{th} century Plum Tree School	Louisa	Lake Anna West	Not evaluated
054-0150	19^{th} to 20^{th} century Talley House	Louisa	Lake Anna West	Not evaluated
054-0151	19^{th} to 20^{th} century house	Louisa	Lake Anna West	Not evaluated
054-0155	18^{th} to 19^{th} century house	Louisa	Lake Anna West	Not evaluated
054-0182	20^{th} century house	Louisa	Mineral	DHR: not eligible
054-0183	20^{th} century house	Louisa	Mineral	DHR: not eligible
054-0184	19^{th} to 20^{th} century house	Louisa	Mineral	No longer extant
054-0185	19^{th} century house	Louisa	Mineral	DHR: not eligible
054-0186	20^{th} century J&R Market	Louisa	Mineral	No longer extant
054-0187	20^{th} century House	Louisa	Mineral	No longer extant
054-0188	20^{th} century House	Louisa	Mineral	Not evaluated
054-0189	20^{th} century G.F. Proctor House	Louisa	Mineral	Not evaluated
054-0190	20^{th} century House	Louisa	Mineral	Not evaluated
054-0191	20^{th} century House	Louisa	Mineral	Not evaluated
054-0192	20^{th} century House	Louisa	Mineral	Not evaluated
054-0193	20^{th} century House	Louisa	Mineral	Not evaluated
054-0194	20^{th} century House	Louisa	Mineral	Not evaluated
054-0195	19^{th} to 20^{th} century R. Perry Store	Louisa	Mineral	Not evaluated
054-0196	19^{th} to 20^{th} century O.G. Mallory House	Louisa	Mineral	Not evaluated
054-0197	20^{th} century O.G. Mallory House	Louisa	Mineral	Not evaluated
054-0198	20^{th} century house	Louisa	Mineral	Not evaluated
054-0199	19^{th} to 20^{th} century house	Louisa	Mineral	Not evaluated
054-0200	19^{th} to 20^{th} century house	Louisa	Mineral	Not evaluated
054-0201	20^{th} century house	Louisa	Mineral	Not evaluated
054-0202	20^{th} century house	Louisa	Mineral	Not evaluated
054-0203	20^{th} century house	Louisa	Mineral	Not evaluated

Table E3.8-1 Archaeological and Architectural Sites within Six-Mile Radius of the NAPS Units 1 and 2

VDHR ID#	Resource Name/Type	County	Quadrangle	NRHP Status
054-0204	19^{th} to 20^{th} century house	Louisa	Mineral	Not evaluated
054-0205	20^{th} century house	Louisa	Mineral	Not evaluated
054-0206	20^{th} century house	Louisa	Mineral	Not evaluated
054-0207	20^{th} century house	Louisa	Mineral	Not evaluated
054-0208	19^{th} to 20^{th} century Walton Ordinary; Walton Tavern; Whitlock Store	Louisa	Mineral	DHR: not eligible
054-0209	19^{th} to 20^{th} century house	Louisa	Mineral	Not evaluated
054-0223	Historic Period bridge	Louisa	Mineral	No longer extant
054-0356	19^{th} to 20^{th} century Woodley House	Louisa	Mineral	Not evaluated
054-0375	20^{th} century house	Louisa	Lake Anna West	DHR: not eligible
054-0376	18^{th} to 19^{th} century Oak Grove Farm	Louisa	Lake Anna West	Not evaluated
054-0384	20^{th} century house	Louisa	Buckner	Not evaluated
054-0386	19^{th} to 20^{th} century Hood house	Louisa	Buckner	Not evaluated
054-0387	19^{th} to 20^{th} century Poindexter Post Office	Louisa	Buckner	Not evaluated
054-0388	19^{th} to 20^{th} century Harris-Poindexter House and Store	Louisa	Buckner	NRHP listed, VLP listed
054-0390	19^{th} to 20^{th} century Bethpage Church	Louisa	Buckner	Not evaluated
054-0399	20^{th} century Trainhan House	Louisa	Buckner	Not evaluated
054-0411	20^{th} century house	Louisa	Lake Anna West	Not evaluated
054-0412	19^{th} to 20^{th} century Green House	Louisa	Lake Anna East	Not evaluated
054-0413	20^{th} century school	Louisa	Lake Anna West	Not evaluated
054-5023	19^{th} to 20^{th} century Harris Family Cemetery	Louisa	Lake Anna East	Not evaluated
054-5024[a]	19^{th} century Collins Cemetery	Louisa	Lake Anna East	Not evaluated
054-5046	19^{th} to 20^{th} century Trinity Baptist Church	Louisa	Mineral	DHR: not eligible
054-5047	20^{th} century house	Louisa	Mineral	DHR: not eligible
054-5049	20^{th} century house	Louisa	Lake Anna West	DHR: not eligible

Table E3.8-1 Archaeological and Architectural Sites within Six-Mile Radius of the NAPS Units 1 and 2

VDHR ID#	Resource Name/Type	County	Quadrangle	NRHP Status
054-5050	19th and 20th century Ware-Waller Family Cemetery	Louisa	Lake Anna West	DHR: not eligible
054-5051	20th century Talley-Keesaer Family Cemetery	Louisa	Lake Anna West	DHR: not eligible
054-5052	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5053	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5054	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5055	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5056	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5057	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5058	20th century house	Louisa	Lake Anna West	DHR: not eligible
088-0054	19th century Pine Forest House	Spotsylvania	Lake Anna East	Not evaluated
088-0096	19th century Good Hope Baptist Church and Cemetery	Spotsylvania	Lake Anna West	Not evaluated
088-0103	19th century Pigeon Plantation/Glenora	Spotsylvania	Lake Anna West	No longer extant
088-0114	19th century Belle Font House	Spotsylvania	Lake Anna East	Not evaluated
088-0115	Historic Period Red House	Spotsylvania	Lake Anna East	Not evaluated
088-0116	19th century William Swift House	Spotsylvania	Lake Anna East	DHR: not eligible
088-0118	20th century Brooks Store	Spotsylvania	Lake Anna West	Not evaluated
088-0120	18th century Livingston Farm	Spotsylvania	Lake Anna West	DHR: not eligible
088-0121	Historic Period Log Cabin Ruins	Spotsylvania	Lake Anna West	Not evaluated
088-0123	19th to 20th century Saint John's Church	Spotsylvania	Lake Anna East	DHR: not eligible
088-0126	19th century Llangollen House/School	Spotsylvania	Lake Anna East	DHR: potentially eligible
088-0133	18th to 20th century Bel Air House	Spotsylvania	Lake Anna West	DHR: eligible
088-0136	18th to 19th century Andrews Tavern	Spotsylvania	Lake Anna West	NRHP listed, VLR listed
088-0156	20th century house	Spotsylvania	Lake Anna East	Not evaluated
088-0157	20th century commercial building	Spotsylvania	Lake Anna West	Not evaluated
088-0158	20th century service station	Spotsylvania	Lake Anna West	Not evaluated

Table E3.8-1 Archaeological and Architectural Sites within Six-Mile Radius of the NAPS Units 1 and 2

VDHR ID#	Resource Name/Type	County	Quadrangle	NRHP Status
088-0159	20th century school	Spotsylvania	Lake Anna West	Not evaluated
088-0160	19th to 20th century New Hope Baptist Church	Spotsylvania	Lake Anna East	Not evaluated
088-0161	19th to 20th century house	Spotsylvania	Lake Anna East	Not evaluated
088-5013	20th century Brecknock House	Spotsylvania	Lake Anna East	DHR: not eligible
088-5038	20th century house	Spotsylvania	Lake Anna East	Not evaluated
088-5041	19th century Levy House	Spotsylvania	Lake Anna East	Not evaluated
088-5042	19th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5043	19th century Ellis House	Spotsylvania	Lake Anna West	Not evaluated
088-5044	20th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5045	20th century Bethel Christian Church Cemetery	Spotsylvania	Lake Anna West	Not evaluated
088-5046	19th and 20th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5047	19th and 20th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5048	19th and 20th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5049	20th century commercial building	Spotsylvania	Lake Anna West	Not evaluated
088-5050	19th century house	Spotsylvania	Belmont	Not evaluated
088-5079	19th to 20th century house	Spotsylvania	Lake Anna East	DHR: not eligible
088-5115	19th century house	Spotsylvania	Lake Anna East	Not evaluated
088-5116	20th century house	Spotsylvania	Lake Anna East	Not evaluated
088-5117	20th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5280	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5335	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5336	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5337	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5338	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5339	19th century Rockland Farm	Spotsylvania	Lake Anna West	DHR: not eligible
088-5340	20th century commercial building	Spotsylvania	Lake Anna West	DHR: not eligible

Table E3.8-1 Archaeological and Architectural Sites within Six-Mile Radius of the NAPS Units 1 and 2

VDHR ID#	Resource Name/Type	County	Quadrangle	NRHP Status
088-5341	19th to 20th century house	Spotsylvania	Lake Anna East	DHR: not eligible
088-5342	20th century house and barns	Spotsylvania	Lake Anna East	DHR: not eligible
088-5343	19th century Wildwood House	Spotsylvania	Lake Anna East	DHR: not eligible
088-5363	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5482	20th century Fairview Road Bridge	Spotsylvania	Lake Anna West	DHR: not eligible
007-5513	Chesapeake and Ohio Railroad/Louisa Railroad/Virginia Central Railroad	Albemarle, Alleghany, Augusta, Bath, Charlottesville, Covington, Hanover, Louisa, Nelson, Orange, Rockbridge, Staunton, Waynesboro	Ashland, Augusta Springs, Beaverdam, Boswells Tavern, Buckner, Charlottesville East, Charlottesville West, Churchville, Clifton Forge, Covington, Craigsville, Crozet, Elliott Knob, Gordonsville, Goshen, Green Valley, Hanover Academy, Hewlett, Keswick, Lake Anna West, Longdale Furnace, Louisa, Millboro, Mineral, Nimrod Hall, Pendleton, Staunton, Stuarts Draft, Waynesboro East, Waynesboro West	DHR: potentially eligible

(VDHR. 2019)

a) Cultural resource sites recorded within the NAPS site boundary.

Figure E3.8-1 NAPS Area Potential for Yielding Archaeological Resources

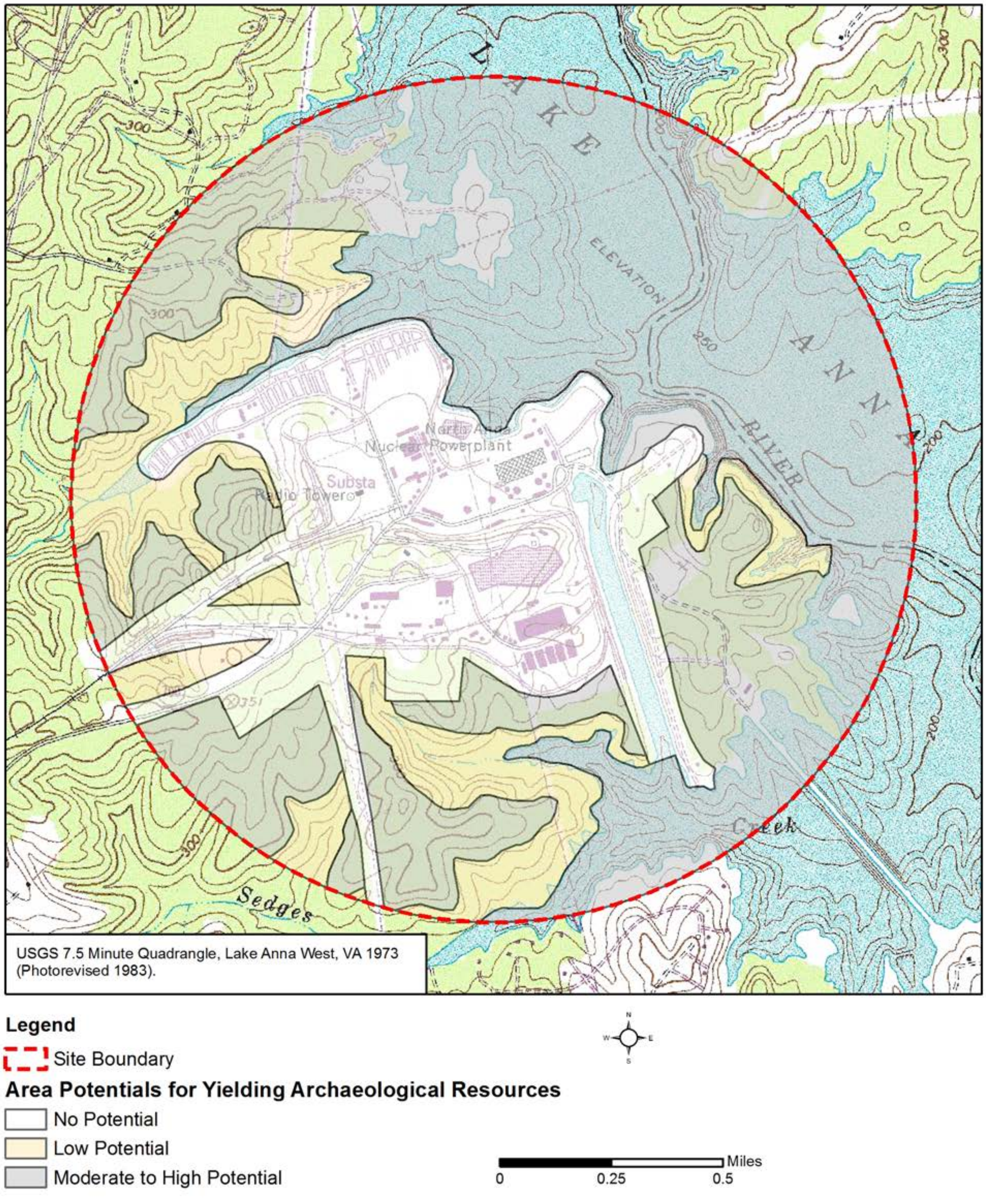


Figure E3.8-2 1822 Historic Map of the Virginias

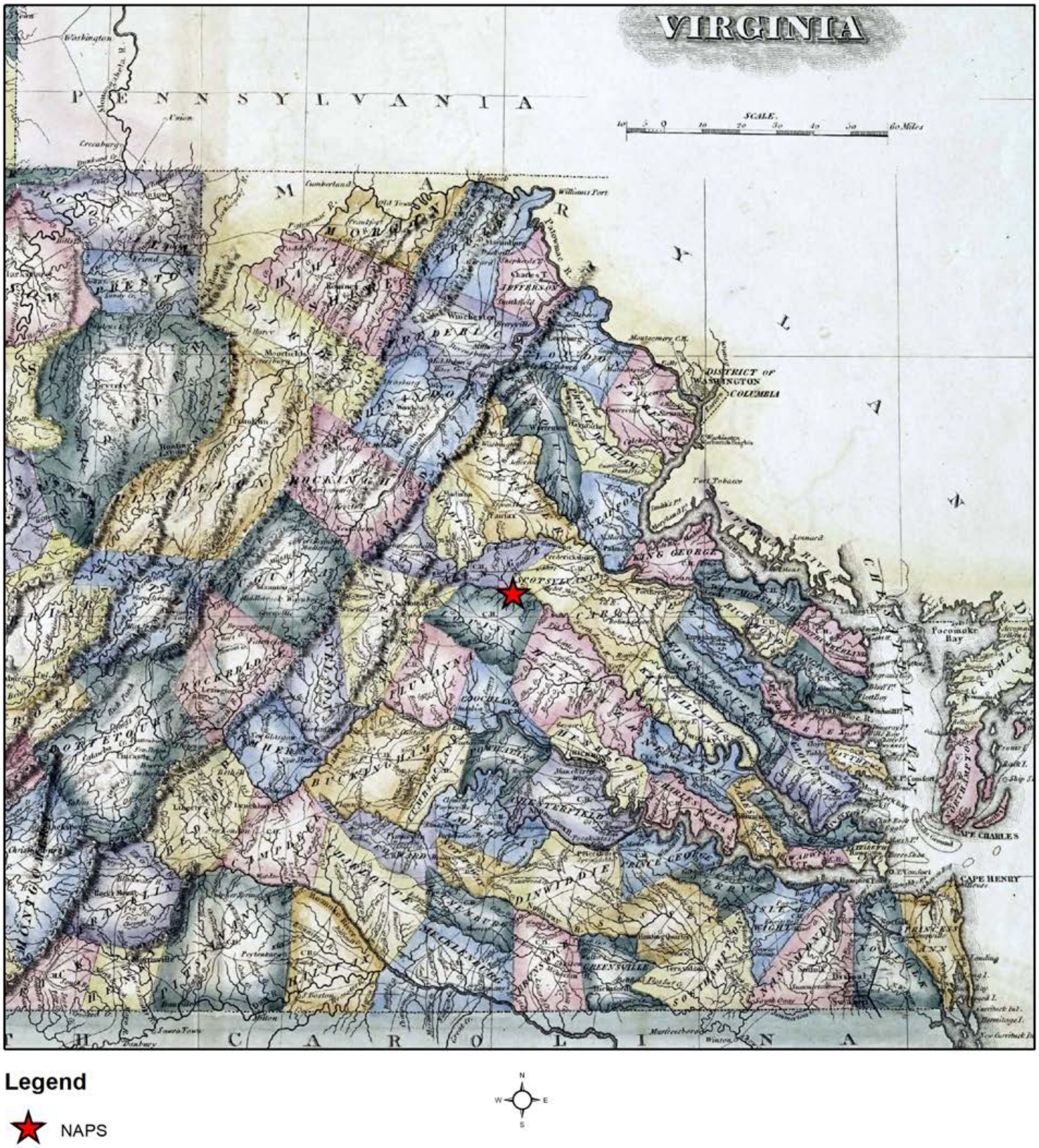


Figure E3.8-3 Map of Louisa County circa 1860s

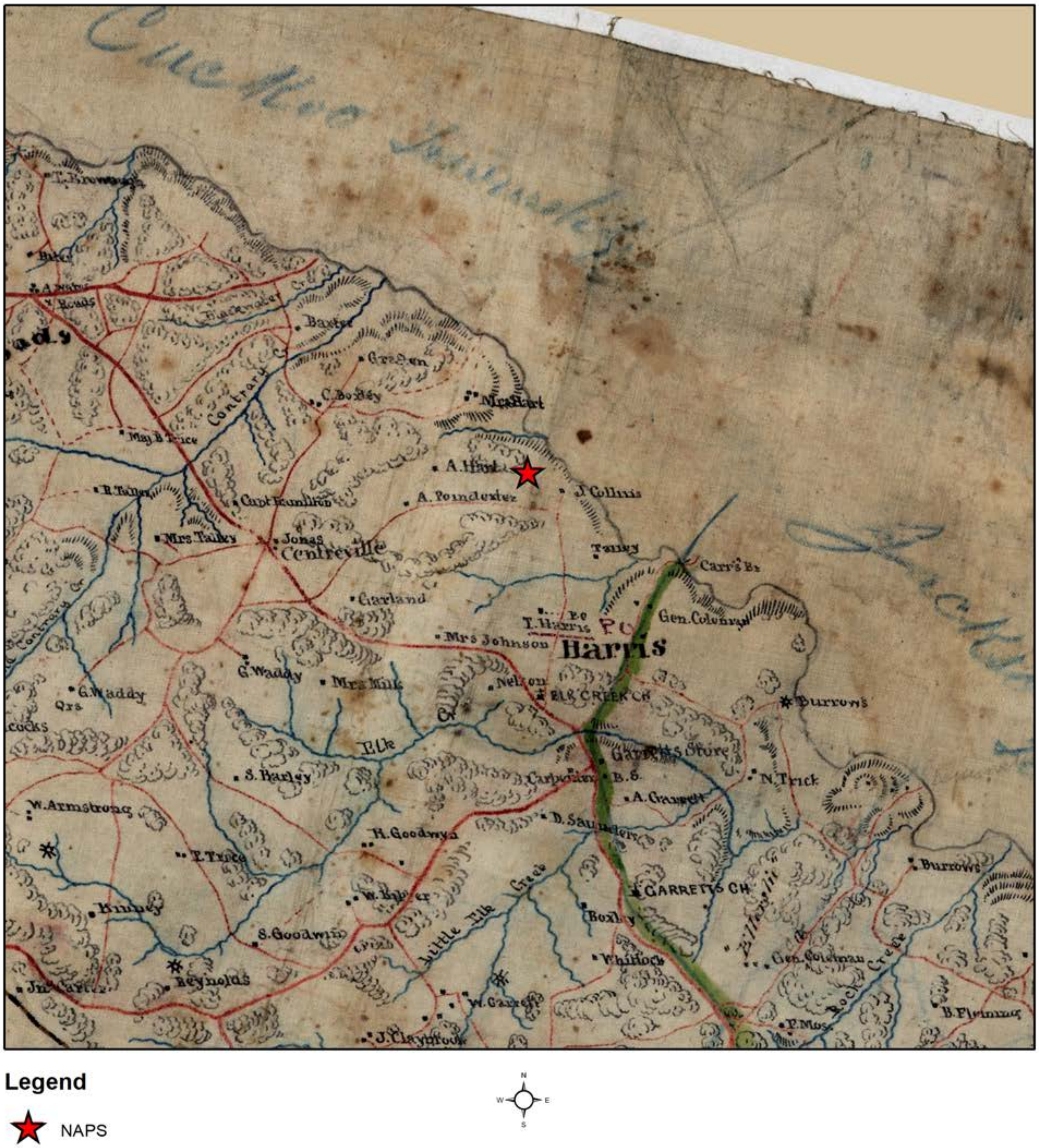


Figure E3.8-4 1863 Chief Engineer's Map of Louisa County, Virginia

Legend

NAPS

Figure E3.8-5 1872 Preliminary Map of Louisa County

Figure E3.8-6 USGS 1892 Spotsylvania Virginia Quadrangle

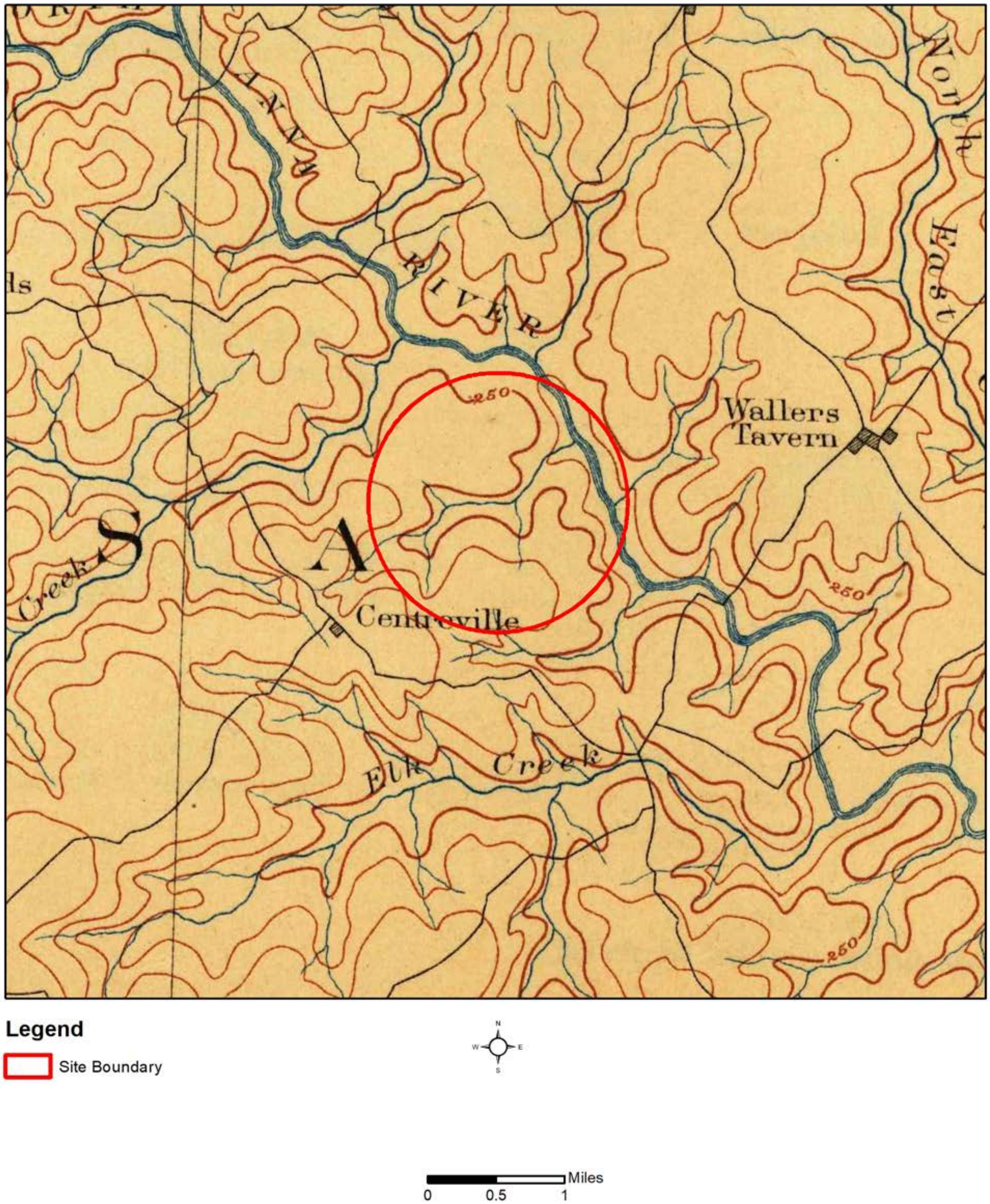


Figure E3.8-7 USGS 1942 Contrary Creek Virginia Quadrangle

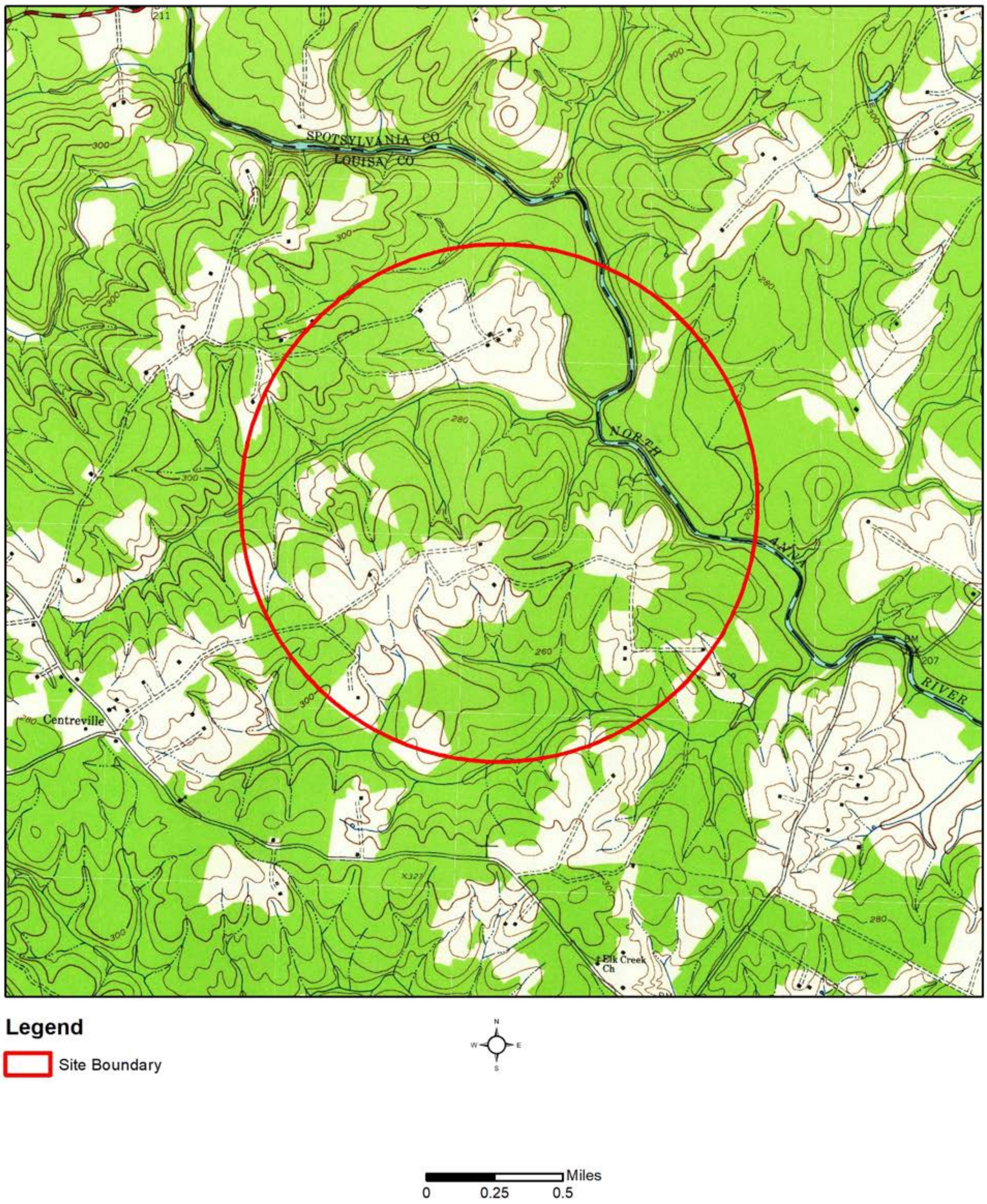


Figure E3.8-8 USGS 1968 Contrary Creek Virginia Quadrangle

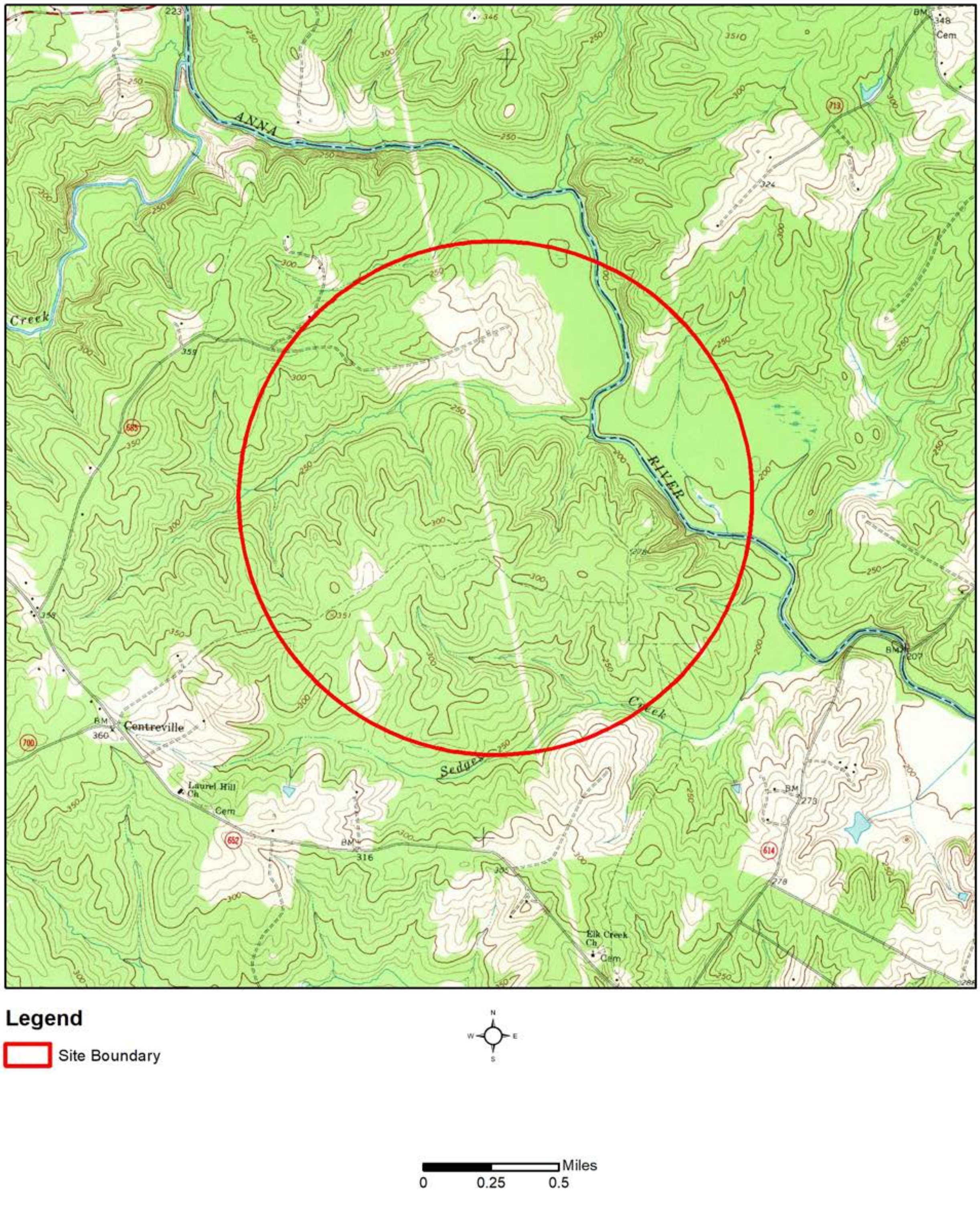
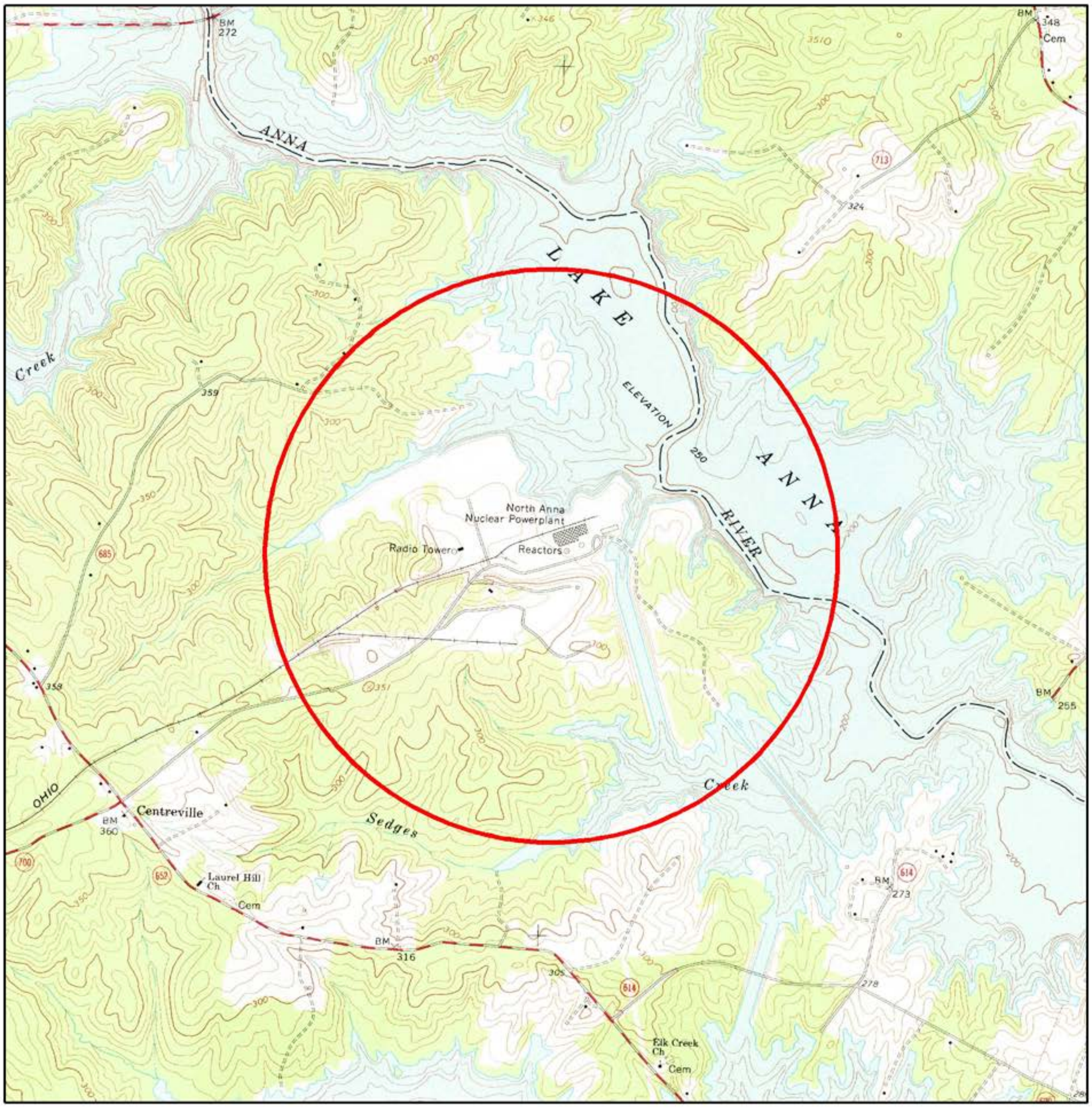


Figure E3.8-9 USGS 1973 Lake Anna West Virginia Quadrangle, 1975



Legend

Site Boundary

Miles
0 0.25 0.5

Figure E3.8-10 USGS 1973 Lake Anna West Virginia Quadrangle, 1978

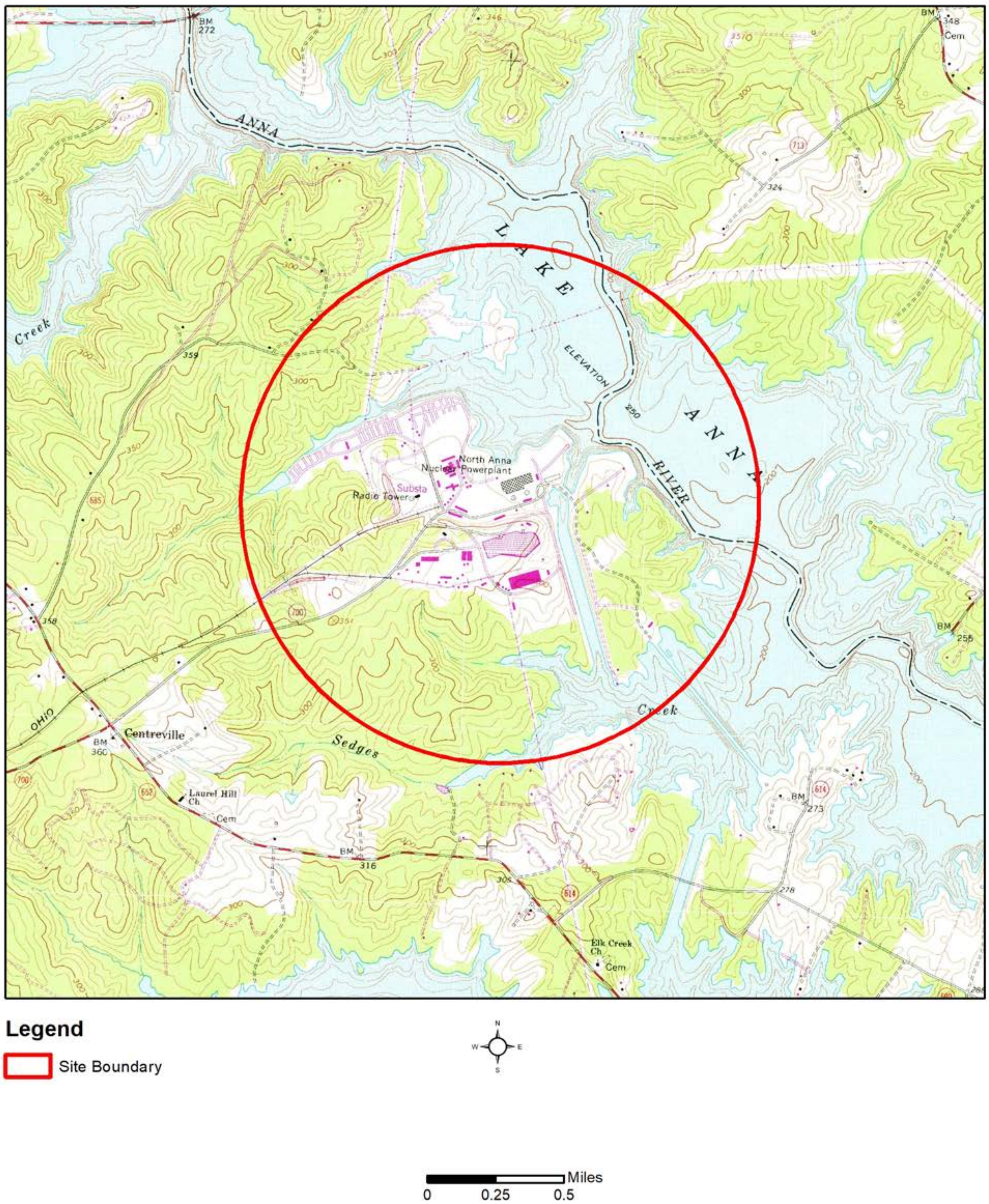


Figure E3.8-11 USGS 1977 Glenora Virginia Quadrangle

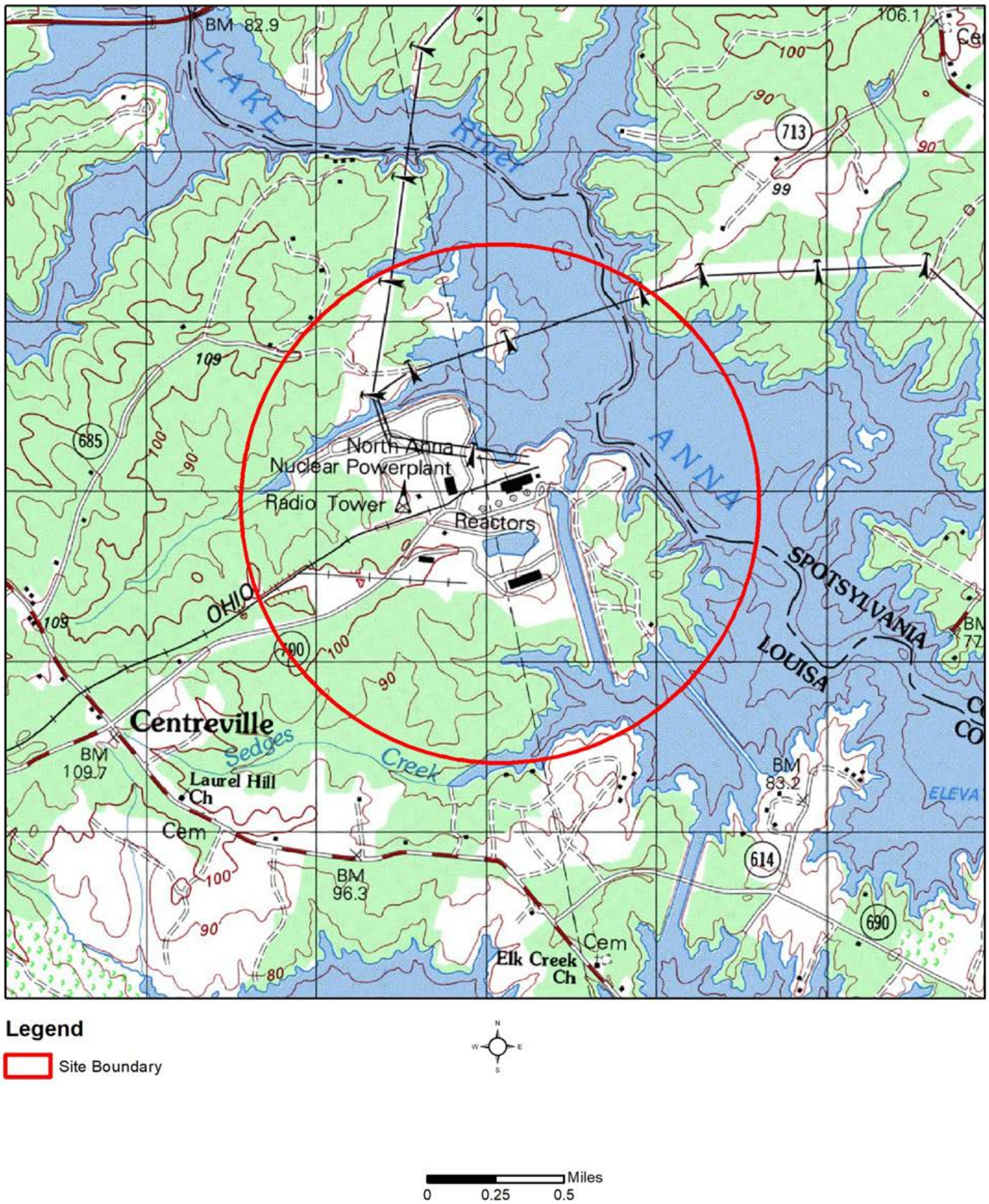


Figure E3.8-12 Construction Photograph of NAPS

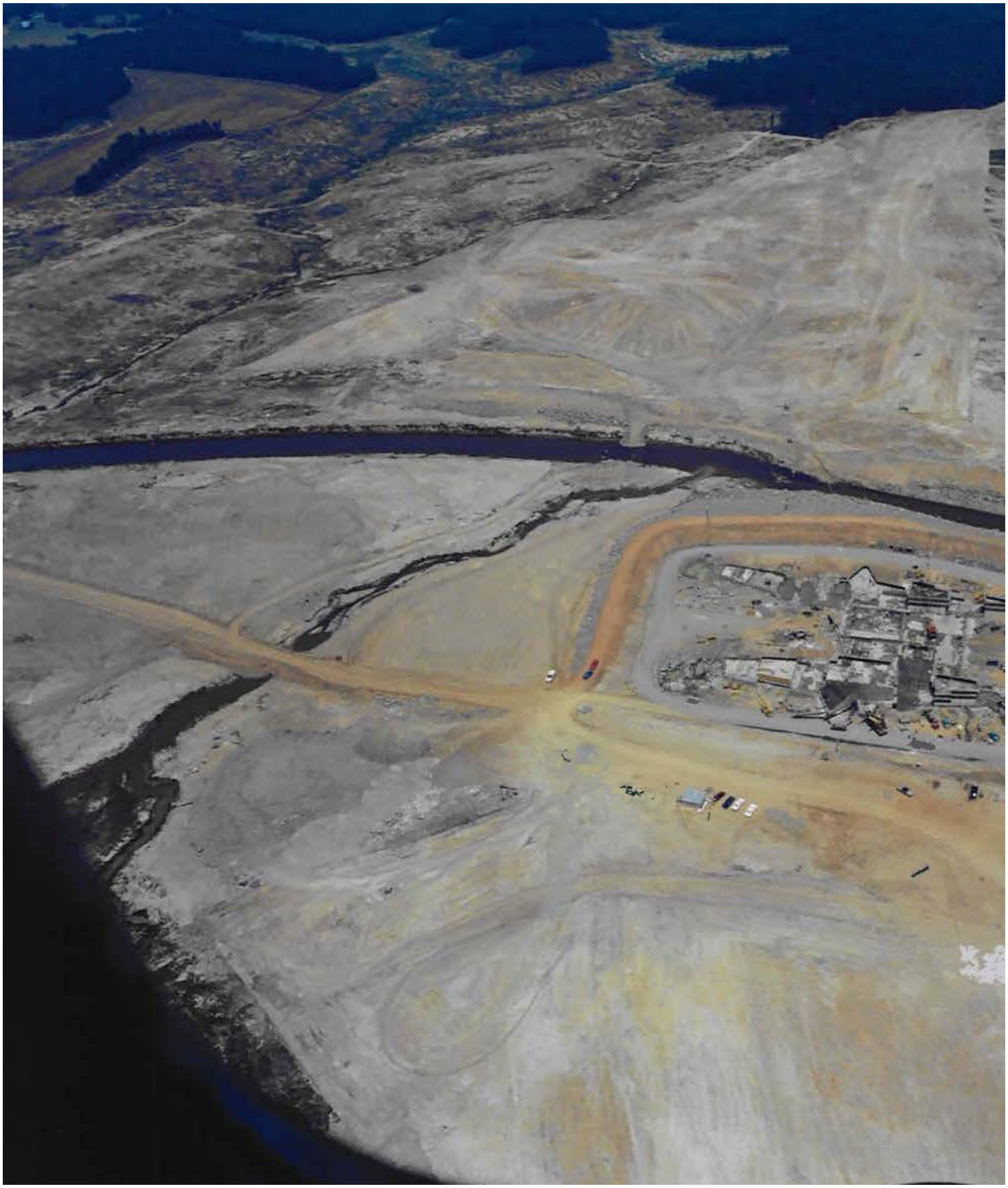


Figure E3.8-13 Construction Photograph of NAPS

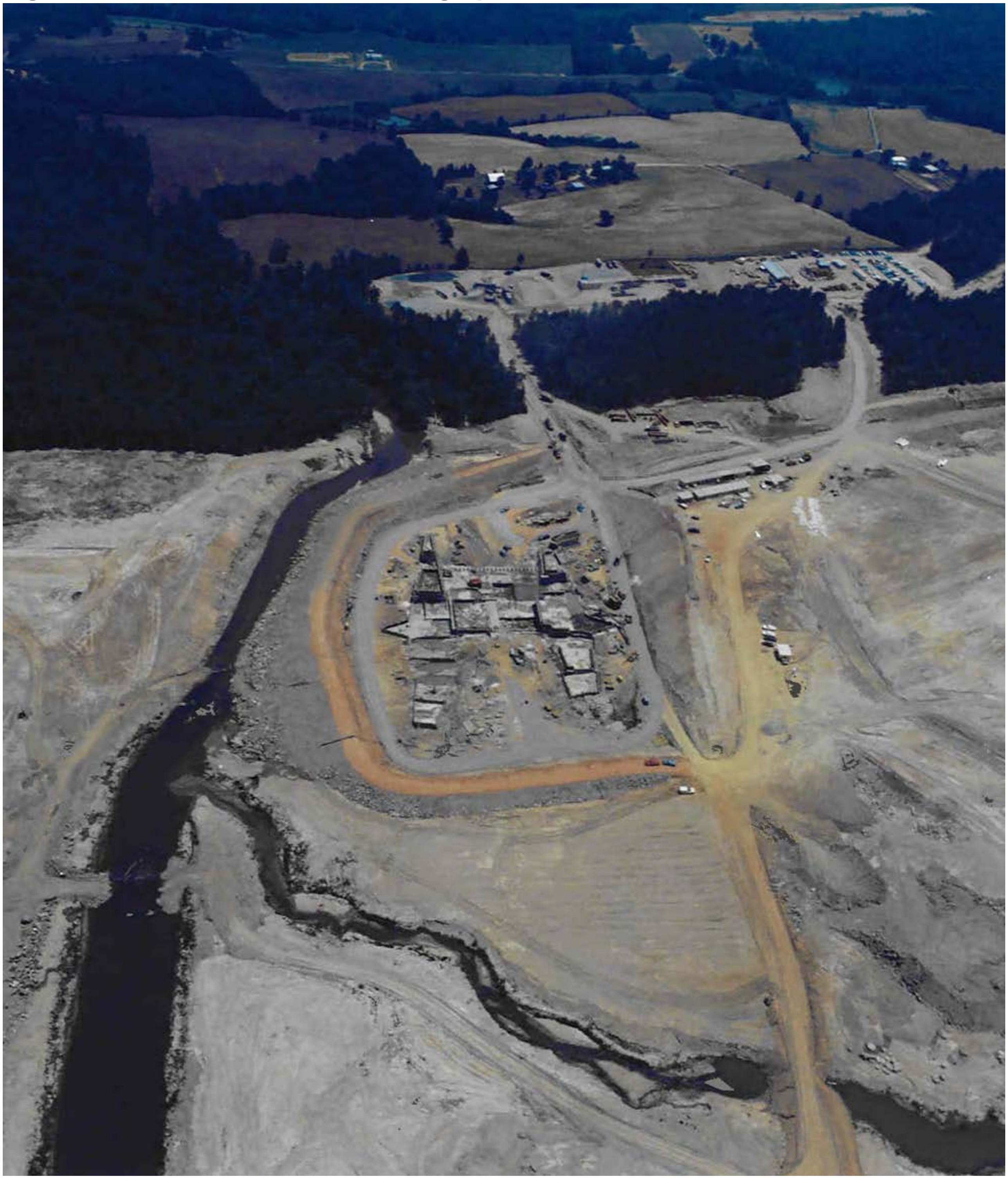


Figure E3.8-14 Construction Photograph of NAPS

Figure E3.8-15 NRHP-Listed Resources within 6 Miles of NAPS

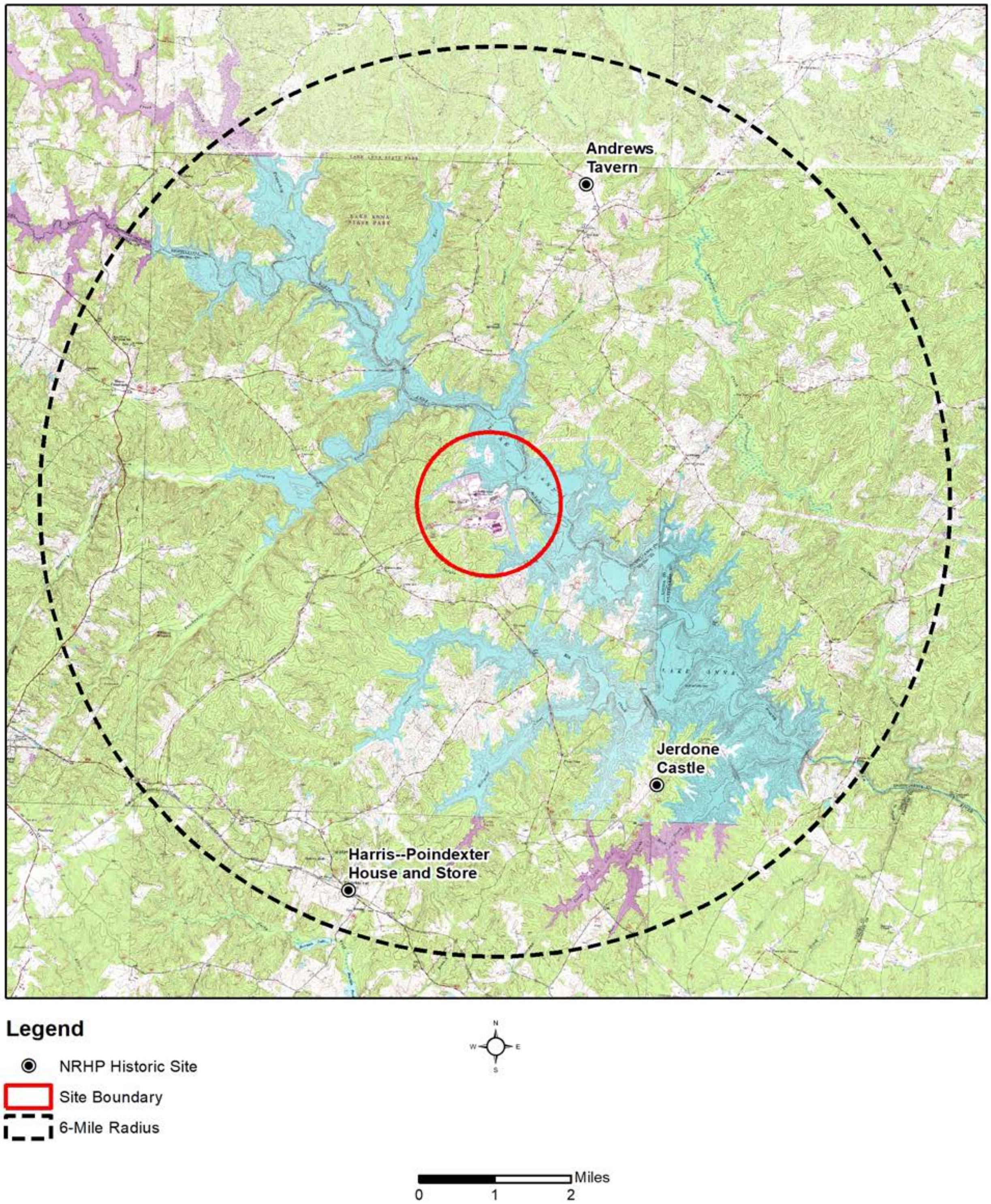
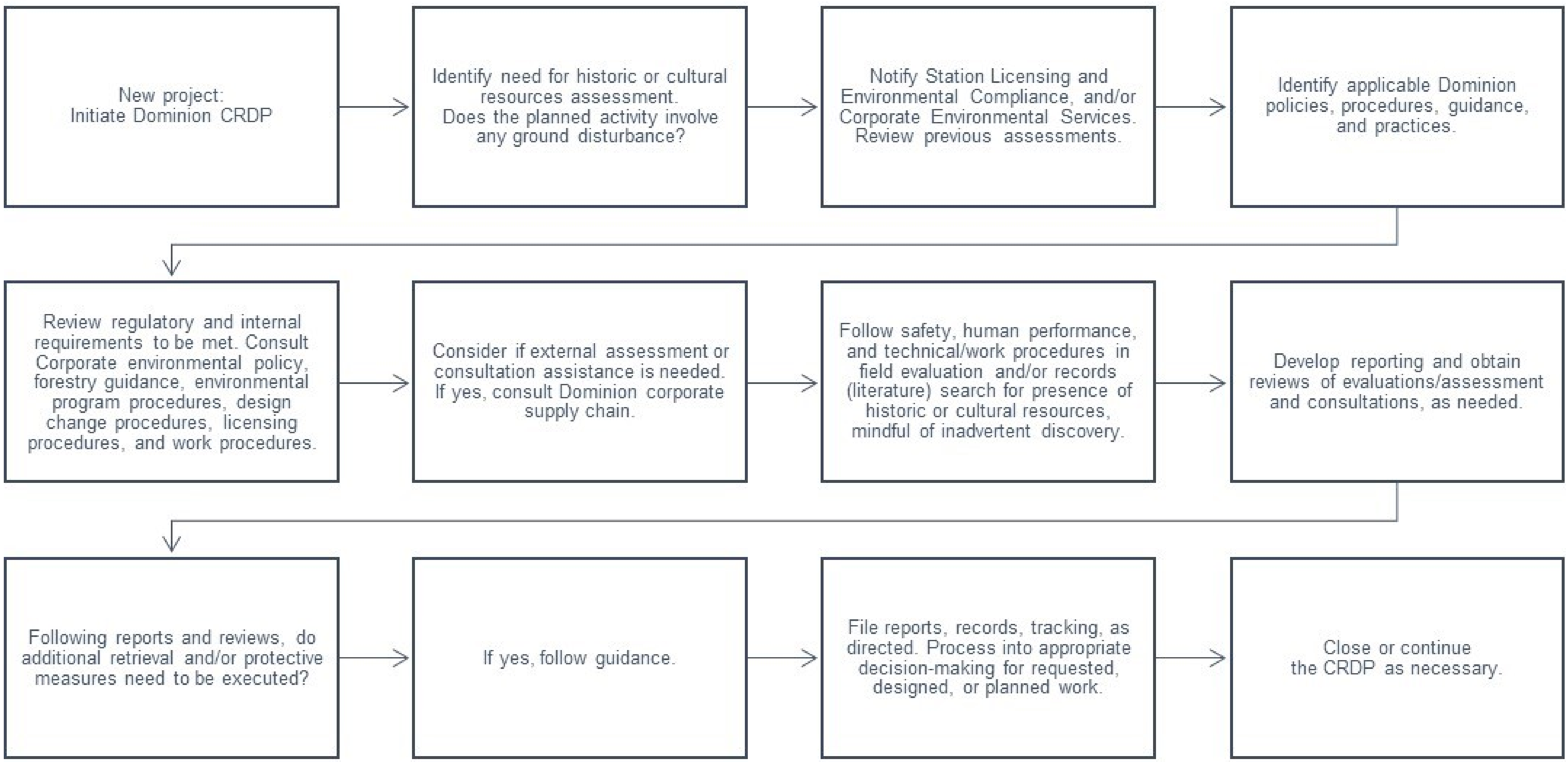


Figure E3.8-16 Cultural Resources Description Process (CRDP) Flow Chart



E3.9 SOCIOECONOMICS

Socioeconomic descriptions are focused on Hanover, Henrico, Louisa, Orange, and Spotsylvania counties because approximately 73% of the permanent and temporary badged NAPS workforce are located there, while the remaining workforce is dispersed throughout the region (see Table E2.5-1).

Refueling outages at NAPS occur on an 18-month staggered cycle for Units 1 and 2 and historically have lasted approximately 32 days per unit. As presented in Section E2.5, there are approximately 500-1,000 contractor employees providing onsite outage support, depending on the outage scope. As seen in Figure E3.1-4, within the 50-mile radius of NAPS there are several municipal areas, including Louisa, Charlottesville, Spotsylvania, Fredericksburg, and Richmond. These towns and cities offer numerous motel, campground, and food service conveniences for contractor workers who provide temporary support during site outages. Transportation corridors such as I-95 and I-64 and local roads provide commuter access to NAPS.

E3.9.1 EMPLOYMENT AND INCOME

The five geographic areas most influenced by NAPS operations are Hanover, Henrico, Louisa, Orange, and Spotsylvania counties. Additionally, NAPS is one of Dominion’s assets on which property taxes are paid to Louisa and Spotsylvania counties. As presented in Section E3.11, the populations of these counties are expected to increase during the proposed SLR operating term. Low-income populations and poverty thresholds for the counties are described in Section E3.11.2.

Hanover County falls within the Richmond, Virginia, metropolitan area (NACo. 2018b). The estimated employed population in Hanover County in 2017 was 70,363 persons. The leading reported occupational sector was retail trade, with approximately 12.5%, or 8,811 persons employed. This was followed by health care and social assistance with 9.9%, or 6,963 persons employed; and construction with 9.8%, or 6,924 persons employed. The annual personal income in Hanover County was approximately $6.2 billion in 2017, and the average wage per job was $45,047. In 2017, per capita personal income was $58,214. (BEA. 2019) The annual average unemployment rate in Hanover County has dropped steadily over the years from a reported recent high in 2010 (6.6%) to 2.6% (preliminary) in 2018 (BLS. 2019). The major Hanover County area employers include the Hanover County School Board, Bon Secours Richmond Health System, and Kings Dominion (Virginia LMI. 2019).

Henrico County falls within the Richmond, Virginia, metropolitan area (NACo. 2018b). The estimated employed population in Henrico County in 2017 was 252,159 persons. The leading reported occupational sector was health care and social assistance, with approximately 12.3%, or 31,000 persons employed. This was followed by retail trade with 10.5%, or 26,568 persons employed; and finance and insurance with 10.2%, or 25,704 persons employed. The annual personal income in Henrico County was approximately $20.9 billion in 2017, and the average wage per job was $55,691. In 2017, per capita personal income was $63,634. (BEA. 2019) The annual average unemployment rate in Henrico County has dropped steadily over the years from a reported recent high in 2010 (7.3%) to 3.0% (preliminary) in 2018 (BLS. 2019). The major Henrico County area employers include the Henrico County School Board, County of Henrico, and Bon Secours Richmond Health System (Virginia LMI. 2019).

Louisa is a small (population-wise) county not associated with any metropolitan or micropolitan area (NACo. 2018b). The estimated employed population in Louisa County in 2017 was 14,596 persons. The leading reported occupational sector was construction, with approximately 14.2%, or 2,075 persons employed. This was followed by government and government enterprises with 11.9%, or 1,733 persons employed; and retail trade with 11.0%, or 1,605 persons employed. The annual personal income in Louisa County was approximately $1.5 billion in 2017, and the average wage per job was $49,506. In 2017, per capita personal income was $40,581. (BEA. 2019) The annual average unemployment rate in Louisa County has dropped steadily over the years from a reported recent high in 2009 (7.8%) to 2.8% (preliminary) in 2018 (BLS. 2019). The major Louisa County area employers include Walmart, Louisa County Public School Board, and Dominion (Virginia LMI. 2019).

Orange is a small (population-wise) county not associated with any metropolitan or micropolitan area (NACo. 2018b). The estimated employed population in Orange County in 2017 was 14,769 persons. The leading reported occupational sector was government and government enterprises with approximately 16.3%, or 2,411 persons employed. This was followed by retail trade with 11.4%, or 1,678 persons employed; and manufacturing with 9.3%, or 1,371 persons employed. The annual personal income in Orange County was approximately $1.7 billion in 2017, and the average wage per job was $38,133. In 2017, per capita personal income was $46,293. (BEA. 2019) The annual average unemployment rate in Orange County has dropped steadily over the years from a reported recent high in 2010 (8.3%) to 3.1% (preliminary) in 2018 (BLS. 2019). The major Orange County area employers include the Orange County School Board, American Woodmark Corporation, and Von Hotzbrinck Publishing (Virginia LMI. 2019).

Spotsylvania County falls within the Washington-Arlington-Alexandria, DC-VA-MD-WV metropolitan area (NACo. 2018b). The estimated employed population in Spotsylvania County (includes Fredericksburg IC) in 2017 was 82,997 persons. The leading reported occupational sector was retail trade with approximately 15.3%, or 12,722 persons employed. This was followed by health care and social assistance trade with 13.7%, or 11,372 persons employed; and government and government enterprises with 13.4%, or 11,145 persons employed. The annual personal income in Spotsylvania County was approximately $7.9 billion in 2017, and the average wage per job was $42,577. In 2017, per capita personal income was $48,823. (BEA. 2019) The annual average unemployment rate in Spotsylvania County has dropped steadily over the years from a reported recent high in 2010 (7.0%) to 3.0% (preliminary) in 2018 (BLS. 2019). The major Spotsylvania County area employers include the Spotsylvania County School Board, County of Spotsylvania, and HCA Virginia Health System (Virginia LMI. 2019).

E3.9.2 HOUSING

Between 2010 and 2017, the Virginia counties where the majority of the NAPS workforce resides all had an increase in population: Hanover County (6.1%), Henrico County (6.8%), Louisa County (8.2%), Orange County (7.7%), and Spotsylvania County (8.7%) (Table E3.11-2).

As presented in Table E3.9-1, the 2017 estimated housing vacancy rates indicate that with the growth in population between 2010 and 2017 in the five counties, there was sufficient housing availability in 2017 to keep up with the population increase, with vacancy rates as follows: Hanover County, 5.2%; Henrico County, 6.9%; Louisa County, 21.0%; Orange County, 10.1%; and Spotsylvania County, 7.1%. (USCB. 2019c)

Table E3.9-1 also shows that a substantial increase in median housing values took place in the five counties between 2000 and 2010, more than doubling in value in most cases. Conversely, median housing values in all five counties subsequently declined between 2010 and 2017 as follows: Hanover County by -6.6%; Henrico County by -5.0%; Louisa County by -1.3%; Orange County by -1.5%; and Spotsylvania County by -5.0%. (USCB. 2019c)

Between 2000 and 2010, median monthly rents increased along with median housing values in the five counties. Between 2010 and 2017, the cost of median monthly rent continued to climb in four of the five counties, while housing values were in decline. The Virginia counties where the monthly rents increased between 2010 and 2017 include the following: Hanover County by 13.0%; Henrico County by 14.9%; Louisa County by 13.2%; and Spotsylvania County by 22.1% (Table E3.9-1). While the median housing values dropped in Orange County between 2010 and 2017, the Orange County median monthly rent also declined by 1.1% during the same period. (USCB. 2019c)

E3.9.3 WATER SUPPLY AND WASTEWATER

E3.9.3.1 Water Supply

In Hanover County (population 99,863 in 2010) and the town of Ashland, the major water sources are the North Anna River, groundwater wells, a quarry, and purchased water. Approximately 5,946 people use private groundwater wells for residential water supply. Overall, Hanover County reported using approximately 9.53 million gallons per day (MGD) in 2010, with water use demand projected to rise to 14.50 MGD by 2040. Of this total, the community water system used approximately 4.835 MGD in 2010, with use projected to rise to 9.808 MGD by 2040. Population and demand are expected to increase through the planning period (2040). Community water systems may experience a deficit of 0.34 MGD by the year 2032. An alternative is the Verdon

Quarry side storage reservoir project, which includes river intakes and raw water pumping stations on North Anna and Little rivers and a reservoir intake and raw water pumping station on Verdon Quarry. Hanover County has adopted ordinances for the implementation and enforcement of a drought response and contingency plan. (VDGIF. 2015)

In Henrico County (population 306,935 in 2010), the major water sources include the James River and purchased water. Approximately 16,023 people use private groundwater wells for residential water supply. Overall, Henrico County reported using 46.39 MGD in 2010, with water use demand projected to rise to 67.65 MGD by 2040. Of this total, the community water system used approximately 42.900 MGD in 2010, with use projected to rise to 64.165 MGD in 2040. Population and demand are projected to increase through the planning period of 2040. Cobbs Creek Reservoir is being developed to meet increasing demands. The county adopted an ordinance to implement and enforce a drought response and contingency plan. (VDGIF. 2015)

Major water sources for Louisa County (population 33,153 in 2010) and the towns of Louisa and Mineral include Lake Anna, groundwater wells, an irrigation lake on Spring Branch, and the Northeast Creek Reservoir. Approximately 25,590 people use private groundwater wells for residential water supply. Overall, Louisa County reported using 28.44 MGD in 2010, with water use demand projected to rise to 45.64 MGD by 2040. Of this total, the community water system used approximately 0.618 MGD, with use projected to rise to 1.918 MGD in 2040. Population and demand are projected to increase through the planning period (2040). Future water demands in the county may exceed current supply by the year 2025. Louisa County partnered with Fluvanna County to create the James River Water Authority, which has a Virginia Water Protection Permit for a withdrawal from the James River. Along with a long-range regional water supply plan adopted in 2011 (Louisa County. 2019e), Louisa County has adopted ordinances for the implementation and enforcement of a regional drought response and contingency plan. (VDGIF. 2015)

NAPS is located in Louisa County, and its access to potable water is through a series of groundwater wells. The station is not connected to a municipal system (see Section E3.6.4.2). (Dominion. 2001 Section 2.10.1).

In Orange County (population 33,481 in 2010) and the towns of Gordonsville and Orange, the major water sources include the Rapidan River, purchased water, and groundwater wells. Approximately 17,280 people use private groundwater wells for residential water supply. Overall, Orange County reported using 1.84 MGD in 2010, with water use demand projected to rise to 4.47 MGD by 2040. Of this total, the community water system used 1.363 MGD in 2010, with use projected to rise to 3.697 MGD in 2040. Population and demand are projected to increase during the planning period (2040). Possible alternatives include increasing the existing, permitted surface water withdrawal, developing new raw water storage, and developing new groundwater supplies. Orange County has adopted ordinances for the implementation and enforcement of a drought response and contingency plan. (VDGIF. 2015)

Major water supply sources in Spotsylvania County (population 122,397 in 2010) include the Rappahannock and Rapidan rivers, Motts Run and Ni River reservoirs, and groundwater wells. Approximately 38,881 people use private groundwater wells for residential water supply. Overall, Spotsylvania County reported using 15.54 MGD in 2010, with water use demand projected to rise to 43.27 MGD by 2040. Of this total, the community water system used 10.482 MGD in 2010, with use projected to rise to 29.166 MGD in 2010. Population and demand are projected to increase through the planning period (2040). Existing water sources are expected to meet projected demands. Spotsylvania County has adopted ordinances for the implementation and enforcement of a drought response and contingency plan. (VDGIF. 2015)

E3.9.3.2 Wastewater

Focusing on Louisa County, where NAPS is located, the Louisa County Water Authority has two public water facilities and two wastewater treatment facilities servicing residents and industry. The county and the town of Louisa share ownership of the regional sewage treatment plant, but each own and operate their own collection system. The town of Mineral owns and operates its collection system. The plant’s latest upgrade was scheduled to be completed in 2011. Additional public sewage treatment facilities in Louisa County include the Zion Crossroads Wastewater Treatment Plant (2014 system upgrades) and Laurel Hill Water and Sewer System (LCWA. 2019). Less than 20% of the county’s present population is serviced by public or private wastewater treatment facilities. The majority of residents and businesses in Louisa County are served by septic tanks and sanitary drainage fields. (Louisa County. 2019c)

As presented in Section E3.6.1.2.3, the sewage treatment facility at NAPS serves plant workers and originally consisted of three small package secondary treatment plants. In 1997, these plants were consolidated into an existing 30,000 gallon-per-day extended aeration sewage treatment plant. (Dominion. 2001, Section 4.12)

E3.9.4 COMMUNITY SERVICES AND EDUCATION

Hanover County has one public school district. Based on the 2014-2015 school year, there were 25 total schools in the county with 18,039 students. The student/teacher ratio was 14.85. There are four private schools in Hanover County, with 456 students. (NCES. 2019). Providing law enforcement, Hanover County has a sheriff’s office and the town of Ashland has a police department (USACOPS. 2019). Hanover County is served by five community fire departments, with 16 stations. There are 169 active career firefighters and 360 volunteer firefighters on call (USFA. 2019). Located within the Richmond metropolitan area, the Hanover County population has access to 10 full-service medical facilities (VHHA. 2019).

Henrico County has one public school district, and during the 2014-2015 school year, there were 81 total schools in the county with 51,425 students. The student/teacher ratio was 17.52. There are

23 private schools in Henrico County, with 2,610 students. (NCES. 2019) Primary law enforcement is provided through the Henrico County Sheriff's Office, Henrico County Police Department, J. Sargeant Reynolds Community College Police Department, and Richmond International Airport Police Department (USACOPS. 2019). The Henrico County Division of Fire serves the county population. Henrico County has 20 stations and 525 active career firefighters on staff, and 10 volunteer firefighters on call (USFA. 2019). Henrico County is located within the Richmond metropolitan area, and the population has access to 10 full-service medical facilities (VHHA. 2019).

During the 2014-2015 school year, Louisa County had one public school district with six total schools and 4,864 students. The student/teacher ratio was 13.31. There is one private school in Louisa County with 76 students. There are no colleges or universities reported for the county. There are 38 public and private higher educational institutions scattered throughout the NAPS 50-mile region. The closest two-year and four-year schools to NAPS are over 24 miles from the plant in Glen Allen, Virginia. (NCES. 2019) Louisa County law enforcement is provided through the Sheriff's Office (USACOPS. 2019). Louisa County is served by six community fire departments, with 12 stations. There are 89 active career firefighters and 200 volunteer firefighters on call (USFA. 2019). Louisa County has several healthcare providers, including family practitioners and dentists. Four full-service medical facilities are located within 30 miles of Louisa County, with two also having a local presence (Martha Jefferson Hospital and the University of Virginia Health System based out of Charlottesville, Virginia). (Louisa County. 2019f)

Orange County in 2014-2015 had one public school district with 11 total schools and 5,109 students. The student/teacher ratio was 14.16. There are two private schools in Orange County with 289 students. (NCES. 2019) Law enforcement is provided through the Orange County Sheriff's Office, Germanna Community College Police Department, town of Gordonsville Police Department, and town of Orange Police Department (USACOPS. 2019). Orange County is served by five community fire departments, with 13 stations. There are 32 active career firefighters and 378 volunteer firefighters on call (USFA. 2019). Orange County population has regional access to five full-service medical facilities in nearby counties (Orange County. 2019)

Spotsylvania County has two public school districts. In 2014-2015, the Spotsylvania County Public School District included 34 total schools and 23,597 students. The student/teacher ratio was 17.10. The Commonwealth Governor's School is a multi-county regional study program with special curriculum for gifted and highly motivated students. Spotsylvania County students participate in the program with Caroline, King George, and Stafford counties, and students travel to six regional school sites to participate. There are six private schools in Spotsylvania County with 1,583 students (CGS. 2019; NCES. 2019) Law enforcement is provided through the Spotsylvania County Sheriff's Office and Germanna Community College Police Department (USACOPS. 2019). The Spotsylvania County Department of Fire Rescue and Emergency Management serves the county population. Spotsylvania County has 10 stations, 151 active career firefighters on staff, and 200 volunteer firefighters on call (USFA. 2019). Spotsylvania County has a regional medical center, and Mary Washington Hospital is in nearby Fredericksburg (VHHA. 2019)

E3.9.5 LOCAL GOVERNMENT REVENUES

For NAPS, Dominion pays annual property taxes to both Louisa County and Spotsylvania County. Louisa County's total revenues from the general fund were $85.0 million for the fiscal year (FY) ended June 30, 2019 (FY19). Revenues are derived primarily from property and other local taxes, state and federal distributions, licenses, permits, charges for service, and interest income. General property taxes, the largest source of revenue in Louisa County, were $60.8 million in FY19 (Table E3.9-2). Almost 72% of the county's revenue is derived from property taxes. The second largest contributor is other local taxes at $8.3 million. (Louisa County. 2020)

Louisa County's total general fund expenses of $92.0 million for FY19 covered a wide range of services. The largest program receiving county funding was education, with 35.1%, or $32.2 million in payments to the school system. This was followed by 15.7%, or $14.4 million for public safety, and 10.0%, or $9.1 million, for health and welfare services. The remainder was expended across a variety of programs, including judicial administration; public works; and parks, recreation and cultural programs. (Louisa County. 2020)

Louisa County funds reported combined ending fund balances of $75.1 million in FY19, a decrease of $7.2 million in comparison with the prior year. The overall decrease in fund balance is largely attributable to the decrease in the capital projects fund and payment of expenses related to the James River water project and the purchase of land for the regional business park project. (Louisa County. 2020)

The assessed valuation of Dominion property in Louisa County was approximately $1.8 billion in FY19 (Louisa County. 2020). As presented in Table E3.9-2, in FY19, Dominion's property tax payments to Louisa County on behalf of NAPS ($11,468,413) represented approximately 19% of the total county property tax revenue. Dominion's tax payout declined slightly between FY19 and FY18 due to depreciation and a change to the payment ratio.

Dominion also pays annual property taxes to Spotsylvania County on behalf of NAPS and other Dominion property located in the county (assessed value $167 million) (Spotsylvania County. 2020). Table E3.9-2 shows Dominion's property taxes on behalf of NAPS to Spotsylvania County (i.e. the portion of the property taxes based on the assessed value of NAPS alone). The Spotsylvania County total revenues from the general fund were $294.9 million in FY19. Revenues from property taxes totaled $178.2 million (60.4% of the county's total revenue) in FY2019. The second largest source of revenue was the other local taxes category at $49.7 million. (Spotsylvania County. 2020)

Spotsylvania County's total general fund expenses were $322.6 million for FY19. The largest program receiving county funding was education, with approximately 38.6% or $124.6 million in payments made to the local school system. This is followed by public safety (17.4% or $56.0 million) and health and welfare (8.2% and $26.5 million). (Spotsylvania County. 2020)

As presented in Table E3.9-2, in FY19, Dominion's property tax payments to Spotsylvania County on behalf of NAPS are based on the assessed valuation for NAPS alone and does not include the total property tax payment for Dominion property in Spotsylvania County. In FY19, Dominion's property tax payment to Spotsylvania County was $55,129, representing less than 1% of the total county property tax revenue.

Overall, Dominion's property tax payments have remained consistent between 2015 and 2019, and there were no adjustments to these payments caused by reassessments and other actions that resulted in notable increases or decreases. At this time, Dominion does not anticipate any future changes in tax laws, rates assessed property value, or any other adjustments that could result in notable future increase or decrease in property taxes or other payments to Louisa County or Spotsylvania County.

Dominion provides annual pass-through funds (e.g., approximately $500,000 to $600,000) to the Commonwealth of Virginia for emergency response support. In addition, Dominion actively participates in supporting NAPS employees in volunteering and fundraising efforts for local charitable programs such as the Louisa County Humane Society.

E3.9.6 TRANSPORTATION

Transportation in the NAPS region includes a rural and urbanized road network. The primary road networks in the area are shown in Figures E3.1-3 and E3.1-4.

Interstate (I-64) runs predominately east-west across the state south of NAPS. Highways US 1 and Interstate 95 (I-95), the two principal highways joining Richmond with the rest of the eastern corridor, pass within 15 and 16 miles, respectively, east of NAPS. Within the vicinity, Virginia SR 700 provides staff access to the plant site and access by the general public to the NAPS visitor's center. SR 601 and SR 652 run parallel with the Lake Anna shoreline and pass about 2.2 miles northeast and 1.5 miles south of the plant site, respectively. SR 208 crosses Lake Anna at a point about two miles northwest of the site and joins US Highway 522 about five miles west-northwest of NAPS. (NAPS. 2020, Sections 2.1.1.2, 2.1.2.3, and 2.2.1.3) As discussed in Section E3.1, Location and Features, there is regional rail service in Louisa County. The BBR short line track spans the entire length of Louisa County from east to west and serves the Dominion spur track that provides access to NAPS.

As seen in Figure E3.1-3, the SR 700 (Haley Drive) access to the plant is via a two-lane, predominantly southwest-northeast paved road. SR 652 (Kentucky Springs Road) is also a two-lane paved road and provides commuter traffic access to NAPS via SR 700 at an intersection located approximately 1.5 miles southwest of the plant site. Neither SR 700 or SR 652 are primary arterials in the area. The Virginia Department of Transportation (VDOT) average annual daily traffic (AADT) volumes for these state roads with plant access are listed in Table E3.9-3. Over the years, the traffic volume counts taken on SR 652 and SR 700 have revealed little fluctuation in traffic flow. The most recent AADT count in September 2013 for SR 700 (Haley Drive) east of SR 652 was 3,600, and the 2017 AADT county for SR 700 (Johnson Road) west of SR 652 was 1,300. The 2017 AADT count on SR 652 (Kentucky Springs Road) south of SR 700 was 3,100; the AADT count was 3,900 north of SR 700. (VDOT. 2019a)

The U.S. Transportation Research Board has developed a commonly used indicator called level of service (LOS) to measure how well a highway accommodates traffic flow. LOS is a qualitative assessment of traffic flow and how much delay the average vehicle might encounter during peak hours. LOS categories are listed and defined in Table E3.9-4.

For the NAPS site, two transportation studies were conducted in recent years, with the 2011 study conducted specific to commuter plant access. The 2011 traffic capacity analysis under existing conditions (AM and PM peak period) indicated that all roadway segments are currently performing at an adequate service level C or better under baseline conditions. At the time of the study, SR 700 east of SR 652 (roadway segment providing access to the existing NAPS plant) operated at LOS D in the AM peak hour. The traffic evaluation was undertaken during plant outage conditions. Because traffic flow conditions have stayed consistent over the years, there should be ample traffic capacity on SR 700 and SR 652 for NAPS workforce access and in support of Units 1 and 2 plant activities.

The Louisa County 2012 comprehensive plan includes SR 652 as one of the local secondary routes identified by the statewide transportation inventory for present and future needs in maintaining a LOS C designation (Louisa County. 2019c). According to the VDOT Statewide Transportation Program (STIP) 2018-2021, no Louisa County road improvement projects were currently on the schedule (VDOT. 2019b).

E3.9.7 RECREATIONAL FACILITIES

In the vicinity of NAPS, Lake Anna is a significant part of Louisa County’s landscape (see Figure E3.1-5). Along with lakeside residential living and Lake Anna State Park overnight and day use visitation, Lake Anna features seasonal recreational opportunities such as water sports, camping, picnicking, boating, and fishing. (LAVC. 2019).

As presented in Section E3.1, Location and Features, Lake Anna is approximately 17 miles long, with an irregular shoreline of more than 200 miles. The lake is divided into two major portions, the North Anna Reservoir and the WHTF. The largest segment, the North Anna Reservoir, consists of approximately 9,600 acres and functions as a storage impoundment to ensure adequate water for

Unit 1 and Unit 2 condenser cooling. The smaller segment, the WHTF, has an area of about 3,400 acres and is separated from the North Anna Reservoir by dikes and includes three cooling lagoons. The only boat activity on Lake Anna is small sport and pleasure craft. There are six marinas near the plant site on the North Anna Reservoir. The closest is 1.4 miles north-northeast of the site. The remaining marinas are located between 2 to 2.5 miles away from the plant. Access to the WHTF cooling lagoons is restricted to property owners and their guests, and there is no access by boat from the North Anna Reservoir. Boaters on the North Anna Reservoir have access to the water via area marinas and boat ramps.

Lake Anna is one of Virginia's most popular lakes. Along with Lake Anna State Park, local marinas also provide recreational users with amenities and services such as food, fuel, and bait; year-round boat rental and storage facilities; camping facilities, playgrounds, and picnic areas. (LAVC. 2019) In 2006, it was estimated that over 600,000 people access Lake Anna annually (Dominion. 2006a, Table 2.1-2). Since then, local officials believe that annual visitor use in the area has increased over the years, as the area population has increased (NRC. 2010, Section 2.8.1.2).

Lake Anna State Park opened in 1983 and is approximately five miles northwest of the plant (see Figure E3.1-5). The park currently includes a total of 3,127 acres with 10 miles of shoreline. Overnight park facilities include cabins and camping. Other park activities include a designated swimming beach located on the lake, picnic facilities, a smaller handicap accessible two-acre fishing pond, Lake Anna fishing and boating access, marine facilities, and day use hiking trails. In 1991, the first full year of operation, attendance exceeded 109,000. By the end of 2010, annual visitation had increased by almost 162% to more than 285,889 persons. (VDCR. 2019a) As of 2016, the Virginia Department of Conservation and Recreation (VDCR) reported that Lake Anna State Park's visitor attendance had increased to over 400,000 persons annually, including overnight and day use visitation (VDCR. 2019b).

NAPS offers exhibits at its NANIC and tours of the facility for school groups and the general public. According to Dominion, the site's annual visitation has increased over the last five years, with a combination of tour groups, walk-in visitors, and company visitors at the plant that totaled 2,258 persons in 2017. Dominion staff also participate in NAPS offsite community outreach and offer takeout programs presenting in the local area.

Table E3.9-1 Housing Statistics, 2000–2017

Name	2000	2010	2000-2010 Change (%)	2017 Estimate[b]	2010-2017 Change (%)
Hanover County					
Total Housing Units	32,196	38,360	19.1%	40,325	5.1%
Occupied Units	31,121	36,589	17.6%	38,208	4.4%
Vacant Units	1,075	1,771	64.7%	2,117	19.5%
Vacancy Rate (%)	3.3%	4.6%	1.3%	5.2%	0.6%
Median House Value ($)	143,300	286,600[a]	100.0%	267,600	-6.6%
Median Rent ($/month)	686	985[a]	43.6%	1,113	13.0%
Henrico County					
Total Housing Units	112,570	132,778	18.0%	135,397	2.0%
Occupied Units	108,121	124,601	15.2%	126,115	1.2%
Vacant Units	4,449	8,177	83.8%	9,282	13.5%
Vacancy Rate (%)	4.0%	6.2%	2.2%	6.9%	0.7%
Median House Value ($)	121,300	235,700[a]	94.3%	223,900	-5.0%
Median Rent ($/month)	676	953[a]	41.0%	1,095	14.9%
Louisa County					
Total Housing Units	11,855	16,319	37.7%	17,021	4.3%
Occupied Units	9,945	12,944	30.2%	13,451	3.9%
Vacant Units	1,910	3,375	76.7%	3,570	5.8%
Vacancy Rate (%)	16.1%	20.7%	4.6%	21.0%	0.3%
Median House Value ($)	96,400	215,700[a]	123.8%	212,900	-1.3%
Median Rent ($/month)	504	823[a]	63.3%	932	13.2%
Orange County					
Total Housing Units	11,354	14,616	28.7%	14,976	2.5%
Occupied Units	10,150	12,895	27.0%	13,470	4.5%
Vacant Units	1,204	1,721	42.9%	1,506	-12.5%
Vacancy Rate (%)	10.6%	11.8%	1.2%	10.1%	-1.7%
Median House Value ($)	115,000	238,900[a]	107.7%	235,200	-1.5%
Median Rent ($/month)	583	928[a]	59.2%	918	-1.1%

Table E3.9-1 Housing Statistics, 2000–2017

Name	2000	2010	2000-2010 Change (%)	2017 Estimate[b]	2010-2017 Change (%)
Spotsylvania County					
Total Housing Units	33,329	45,185	35.6%	46,594	3.1%
Occupied Units	31,308	41,942	34.0%	43,279	3.2%
Vacant Units	2,021	3,243	60.5%	3,315	2.2%
Vacancy Rate (%)	6.1%	7.2%	1.1%	7.1%	-0.1%
Median House Value ($)	128,500	279,500[a]	117.5%	265,600	-5.0%
Median Rent ($/month)	805	1,147[a]	42.5%	1,400	22.1%

(USCB. 2019c)

a) 2008-2010 American Community Survey three-year estimates.

b) 2013-2017 American Community Survey five-year estimates.

Table E3.9-2 Property Tax Payments 2015–2019

Year	Total County Property Tax Revenues (USD)	Property Tax Paid by Dominion (USD)	% of Total Property Tax	Operating Budget for County (USD)
Louisa County				
2015	52,205,038	12,999,452	25	108,439,370
2016	55,027,281	12,469,972	23	78,131,854
2017	58,357,514	12,601,220	22	88,533,692
2018	60,518,750	11,932,784	20	98,886,894
2019	60,874,073	11,468,413	19	91,897,744
Spotsylvania County				
2015	156,655,140	53,756	0.03	261,949,379
2016	161,724,970	52,423	0.03	288,229,290
2017	167,521,135	50,268	0.03	295,962,200
2018	172,314,525	52,174	0.03	301,808,417
2019	178,186,133	55,129	0.03	322,641,816

(Louisa County. 2020; Spotsylvania County. 2019c; Spotsylvania County. 2019d; Spotsylvania County. 2019e; Spotsylvania County. 2019f; Spotsylvania County. 2020)

Table E3.9-3 Total Average Annual Daily Traffic Counts on State Routes Near NAPS

Route	AADT Count Location (commuter access to NAPS)	2010	2014	2017
SR 652 Kentucky Springs Rd (south of SR 700)	SR 1205 Ordinary Rd to SR 700 Johnson Rd	2,900	2,700	3,100
SR 652 Kentucky Springs Rd (north of SR 700)	SR 700 Johnson Rd to SR 790 Michell Point Rd	3,500	3,500	3,900
SR 700 Johnson Rd (west of SR 652)	SR 618 Fredericks Hall Rd to SR 652 Kentucky Springs Rd	1,900	1,500	1,300
SR 700 Haley Rd (east of SR 652)	SR 652 Kentucky Springs Rd to Dead End (NAPS entrance)	2,800[a]	3,600[b]	3,600[b]

a) Count as of 10/01/2001

b) Count as of 09/24/2013

AADT reports for 2010, 2014, 2017 from VDOT. 2019a

Table E3.9-4 Level of Service Definitions

Level of Service	Conditions
A	Free flow of the traffic stream; users are mostly unaffected by the presence of other vehicles.
B	Free flow of the traffic stream, although the presence of other vehicles becomes noticeable. Drivers have slightly less freedom to maneuver.
C	The influence of the traffic density on operations becomes marked and queues may be expected to form. The ability to maneuver with the traffic stream is clearly affected by other vehicles.
D	The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.
E	Operations at or near capacity, an unstable level. The densities vary, depending on the free-flow speed. Vehicles are operating with the minimum spacing (or gaps) for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F.
F	Forced or breakdown of flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity. Queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages.

(TRB. 2010)

E3.10 HUMAN HEALTH

E3.10.1 MICROBIOLOGICAL HAZARDS

In the GEIS, the NRC considered health impacts from thermophilic organisms posed to both the public and plant workers because conditions favorable for thermophilic bacteria can result from nuclear facility operations and discharges. The NRC designated public health impacts resulting from thermophilic organisms as a Category 2 issue requiring plant-specific analysis. Information to be considered in evaluating impacts includes thermal discharge temperature; thermal characteristics of the receiving water bodies; thermal conditions for the enhancement of *Naegleria fowleri* and other pathogens; and potential impacts to public health. (NRC. 2013a)

The GEIS discussion of microbiological hazards focuses on the thermophilic microorganisms *Legionella* spp. (which can be a hazard in cooling towers) and the pathogenic amoeba, *N. fowleri* (which can be a hazard resulting from cooling water discharges) *Naegleria* spp. is ubiquitous in nature and thrives in heated water bodies at temperatures ranging from 95-106°F or higher. *Naegleria* is rarely found in water cooler than 95°F, and infection rarely occurs in water temperatures of 95°F or less. (NRC. 2013a, Section 3.9.3).

The Virginia State Water Control Board and VDEQ have not set state standards for any of these organisms. The only state water quality standard for microorganisms in Lake Anna (which is classified by the Virginia State Water Control Board as Class III non-tidal waters) applies to fecal coliform bacteria, which are not to exceed a geometric mean of 126 colony forming units (CFU) per 100 milliliters (for a minimum of four weekly samples over a 30-day period). Fecal coliform bacteria are used by many state agencies, including the Commonwealth of Virginia, as indicators of other potentially harmful waterborne microorganisms. (Dominion. 2001, Section 4.12; VAC. 2019)

As presented in Section E2.2 NAPS utilizes an open-cycle cooling system in which cooling water is withdrawn from the North Anna Reservoir, heated in the condensers, and returned to the North Anna Reservoir through the WHTF. The public has access to the areas impacted by the heated water from the cooling system, including the North Anna Reservoir and the WHTF. Activities in these areas include swimming, recreational boating, fishing, and residential housing. (Dominion. 2019c; LACA. 2019a)

The thermophilic pathogen amoeba *N. fowleri* is naturally found in warm freshwater environments such as lakes and rivers and soil, where it lives by feeding on bacteria and other microbes in the environment. Sampling of lakes in the southern tier of the United States indicates that *N. fowleri* is common in many of them during the summer (CDC. 2019a). *N. fowleri* was found in the NAPS WHTF following start-up of the plant in June 1978. In 1982, Dominion environmental personnel met with the state epidemiologist to determine whether *N. fowleri* at NAPS represented a public health risk. After consultation with other state and federal agencies, the risk of contracting primary amoebic meningoencephalitis (PAM) was determined to be too low to justify any action by

Dominion or state agencies. (NRC. 2002a, Section 4.1.4) Consultation with the Virginia Department of Health (VDH) was initiated in 2019 for this SLR (Attachment F).

Studies of Lake Anna conducted in 2007 found *N. fowleri* was present at nine out of 16 sites tested during the summer, but that total amoeba counts, inclusive of *N. fowleri*, did not exceed 12 amebae per 50 ml. (Jamerson, et al. 2009; Marciano-Cabral, F. 2007).

In late summer and early fall of 2018, Lake Anna experienced harmful algae blooms in several different areas, including the WHTF. Harmful algae, or cyanobacteria, can cause skin rash and gastrointestinal illnesses. The blooms occur when warm water and nutrients combine to make conditions favorable for algae growth. In early September 2018, the VDH issued no-swimming advisories for three areas in Lake Anna that presented a moderate to high risk for human health effects, while another four areas merited public notification and warning. Dominion developed a sampling plan and initiated sampling based on the VDH's sampling protocol, and issued no-swimming advisories for four WHTF areas. With the end of the recreational swimming season on October 31, 2018, water sampling by the VDH was discontinued. (Dominion. 2019d; VDH. 2019a; VDH. 2019b)

In response to Dominion's request for consultation (Attachment F), VDH expressed concern that a harmful algae bloom could potentially impact the water quality at a downstream drinking water intake. VDH further stated that impact of the thermally enriched cooling water discharge from NAPS on algae blooms in Lake Anna is not known. In response, Dominion clarified that the locations of the observed algae blooms and the fact that no significant changes have been made to the station's cooling water system, indicate that the factors facilitating the algae blooms are not a result of station operations.

Dominion monitored water temperatures at seven Lake Anna stations from 1975 through 1985 as part of a CWA Section 316(a) demonstration for NAPS. Temperatures were recorded hourly at most locations. Highest (hourly average) temperatures recorded in June, July, and August over this period were 91.8ºF (at an upper lake station in 1984), 92.7ºF (at an upper lake station in 1977), and 91.6ºF (at a lower lake station in 1980). The highest (hourly average) water temperature was measured on July 19, 1977, at the northern-most station (Pamunkey Creek arm) before NAPS began operating. The highest (hourly average) water temperature measured in an operational year was 92.3ºF, recorded in 1983. (Dominion. 2001)

Following the submission and acceptance in 1986 of the NAPS Section 316(a) demonstration, Dominion continued monitoring Lake Anna to ensure that biological resources were not harmed by ongoing station operations. In 2018, the maximum hourly water temperature recorded in July for the North Anna Reservoir was 91.4°F, and the highest temperature recorded in September for the WHTF was 102.6°F (Dominion. 2018d). In July 2016, the WHTF reached 105°F, the highest temperature recorded since the survey began (Dominion. 2016d). These temperatures are higher than those recorded in July 1997, which were 86.4°F for the North Anna Reservoir and 94.3°F for the WHTF (Dominion. 2001, Section 4.12). Section E3.6 provides additional analysis of water temperatures.

Thermophilic microorganisms thrive at temperatures of 122°F or more, with a tolerance minimum of 68°F and a maximum of 158°F (NRC. 2013a). As illustrated above, NAPS WHTF temperatures in summer are within the range of those known to permit the growth and reproduction of pathogenic microorganisms, but are below those considered optimal for thermophilic forms. Dominion posts North Anna Reservoir and WHTF temperatures daily throughout the year on its public website for Lake Anna, advising the public to consider these temperatures in relation to health risk information published by the VDH (Dominion. 2019d).

Another factor limiting concentrations of pathogenic microorganisms in the NAPS discharge is the absence of a seed source or inoculant. Wastewater, whether domestic sewage or industrial wastewater, is usually the source of pathogens in natural waters. The sewage treatment facility at NAPS is a 30,000 gallon-per-day extended aeration sewage treatment plant. Disinfection in the sewage treatment facility reduces coliform bacteria (and other microorganisms) to levels that meet state water quality standards. Discharge is regulated by VPDES Permit No. VA0052451. (Dominion. 2001, Section 4.12; Dominion. 2018e) The Lake Anna Civic Association, in conjunction with the VDEQ, also monitors for *E. coli*, phosphorus, and various water quality parameters annually from April to October (LACA. 2019b).

Microbiologic hazards resulting from public contact with potentially contaminated waters would not be an anticipated issue for SLR of NAPS, given the following:

- Field measurements show water temperatures in the WHTF and the North Anna Reservoir are below the optimum for growth of thermophilic microorganisms.
- NAPS, due to its wastewater disinfection practices, does not provide a seed source or inoculant that would stimulate population growth.
- Annual sampling for *E. coli* and phosphorus in Lake Anna during warm weather months.
- Field sampling has detected *N. fowleri* in low concentrations in some, but not all samples, and no case of PAM has been reported for Lake Anna.
- The extremely low occurrence of PAM in the United States, with annual infections ranging from 0 to 8, in spite of hundreds of millions of visits to freshwater swimming venues each year (CDC. 2019b).
- During the proposed SLR term, Dominion plans to continue operating the units as currently operated and anticipates no license renewal-related refurbishment for NAPS.

Microbiological hazards to plant workers are designated a Category 1 issue. The GEIS discussion of microbiological hazards focuses on the thermophilic microorganisms *Legionella* spp., which can be a hazard in cooling towers, and the pathogenic amoeba, *N. fowleri,* which can be a hazard in cooling water discharges. (NRC. 2013a, Section 3.9.3)

Exposure to *Legionella* spp. from power plant operations is a potential concern for a subset of the workforce. Plant personnel most likely to come into contact with *Legionella* aerosols would be those who dislodge biofilms, where *Legionella* are often concentrated, such as during the cleaning of condenser tubes and cooling towers (NRC. 2013a, Section 3.9.3.3). Industrial hygiene practices are utilized to minimize the potential for plant worker exposure per federal and state regulatory requirements (NRC. 2002a, Section 4.1). In June 2019, Dominion conducted a *Legionella* survey of the NAPS bearing cooling tower. The results indicate that *Legionella* bacteria are not present at detectable concentrations in the samples collected from the bearing cooling tower and associated water lines or the lake. The survey concluded that the risk of employee exposure to *Legionella* bacteria from the bearing cooling tower water or mist remains very low and that the current biocide and treatment plans be continued. (ATC. 2019)

E3.10.2 ELECTRIC SHOCK HAZARDS

As presented in Section E2.2.5 and depicted on Figure E2.2-5, the seven in-scope transmission lines are located completely within the NAPS property boundary, with three of the seven being underground. Thus, no induced shock hazards would exist for the public, due to restricted site access.

Concerning the aboveground in-scope transmission lines, a 2018 investigation by Dominion confirmed that the steady-state discharge current in a worst-case scenario is less than 5 mA root mean square (rms).

Dominion adheres to the National Electric Safety Code (NESC) compliance requirements for shock hazard avoidance through implementation of the Dominion engineering manual (Dominion. 2017c) and the Dominion Blue Book (Dominion. 2017d). These guidance documents ensure all necessary mitigation measures are incorporated for maintaining worker and visitor safety through design ground clearances and other shock prevention measures applicable to the in-scope transmission lines.

E3.10.3 RADIOLOGICAL HAZARDS

The NAPS radiological environmental monitoring program (REMP) has been conducted since power operations began at the plant. This program carefully monitors and documents radiological impacts to members of the public and site employees by measuring radiation and radioactive materials with potential exposure pathways and confirms measurable concentrations of radioactive effluent releases do not exceed expected concentrations within the environment. Dominion monitors radioactivity levels annually by collecting samples of air, water, silt, shoreline sediment, milk, aquatic biota, and food products, and collects direct radiation exposure using thermoluminescent dosimetry at various sampling locations for each media within a 25-mile radius of the plant. Control samples are collected from areas not subject to the influence of NAPS or any other nuclear facility, while indicator samples are obtained from areas where environmental radiation levels could increase as a result of station operations. Dominion utilizes independent laboratory services from Teledyne Brown Engineering, Inc. (radioanalytical services) and thermoluminescent dosimetry by Global Dosimetry Solutions (2013-2015) and Mirion Technologies (2016 to present) as a part of Dominion's inter-laboratory comparison program, thus ensuring precise and accurate sample measurements. (NAPS. 2014b; NAPS. 2015c; NAPS. 2016c; NAPS. 2017b; NAPS. 2018c).

Dominion prepares an annual radiological environmental operating report for NAPS, which contains a discussion of the results of the monitoring program performed for the previous year, and submits it to the NRC. Other than tritium in surface or river water, the results for 2013-2017 did not detect radionuclides attributable to NAPS. The 2017 sampling results are included in the following bullets and the subsequent years were indicated to be similar. Dominion concluded that as in previous years, the operation of NAPS has created no adverse environmental effects or health hazards. (NAPS. 2014b; NAPS. 2015c; NAPS. 2016c; NAPS. 2017b; NAPS. 2018c)

- The airborne exposure pathway includes radioactive airborne iodine and particulates, and precipitation. The 2017 airborne results were similar to previous years. Fallout or natural radioactivity levels remained at levels consistent with past years' results.
- Water and aquatic exposure pathway samples include precipitation, surface, river, and well water, silt and shoreline sediments, and fish. The average tritium activity in surface water varies by year. The lowest average was 2,630 pCi/liter in 2014; the highest average was 5,243 pCi/liter in 2017. No other plant-related isotopes were reported in any surface or river water. River water collected from the North Anna River, 5.8 miles downstream of the site had an average tritium level ranging from 2,870 pCi/liter (in 2014) to 4,570 pCi/liter (in 2017).
- No plant-related isotopes were detected in quarterly precipitation samples.
- Silt samples indicated the presence of naturally occurring potassium-40 and thorium and uranium decay daughters at levels consistent with the natural background. No plant-related isotope was identified in any sample.
- Shoreline soil, which may provide a direct exposure pathway, indicated the presence of potassium-40, thorium, and uranium decay daughters also at levels consistent with natural

levels. No plant-related isotope was detected in the indicator or control locations in shoreline soil.

- No plant-related isotope was detected in fish samples from either Lake Anna or the control location, Lake Orange.
- Soil samples are collected every three years from 12 stations, and were collected in 2013 and 2016. In 2013, Cs-137 was identified in 10 of 11 indicator samples and the control sample, with an average of 208.9 pCi/kg. In 2016, Cs-137 was identified in 6 of 11 indicator samples, with an average of 362 pCi/kg. During the preoperational phase Cs-137 was routinely detected and attributed to fallout. Levels during this phase varied by location and averaged 645 pCi/kg. The current levels vary significantly by location and date. The decrease in the average from the preoperational phase is indicative of fallout. No other plant-related isotope was identified in soil samples during 2013 or 2016.
- The terrestrial exposure pathway includes milk and food products. No plant-related radioisotope was detected in any milk samples. Naturally occurring beryllium-7, potassium-40, and radionuclides associated with the uranium and thorium series were detected at environmental levels consistent with historical data. No plant-related isotope was detected in any vegetation sample. Low levels of Cs-137 have been detected intermittently in past years.
- The direct exposure pathway measures environmental radiation doses by use of thermoluminescent dosimeters (TLDs). TLD results have remained essentially constant over the years.

As presented in Section E2.3, no license renewal-related refurbishment activities have been identified, and therefore there are no associated radiological concerns.

E3.10.3.1 Liquid and Gaseous Effluent Releases

A description of the NAPS Units 1 and 2 radwaste system is presented in Section E2.2.6. Normal liquid and gaseous release pathways are continuously monitored to ensure that potential doses to the public would remain within the allowable limits of 10 CFR 20 and 10 CFR 50, Appendix I. The controls for limiting the release of radiological liquid and gaseous effluents are described in Chapter 11 of the updated final safety analysis report (UFSAR). Offsite dose calculation methods are documented within Appendix 11B of the UFSAR. Controls are based on: (1) concentrations of radioactive materials in liquid and gaseous effluents and projected dose; or (2) dose commitment to a hypothetical member of the public, with consideration of background levels and other source inputs. (NAPS. 2020)

Per 10 CFR 50.36(a), nuclear power plants are required to submit an annual report to the NRC that lists the types and quantities of radioactive effluents released into the environment. Based on review of NAPS annual radioactive effluent release reports from years 2013-2017, doses to members of the public were negligible and in accordance with radiation protection standards identified within: (1) Appendix I to 10 CFR 50; (2) 10 CFR 20; and (3) 40 CFR 190. (NAPS. 2014a; NAPS. 2015b; NAPS. 2016b; NAPS. 2017a; NAPS. 2018b).

Calculations for dose estimates to members of the public are based on radioactive gaseous and liquid effluent release data, and atmospheric and aquatic transport models. The 2017 annual radioactive effluent release report contains detailed information for each type of radioactive discharge and the resultant dose calculations (NAPS. 2018b).

The following bullets summarize the calculated dose to a member of the public from radioactive gaseous and liquid effluents released during reporting year 2017 (NAPS. 2018b):

- The total body dose due to liquid effluents was 6.29E-01 mrem, which is 10.48% of the dose limit, and the critical organ dose due to liquid effluents was 6.31E-01 mrem, which is 3.16% of the dose limit.
- The air dose due to noble gases was 3.57E-05 mrad gamma, which is l.78E-04% of the annual gamma dose limit, and 3.51E-05 mrad beta, which is 8.78E-05% of the annual beta dose limit.
- The critical organ dose for 1-131, 1-133, H-3, and particulates with half-lives greater than eight days including C-14 was 6.99E-01 mrem, which is 2.33% of the annual dose limit.
- The critical organ dose for 1-131, 1-133, H-3, and particulates with half-lives greater than eight days not including C-14 was l.37E-02 mrem, which is 4.57E-02% of the annual dose limit.

A hypothetical individual at the station site boundary exposed to liquid and gaseous effluents released from the station during 2017 would be exposed a maximum total body dose of 0.628 mrem (NAPS. 2018c).

E3.11 ENVIRONMENTAL JUSTICE

E3.11.1 REGIONAL POPULATION

The GEIS presents a population characterization method based on two factors: "sparseness" and "proximity" (NRC. 1996b, Section C.1.4). Sparseness measures population density and city size within 20 miles of a site and categorizes the demographic information as follows.

Demographic Categories Based on Sparseness

		Category
Most sparse	1.	Less than 40 persons per square mile and no community with 25,000 or more persons within 20 miles.
	2.	40 to 60 persons per square mile and no community with 25,000 or more persons within 20 miles.
	3.	60 to 120 persons per square mile or less than 60 persons per square mile with at least one community with 25,000 or more persons within 20 miles.
Least sparse	4.	Greater than or equal to 120 persons per square mile within 20 miles.

(NRC. 1996b, Section C.1.4)

"Proximity" measures population density and city size within 50 miles and categorizes the demographic information as follows:

Demographic Categories Based on Proximity

		Category
Not close proximity	1.	No city with 100,000 or more persons and less than 50 persons per square mile within 50 miles.
	2.	No city with 100,000 or more persons and between 50 and 190 persons per square mile within 50 miles.
	3.	One or more cities with 100,000 or more persons and less than 190 persons per square mile within 50 miles.
Close proximity	4.	Greater than or equal to 190 persons per square mile within 50 miles.

(NRC. 1996b, Section C.1.4)

The GEIS then uses the following matrix to rank the population in the vicinity of the plant as low, medium, or high:

GEIS Sparseness and Proximity Matrix

		Proximity			
		1	**2**	**3**	**4**
Sparseness	**1**	1.1	1.2	1.3	1.4
	2	2.1	2.2	2.3	2.4
	3	3.1	3.2	3.3	**3.4**
	4	4.1	4.2	**4.3**	**4.4**

Low Population Area	**Medium Population Area**	**High Population Area**

(NRC. 1996b, Figure C.1)

The 2010 census population and TIGER/Line data from the USCB were used to determine demographic characteristics in the vicinity of the site. The data were processed at the state, county, and census block levels using ArcGIS (USCB. 2018b; USCB. 2018e; USCB. 2018f). Census data include people living in group quarters such as institutionalized and non-institutionalized populations. Examples of institutional populations living in group quarters are correctional institutions (i.e., prisons, jails, and detention centers); nursing homes; mental (psychiatric) hospitals; hospitals or wards for the chronically ill; and juvenile institutions. Examples of non-institutional populations living in group quarters are group homes; college dormitories; military quarters; soup kitchens; shelters for abused women (shelters against domestic violence or family crisis centers); and shelters for children who are runaways, neglected, or without conventional housing.

The 2010 census data indicate that approximately 154,124 people live within a 20-mile radius of the NAPS site, which equates to a population density of 123 persons per square mile (USCB. 2018f). Based on the GEIS sparseness index, the site is classified as Category 4 with greater than or equal to 120 persons per square mile within 20 miles.

The 2010 census data indicate that approximately 1,905,160 people live within a 50-mile radius of the site, which equates to a population density of 243 persons per square mile (USCB. 2018f). One community within a 50-mile radius has a population greater than 100,000 residents (Table E3.11-1). Based on the GEIS proximity index, the site is classified as Category 4, greater than or equal to 190 persons per square mile within 50 miles.

As illustrated in the GEIS sparseness and proximity matrix, the combination of "sparseness" Category 4 and "proximity" Category 4 results in the conclusion that the NAPS site is located in a "high" population area.

The area within a 50-mile radius of the NAPS site totally or partially includes 32 counties and four independent cities within the states of Maryland and Virginia (Table E3.11-2). According to the 2010 census, the permanent population (not including transient populations) of the entire 32 counties and four independent cities was approximately 3,121,708 (Table E3.11-2). By 2060, the end of the proposed SLR term, the permanent population (not including transient populations) of the entire 32 counties and four independent cities is projected to be approximately 5,069,774. Based on 2010-2060 population projections, an annual growth rate of approximately 0.96% is anticipated for the permanent population within the 50-mile radius (MSDC. 2018; UVA. 2018).

As shown in Table E3.11-2, the total population (including transient populations) of the 32 counties and four independent cities, which are totally or partially included within a 50-mile radius, is projected to be approximately 5,145,457 in 2060. The total population (including transient populations) within a 50-mile radius is projected to be 3,270,629 in 2060. (MDOTD. 2018; MSDC. 2018; USCB. 2018f; USCB. 2018d; UVA. 2018; VTC. 2018).

The latest permanent population projections for Maryland were obtained from the Maryland Department of Planning Maryland State Data Center (MSDC. 2018). The latest permanent population projections for Virginia were obtained from the University of Virginia the Weldon Cooper Center for Public Service (UVA. 2018). County-level permanent population values for the counties within a 50-mile radius are shown in Table E3.11-2. Transient data for the state of Maryland were obtained from the Maryland Office of Tourism Development website (MDOTD. 2018). Transient data for the state of Virginia were obtained from the Virginia Tourism Corporation and the U.S. Travel Association (USTA. 2018; VTC. 2018).

NAPS is located in Louisa County. As shown in Table E3.11-2, the 2010 census population of Louisa County, Virginia, was 33,153. Based on Virginia's projected population data set (Table E3.11-3), Louisa County's projected permanent population for 2060 is expected to be 55,801 (UVA. 2018). Estimated projected populations and average annual growth rates for Hanover, Henrico, Louisa, Orange, and Spotsylvania counties are shown in Table E3.11-3.

Cities, towns, and villages with centers falling within a 50-mile radius of NAPS are listed in Table E3.11-1 Census designated places (CDPs) with populations greater than 25,000 are also listed in the table. The town nearest to NAPS with a census-reported population is Mineral, Virginia. As shown in Table E3.11-1, its 2010 population was reported at 467 residents.

There are two towns in Louisa County for which the USCB provides population data. These are Louisa and Mineral, with estimated 2017 populations of 1,663 and 499 residents, respectively. One community within a 50-mile radius has a population greater than 100,000: Richmond, Virginia (approximately 50 miles). This city had a 2017 population of 227,032 residents. A total of ten additional communities (Charlottesville, Dale City, Fredericksburg, Lake Ridge, Linton Hall, Manassas, Marumsco, Mechanicsville, Short Pump, and Tuckahoe) within a 50-mile radius have a population greater than 25,000 (Table E3.11-1).

E3.11.2 MINORITY AND LOW-INCOME POPULATIONS

E3.11.2.1 Background

The NRC performs environmental justice analyses utilizing a 50-mile radius around the plant as the environmental "impact area." NRR Office Instruction LIC-203 Revision 3 (NRC. 2013d) defines a geographic area for comparison as a 50-mile radius (also referred to as "the region" in this discussion) centered on the nuclear plant. An alternative approach is also addressed that uses an individual state that encompasses the 50-mile radius individually for comparative analysis as the "geographic area." Both approaches were used to assess the minority and low-income population criteria for NAPS.

LIC-203 guidance suggests using the most recent USCB decennial census data. However, low-income data are collected separately from the decennial census and are available in five-year averages. The 2016 low-income and minority census population data and TIGER/Line data for Maryland and Virginia were obtained from the USCB website and processed using ArcGIS software (USCB. 2018f). Census population data were used to identify the minority and low-income populations within a 50-mile radius of NAPS. Environmental justice evaluations for minority and low-income populations are based on the use of USCB block groups for minority and low-income populations.

E3.11.2.2 Minority Populations

NRC procedural guidance defines a "minority" population as Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian/other Pacific Islander, some other race, two or more races, the aggregate of all minority races, Hispanic or Latino ethnicity, and the aggregate of all minority races and Hispanic ethnicity (NRC. 2013d). The guidance indicates that a minority population is considered present if either of the following two conditions exists:

1. The minority population in the census block group exceeds 50%; or
2. The minority population percentage is more than 20 percentage points greater in the census block group than the minority percentage of the geographic area chosen for the comparative analysis.

To establish minimum thresholds for each minority category, the non-white minority population total for each state was divided by the total population in the state. This process was repeated with a 50-mile radius total minority population and 50-mile radius total population. As described in the second criterion, 20 percentage points was added to the minority percentage values for each geographic area. The lower of the two NRC conditions for a minority population was selected as defining a minority area (i.e., census block group minority population exceeds 50%, or minority population is more than 20 percentage points greater than the minority population of the geographic area). Any census block group with a percentage exceeding this value was considered a minority population. Minority percentages for Maryland, Virginia, and a 50-mile radius, and the corresponding criteria, are shown in Table E3.11-4.

A minority category of aggregate of all races is created when the populations of all the 2016 U.S. census minority categories are summed. As shown in Table E3.11-4, the 2016 aggregate of all races category, when compared to the total population, indicates 32.9% of the population in a 50-mile radius are minorities. The aggregate of all races population percentages for Maryland and Virginia are 42.8% and 31.3%, respectively. Using the alternate approach defined above, where a 50-mile radius is used as the geographic area, any census block group with a combined aggregate of all races population equal to or greater than 52.9% would be considered a minority population. Because 52.9% exceeds the 50% noted for Condition 1, defined above, the lower criterion (50%) would be used for the threshold. Similarly, each state was evaluated and a series of criteria for each race and low-income category were defined. When the two states are used as the geographic area, any census block group with an aggregate of all races population exceeding 50% in Maryland or Virginia would be considered a minority population.

Because the Hispanic ethnicity is not considered a race by the USCB, Hispanics are already represented in the census-defined race categories. However, because Hispanics can be represented in any race category, some white Hispanics not otherwise considered minorities become classified as a minority when categorized in the aggregate and Hispanic category.

The number of census block groups contributing to the minority population count was evaluated using the criteria shown in Table E3.11-4 and summarized in Table E3.11-5. The results of the evaluation are census block groups flagged as having a minority population(s). The resulting maps (Figures E3.11-1, E3.11-2, E3.11-3, E3.11-4, E3.11-5, E3.11-6, E3.11-7, E3.11-8, E3.11-9, E3.11-10, E3.11-11, and E3.11-12) depict the location of minority population census block groups flagged accordingly for each race or aggregate category. Because no block group met the criteria for the American Indian or Alaska Native, two or more, or Native Hawaiian or Other Pacific Islander race categories, no figures illustrating those race categories were produced.

The percentage of census block groups exceeding the aggregate of all races minority population criterion was 21.4% when a 50-mile radius was used and 21.4% when the individual state was used as the geographic area (Table E3.11-5). For the aggregate and Hispanic category, 32.4% of the census block groups contained a minority population when the region was used, and 32.4% of the block groups contained minority populations when the individual state was used (Table E3.11-5). The minority population values of the block groups were significantly reduced when races were analyzed individually.

The identified minority population closest to the NAPS center point is 15 miles from the site: Block Group 510330305002. This census block group contained a total of 1,281 people, with 745 Black or African American, and 129 Hispanic or Latino individuals. Using either the individual state criteria or the regional criteria, the block group contains a Black or African American population, a Hispanic or Latino population, an aggregate of all races minority population, and an aggregate of all races and Hispanic minority population. (USCB. 2018d; USCB. 2018g)

There are no block groups within a six-mile radius that meet the criteria for a minority population. There are 357 identified minority population block groups located in, partially within, or adjacent to cities, municipalities, or USCB-defined urban areas (USCB. 2018g; USCB. 2018h; USCB. 2018i). This leaves 12 block groups that do not fall within or are not immediately adjacent to cities, municipalities, or USCB-defined urban areas (USCB. 2018g; USCB. 2018h; USCB. 2018i).

As presented in Section E3.1.3, there are no federally recognized Indian reservations or Native American tribal lands held in trust by the federal government located in the NAPS region.

E3.11.2.3 Low-Income Populations

NRC guidance defines “low-income” using USCB statistical poverty thresholds for individuals or families (NRC. 2013d). As addressed above with minority populations, two alternative geographic areas (Maryland and Virginia individually and the region) were used as the geographic areas for comparison in this analysis. The guidance indicates that a low-income population is considered present if either of the two following conditions exists:

1. The low-income population in the census block group exceeds 50%; or
2. The percentage of households below the poverty level in a block group is significantly greater (typically at least 20 percentage points) than the low-income population percentage of the geographic area chosen for the comparative analysis (i.e., individual state and region's combined average).

To establish minimum thresholds for the individual low-income category, the population with an income below the poverty level for the state was divided by the total population for whom poverty status is determined in the state. To establish minimum thresholds for the family low-income category, the family population count with an income below the poverty level for the state was divided by the total family population count in the state. This process was repeated for the regional population with an income below the poverty level and regional total population for whom poverty status is determined. As described in Condition 2, above, 20 percentage points was added to the low-income values for individuals and families and each geographic area. None of the geographic areas described in the first condition exceeded 50%.

As shown in Table E3.11-6, when the 2012-2016 census data category "income in the past 12 months below poverty level" (individual) is compared to "total population for whom poverty status is determined," 10.4% of the population in the region has an individual income below poverty level. In the states of Maryland and Virginia, the percentages of individuals with an income below poverty level are 9.9% and 11.4%, respectively.

As shown in Table E3.11-6, Maryland has an estimated 205,686 families and Virginia has an estimated 340,151 families living below poverty level. When the 2012-2016 census data family category "income in the past 12 months below poverty level" is compared to "total family count," 9.8% of the families within the region have an income below poverty level. In the states of Maryland and Virginia, the percentages of the family population with an income below poverty level are 9.4% and 11.0%, respectively.

As an example, when the region is used as the geographic area, any census block group within a 50-mile radius with populations of low-income individuals equal to or greater than 30.4% of the total block group population would be considered a "low-income population." Using this criterion, 98 of the 1,187 census block groups (8.3%) were identified as low-income populations within a 50-mile radius of the NAPS site, as shown in Figure E3.11-13. (USCB. 2018g)

When Virginia is used as the geographic area, any census block group within the region with a low-income population equal to or greater than 31.4% of the total block group, the population would be considered a "low-income population" (individual) (Table E3.11-6). Using the appropriate criteria for the individual state (Virginia and Maryland), 87 of the total 1187 census block groups (7.3%) have low-income individual population percentages which meet or exceed the threshold criteria noted in Table E3.11-5. These census block groups are illustrated in Figure E3.11-14.

Similarly, these criteria are found using both geographies and family census counts (Table E3.11-5). Using the family individual state and regional criteria, 64 and 75 block groups were identified as having low-income families that meet each criterion (Table E3.11-5). These census block groups are illustrated in Figures E3.11-15 and E3.11-16. (USCB. 2018g; USCB. 2018d) The closest block group that meets the low-income criteria for individuals or families, Block Group 511099505001, is approximately eight miles south of the NAPS center point. (USCB. 2018g)

There are no block groups within a six-mile radius that meets the criteria for a low-income population. There are 106 identified low-income population block groups located in, partially within, or adjacent to cities, municipalities, or USCB-defined urban areas (USCB. 2018g; USCB. 2018h; USCB. 2018i). The remaining four block groups do not fall within or are not immediately adjacent to cities, municipalities, or USCB-defined urban areas (USCB. 2018g; USCB. 2018h; USCB. 2018i).

E3.11.3 SUBSISTENCE POPULATIONS AND MIGRANT WORKERS

Migrant labor, or migrant worker, is defined by the USDA as "a farm worker whose employment required travel that prevented the migrant worker from returning to his/her permanent place of residence the same day." In 2012, Louisa County reported that 123 out of 485 total farms employed farm labor. Hanover County reported that 159 out of 600 total farms employed farm labor. Henrico County reported that 29 out of 117 total farms employed farm labor. Orange County reported that 174 out of 547 total farms employed farm labor. Spotsylvania County reported 71 out of 369 total farms employed farm labor. The 2012 Census of Agriculture reported that four of the Louisa County farms employed migrant farm workers. In Hanover County eight farms employed 60 migrant workers. Two of the farms in Henrico County employed migrant workers. In Orange County five farms employed 68 migrant workers. Three farms in Spotsylvania County employed 13 migrant workers. For Louisa County, an estimated total of 538 farm laborers were hired, of which 434 were estimated to work fewer than 150 days per year. In Hanover County an estimated total of 851 farm laborers were hired, of which 456 were estimated to work fewer than 150 days per year. For Henrico County an estimated total of 130 farm laborers were hired, of which 82 were estimated to work fewer than 150 days per year. In Orange County an estimated total of 831 farm laborers were hired, of which 324 were estimated to work fewer than 150 days per year. For Spotsylvania County, an estimated total of 449 farm laborers were hired, of which 324 were estimated to work fewer than 150 days per year. (USDA. 2012)

Subsistence refers to the use of natural resources as food for consumption and for ceremonial and traditional cultural purposes, usually by low-income or minority populations. Specific examples of subsistence use include gathering plants for direct consumption (rather than produced for sale from farming operations), for use as medicine, or in ritual practices. Fishing or hunting activities associated with direct consumption or use in ceremonies, rather than for sport, are other examples.

Determining the presence of subsistence use can be difficult, as data at the county or block group level is aggregated and not usually structured to identify such uses on or near the site, where any potential impacts arising from the continued operation of NAPS would arise. Frequently, the best means of investigating the presence of subsistence use is through dialogue with the local population who are most likely to know of such activity. This may include county officials, community leaders, and land owners in the vicinity who would have knowledge of subsistence activity.

The area surrounding NAPS is predominantly rural and characterized by farmland and wooded tracts with no known subsistence-based activity. The NRC found no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing, through which the minority and low-income populations could experience disproportionately high and adverse impacts (NRC. 2002a). No additional subsistence studies have since been conducted on behalf of NAPS Units 1 and 2, although Virginia tribes have been consulted regarding the proposed SLR action.

Plant staff living and working in the area are not aware of any cases of subsistence activity in the vicinity of NAPS.

Table E3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of NAPS

City/Town/CDP	County	2000 Census Population[a]	2010 Census Population[a]	2017 Census Population Estimates[a][b]	Distance to NAPS (miles)[c][d]	Direction to NAPS (miles)[c][d]
Ashland	Hanover	6,619	7,225	7,796	27	SE
Bowling Green	Caroline	936	1,111	1,166	24	E
Charlottesville	Charlottesville (IC)	45,049	43,435	48,019	38	W
Colonial Beach	Westmoreland	3,228	3,542	3,579	47	ENE
Columbia	Fluvanna	49	83	105[b]	29	SW
Culpeper	Culpeper	9,664	16,379	18,413	31	NNW
Dale City	Prince William	55,971	65,969	73,384[b]	48	NE
Dumfries	Prince William	4,937	4,961	5,230	43	NE
Elkton	Rockingham	2,042	2,726	2,844	50	WNW
Fredericksburg	Fredericksburg (IC)	19,279	24,286	28,360	25	NE
Gordonsville	Orange	1,498	1,496	1,591	22	WNW
Indian Head (MD)	Charles (MD)	3,422	3,844	3,807	50	NE
Lake Ridge	Prince William	30,404	41,058	44,685[b]	50	NNE
Linton Hall	Prince William	8,620	35,725	40,026[b]	50	NNE
Louisa	Louisa	1,401	1,555	1,663	12	W
Madison	Madison	210	229	242	34	NW
Manassas	Manassas (IC)	35,135	37,821	41,501	50	NNE
Marumsco	Prince William	N/A	35,036	38,815[b]	49	NE
Mechanicsville	Hanover	30,464	36,348	37,201[b]	39	SE
Mineral	Louisa	424	467	499	7	WSW
Orange	Orange	4,123	4,721	4,978	22	NW
Port Royal	Caroline	170	126	205	34	ENE
Quantico	Prince William	561	480	520	42	NE

Table E3.11-1 Cities or Towns Located Totally or Partially within a 50-Mile Radius of NAPS

City/Town/CDP	County	2000 Census Population[a]	2010 Census Population[a]	2017 Census Population Estimates[a][b]	Distance to NAPS (miles)[c][d]	Direction to NAPS (miles)[c][d]
Remington	Fauquier	624	598	639	33	N
Richmond	Richmond (IC)	197,790	204,214	227,032	50	SSE
Scottsville	Albemarle	555	566	612	43	WSW
Short Pump	Henrico	182	24,729	27,099[b]	30	SSE
Spotsylvania	Spotsylvania	3,833	4,239	4,590[b]	15	NE
Stanardsville	Greene	476	367	384	39	WNW
Tuckahoe	Henrico	43,242	44,990	47,997[b]	35	SSE
Warrenton	Fauquier	6,670	9,611	9,875	45	N
Washington	Rappahannock	183	135	127	49	NNW

N/A = No available data; IC = Independent City; MD = Maryland

a. (USCB. 2018h)

b. 2012-2016 five-year estimates.

c. (USDOT. 2018)

d. Distance and direction are approximate and measured from the NAPS center point to the city center.

Table E3.11-2 County Populations Totally or Partially Included within a 50-Mile Radius of NAPS

State, County and Independent City	2000 Population[(a)]	2010 Population[(a)]	2017 Population Estimates[(a)]	2060 Projected Permanent Population[(b)]	2060 Projected Total Population[(b)]
Maryland (1 county)	**120,546**	**146,551**	**159,700**	**275,376**	**280,779**
Charles	120,546	146,551	159,700	275,376	280,779
Virginia (31 counties)	**2,590,725**	**3,121,708**	**3,370,680**	**5,069,774**	**5,144,817**
Albemarle	79,236	99,010	107,702	172,120	176,325
Amelia	11,400	12,690	13,020	16,330	16,379
Buckingham	15,623	17,146	17,065	19,487	19,582
Caroline	22,121	28,545	30,461	49,274	50,390
Chesterfield	259,903	316,236	343,599	522,473	527,824
Culpeper	34,262	46,689	51,282	86,402	86,901
Cumberland	9,017	10,052	9,811	11,925	11,977
Essex	9,989	11,151	11,028	12,532	12,793
Fairfax	969,749	1,081,699	1,148,433	1,526,198	1,555,817
Fauquier	55,139	65,203	69,465	99,852	101,691
Fluvanna	20,047	25,691	26,452	41,085	41,698
Goochland	16,863	21,717	22,685	35,666	35,925
Greene	15,244	18,403	19,612	32,059	32,285
Hanover	86,320	99,863	105,923	148,155	150,501
Henrico	262,300	306,935	327,898	467,804	477,027
King and Queen	6,630	6,945	7,003	8,475	8,508
King George	16,803	23,584	26,337	44,487	44,747
King William	13,146	15,935	16,708	23,743	23,839
Louisa	25,627	33,153	35,860	55,801	56,647
Madison	12,520	13,308	13,277	13,719	13,978
New Kent	13,462	18,429	21,682	39,541	39,991

Table E3.11-2 County Populations Totally or Partially Included within a 50-Mile Radius of NAPS

State, County and Independent City	2000 Population[(a)]	2010 Population[(a)]	2017 Population Estimates[(a)]	2060 Projected Permanent Population[(b)]	2060 Projected Total Population[(b)]
Orange	25,881	33,481	36,073	53,827	54,357
Page	23,177	24,042	23,731	24,042	24,542
Powhatan	22,377	28,046	28,601	43,044	43,147
Prince William	280,813	402,002	463,023	882,181	890,174
Rappahannock	6,983	7,373	7,321	7,702	7,869
Richmond	8,809	9,254	8,939	9,317	9,554
Rockingham	67,725	76,314	80,227	107,059	109,125
Spotsylvania	90,395	122,397	133,033	228,524	232,008
Stafford	92,446	128,961	146,649	267,331	269,101
Westmoreland	16,718	17,454	17,780	19,620	20,116
Virginia (4 ICs)	**297,253**	**309,756**	**344,912**	**437,069**	**448,444**
Charlottesville	45,049	43,435	48,019	58,294	60,457
Fredericksburg	19,279	24,286	28,360	48,079	50,287
Manassas	35,135	37,821	41,501	59,620	60,338
Richmond	197,790	204,214	227,032	271,077	277,361
Total	**3,008,524**	**3,578,015**	**3,875,292**	**5,782,219**	**5,874,039**

a. (USCB. 2018e)

b. (MDOTD. 2018; MSDC. 2018; USCB. 2018d; USTA. 2018; UVA. 2018; VTC. 2018)

Table E3.11-3 County Population Growth, 2010-2060

Virginia		2010	2017	2020	2025	2030	2035	2040	2045	2050	2060
Hanover County	Population	99,863	105,923	107,716	113,198	118,679	123,230	127,780	133,107	138,123	148,155
	Average Annual Growth %		0.85	0.56	1.00	0.95	0.76	0.73	0.82	0.74	0.70
Henrico County	Population	306,935	327,898	333,100	351,277	369,454	384,710	399,966	417,656	434,372	467,804
	Average Annual Growth %		0.95	0.53	1.07	1.01	0.81	0.78	0.87	0.79	0.74
Louisa County	Population	33,153	35,860	35,197	37,926	40,656	43,049	45,443	48,116	50,678	55,801
	Average Annual Growth %		1.13	-0.62	1.51	1.40	1.15	1.09	1.15	1.04	0.97
Orange County	Population	33,481	36,073	34,442	37,014	39,587	41,833	44,080	46,598	49,008	53,827
	Average Annual Growth %		1.07	-1.53	1.45	1.35	1.11	1.05	1.12	1.01	0.94
Spotsylvania County	Population	122,397	133,033	135,026	147,334	159,641	170,595	181,549	193,631	205,262	228,524
	Average Annual Growth %		1.20	0.50	1.76	1.62	1.34	1.25	1.30	1.17	1.08

(USCB. 2018e; UVA. 2018)

Note: Projected population values are based on the population projection growth trend for the years reported by the University of Virginia.

Table E3.11-4 Minority Populations Evaluated Against Criterion

Geographic Area	Maryland[a]			Virginia[a]			50-Mile Radius (Region)[b]		
Total Population	5,959,902			8,310,301			2,146,986		
Census Categories	State Population by Census Category[a]	Percent[c]	Criteria	State Population by Census Category[a]	Percent[c]	Criteria	Regional Population by Census Category[b]	%[c]	Criteria
Black or African American	1,765,926	29.6	49.6	1,596,352	19.2	39.2	485,333	22.6	42.6
American Indian or Alaska Native	15,946	0.3	20.3	21,948	0.3	20.3	7,214	0.3	20.3
Asian	362,259	6.1	26.1	502,878	6.1	26.1	86,486	4.0	24.0
Native Hawaiian/Other Pacific Islander	2,792	0.0	20.0	5,494	0.1	20.1	1,419	0.1	20.1
Some Other Race	218,586	3.7	23.7	190,972	2.3	22.3	51,792	2.4	22.4
Two or More Races	186,153	3.1	23.1	279,699	3.4	23.4	74,639	3.5	23.5
Aggregate of All Races	2,551,662	42.8	50.0	2,597,343	31.3	50.0	706,883	32.9	50.0
Hispanic or Latino	550,146	9.2	29.2	725,092	8.7	28.7	184,286	8.6	28.6
Aggregate and Hispanic[d]	2,831,512	47.5	50.0	3,065,042	36.9	50.0	822,845	38.3	50.0

a. (USCB. 2018d)

b. (USCB. 2018g)

c. Percent values were calculated by dividing each census categories' population by the state or region total population values.

d. Includes everyone except persons who identified themselves as white, not Hispanic or Latino (NRC. 2013d).

Table E3.11-5 Minority and Low-Income Census Block Group Counts, 50-Mile Radius of NAPS

Total Number of Block Groups with Population within 50-mile Radius	Individual State Method		50-Mile Radius (Region)	
	Census Block Groups		Census Block Groups	
	1,187		1,187	
Census Categories	**Number of Block Groups with Identified Minority and Low Income Populations**	**Percent of Block Groups within 50 miles**	**Number of Block Groups with Identified Minority and Low Income Populations**	**Percent of Block Groups within 50 miles**
Black or African American	225	19	202	17
American Indian or Alaska Native	0	0	0	0
Asian	12	1	13	1.1
Native Hawaiian/Other Pacific Islander	0	0	0	0
Some Other Race	12	1	12	1
Two or More Races	0	0	0	0
Aggregate of All Races	254	21.4	254	21.4
Hispanic or Latino	73	6.1	73	6.1
Aggregate and Hispanic	384	32.4	384	32.4
Low Income (Individuals)	87	7.3	98	8.3
Low Income (Families)	64	5.4	75	6.3

(USCB. 2018g)

Table E3.11-6 Low-Income Population Criteria Using Two Geographic Areas

Geographic Area	Maryland[a]			Virginia[a]			50-Mile Radius (Region)[b]		
(Income) Total Population	5,819,563			8,060,892			2,092,910		
(Income) Total Families	2,177,492			3,090,178			773,006		
Census Category	State Population by Census Category	Percent[c]	Criteria	State Population by Census Category	Percent[c]	Criteria	State Population by Census Category	Percent[c]	Criteria
Low Income: Number of Persons Below Poverty Level	576,835	9.9	29.9	921,664	11.4	31.4	217,373	10.4	30.4
Low Income: Number of Families Below Poverty Level	205,686	9.4	29.4	340,151	11.0	31.0	76,023	9.8	29.8

a. (USCB. 2018d)

b. (USCB. 2018g)

c. Percent values were calculated by dividing each census category’s population by the state and regional total population values.

Figure E3.11-1 Census-Aggregate of All Race Populations (Regional)

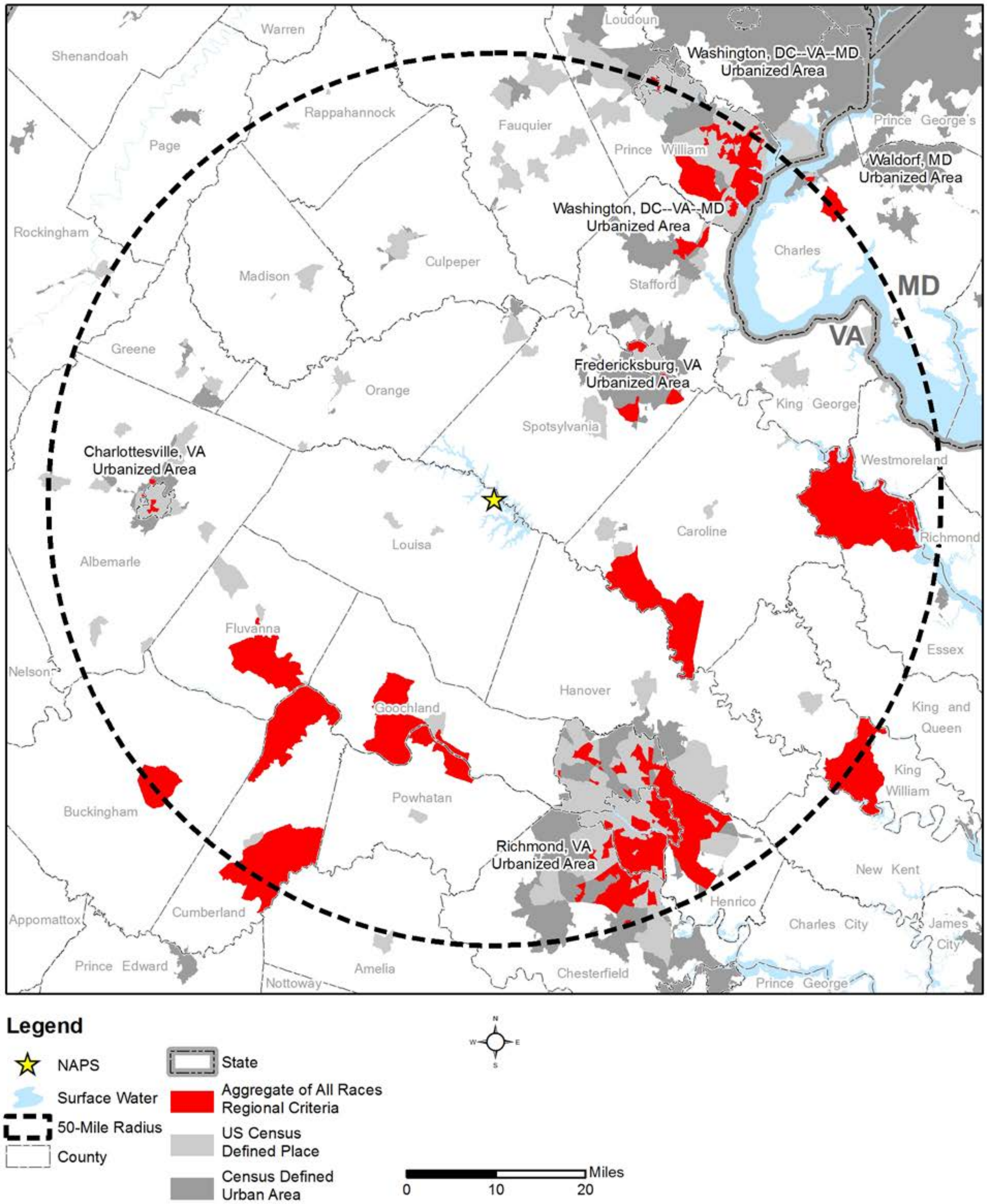


Figure E3.11-2 Census-Aggregate of All Races Populations (Individual State)

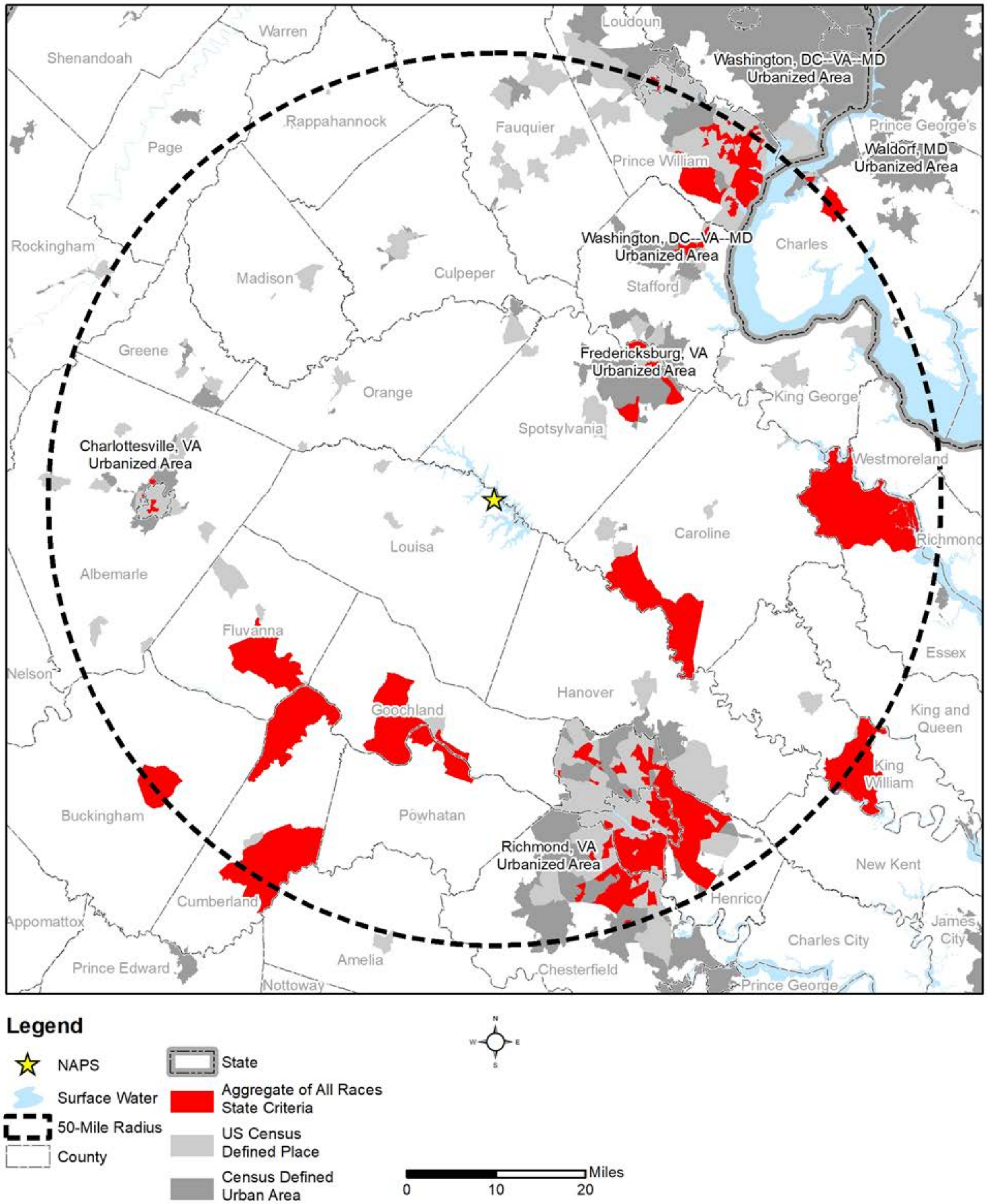


Figure E3.11-3 Census-Aggregate and Hispanic Populations (Regional)

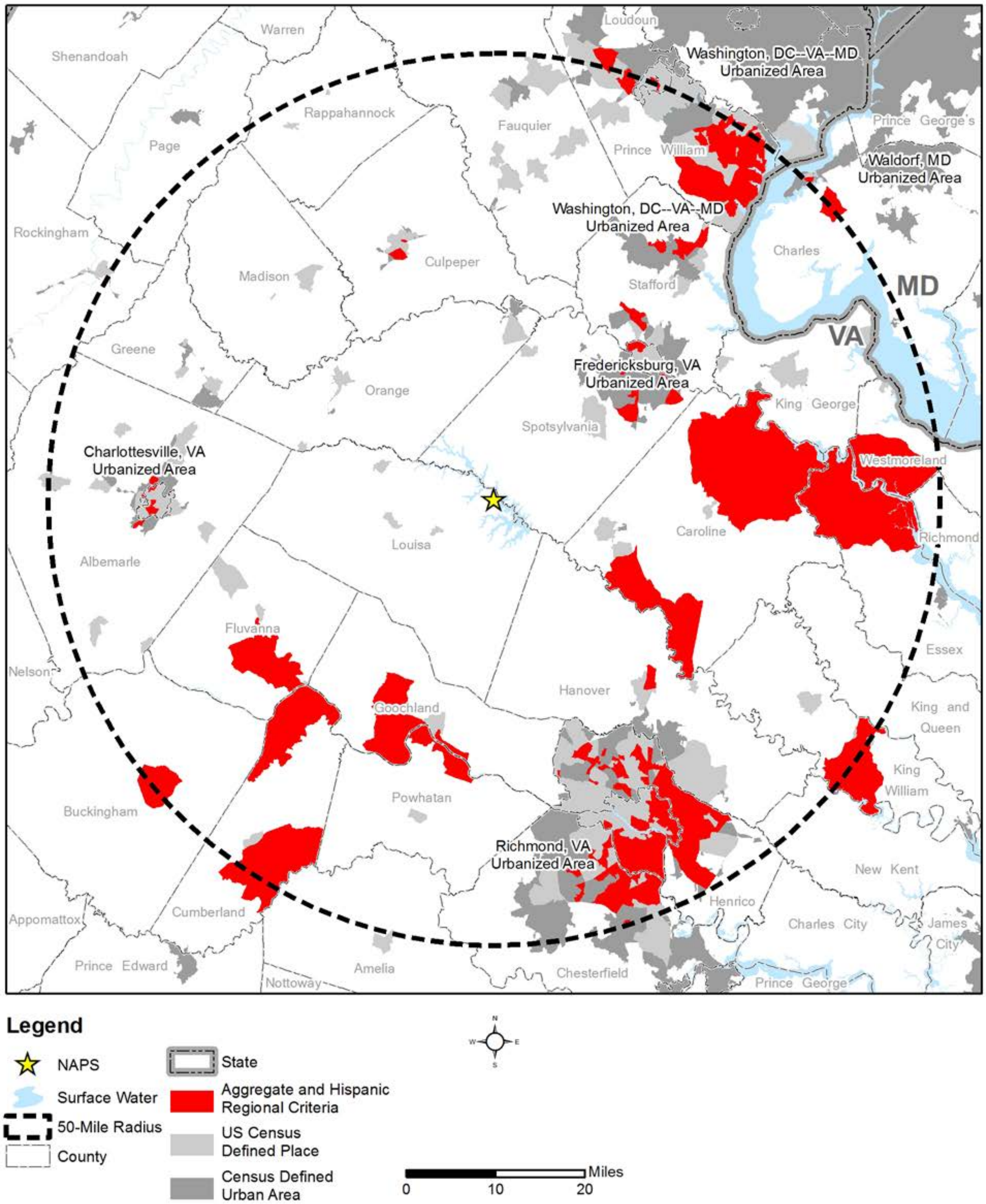


Figure E3.11-4 Census-Aggregate and Hispanic Populations (Individual State)

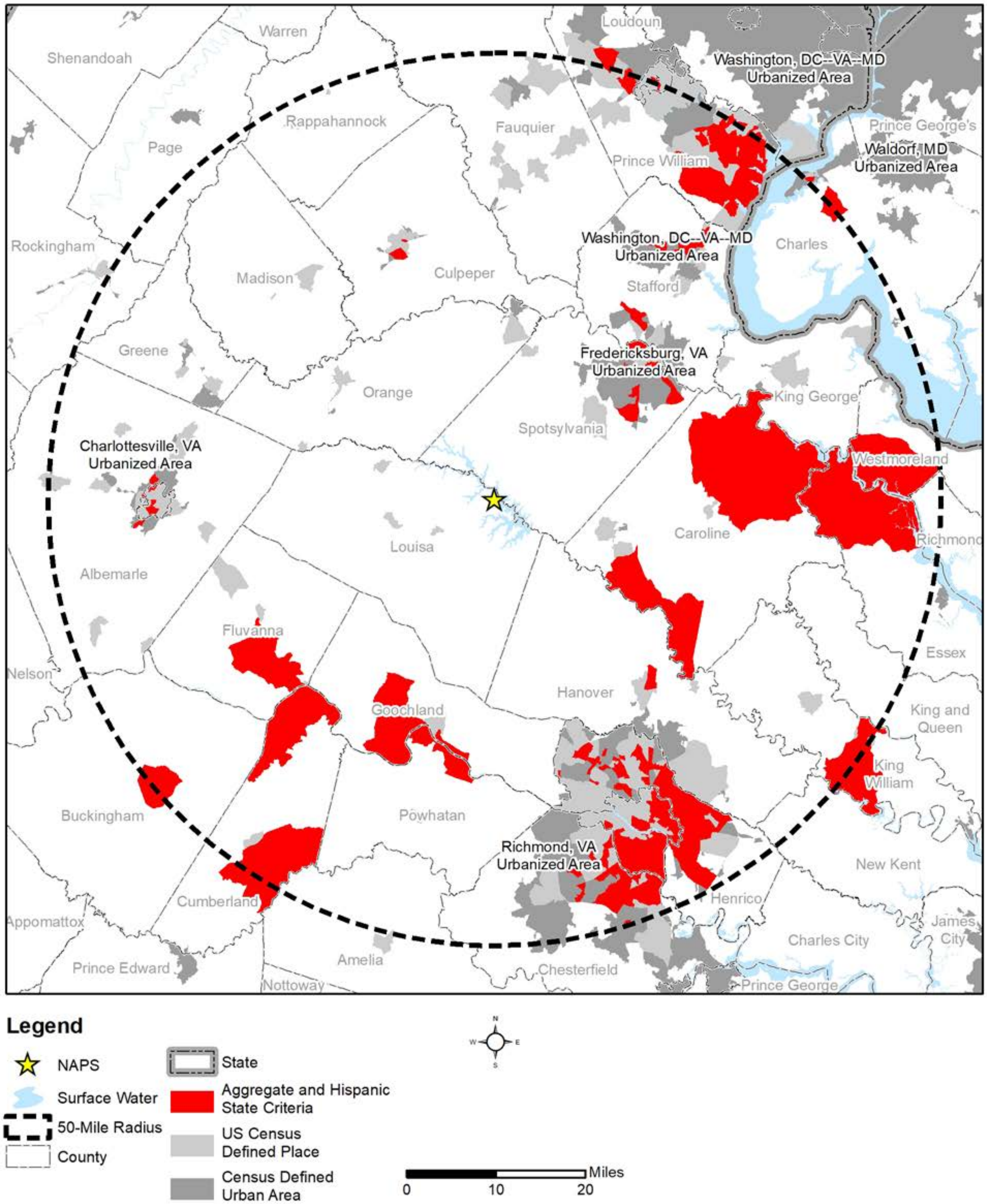


Figure E3.11-5 Census-Black or African American Populations (Regional)

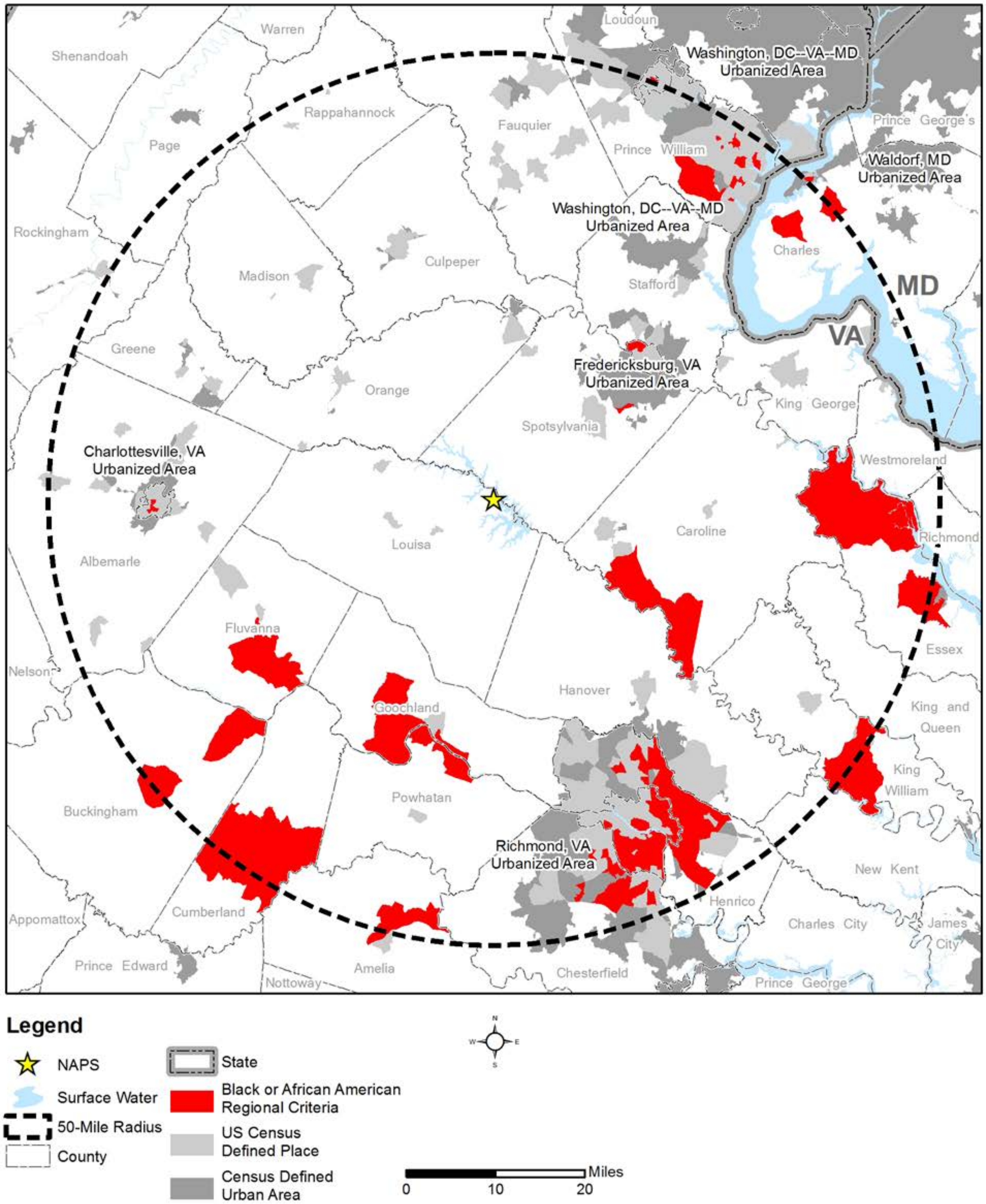


Figure E3.11-6 Census-Black or African American Populations (Individual State)

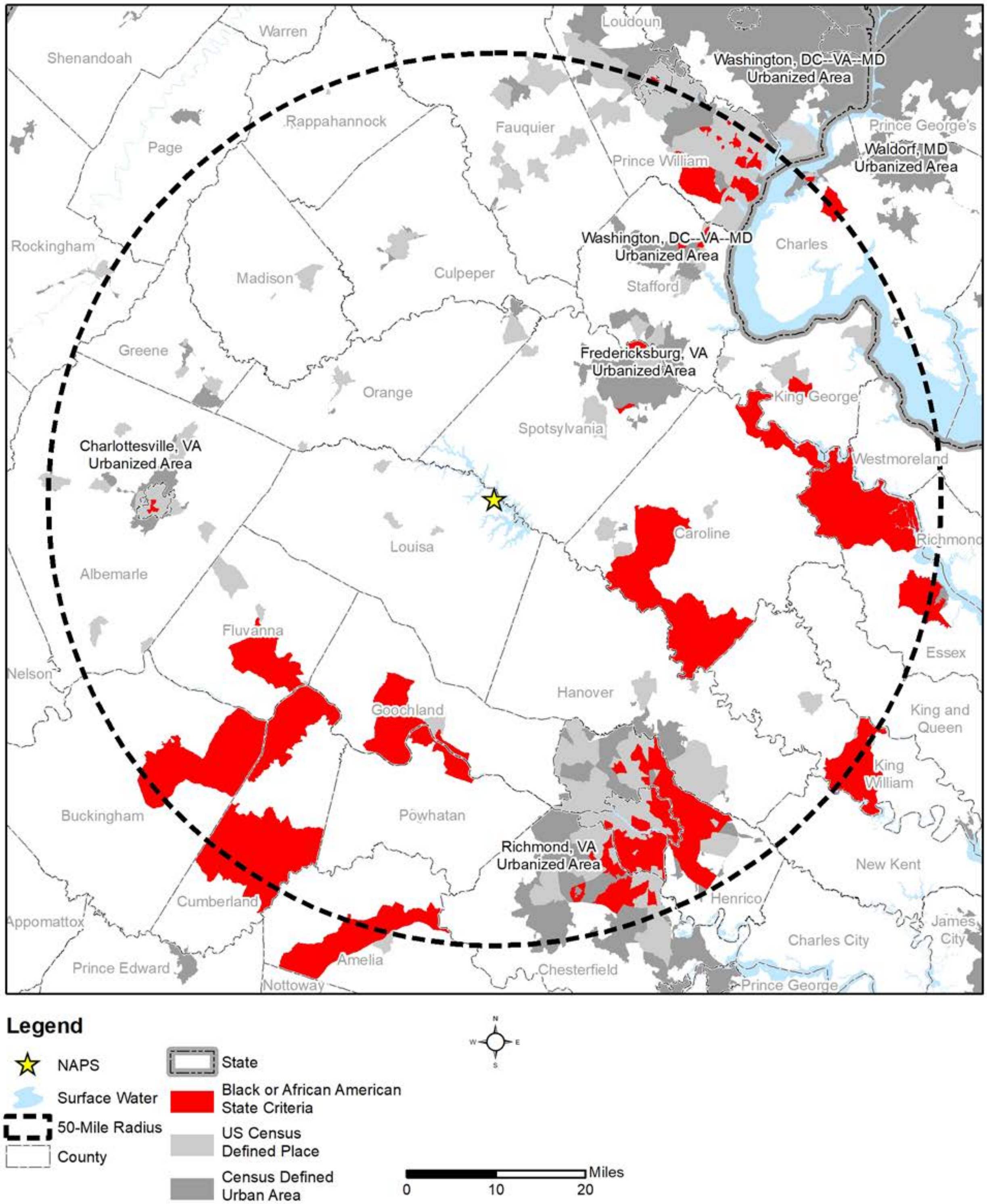


Figure E3.11-7 Census-Asian Populations (Regional)

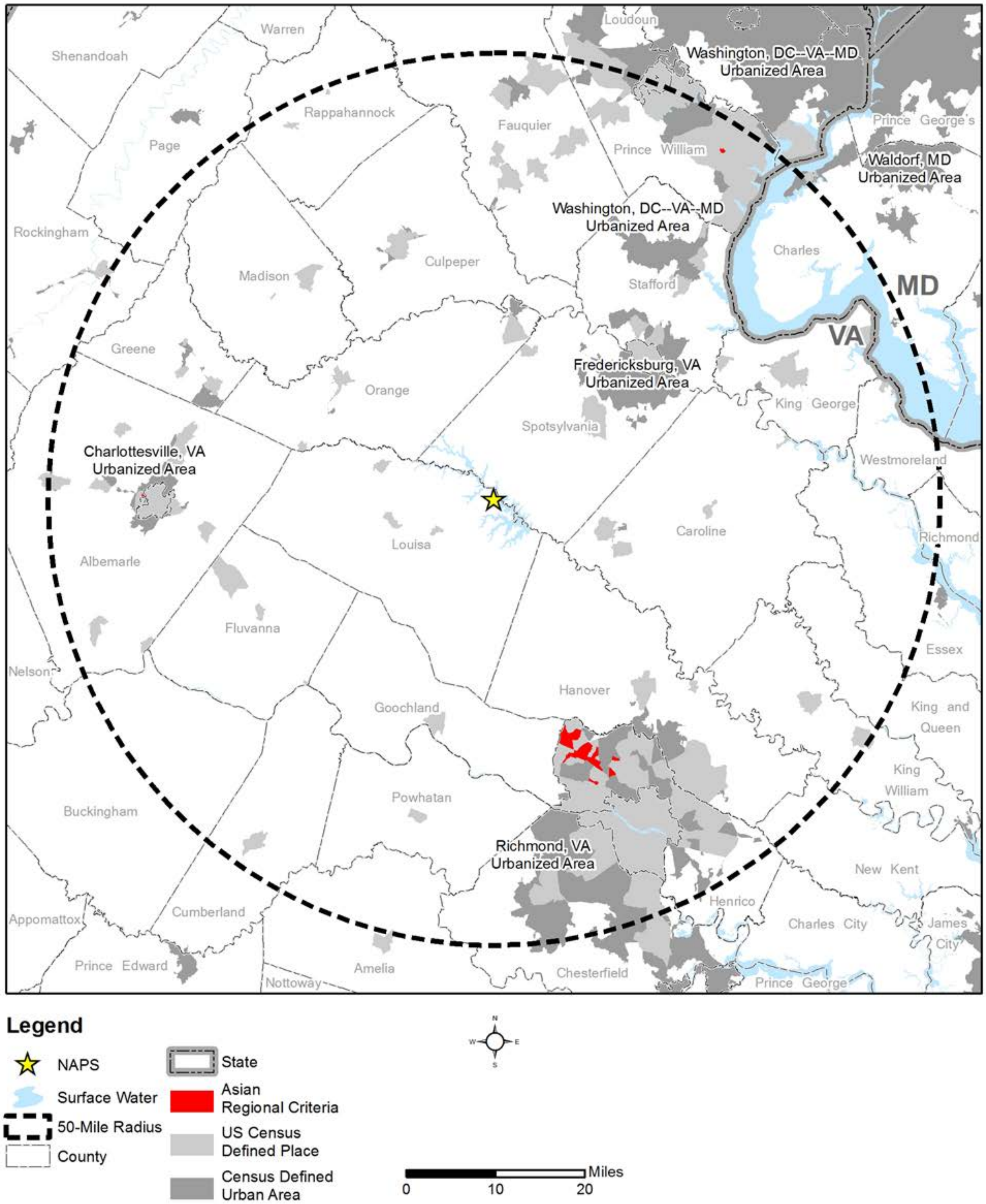


Figure E3.11-8 Census-Asian Populations (Individual State)

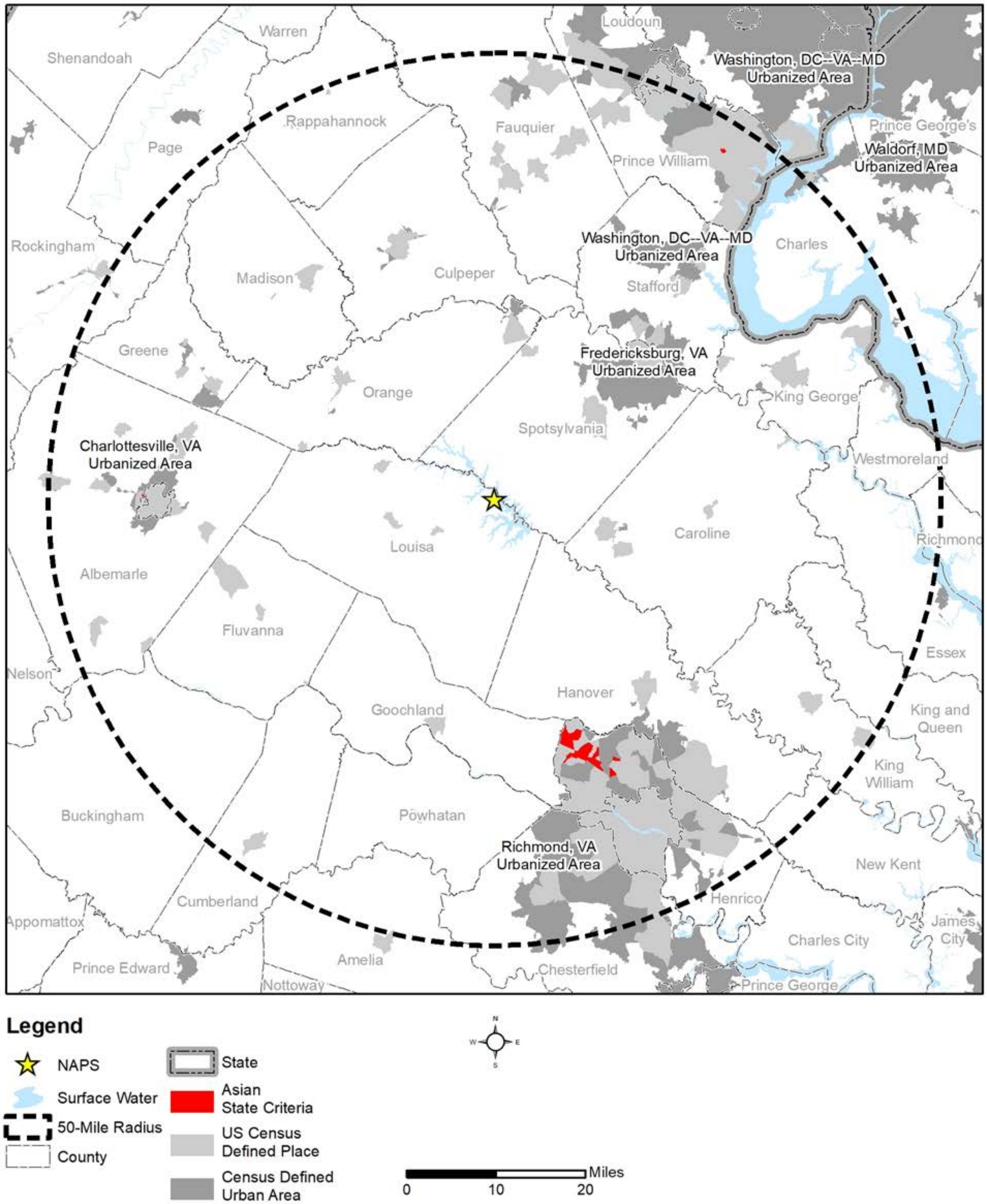


Figure E3.11-9 Census-Other Race Populations (Regional)

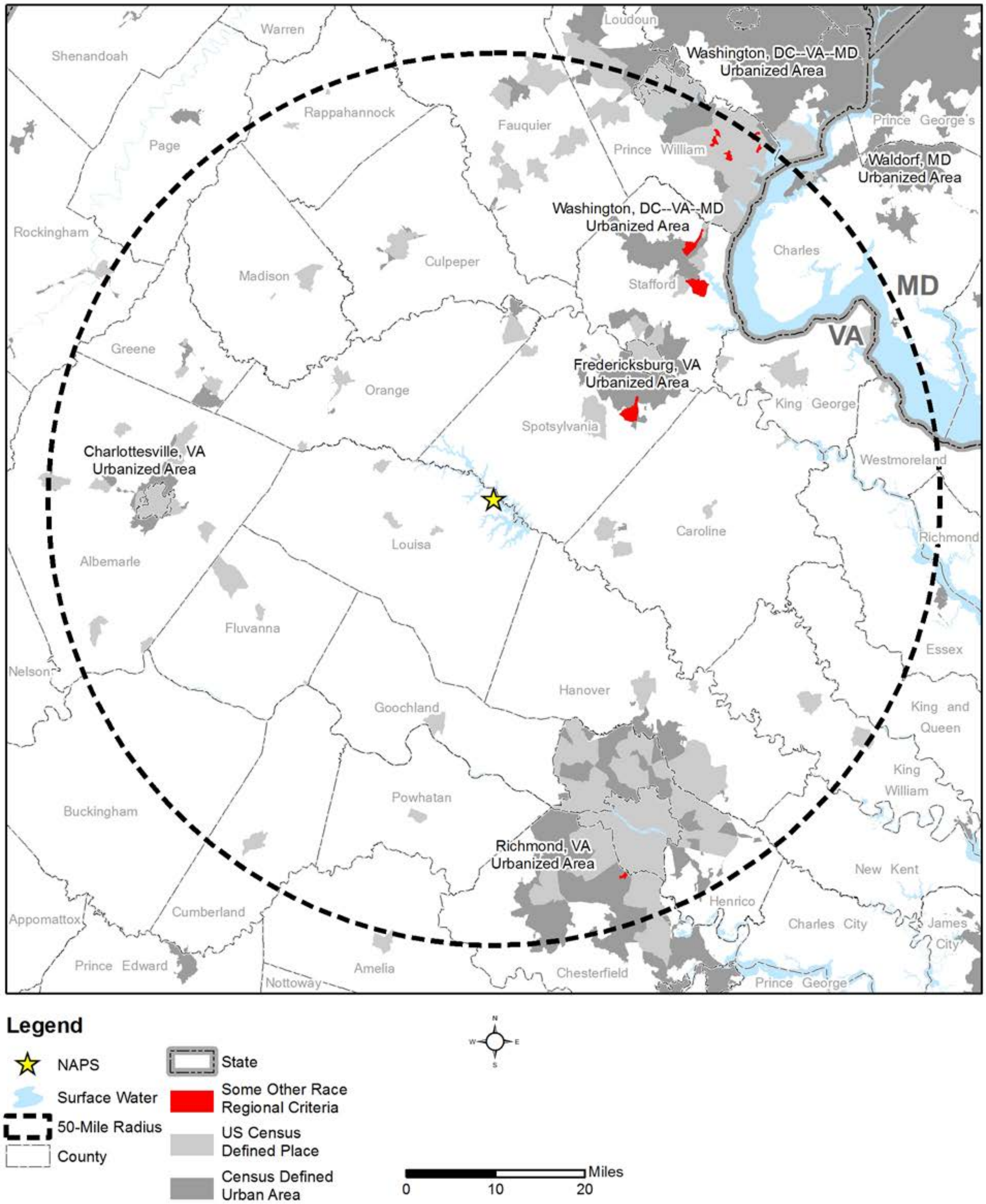


Figure E3.11-10 Census-Other Race Populations (Individual State)

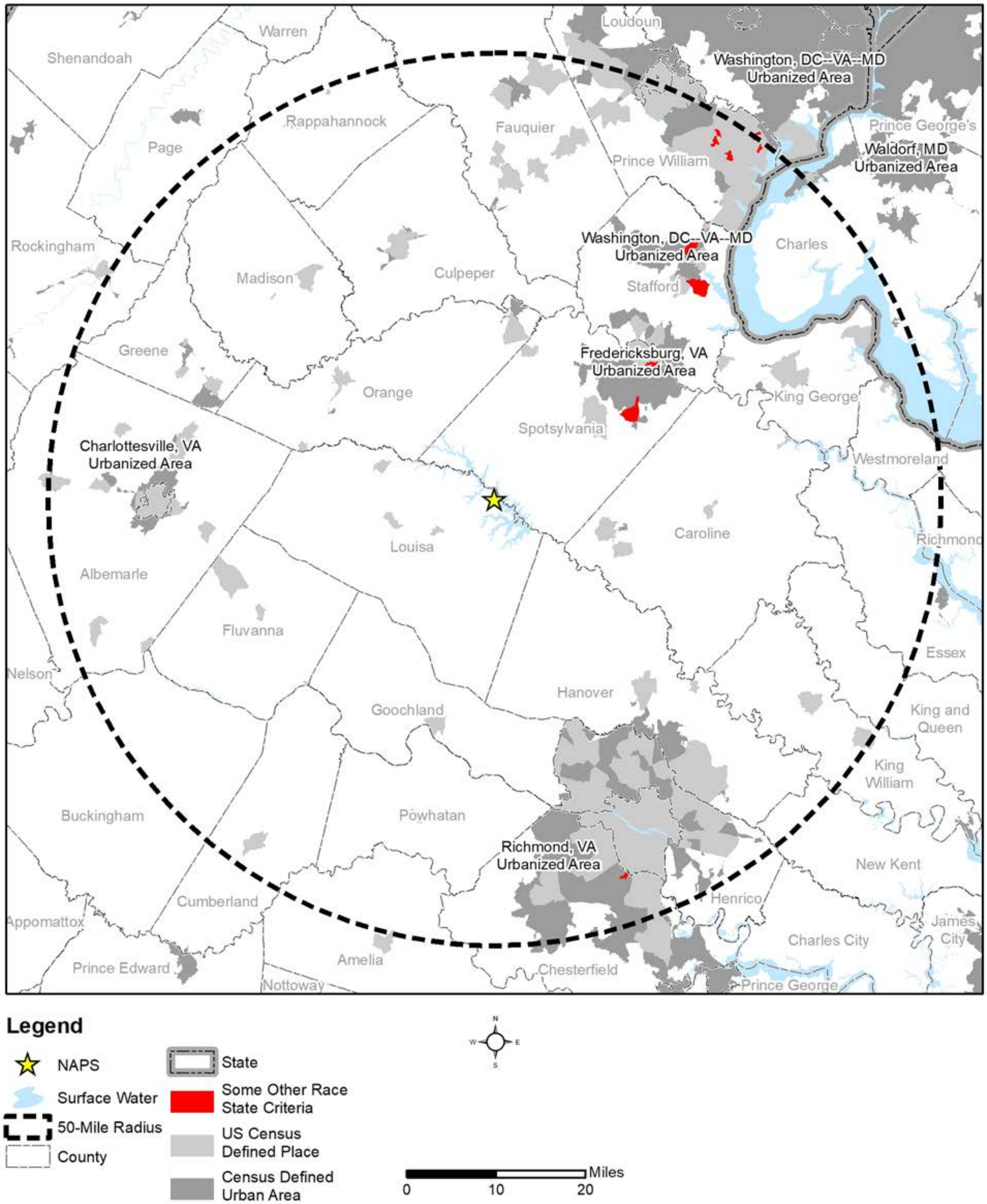


Figure E3.11-11 Census-Hispanic or Latino Populations (Regional)

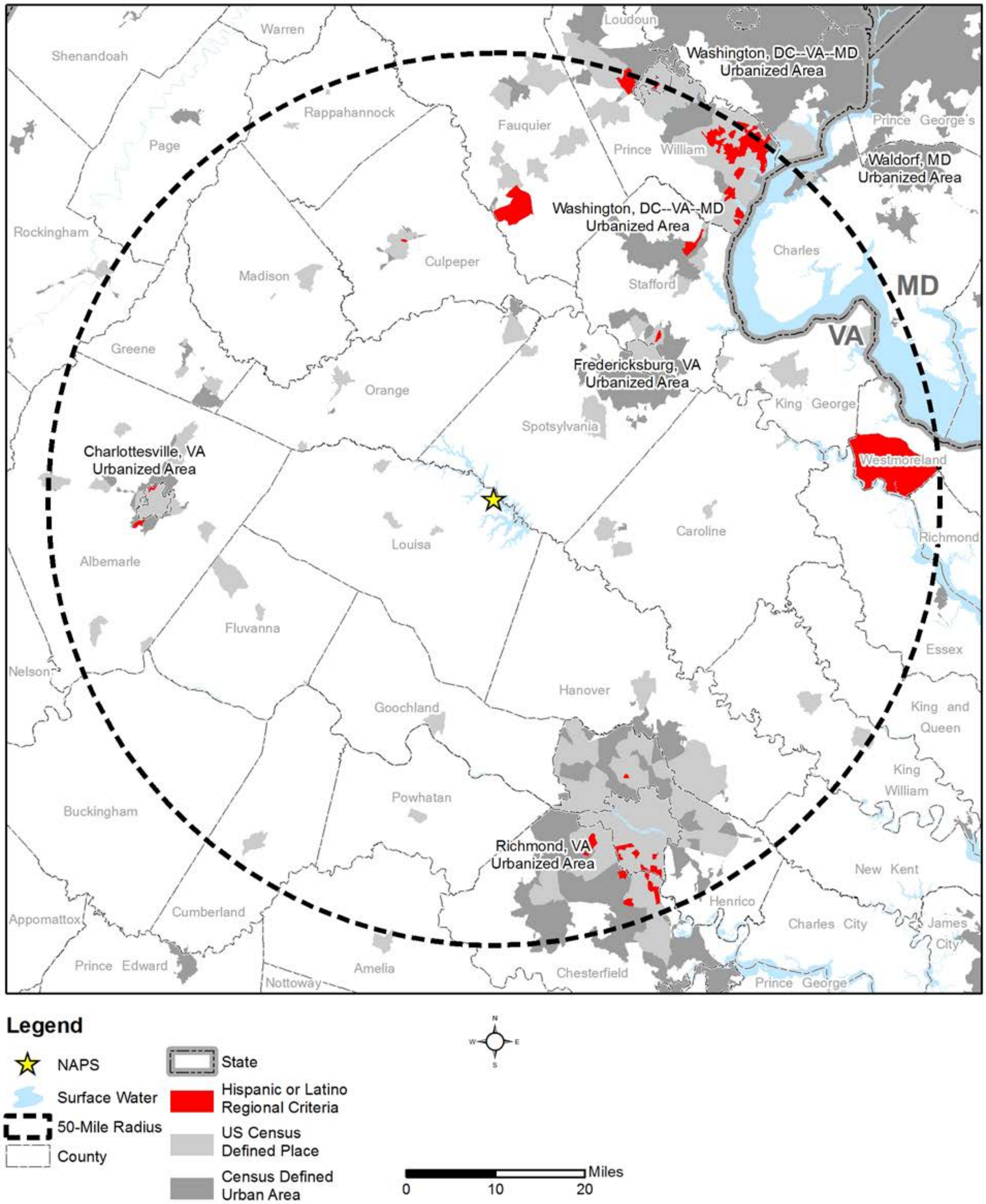


Figure E3.11-12 Census-Hispanic or Latino Populations (Individual State)

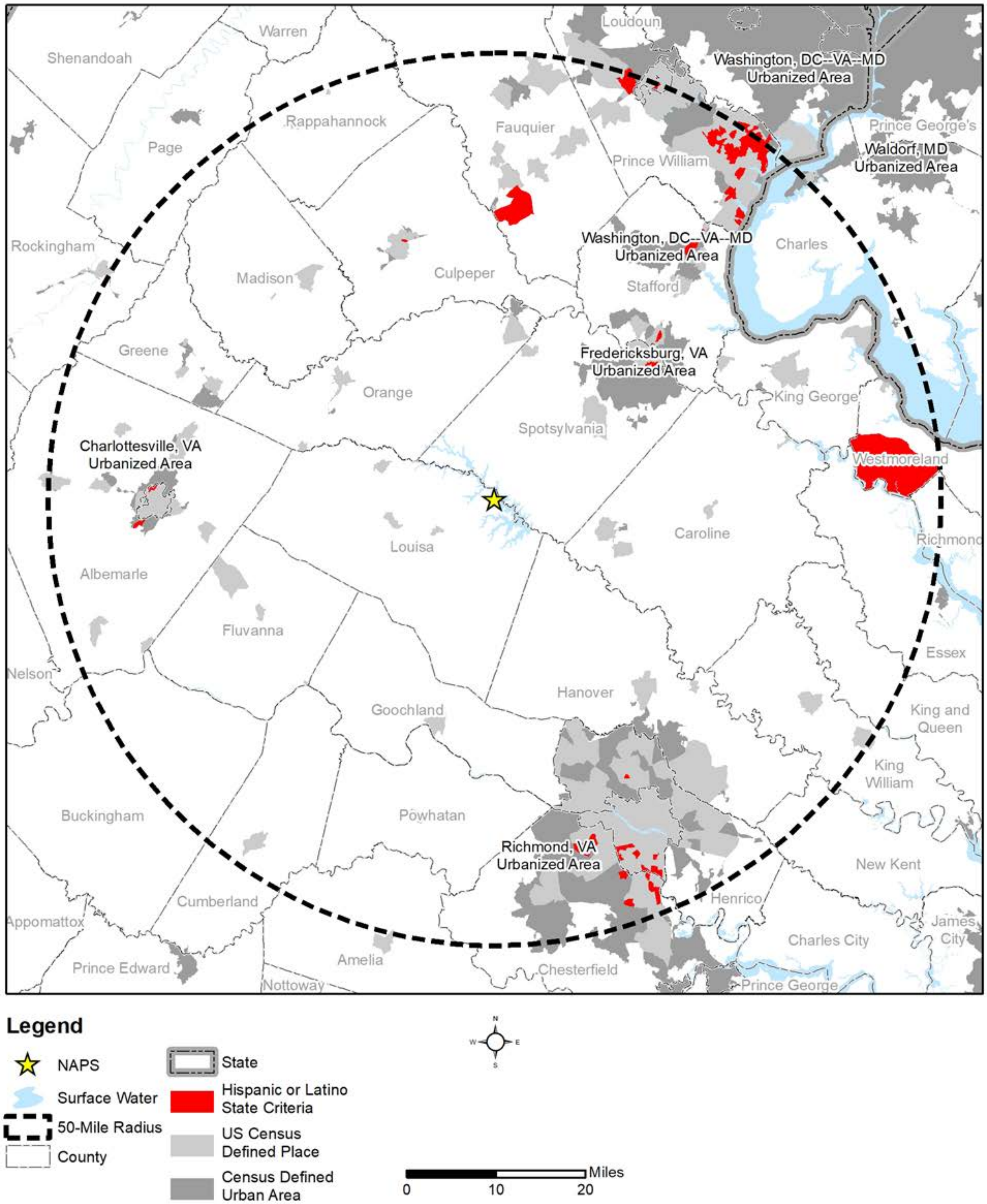


Figure E3.11-13 Census-Low Income Individuals (Regional)

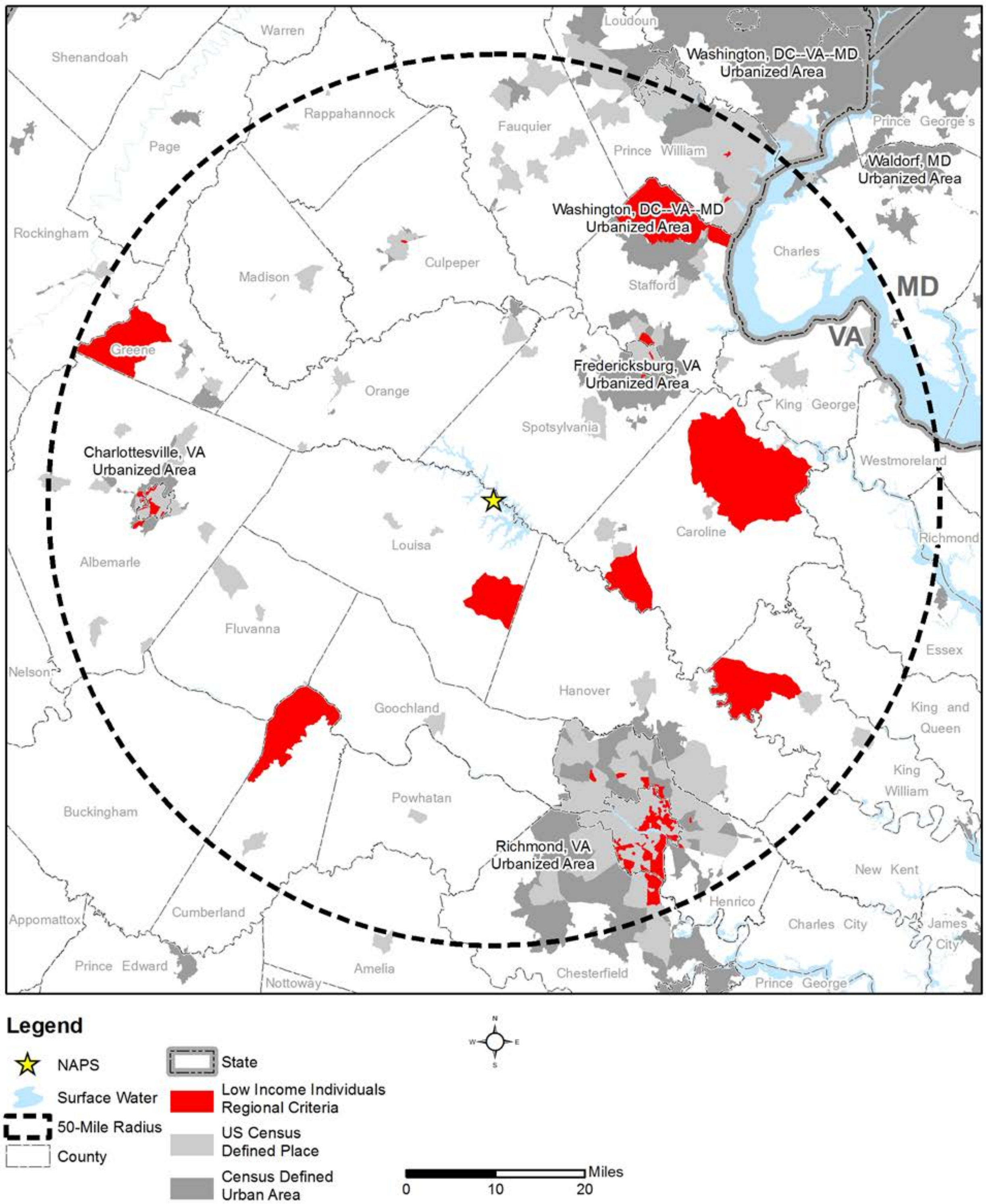


Figure E3.11-14 Census-Low Income Individuals (Individual State)

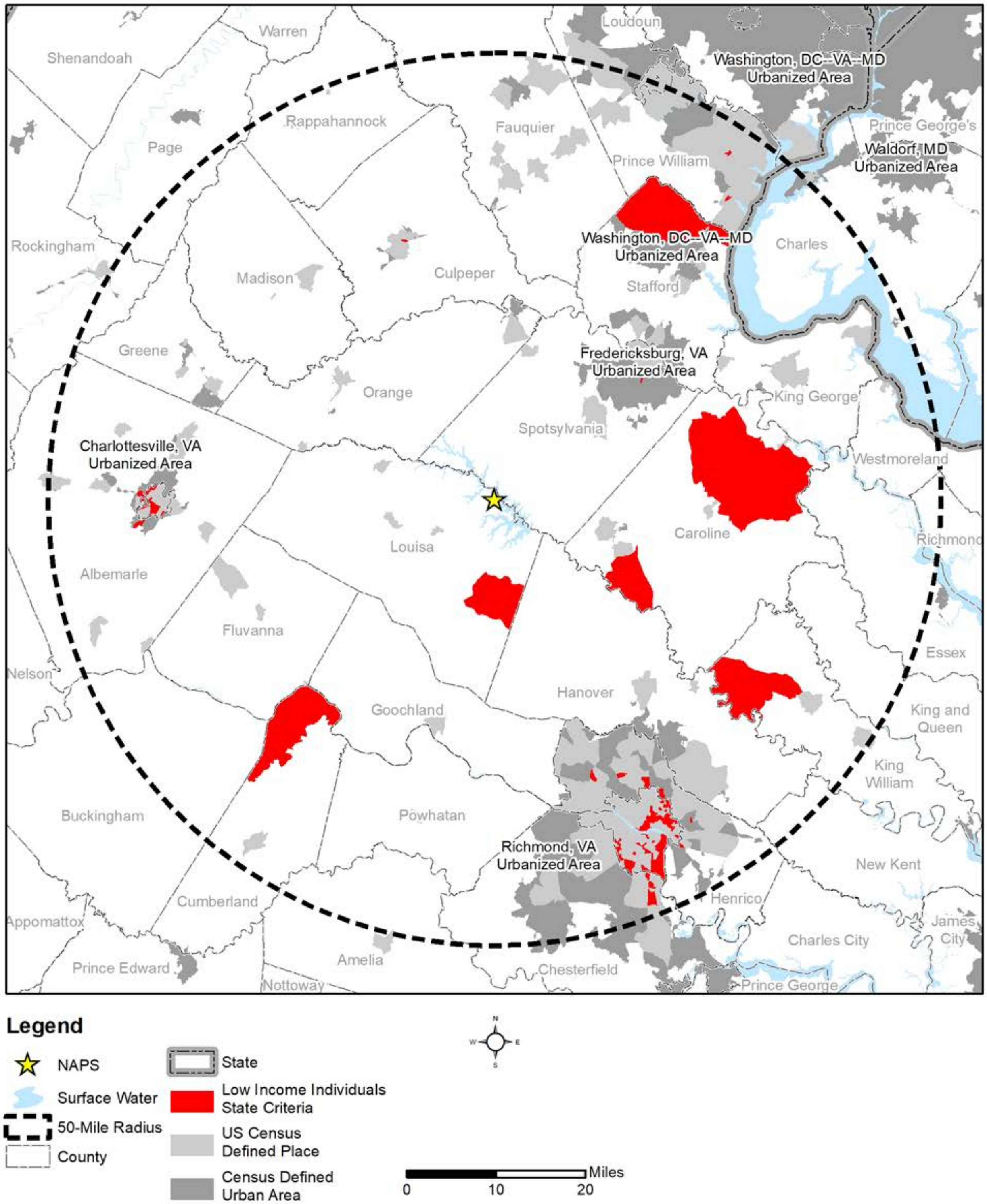


Figure E3.11-15 Census-Low Income Households (Regional)

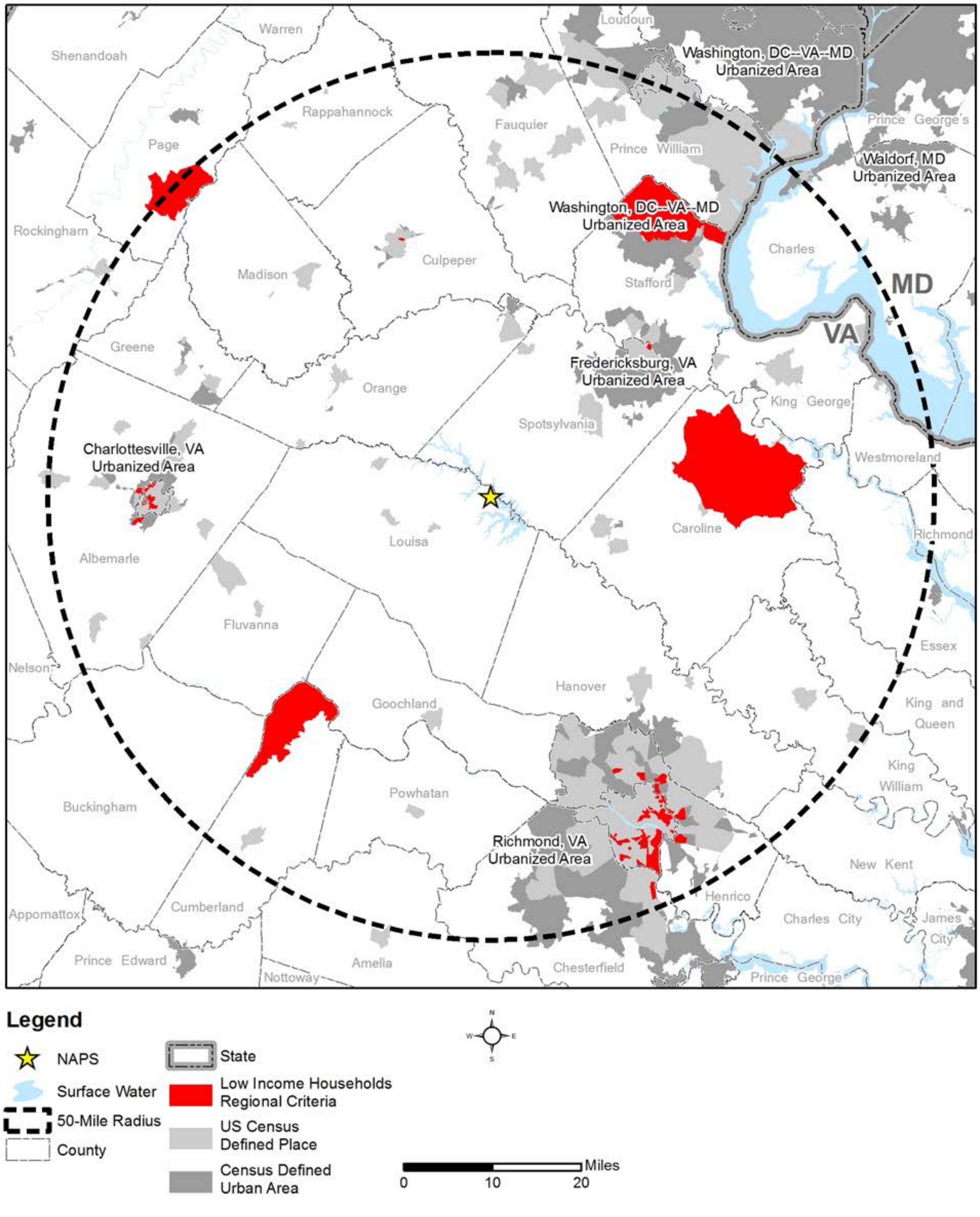
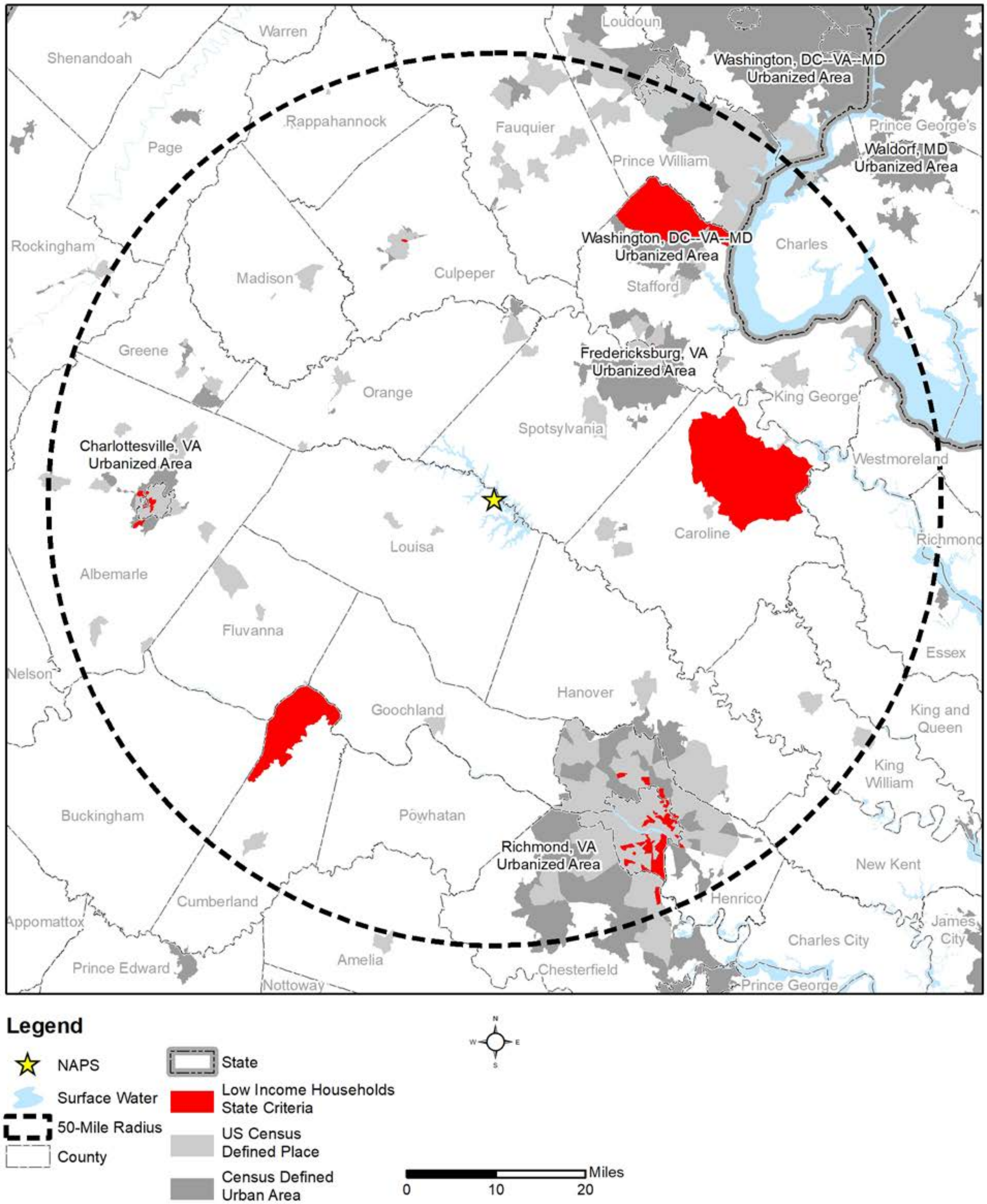


Figure E3.11-16 Census-Low Income Households (Individual State)



E3.12 WASTE MANAGEMENT

In addressing the plant's radioactive and nonradioactive waste management systems and programs, NRC Regulatory Guide 4.2, Supplement 1, Revision 1, specifies that the information being requested in this section can be incorporated by reference into Section E2.2 of the ER (NRC. 2013b, Section 3.11). Therefore, consistent with NRC Regulatory Guide 4.2, Dominion is providing the information below to address radioactive and nonradioactive waste management systems and programs at NAPS.

E3.12.1 RADIOACTIVE WASTE MANAGEMENT

Section E2.2.6 includes a discussion of liquid, gaseous, and solid radwaste systems at NAPS. The section provides a description of the systems, management of LLMW, radwaste storage, spent fuel storage, and permitted facilities currently utilized for offsite processing and disposal of radioactive wastes.

E3.12.2 NONRADIOACTIVE WASTE MANAGEMENT

Section E2.2.7 includes a discussion of the RCRA nonradioactive waste management program at NAPS, types of wastes generated, waste minimization program, and permitted facilities currently utilized for disposition of wastes.

E4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MITIGATING ACTIONS

The report must contain a consideration of alternatives for reducing adverse impacts . . . for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]

The environmental report must include an analysis that considers . . . the environmental effects of the proposed action . . . and alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]

The environmental report shall . . . discuss . . . the impact of the proposed action on the environment. Impacts shall be discussed in proportion to their significance. [10 CFR 51.45(b)(1)]

The information submitted . . . should not be confined to information supporting the proposed action but should also include adverse information. [10 CFR 51.45(e)]

The NRC has identified and analyzed 78 environmental issues that it considers to be associated with nuclear power plant license renewal and has designated the issues as Category 1, Category 2, or uncategorized). The NRC designated an issue as Category 1 if the following criteria were met:

- The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic.
- A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts that would occur at any plant, regardless of which plant is being evaluated (except for offsite radiological impacts—collective impacts from other than the disposal of spent fuel and high-level waste).
- Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

If the NRC concluded that one or more of the Category 1 criteria could not be met, the NRC designated the issue Category 2, which requires plant-specific analysis. The NRC designated one issue as uncategorized (chronic effects of electromagnetic fields), signifying that the categorization and impact definitions do not apply to this issue. Until such time that this issue is categorized, applicants for license renewal are not required to submit information on this issue [10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 6]; therefore, this issue is not included in Tables E4.0-1, E4.0-2, or E4.0-3, nor is it addressed in Section E4.9. NRC rules do not require analyses of Category 1 issues that were resolved using generic findings [10 CFR 51, Subpart A, Appendix B, Table B-1] as described in the GEIS. Therefore, an applicant may reference the GEIS findings for Category 1 issues, absent new and significant information.

The NRC provides guidance on new and significant information in Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC. 2013b). In this guidance, new and significant information is defined as follows:

- Information that identifies a significant environmental issue not considered or addressed in the GEIS and, consequently, not codified in Table B-1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Plants, in Appendix B, Environmental Effect of Renewing the Operating License of a Nuclear Power Plant, to Subpart A, National Environmental Policy Act—Regulations Implementing Section 102(2), of 10 CFR 51; or
- Information not considered in the assessment of impacts evaluated in the GEIS, leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1.
- Further, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity and/or scope (context) not previously recognized.

E4.0.1 CATEGORY 1 LICENSE RENEWAL ISSUES

The environmental report for the operating license renewal stage is not required to contain analyses of the environmental impacts of the license renewal issues identified as Category 1 issues in Appendix B to subpart A of this part. [10 CFR 51.53(c)(3)(i)]

[A]bsent new and significant information, the analyses for certain impacts codified by this rulemaking need only be incorporated by reference in an applicant's environmental report for license renewal . . . (61 FR 28467)

Dominion has determined that, of the 60 Category 1 issues, six are not applicable to NAPS because they result from a design or operational features that do not exist at the facility. Table E4.0-1 lists these six issues and provides a brief explanation of why they are not applicable to the site. Table E4.0-2 lists the 54 issues applicable to the site. Dominion reviewed the NRC findings on these 54 issues and identified no new and significant information concerning the impacts addressed by these findings (Chapter E5.0). Therefore, as permitted by 10 CFR 51.53(a), Dominion adopts and incorporates by reference the NRC findings for these Category 1 issues.

E4.0.2 CATEGORY 2 LICENSE RENEWAL ISSUES

The environmental report must contain analyses of the environmental impacts of the proposed action, including the impacts of refurbishment activities, if any, associated with license renewal and the impacts of operation during the renewal term, for those issues identified as Category 2 issues in Appendix B to subpart A of this part. [10 CFR 51.53(c)(3)(ii)]

The report must contain a consideration of alternatives for reducing adverse impacts, as required by § 51.45(c), for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]

The NRC designated 17 issues as Category 2. Dominion has determined that, of the 17 issues shown in Table E4.0-3, six issues are not applicable to NAPS.

For the 11 issues applicable to the site, the corresponding sections contain the required analyses. These analyses include conclusions regarding the significance of the impacts relative to renewal of the NAPS Units 1 and 2 OLs and, when applicable, discuss potential mitigation alternatives to the extent appropriate. With the exception of threatened and endangered species/EFH, historic and cultural resources, and environmental justice, NAPS has identified the significance of the impacts associated with each issue as SMALL, MODERATE, or LARGE, consistent with the criteria that the NRC established in 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3 as follows:

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the NRC has concluded that those impacts that do not exceed permissible levels in the NRC's regulations are considered small.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource. For issues where probability is a key consideration (i.e., accident consequences), probability was a factor in determining significance.

Threatened and endangered species/EFH, historic and cultural resources, and environmental justice were not assigned a significance impact of SMALL, MODERATE, or LARGE in 10 CFR 51, Subpart A, Appendix B, Table B-1. Therefore, consistent with NRC guidance, NAPS identified the significance of the impacts for these three Category 2 issues as follows (NRC. 2013a):

- For threatened and endangered species (Endangered Species Act [ESA]), the significance of the effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations including refurbishment (1) would have no effect on federally listed species; (2) are not likely to adversely affect federally listed species; (3) are likely to adversely affect federally listed species; or (4) are likely to jeopardize a federally listed species or adversely modify designated critical habitat. For EFH (Magnuson Stevens Fishery Conservation and Management Act) the significance of effects from license renewal can be characterized based on a determination of whether continued nuclear power plant operations, including refurbishment, would have: (1) no adverse impact; (2) minimal adverse impact; or (3) substantial adverse impact to the essential habitat of federally managed fish populations.

- For historic and cultural resources (NHPA) the significance of the effects from license renewal can be characterized based on a determination that (1) no historic properties are present (no effect); (2) historic properties are present, but not adversely affected (no adverse effect); or (3) historic properties are adversely affected (adverse effect).
- For environmental justice, impacts would be based on disproportionately high and adverse human health and environmental effects on minority and low-income populations.

In accordance with NEPA practice, NAPS considered ongoing and potential additional mitigation in proportion to the significance of the impact to be addressed (i.e., impacts that are SMALL receive less mitigation consideration than impacts that are LARGE).

E4.0.3 UNCATEGORIZED LICENSE RENEWAL ISSUES

The NRC determined that its categorization and impact-finding definitions did not apply to chronic effects of electromagnetic fields. Because the categorization and impact finding definitions do not apply as noted in 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 5, applicants are not currently required to submit information on this issue.

E4.0.4 FORMAT OF ISSUES REVIEWED

The review and analysis of the Category 1 and 2 issues identified in NRC Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC. 2013b) are discussed in the following sections. The format for the review of these issues is described below. Although Category 1 issues have been evaluated for new and significant information in Chapter E5.0, specific issues are also being listed in this chapter for consistency purposes with the recommended NRC Regulatory Guide 4.2 format.

- *Issue:* Title of the issue.
- *Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1:* The findings for the issue from 10 CFR 51, Subpart A, Appendix B, Table B-1, Summary of Findings on NEPA Issues for License Renewal of Nuclear Power Plants.
- *Requirement:* Restatement of the applicable 10 CFR 51.53 requirement.
- *Background: A* background excerpt from the applicable section of the GEIS. The specific section of the GEIS is referenced for the convenience of the reader.
- *Analysis:* An analysis of the environmental impact, taking into account information provided in the GEIS, 10 CFR 51, Subpart A, Appendix B, as well as current site-specific information. If an issue is not applicable, the analysis lists the explanation. The analysis section also provides a summary conclusion of the environmental impacts, and identifies as applicable, either ongoing or additional planned mitigation measures to reduce adverse impacts. For Category 1 issues listed in this chapter, an analysis is not required absent new and significant information.

Table E4.0-1 Category 1 Issues Not Applicable to NAPS

Issue	Comment
Land Use	
Offsite land use in transmission line rights-of-way (ROWs)	All in-scope transmission lines subject to the evaluation of environmental impacts for license renewal are located completely within the NAPS site.
Surface Water Resources	
Altered salinity gradients	NAPS does not have cooling towers and does not discharge to an estuary.
Groundwater Resources	
Groundwater quality degradation (plants with cooling ponds in salt marshes)	NAPS is located on a freshwater body and does not utilize cooling ponds.
Terrestrial Resources	
Cooling tower impacts on vegetation (plants with cooling towers)	NAPS uses once-through cooling.
Aquatic Resources	
Impingement and entrainment of aquatic organisms (plants with cooling towers)	NAPS uses once-through cooling.
Thermal impacts on aquatic organisms (plants with cooling towers)	NAPS uses once-through cooling.

Table E4.0-2 Category 1 Issues Applicable to NAPS

Resource	Issue
Land Use	Onsite land uses
	Offsite land uses
Visual Resources	Aesthetic impacts
Air Quality	Air quality impacts (all plants)
	Air quality effects of transmission lines
Noise	Noise impacts
Geologic Environment	Geology and soils
Surface Water Resources	Surface water use and quality (non-cooling system impacts)
	Altered current patterns at intake and discharge structures
	Altered thermal stratification of lakes
	Scouring caused by discharged cooling water
	Discharge of metals in cooling system effluent
	Discharge of biocides, sanitary wastes, and minor chemical spills
	Surface water use conflicts (plants with once-through cooling systems)
	Effects of dredging on surface water quality
	Temperature effects on sediment transport capacity
Groundwater Resources	Groundwater contamination and use (non-cooling system impacts)
	Groundwater use conflicts (plants that withdraw less than 100 gallons per minute)
	Groundwater quality degradation resulting from water withdrawals
Terrestrial Resources	Exposure of terrestrial organisms to radionuclides
	Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds)
	Bird collisions with plant structures and transmission lines
	Transmission line right-of-way management impacts on terrestrial resources
	Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)

Table E4.0-2 Category 1 Issues Applicable to NAPS

Resource	Issue
Aquatic Resources	Entrainment of phytoplankton and zooplankton (all plants)
	Infrequently reported thermal impacts (all plants)
	Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication
	Effects of nonradiological contaminants on aquatic organisms
	Exposure of aquatic organisms to radionuclides
	Effects of dredging on aquatic organisms
	Effects on aquatic resources (non-cooling system impacts)
	Impacts of transmission line right-of-way management on aquatic resources
	Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses
Socioeconomics	Employment and income, recreation and tourism
	Tax revenues
	Community services and education
	Population and housing
	Transportation
Human Health	Radiation exposures to the public
	Radiation exposures to plant workers
	Human health impact from chemicals
	Microbiological hazards to plant workers
	Physical occupational hazards
Postulated Accidents	Design-basis accidents

Table E4.0-2 Category 1 Issues Applicable to NAPS

Resource	Issue
Waste Management	Low-level waste storage and disposal
	Onsite storage of spent nuclear fuel
	Offsite radiological impacts of spent nuclear fuel and high-level waste disposal
	Mixed-waste storage and disposal
	Nonradioactive waste storage and disposal
Uranium Fuel Cycle	Offsite radiological impacts—individual impacts from other than the disposal of spent fuel and high-level waste
	Offsite radiological impacts—collective impacts from other than the disposal of spent fuel and high-level waste
	Nonradiological impacts of the uranium fuel cycle
	Transportation
Termination of Nuclear Power Plant Operations and Decommissioning	Termination of plant operations and decommissioning

Table E4.0-3 Category 2 Issues Applicability to NAPS

Resource Issue	Applicability	ER Section
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river)	Not Applicable	E4.5.1
Groundwater Resources		
Groundwater use conflicts (plants that withdraw more than 100 gallons per minute)	Not Applicable	E4.5.3
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)	Not Applicable	E4.5.2
Groundwater quality degradation (plants with cooling ponds at inland sites)	Not Applicable	E4.5.4
Radionuclides released to groundwater	Applicable	E4.5.5
Terrestrial Resources		
Effects on terrestrial resources (non-cooling system impacts)	Applicable	E4.6.5
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)	Not Applicable	E4.6.4
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	Applicable	E4.6.1
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	Applicable	E4.6.2
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)	Not Applicable	E4.6.3
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat	Applicable	E4.6.6
Historic and Cultural Resources		
Historic and cultural resources	Applicable	E4.7
Human Health		
Microbiological hazards to the public (plants that use cooling ponds, lake, or canals, or that discharge to a river)	Applicable	E4.9.1
Electric shock hazards	Applicable	E4.9.2

Table E4.0-3 Category 2 Issues Applicability to NAPS

Resource Issue	Applicability	ER Section
Postulated Accidents		
Severe accidents	Applicable	E4.15.2
Environmental Justice		
Minority and low-income populations	Applicable	E4.10.1
Cumulative Impacts		
Cumulative impacts	Applicable	E4.12

E4.1 LAND USE AND VISUAL RESOURCES

E4.1.1 ONSITE LAND USE

E4.1.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Changes in onsite land use from continued operations and refurbishment associated with license renewal would be a small fraction of the nuclear power plant site and would involve only land that is controlled by the licensee.

E4.1.1.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.1.1.3 Background [GEIS Section 4.2.1.1]

Operational activities at a nuclear power plant during the license renewal term would be similar to those occurring during the current license term. Generally, onsite land use conditions would remain unchanged. However, additional spent nuclear fuel and low-level radioactive waste generated during the license renewal term could require the construction of new or expansion of existing onsite storage facilities. Should additional storage facilities be required, this action would be addressed in separate license reviews conducted by the NRC. Refurbishment activities, such as steam generator and vessel head replacement, have not permanently changed onsite land use conditions.

E4.1.1.4 Analysis

Onsite land use information is presented in Section E3.2.1 of this ER. No license renewal-related refurbishment activities have been identified, as presented in Section E2.3. In addition, no license renewal-related construction activities have been identified. Therefore, no changes in onsite land use during the proposed SLR operating term are anticipated. In the GEIS, the NRC determined that onsite land use impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a Category 1 issue (NRC. 2013a, Section 4.2.1.1). Based on Dominion's review, no new and significant information was identified as it relates to onsite land use, and further analysis is not required.

E4.1.2 OFFSITE LAND USE

E4.1.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Offsite land use would not be affected by continued operations and refurbishment associated with license renewal.

E4.1.2.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.1.2.3 Background [GEIS Section 4.2.1.1]

The impacts of continued plant operations during the license renewal term and refurbishment on offsite land use were evaluated separately in the 1996 GEIS. It was predicted that impacts associated with refurbishment and changes in population and tax revenue on offsite land use could range from SMALL to MODERATE. Subsequent license renewal reviews, however, have shown no power plant-related population changes or significant tax revenue changes due to license renewal. Non-outage employment levels at nuclear power plants have remained relatively unchanged or have decreased. With no increase in the number of workers, there has been no increase in housing, infrastructure, or demand for services beyond what has already occurred. Operational activities during the license renewal term would be similar to those occurring during the current license term and would not affect offsite land use beyond what has already been affected.

For plants that have the potential to impact a coastal zone or coastal watershed, as defined by each state participating in the national Coastal Zone Management Program (CZMP), applicants for license renewal must submit to the affected state a certification that the proposed license renewal is consistent with the state CZMP. Applicants must coordinate with the state agency that manages the state CZMP to obtain a determination that the proposed nuclear plant license renewal would be consistent with the state program.

E4.1.2.4 Analysis

Offsite land use information is presented in Section E3.2.2 of this ER. As presented in Section E2.5, there are no plans to add workers to support plant operations during the SLR operating term and, as presented in Section E2.3, no license renewal-related refurbishment activities have been identified. Therefore, no changes in offsite land use during the proposed SLR operating term are anticipated.

In the GEIS, the NRC determined that offsite land use impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a Category 1 issue (NRC. 2013a, Section 4.2.1.1). Based on Dominion's review, no new and significant information was identified as it relates to offsite land use, and further analysis is not required.

E4.1.3 AESTHETICS IMPACTS

E4.1.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. No important changes to the visual appearance of plant structures or transmission lines are expected from continued operations and refurbishment associated with license renewal.

E4.1.3.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.1.3.3 Background [GEIS Section 4.2.1.2]

A case study performed for the 1996 GEIS found a limited number of situations where nuclear power plants had a negative effect on visual resources. Negative perceptions were based on aesthetic considerations (for instance, the plant is out of character or scale with the community or the viewshed), physical environmental concerns, safety and perceived risk issues, an anti-plant attitude, or an anti-nuclear orientation. It is believed that these negative perceptions would persist regardless of mitigation measures.

In addition, the visual appearance of transmission lines is not expected to change during the license renewal term. After the containment building and cooling towers, transmission line towers are probably the most frequently observed structure associated with nuclear power plants. Transmission lines from nuclear power plants are generally indistinguishable from those from other power plants. Because electrical transmission lines are common throughout the United States, they are generally perceived with less prejudice than the nuclear power plant itself. Also, the visual impact of transmission lines tends to wear off when viewed repeatedly.

E4.1.3.4 Analysis

The visual appearance of the plant and in-scope transmission lines is presented in Section E3.2.3 of this ER. As presented in Section E3.2.3, the NAPS plant is located on the south side of Lake Anna in a rural area surrounded by forest. Predominant visual features at NAPS are the reactor containment buildings, the turbine buildings, and transmission lines. Because of the wooded setting and remote location, NAPS would have minimal visual impact on neighboring properties or from the viewpoint of Lake Anna. As noted in Section E2.3, no refurbishment or construction activities have been identified that would change the aesthetics of the NAPS facility during the proposed SLR operating term. Therefore, no changes in visual resources during the proposed SLR operating term are anticipated.

In the GEIS, the NRC determined that aesthetic impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a Category 1 issue (NRC. 2013a, Section 4.2.1.2). Based on Dominion's review, no new and significant information was identified as it relates to visual resources, and further analysis is not required.

E4.2 AIR QUALITY

E4.2.1 AIR QUALITY IMPACTS (ALL PLANTS)

E4.2.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Air quality impacts from continued operations and refurbishment associated with license renewal are expected to be SMALL at all plants. Emissions resulting from refurbishment activities at locations in or near air quality nonattainment or maintenance areas would be short-lived and would cease after these refurbishment activities are completed. Operating experience has shown that the scale of refurbishment activities has not resulted in exceedance of the de minimis thresholds for criteria pollutants, and BMPs, including fugitive dust controls and the imposition of permit conditions in state and local air emissions permits, would ensure conformance with applicable state or tribal implementation plans.

Emissions from emergency diesel generators and fire pumps, and routine operations of boilers used for space heating, would not be a concern, even for plants located in or adjacent to nonattainment areas. Impacts from cooling tower particulate emissions, even under the worst-case situations, have been SMALL.

E4.2.1.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.2.1.3 Background [GEIS Section 4.3.1.1]

Impacts on air quality during normal plant operations can result from operations of fossil fuel-fired equipment needed for various plant functions. Each licensed plant typically employs emergency diesel generators for use as a backup power source. Emergency diesel generators and fire pumps typically require state or local operating permits. These diesel generators are typically tested once a month with several test burns of various durations (e.g., one to several hours).

In addition to these maintenance tests, longer-running endurance tests are typically conducted at each plant. Each generator is typically tested for 24 hours on a staggered test schedule (e.g., once every refueling outage). In addition to the emergency diesel generators, fossil fuel (i.e., diesel-, oil-, or natural-gas-fired) boilers are used primarily for evaporator heating, plant space heating, and/or feedwater purification. These units typically operate at a variable load on a continuous basis throughout the year unless end use is restricted to one application, such as space heating. The utility boilers at commercial plants are relatively small when compared with most industrial boilers and are typically regulated through state-level operating permits.

As presented in Section 3.3 of the GEIS, cooling tower drift can increase downwind particulate matter (PM) concentrations, impair visibility, ice roadways, cause drift deposition, and damage vegetation and painted surfaces. Thus, although there is the potential for some air quality impacts to occur as a result of equipment and cooling tower operations, even in the worst-case situation (Hope Creek), the impacts have been SMALL, and licensees would be required to operate within state permit requirements.

In the 1996 GEIS, the NRC concluded that the impacts from plant refurbishment associated with license renewal on air quality could range from SMALL to LARGE, although these impacts were expected to be SMALL for most plants. However, findings from license renewal SEISs published since the 1996 GEIS have shown that refurbishment activities, such as steam generator and vessel head replacement, have not required the large numbers of workers and months of time, as well as the degree of land disturbance that was conservatively estimated in the 1996 GEIS. Presumed air pollutant emissions, including levels of fugitive dust, have therefore not been realized.

E4.2.1.4 Analysis

Air quality information is presented in Section E3.3.3 of this ER. No license renewal-related refurbishment activities have been identified, as presented in Section E2.3. As stated in the GEIS, BMPs, including fugitive dust controls and the imposition of permit conditions in VDEQ air emissions permits, would ensure conformance with applicable state implementation plans. As presented in Section E3.3.3.1, Louisa County is in attainment with the NAAQS for all criteria air pollutants.

As presented in Section E3.3.3.2, no future upgrade or replacement activities (e.g., diesel generators, diesel pumps) that would increase or decrease air emissions over the SLR operating term were identified as necessary for plant operations.

NAPS is permitted under a 2019 air permit No. 40726 (VDEQ. 2019b). Dominion is not aware of any issues that will significantly change the permit compliance of NAPS.

As presented in Section E3.3.3.2, the NAPS air permit contains conditions established by the VDEQ to protect Virginia's ambient air quality standards and ensure impacts are maintained at acceptable levels. Appropriate permit conditions would regulate any future NAPS activities that may increase air pollutants or threaten the attainment status of Louisa County.

Compliance with current and future air emissions regulatory requirements, applicable emissions control measures, and reporting requirements will ensure continued SMALL impact on ambient air quality. In the GEIS, the NRC determined that air quality impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a

Category 1 issue (NRC. 2013a, Section 4.3.1.1). Based on Dominion's review, no new and significant information was identified as it relates to air quality, and further analysis is not required.

E4.2.2 AIR QUALITY EFFECTS OF TRANSMISSION LINES

E4.2.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.

E4.2.2.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.2.2.3 Background [GEIS Section 4.3.1.1]

Small amounts of ozone and substantially smaller amounts of oxides of nitrogen are produced by transmission lines during corona, a phenomenon that occurs when air ionizes near isolated irregularities on the conductor surface such as abrasions, dust particles, raindrops, and insects. Several studies have quantified the amount of ozone generated and concluded that the amount produced by even the largest lines in operation (765 kilovolts [kV]) is insignificant.

Ozone concentrations generated by transmission lines are therefore too low to cause any significant effects. The minute amounts of oxides of nitrogen produced are similarly insignificant. A finding of SMALL significance for transmission lines within this scope of review is supported by the evidence that production of ozone and oxides of nitrogen are insignificant and does not measurably contribute to ambient levels of those gases.

E4.2.2.4 Analysis

Based on the GEIS, it was determined through several studies that the amount of ozone generated by even the largest lines in operation (765 kV) would be insignificant (NRC. 2013a, Section 4.3.1.1). As presented in Section E2.2.5, the NAPS in-scope transmission lines are 34.5-kV and 500-kV. Therefore, the production of ozone and oxides of nitrogen would be de minimis.

In the GEIS, the NRC determined that air quality effects of transmission lines from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a Category 1 issue (NRC. 2013a, Section 4.3.1.1). Based on Dominion's review, no new and significant information was identified as it relates to air quality effects of transmission lines, and further analysis is not required.

E4.3 NOISE

E4.3.1 FINDINGS FROM 10 CFR 51, SUBPART A, APPENDIX B, TABLE B-1

SMALL. Noise levels would remain below regulatory guidelines for offsite receptors during continued operations and refurbishment associated with license renewal.

E4.3.2 REQUIREMENT [10 CFR 51.53(C)(3)(IV)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.3.3 BACKGROUND [GEIS SECTION 4.3.1.2]

Major sources of noise at operating nuclear power plants are cooling towers, turbines, transformers, large pumps, and cooling water system motors. Nuclear plant operations have not changed appreciably with time, and no change in noise levels or noise-related impacts is expected during the license renewal term. Since no change is expected in the amount of noise generated during the license renewal term, the only issue of concern is the number of people now living close to the nuclear power plant who are exposed to operational noise.

Given the industrial nature of the power plant and the number of years of plant operation, noise from a nuclear plant is generally nothing more than a continuous minor nuisance. However, noise levels may sometimes exceed the 55 dBA level that the EPA uses as a threshold level to protect against excess noise during outdoor activities. However, according to the EPA, this threshold does “not constitute a standard, specification, or regulation,” but was intended to provide a basis for state and local governments establishing noise standards. Nevertheless, noise levels at the site boundary are expected to remain well below regulatory standards for offsite residents.

Noise would also be generated by construction-related activities and equipment used during refurbishment. However, this noise would occur for relatively short periods of time (several weeks) and is not expected to be distinguishable from other operational noises at the site boundary nor create an adverse impact on nearby residents.

E4.3.4 ANALYSIS

Noise associated with plant operations is presented in Section E3.4 of this ER. No license renewal-related refurbishment activities have been identified, as presented in Section E2.3. As presented in Section E3.4, because NAPS is located in a rural area, it is unlikely that noise from NAPS would affect offsite residences. As discussed in Section E3.4, NAPS meets the buffer zone distance requirements set by Louisa County's zoning ordinance for industrial land use.

As presented in Section E3.4, NAPS has received one noise complaint for the period 2013–2017. NAPS may make a public announcement for planned noise-generating activities when necessary and perform outreach to the public for an unplanned noise-generating activity. NAPS also monitors noise at and around the plant site for occupational and ambient effects on an as-needed basis.

In the GEIS (NRC. 2013a, Section 4.3.1.2), the NRC determined that noise impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a Category 1 issue. Based on Dominion's review, no new and significant information was identified as it relates to noise, and further analysis is not required.

E4.4 GEOLOGY AND SOILS

E4.4.1 FINDINGS FROM 10 CFR 51, SUBPART A, APPENDIX B, TABLE B-1

SMALL. The effect of geologic and soil conditions on plant operations and the impact of continued operations and refurbishment activities on geology and soils would be SMALL for all nuclear power plants and would not change appreciably during the proposed license renewal term.

E4.4.2 REQUIREMENT [10 CFR 51.53(C)(3)(IV)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.4.3 BACKGROUND [GEIS SECTION 4.4.1]

The impact of continued operations and refurbishment associated with license renewal on geologic and soil resources would consist of soil disturbance, including sediment and/or any associated bedrock, for projects, such as replacing or adding buildings, roads, parking lots, and belowground and aboveground utility structures. Implementing BMPs would reduce soil erosion and subsequent impacts on surface water quality. These practices include, but are not limited to, minimizing the amount of disturbed land, stockpiling topsoil before ground disturbance, mulching and seeding in disturbed areas, covering loose materials with geotextiles, using silt fences to reduce sediment loading to surface water, using check dams to minimize the erosive power of drainages, and installing proper culvert outlets to direct flows in streams or drainages.

Detailed geotechnical analyses would be required to address the stability of excavations, foundation footings, and slope cuts for building construction, road creation, or other refurbishment-related construction projects. Depending on the plant location and design, riverbank or coastline protection might need to be upgraded, especially at water intake or discharge structures, if natural flows, such as storm surges, cause an increase in erosion. In addition, the Farmland Protection Policy Act [7 USC 4201 et seq.] requires federal agencies to take into account agency actions affecting the preservation of farmland including prime and other important farmland soils, as described in Section 3.4 of the GEIS.

E4.4.4 ANALYSIS

Geology and soils information is presented in Section E3.5 of this ER. Routine infrastructure, renovation, and maintenance projects would be expected during continued operation. As presented in Section E3.5.3.2 and Section E3.6.1.2.2, NAPS maintains and implements an SWPPP that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater, such as erosion, and identifies BMPs that will be used to prevent or reduce the pollutants in stormwater discharges.

In the GEIS, the NRC determined that geology and soil impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a Category 1 issue (NRC. 2013a, Section 4.4.1). Based on Dominion's review, no new and significant information was identified as it relates to geology and soils, and further analysis is not required.

E4.5 WATER RESOURCES

E4.5.1 SURFACE WATER USE CONFLICTS (PLANTS WITH COOLING PONDS OR COOLING TOWERS USING MAKEUP WATER FROM A RIVER)

E4.5.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts could be of SMALL or MODERATE significance, depending on makeup water requirements, water availability, and competing water demands.

E4.5.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river . . . must be provided.

E4.5.1.3 Background [GEIS Section 4.5.1.1]

Nuclear power plant cooling systems may compete with other users relying on surface water resources, including downstream municipal, agricultural, or industrial users. Closed-cycle cooling is not completely closed, because the system discharges blowdown water to a surface water body and withdraws water for makeup of both the consumptive water loss due to evaporation and drift (for cooling towers) and blowdown discharge. For plants using cooling towers, the makeup water needed to replenish the consumptive loss of water to evaporation can be significant and is reported at 60% or more of the condenser flow rate. Cooling ponds will also require makeup water as a result of naturally occurring evaporation, evaporation of the warm effluent, and possible seepage to groundwater.

Consumptive use by plants with cooling ponds or cooling towers using makeup water from a river during the license renewal term is not expected to change unless power uprates, with associated increases in water use, are proposed. Such uprates would require an environmental assessment by the NRC. In the 1996 GEIS, application of this issue applied only to rivers with low flow to define the difference between plants located on “small” versus “large” rivers.

However, any river, regardless of size, can experience low flow conditions of varying severity during periods of drought and changing conditions in the affected watershed such as upstream diversions and use of river water. The NRC subsequently determined that use of the term “low flow” in categorizing river flow is of little value, considering that all rivers can experience low flow conditions.

Population growth around nuclear power plants has increased demand on municipal water systems, including systems that rely on surface water. Municipal intakes located downstream from a nuclear power plant could experience water shortages, especially in times of drought. Similarly, water demands upstream from a plant could impact the water availability at the plant’s intake.

Water use conflicts associated with plants with cooling ponds or cooling towers using makeup water from a river with low flow were considered to vary among sites because of differing site-specific factors, such as makeup water requirements, water availability (especially in terms of varying river flow rates), changing or anticipated changes in population distributions, or changes in agricultural or industrial demands.

E4.5.1.4 Analysis

As presented in Section E2.2.3 of this ER, NAPS utilizes an open-cycle cooling system and does not utilize cooling ponds or cooling towers. Therefore, this issue is not applicable and further analysis is not required.

E4.5.2 GROUNDWATER USE CONFLICTS (PLANTS WITH CLOSED-CYCLE COOLING SYSTEMS THAT WITHDRAW MAKEUP WATER FROM A RIVER)

E4.5.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Water use conflicts could result from water withdrawals from rivers during low-flow conditions, which may affect aquifer recharge. The significance of impacts would depend on makeup water requirements, water availability, and competing water demands.

E4.5.2.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands . . . must be provided. The applicant shall also provide an assessment of the impacts of the withdrawal of water from the river on alluvial aquifers during low flow.

E4.5.2.3 Background [GEIS Section 4.5.1.2]

In the case of plants with cooling towers or cooling ponds that rely on a river for makeup of consumed (evaporated) cooling water, it is possible water withdrawals from the river could lead to groundwater use conflicts with other users. This situation could occur because of the interaction between groundwater and surface water, especially in the setting of an alluvial aquifer in a river valley. Consumptive use of the river water, if significant enough to lower the river's water level, would also influence water levels in the alluvial aquifer. Shallow wells of nearby groundwater users could therefore have reduced water availability or go dry. During times of drought, the effect would occur naturally, although withdrawals for makeup water would increase the effect.

E4.5.2.4 Analysis

As presented in Section E2.2.3 of this ER, NAPS utilizes an open-cycle cooling system and does not utilize a closed-cycle cooling system for condenser cooling purposes. Therefore, this issue is not applicable and further analysis is not required.

E4.5.3 GROUNDWATER USE CONFLICTS (PLANTS THAT WITHDRAW MORE THAN 100 GPM)

E4.5.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Plants that withdraw more than 100 gpm could cause groundwater use conflicts with nearby groundwater users.

E4.5.3.2 Requirement [10 CFR 51.53(c)(3)(ii)(C)]

If the applicant's plant pumps more than 100 gallons (total onsite) of groundwater per minute, an assessment of the impact of the proposed action on groundwater must be provided.

E4.5.3.3 Background [GEIS Section 4.5.1.2]

A nuclear plant may have several wells with combined pumping in excess of 100 gpm (378 liters per minute [L/min]). Overall site pumping rates of this magnitude have the potential to create conflicts with other local groundwater users if the cone of depression extends to the offsite well(s). Large offsite pumping rates for municipal, industrial, or agricultural purposes may, in turn, lower the water level at power plant wells. For any user, allocation is normally determined through a state-issued permit.

Groundwater use conflicts have not been observed at any nuclear power plants, and no significant change in water well systems is expected over the license renewal term. If a conflict did occur, it might be possible to resolve it if the power plant relocated its well or wellfield to a different part of the property. The siting of new wells would be determined through a hydrogeologic assessment.

E4.5.3.4 Analysis

The Virginia Department of Health (VDH) (Permits No. 2109600 and 2109610) allows a maximum withdrawal of 169,200 gpd (117.50 gpm). (VDH. 1991; VDH. 2014)

The VDEQ reviews all groundwater withdrawals/usage for the area when approving a groundwater withdrawal permit. In addition, NAPS is required to report monthly potable groundwater withdrawals to the VDH and submit an annual report of water withdrawals (surface and groundwater) for the previous year to the VDEQ.

As presented in Section E3.6.3.2, groundwater withdrawal for use by NAPS is accomplished from three water supply wells permitted for public use by the VDH. These three wells (Nos. 6, 7, and 8) comprise a single water supply system at the site. A separately permitted well (NANIC) provides the water supply for the North Anna Nuclear Information Center. Supply well No. 4 was permanently abandoned in November 2013.

As presented in Table E3.6-7a, the average groundwater withdrawal rate by NAPS in 2019 was reported as 7,969.86 gpd (5.53 gpm) and averaged 8,059.80 gpd (5.60 gpm) between 2013 and 2019, well below 100 gpm. As it is not anticipated that groundwater withdrawal increases will be required during the SLR operating term, Dominion concludes that impacts from groundwater withdrawals are SMALL and do not warrant additional mitigation measures. Because NAPS does not withdraw more than 100 gpm, this issue is not applicable and further analysis is not required.

E4.5.4 GROUNDWATER QUALITY DEGRADATION (PLANTS WITH COOLING PONDS AT INLAND SITES)

E4.5.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Inland sites with closed-cycle cooling ponds could degrade groundwater quality. The significance of the impact would depend on cooling pond water quality, site hydrogeologic conditions (including the interaction of surface water and groundwater), and the location, depth, and pump rate of water wells.

E4.5.4.2 Requirement [10 CFR 51.53(c)(3)(ii)(D)]

If the applicant's plant is located at an inland site and utilizes cooling ponds, an assessment of the impact of the proposed action on groundwater quality must be provided.

E4.5.4.3 Background [GEIS Section 4.5.1.2]

Some nuclear power plants that rely on unlined cooling ponds are located at inland sites surrounded by farmland or forest or undeveloped open land. Degraded groundwater has the potential to flow radially from the ponds and reach offsite groundwater wells. The degree to which this occurs depends on the water quality of the cooling pond; site hydrogeologic conditions (including the interaction of surface water and groundwater); and the location, depth, and pump rate of water wells. Mitigation of significant problems stemming from this issue could include lining existing ponds, constructing new lined ponds, or installing subsurface flow barrier walls. Groundwater monitoring networks would be necessary to detect and evaluate groundwater quality degradation. The degradation of groundwater quality associated with cooling ponds has not been reported for any inland nuclear plant sites.

E4.5.4.4 Analysis

As presented in Section E2.2.3 of this ER, NAPS utilizes an open-cycle cooling system and does not utilize cooling ponds. Therefore, this issue is not applicable and further analysis is not required.

E4.5.5 RADIONUCLIDES RELEASED TO GROUNDWATER

E4.5.5.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Leaks of radioactive liquids from plant components and pipes have occurred at numerous plants. Groundwater protection programs have been established at all operating nuclear power plants to minimize the potential impact from any inadvertent releases. The magnitude of impacts would depend on site-specific characteristics.

E4.5.5.2 Requirement [10 CFR 51.53(c)(3)(ii)(P)]

An applicant shall assess the impact of any documented inadvertent releases of radionuclides into groundwater. The applicant shall include in its assessment a description of any groundwater protection program used for the surveillance of piping and components containing radioactive liquids for which a pathway to groundwater may exist. The assessment must also include a description of any past inadvertent releases and the projected impact to the environment (e.g., aquifers, rivers, lakes, ponds, ocean) during the license renewal term.

E4.5.5.3 Background [GEIS Section 4.5.1.2]

The issue is relevant to license renewal because all commercial nuclear power plants routinely release radioactive gaseous and liquid materials into the environment. These radioactive releases are designed to be planned, monitored, documented, and released into the environment at designated discharge points. But over the years, there have been numerous events at nuclear power reactor sites which involved unknown, uncontrolled, and unmonitored releases of liquids containing radioactive material into the groundwater.

The majority of the inadvertent liquid release events involved tritium, which is a radioactive isotope of hydrogen. However, other radioactive isotopes, such as cesium and strontium, have also been inadvertently released into the groundwater. The types of events include leakage from spent fuel pools, buried piping, and failed pressure relief valves on an effluent discharge line.

In 2006, the NRC's executive director for operations chartered a task force to conduct a lessons learned review of these incidents. On September 1, 2006, the task force issued its report: *Liquid Radioactive Release Lessons Learned Task Force Report*.

The most significant conclusion dealt with the potential health impacts on the public from the inadvertent releases. Although there were numerous events during which radioactive liquid was released to the groundwater in an unplanned, uncontrolled, and unmonitored fashion, based on the data available, the task force did not identify any instances where public health and safety were adversely impacted.

On the basis of the information and experience with these leaks, the NRC concludes that the impact to groundwater quality from the release of radionuclides could be SMALL or MODERATE, depending on the magnitude of the leak, the radionuclides involved, hydrogeologic factors, the distance to receptors, and the response time of plant personnel in identifying and stopping the leak in a timely fashion.

E4.5.5.4 Analysis

A description of the NAPS groundwater protection and underground piping and tank integrity programs is presented in Section E3.6.2.4. Table E3.6-3 presents well construction details for the NAPS groundwater monitoring wells, while Figure E3.6-5 shows the location of the wells. No registered water wells or municipal water supply wells were located within a two-mile band around the NAPS property boundary.

As presented in Section E3.6.4.2.1, no unplanned radioactive liquid releases were reported between 2012 and 2019. Tritium has been detected in groundwater monitoring wells in the vicinity of the power block, as discussed in Section E3.6.4.2, but all current measurements are well below the safe drinking water standard. Further, groundwater movement in the area is toward Lake Anna, where any groundwater migration from the power block would be greatly diluted.

Therefore, since water from station uses continues to be processed and monitored in compliance with licensing and permitting, and site procedures and programs have been established to reduce the probability and consequences of pipe and tank failure, and tritium has not been detected in groundwater from the facility boundary monitoring wells, Dominion concludes that impacts from radionuclides to groundwater are SMALL and do not warrant additional mitigation measures beyond Dominion's existing groundwater monitoring program.

E4.6 ECOLOGICAL RESOURCES

E4.6.1 IMPINGEMENT AND ENTRAINMENT OF AQUATIC ORGANISMS (PLANTS WITH ONCE-THROUGH COOLING SYSTEMS OR COOLING PONDS)

E4.6.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. The impacts of impingement and entrainment are SMALL at many plants but may be MODERATE or even LARGE at a few plants with once-through and cooling-pond cooling systems, depending on cooling system withdrawal rates and volumes and the aquatic resources at the site.

E4.6.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(B)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of current Clean Water Act 316(b) determinations . . . or equivalent State permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from . . . impingement and entrainment.

E4.6.1.3 Background [GEIS Section 4.6.1.2]

Impingement occurs when organisms are held against the intake screen or netting placed within intake canals. Most impingement involves fish and shellfish. At some nuclear power plants, other vertebrate species may also be impinged on the traveling screens or on intake netting placed within intake canals.

Entrainment occurs when organisms pass through the intake screens and travel through the condenser cooling system. Aquatic organisms typically entrained include ichthyoplankton (fish eggs and larvae), larval stages of shellfish and other macroinvertebrates, zooplankton, and phytoplankton. Juveniles and adults of some species may also be entrained if they are small enough to pass through the intake screen openings, which are commonly 0.38 in. (1 cm) at the widest point.

The magnitude of the impact would depend on plant-specific characteristics of the cooling system (including location, intake velocities, screening technologies, and withdrawal rates) and characteristics of the aquatic resource (including population distribution, status, management objectives, and life history).

E4.6.1.4 Analysis

The two nuclear power-generating units at NAPS use an open-cycle cooling water system with cooling water for both units withdrawn from Lake Anna. As presented in Section E3.7.3, NAPS has a single cooling water intake structure with two screenwells, one for each unit. The screenwells have traveling water screens of 1/8-inch by 1/2-inch screen mesh. There is no fish return system; fish and debris collected on the traveling screens are conveyed to a debris collection structure and disposed of offsite. (HDR. 2018).

The NAPS cooling water system is operated under VPDES Permit No. VA0052451. As described in the VDPES permit, a "1985 environmental report on impingement and entrainment studies conducted at the facility indicated minimal or no adverse environmental impact." The 1985 report is the CWA Section 316(b) demonstration (Virginia Power. 1985). As discussed in the SEIS for the initial license renewal (NRC. 2002a, Sections 4.1.1 and 4.1.2), the demonstration was submitted to the Virginia State Water Control Board in May 1985, and based on the demonstration and other input, the board issued NPDES Permit No. VA0052451 for NAPS in 2001. Virginia regulations provide that compliance with a NPDES permit constitutes compliance with Sections 301 and 306 of the CWA (9 VAC25-31-60.A.1). Section 316(b) requires that any standard established pursuant to Sections 301 or 306 of the CWA shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts. Therefore, issuance of the VPDES permit indicated that NAPS's intake structure met best technology available.

VPDES Permit No. VA0052451 was issued in 2014 (Attachment B) and included an expiration date of May 7, 2019, but remains in effect because a timely renewal application was filed. An application for renewal of the permit was submitted on October 15, 2018 (Dominion. 2018e), and an addendum was submitted on March 12, 2019 (Dominion. 2019e).

For a renewed VPDES permit, NAPS is required by 316(b) regulations (40 CFR §122.21(r)) to address impingement and entrainment requirements under the rule's regulations that became effective in October 2014. Regarding impingement reduction requirements of the rule, Dominion requested concurrence from VDEQ regarding the application of the 40 CFR §125.92(c)(2) definition of closed-cycle recirculating system to NAPS. After the VDEQ's consultation with the EPA Region 3, the VDEQ agreed that the station meets the administrative criteria of a closed-cycle recirculating system consistent with the definition in 40 CFR §125.92(c)(2) (VDEQ. 2017). Therefore, NAPS meets the impingement mortality reduction standard through Compliance Alternative 1

(§125.94(c)(1)). For the rule's entrainment-related requirements, Dominion commissioned a two-year entrainment study as presented in Section E3.7.3. As mentioned above, Dominion has submitted a renewal application. These submittals collectively fulfilled the 316(b) rule application requirements specified in 40 CFR §122.21(r). Per the 316(b) regulations, VDEQ will evaluate the study results and determine the best technology available.

The results of the entrainment sampling were used to develop entrainment estimates in accordance with the 316(b) Rule. As mentioned above, the traveling water screens in use at NAPS are 1/8-inch by 1/2-inch screen mesh, which is a finer mesh size than the maximum opening of 0.56 inch (1/2-inch by 1/4-inch) defined by CWA Section 316(b) for the calculation of entrainable organisms. Therefore, a subset of the organisms that would be entrainable by the rule's definition of entrainment are instead retained by the NAPS screens as impinged organisms. To account for the finer mesh screen, Dominion calculated a baseline entrainment density and annual loss estimates based on the 2016–2017 entrainment study (see Section E3.7.3). Annual baseline entrainment at NAPS during 2016 (April through September) was estimated at 53,593,333 finfish and 67,924,622 finfish under actual intake flows and design flows, respectively, based on the first year of sampling. Annual baseline entrainment for 2017 (March through September) was estimated at 83,421,119 finfish and 99,782,529 finfish under actual intake flows and design flows, respectively, based on the second year of sampling. (HDR. 2018)

As presented in Section E3.7.1, the VDGIF manages the fisheries of Lake Anna. The VDGIF monitors the abundance of fish species through annual electrofishing or net sampling and makes fish stocking decisions accordingly. The VDGIF reviews the results of annual sampling and considers trends in the diversity and abundance of the fishery. For the 2003 to 2015 period, the VDGIF evaluated the community structure for fish in Lake Anna with gill netting. Results indicate Lake Anna is home to many species including recreationally important species such as largemouth bass, striped bass, and black crappie and forage species. Gill net sampling identified 32 species with year-to-year variation in species abundance. The VDGIF evaluated Lake Anna's largemouth bass population through electrofishing and found that all size groups increased or remained stable over the past 15 years (VDGIF. 2016).

Dominion also monitors the health of the Lake Anna fishery through annual biological sampling required under the NAPS VPDES permit. The recent results and trends of the annual sampling are presented in Section E3.7.3. Dominion found annual sampling results and trends demonstrate a balanced, indigenous fish community exists in Lake Anna. Trending of abundance based on CPUE measures also indicate year-to-year variations, but no consistent downward or upward trends. Dominion's monitoring and trending of the North Anna River's fishery below the North Anna Dam likewise demonstrated diversity to be rich and stable and abundance fairly consistent. (Dominion. 2018d) The annual sampling data from 2013–2018 do not identify any negative impacts from the operation of NAPS (Dominion. 2013b; Dominion. 2014c; Dominion. 2015d; Dominion. 2016d; Dominion. 2017b; Dominion. 2018d).

Dominion complies with the current VPDES permit and will comply with future renewal of the permit, implementing any best technology available requirements determined necessary to minimize impacts of impingement and entrainment. Further, annual sampling and analysis indicates that operation of NAPS is not having a negative impact on the fisheries of Lake Anna or the North Anna River. Because of continued compliance with VDEQ requirements, Dominion concludes that impacts from impingement and entrainment of aquatic organisms during the proposed SLR operating term would be SMALL. Although additional mitigation measures may be implemented in the future as a result of the 316(b) Rule, these measures would minimize the already existing SMALL impacts.

E4.6.2 THERMAL IMPACTS ON AQUATIC ORGANISMS (PLANTS WITH ONCE-THROUGH COOLING SYSTEMS OR COOLING PONDS)

E4.6.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Most of the effects associated with thermal discharges are localized and are not expected to affect overall stability of populations or resources. The magnitude of impacts, however, would depend on site-specific thermal plume characteristics and the nature of aquatic resources in the area.

E4.6.2.2 Requirement [10 CFR 51.53(c)(3)(ii)(B)]

If the applicant's plant utilizes once-through cooling or cooling pond heat dissipation systems, the applicant shall provide a copy of . . . a 316(a) variance in accordance with 40 CFR 125, or equivalent State permits and supporting documentation. If the applicant cannot provide these documents, it shall assess the impact of the proposed action on fish and shellfish resources resulting from thermal changes . . . .

E4.6.2.3 Background [GEIS Section 4.6.1.2]

Because characteristics of both the thermal discharges and the affected aquatic resources are specific to each site, the NRC classified heat shock as a Category 2 issue that required a site-specific assessment for license renewal. The NRC found the potential for thermal discharge impacts to be greatest at plants with once-through cooling systems, primarily because of the higher discharge temperatures and larger thermal plume area compared to plants with cooling towers.

The impact level at any plant depends on the characteristics of its cooling system (including location and type of discharge structure, discharge velocity and volume, and three-dimensional characteristics of the thermal plume) and characteristics of the affected aquatic resources (including the species present and their physiology, habitat, population distribution, status, management objectives, and life history).

E4.6.2.4 Analysis

Section 316(a) of the CWA establishes a process whereby a thermal effluent discharger can demonstrate that thermal discharge limitations are more stringent than necessary and, using a variance, obtain alternative facility-specific thermal discharge limits [33 USC 1326].

As presented in Section E2.2.3, NAPS has an open-cycle heat dissipation system. The NAPS discharge permit limits waste heat rejected to the WHTF from NAPS to 13.54 x 10^9 Btu/hour. The thermal effluent limit is allowed under a CWA 316(a) variance based on a successful 316(a) demonstration and continuing monitoring requirements (VDEQ. 2014) as presented below.

A CWA Section 316(a) demonstration study was initiated in 1984 and a final report issued in 1986 (Virginia Power. 1986). The Virginia Water Control Board (VWCB) accepted that the study demonstrated that the operation of the power station had not resulted in significant harm to the biological community of Lake Anna. The VWCB also found that effluent limitations more stringent than the thermal limitations in the VPDES permit are not necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in Lake Anna and the North Anna River downstream of the lake. It therefore granted a 316(a) variance. This variance is continued in the current VPDES permit (Attachment B). As the fact sheet supporting that permit states, "[t]he permittee has been granted a variance in accordance with 316(a) of the Clean Water Act" (VDEQ. 2014). Subsequent to the 316(a) study, Dominion committed to continue selected environmental studies on the North Anna Reservoir, the WHTF, and the lower North Anna River as part of a post-316(a) demonstration agreement. As presented in Section E3.7.3, under this agreement Dominion conducts annual biological studies and monitors temperature and other water quality parameters in accordance with a VDEQ-approved study plan. (VDEQ. 2014; Virginia Power. 1986).

Dominion monitors Lake Anna water temperatures, using fixed temperature recorders at seven stations. Temperatures are reported by monitoring station as monthly maximum, mean, and minimum temperatures and compared with historical data. The range of temperatures and between-station temperature trends recorded over 2013–2018 were within the range of previously reported minimum and maximum lake temperatures. The maximum hourly average temperature reported for Lake Anna for years 2013–2018 was 91.4ºF, 88.9ºF, 91.2ºF, 93.7ºF, 91.0ºF, and 91.4ºF, respectively. (Dominion. 2013b; Dominion. 2014c; Dominion. 2015d; Dominion. 2016d; Dominion. 2017b; Dominion. 2018d) In the 2001 LRA, the highest (hourly average) water temperature for an operational year was stated to be 92.3ºF, recorded in July 1983 (Dominion. 2001, Section 2.2). These temperature data do not indicate an overall long-term warming trend in the lake.

Dominion also monitors temperature hourly at a station approximately 0.6 miles below the North Anna Dam. The maximum hourly average temperature reported for years 2013–2018 was 86.4ºF, 89.4ºF, 90.4ºF, 92.8ºF, 91.9ºF, and 90.9ºF, respectively. (Dominion. 2013b; Dominion. 2014c; Dominion. 2015d; Dominion. 2016d; Dominion. 2017b; Dominion. 2018d). The fact sheet developed by the VDEQ for the current VPDES permit presented the VDEQ's review of the monitoring reports and its decision that the granted thermal variance continues to be protective of the aquatic organisms in the receiving waterbody.

In conclusion, the thermal discharge associated with NAPS discharge has been demonstrated to be protective of the Lake Anna fishery and this demonstration continues to be supported by annual biological studies and temperature readings and trending. Issuance of the NAPS VPDES permit indicates the VDEQ's conclusion that NAPS, in operating in conformance with the permit, would be in compliance with the CWA requirements. Because there are no planned operational changes during the proposed SLR operating term that would increase the temperature of the existing NAPS thermal discharge, impacts are anticipated to be SMALL and mitigation measures are not warranted.

E4.6.3 WATER USE CONFLICTS WITH AQUATIC RESOURCES (PLANTS WITH COOLING PONDS OR COOLING TOWERS USING MAKEUP WATER FROM A RIVER)

E4.6.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts on aquatic resources in stream communities affected by water use conflicts could be of moderate significance in some situations.

E4.6.3.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river, and related impacts on stream (aquatic). . . ecological communities must be provided.

E4.6.3.3 Background [GEIS Section 4.6.1.2]

Increased temperatures and/or decreased rainfall would result in lower river flows, increased cooling pond evaporation, and lowered water levels in the Great Lakes or reservoirs. Regardless of overall climate change, droughts could result in problems with water supplies and allocations. Because future agricultural, municipal, and industrial users would continue to share their demands for surface water with power plants, conflicts might arise if the availability of this resource decreased.

Water use conflicts with aquatic resources could occur when water to support these resources is diminished either because of decreased water availability due to droughts; increased demand for agricultural, municipal, or industrial usage; or due to a combination of such factors. Water use conflicts with biological resources in stream communities are a concern due to the duration of license renewal and potentially increasing demands on surface water.

E4.6.3.4 Analysis

As presented in Section E2.2.3 of this ER, NAPS Units 1 and 2 utilize an open-cycle cooling system. Therefore, this issue is not applicable and further analysis is not required.

E4.6.4 WATER USE CONFLICTS WITH TERRESTRIAL RESOURCES (PLANTS WITH COOLING PONDS OR COOLING TOWERS USING MAKEUP WATER FROM A RIVER)

E4.6.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL or MODERATE. Impacts on terrestrial resources in riparian communities affected by water use conflicts could be of moderate significance.

E4.6.4.2 Requirement [10 CFR 51.53(c)(3)(ii)(A)]

If the applicant's plant utilizes cooling towers or cooling ponds and withdraws makeup water from a river, an assessment of the impact of the proposed action on water availability and competing water demands, the flow of the river, and related impacts on . . . riparian (terrestrial) ecological communities must be provided.

E4.6.4.3 Background [GEIS Section 4.6.1.1]

Water use conflicts with terrestrial resources in riparian communities could occur when water that supports these resources is diminished either because of decreased availability due to droughts; increased water demand for agricultural, municipal, or industrial usage; or a combination of such factors. For future license renewals, the potential range of impact levels at plants with cooling ponds or cooling towers using makeup water from a river cannot be determined at this time.

E4.6.4.4 Analysis

As presented in Section E2.2.3 of this ER, NAPS Units 1 and 2 utilize an open-cycle cooling system. Therefore, this issue is not applicable and further analysis is not required.

E4.6.5 EFFECTS ON TERRESTRIAL RESOURCES (NON-COOLING SYSTEM IMPACTS)

E4.6.5.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Impacts resulting from continued operations and refurbishment associated with license renewal may affect terrestrial communities. Application of best management practices would reduce the potential for impacts. The magnitude of impacts would depend on the nature of the activity, the status of the resources that could be affected, and the effectiveness of mitigation.

E4.6.5.2 Requirement [10 CFR 51.53(c)(3)(ii)(E)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license renewal-related construction activities on important plant and animal habitats.

E4.6.5.3 Background [GEIS Section 4.6.1.1]

Continued operations and refurbishment activities could continue to affect onsite terrestrial resources during the license renewal term at all operating nuclear power plants. Factors that could potentially result in impacts include landscape maintenance activities, stormwater management, and elevated noise levels. These impacts would, for the most part, be similar to past and ongoing impacts.

The characteristics of terrestrial habitats and wildlife communities currently on nuclear power plant sites have generally developed in response to many years of typical operations and maintenance programs. While some may have reached a relatively stable condition, some habitats and populations of some species may have continued to change gradually over time. Operations and maintenance activities during the license renewal term are expected to be similar to current activities. Because the species and habitats present on the sites (i.e., weedy species and habitats they make up) are generally tolerant of disturbance, it is expected that continued operations during the license renewal term would maintain these habitats and wildlife communities in their current state, or maintain current trends of change.

Terrestrial habitats and wildlife could be affected by ground disturbance from refurbishment-related construction activities. Land disturbed during the construction of new independent spent fuel storage installations (ISFSIs) would range from about 2.5 to 10 acres (1 to 4 ha). Other activities may include new parking areas for plant employees, access roads, buildings, and facilities. Temporary project support areas for equipment storage, worker parking, and material laydown areas could also result in the disturbance of habitat and wildlife.

Successful application of environmental review procedures, employed by the licensees at many of the operating nuclear plant sites, would result in the identification and avoidance of important terrestrial habitats. In addition, the application of BMPs to minimize the area affected; to control fugitive dust, runoff, and erosion from project sites; to reduce the spread of invasive nonnative plant species; and to reduce disturbance of wildlife in adjacent habitats could greatly reduce the impacts of continued operations and refurbishment activities.

E4.6.5.4 Analysis

E4.6.5.4.1 Refurbishment Activities

As presented in Section E2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no license renewal-related refurbishment impacts to important plant and animal habitats, and no further analysis is required.

E4.6.5.4.2 Operational Activities

Terrestrial resources are described in Section E3.7.2. No license renewal-related construction activities or changes in operational practices have been identified that would involve disturbing habitats. Dominion would continue to conduct ongoing plant operational and maintenance activities during the SLR term. Operational and maintenance activities that Dominion might undertake during the SLR term, such as maintenance and repair of plant infrastructure (e.g., roadways, piping installations, fencing, and other security infrastructure), would likely be confined to previously disturbed areas of the site. Existing regulatory programs that the site is subject to, as presented in Section E3.7.6, ensure that habitats and wildlife are protected. These are related to programs such as the following: stormwater management for controlling the runoff of pollution sources such as sediment, metals, or chemicals; spill prevention to ensure that BMPs and structural controls are in place to minimize the potential for a chemical release to the environment; and management of herbicide applications to ensure that the intended use will not adversely affect the environment. As presented in Section E3.7.5, Dominion has invasive species control guidance that includes requirements for selection of appropriate and approved herbicides and pesticides. Dominion also maintains procedures on the use of herbicides and pesticides for transmission line ROWs (see Section E3.7.2.5).

Dominion has issued guidance on the review of proposed construction and changes to existing equipment or processes. The guidance is designed to prompt review of proposed construction and changes for environmental implications and the need for permits or permit modifications, ensuring Dominion complies with Virginia's regulatory programs. The guidance includes a series of questions on the proposed construction or change regarding the potential for air emissions, for water use, new or modification of existing wastewater discharges, waste generation, land disturbance, encroachment on wetlands, etc. Dominion has established specific procedures and guidance to address ground disturbance from any activity to ensure compliance with regulations and permit requirements for erosion and sediment control, stormwater, and wetlands and wetland buffers. The VDEQ requires implementation of BMPs to prevent and control sedimentation and silting of waterways and wetlands and stabilization of soils and stormwater management and controls. Dominion procedures address air emission permitting and surface and groundwater withdrawal permitting. Dominion also has spill control and prevention plans and periodic reviews to ensure the control and practices are in place to protect aquatic and terrestrial habitats and species from inadvertent spills and releases.

While operations and maintenance activities for NAPS during the SLR term would likely be confined to the previously disturbed portions of the NAPS site, as presented in Section E7.2.3.1.7, the NRC reviewed the potential impacts of constructing an additional generating unit (NAPS Unit 3) at the NAPS site. The NRC addressed impacts on terrestrial ecological resources, including loss of habitat, loss of wetlands, noise, dust emissions, and avian collisions. Based on Dominion's implementation of construction mitigation measures, the NRC concluded that impact to terrestrial resources would be SMALL. The mitigation measures would include instituting construction BMPs for erosion and dust control, noise abatement, and proper equipment maintenance; restricting the timing of activities to minimize impacts to resources such as breeding birds and rare plants; and adhering to applicable permit conditions.

In summary, adequate management programs and regulatory controls are in place to ensure that important plant and animal habitats are protected during the NAPS SLR term. Therefore, Dominion concludes the impacts to the terrestrial ecosystems from license renewal are SMALL and no additional mitigation measures beyond current management programs and existing regulatory controls are required.

E4.6.6 THREATENED, ENDANGERED, AND PROTECTED SPECIES, AND ESSENTIAL FISH HABITAT

E4.6.6.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

The magnitude of impacts on threatened, endangered, and protected species, critical habitat, and essential fish habitat would depend on the occurrence of listed species and habitats and the effects of power plant systems on them. Consultation with appropriate agencies would be needed to determine whether special status species or habitats are present and whether they would be adversely affected by continued operations and refurbishment associated with license renewal.

E4.6.6.2 Requirement [10 CFR 51.53(c)(3)(ii)(E)]

All license renewal applicants shall assess the impact of refurbishment, continued operations, and other license renewal-related construction activities on important plant and animal habitats. Additionally, the applicant shall assess the impact of the proposed action on threatened or endangered species in accordance with federal laws protecting wildlife, including but not limited to, the ESA, and EFH in accordance with the Magnuson-Stevens Fishery Conservation and Management Act.

E4.6.6.3 Background [GEIS Section 4.6.1.3]

There are several federal acts that provide protection to certain species and habitats that are treated here under a single issue. The issue includes impacts to biological resources such as threatened and endangered species and their critical habitat under the ESA, EFH as protected under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and impacts to mammalian species protected under the Marine Mammal Protection Act.

Factors that could potentially result in impacts on listed terrestrial species include habitat disturbance, cooling tower drift, operation and maintenance of cooling systems, transmission line ROW maintenance, collisions with cooling towers and transmission lines, and exposure to radionuclides. The listed species on or in the vicinity of nuclear power plants also range widely, depending on numerous factors such as the plant location and habitat types present.

Potential impacts of continued operations and refurbishment activities on federally or state-listed threatened and endangered species, protected marine mammals, and EFH could occur during the license renewal term. Factors that could potentially result in impacts to these species and habitats include impacts of refurbishment, other ground-disturbing activities, release of contaminants, effects of cooling water discharge on dissolved oxygen, gas supersaturation, eutrophication, thermal discharges, entrainment, impingement, reduction in water levels due to the cooling system operations, dredging, radionuclides, and transmission line ROW maintenance.

E4.6.6.4 Analysis

E4.6.6.4.1 Refurbishment Activities

As presented in Section E2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no license renewal-related refurbishment impacts to threatened, endangered, and protected species, designated critical habitat, or EFH, and no further analysis is required.

E4.6.6.4.2 Operational Activities

E4.6.6.4.2.1 Impacts on Protected Species

As presented in Section E3.7.8.1, there are six federally listed species which are either threatened, endangered, or candidate species within Louisa and Spotsylvania counties. In addition, as presented in Section E3.7.8.2, the VDGIF-FWIS and Virginia Natural Heritage Program (VNHP) have designated five species that do not have a federal listing status as state-listed threatened or endangered.

Of the six federally listed species, suitable habitat for four species—the dwarf wedge mussel, the James spinymussel, the green floater, and the yellow lance—does not occur on the NAPS site. Occurrences of these species at the NAPS site are unlikely, and have not been observed.

Suitable habitat for the federally listed northern long-eared bat and the small whorled pogonia, as well as the bald eagle (protected under the BGEPA), exists on or in the vicinity of the NAPS site.

The bald eagle is known to nest on the NAPS site. There are four known bald eagle nests adjacent to Lake Anna, one of which is located on the NAPS site. All four nests were occupied and produced young in 2019. Although the bald eagle is no longer listed as threatened, activities on the NAPS site are evaluated to ensure compliance under the BGEPA and MBTA. When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. Compliance with all regulatory requirements associated with this species will continue to be an administrative control practiced by Dominion for the life of the NAPS facility. Adherence to these controls, as well as compliance with laws and regulations, will minimize the potential for impacts to bald eagles. The continued operation of NAPS is not likely to impact this species.

While there is potentially habitat for the northern long-eared bat on the NAPS site, the nearest locations of summer habitat and hibernacula that have been identified by the VDGIF are 70 miles away. Further, surveys conducted in 2016 found no evidence that the northern long-eared bat utilizes the NAPS site (GAI Consultants. 2016).

Actions requiring the removal of trees by Dominion would require adherence to the USFWS 4(d) Rule which sets guidelines for incidental take and consultation with federal wildlife agencies (USFWS. 2018e). Dominion's compliance with federal, state and local laws and regulations will prevent unlawful take of this species. As presented in Section E3.4, noise levels at NAPS are anticipated to remain the same as under current operating conditions during the proposed SLR operating term. Continued operations of the NAPS facility are not likely to affect the northern long-eared bat.

Plant-specific identification surveys, conducted on the site during the 2010 and 2012 flowering seasons, determined that the small whorled pogonia was not present. The VDCR reviewed the 2010 survey report and concurred with the methodology and findings (Dominion. 2016b, Section 2.4.1.6). Dominion has a commitment for biennial surveys for small whorled pogonia tied to construction of NAPS Unit 3 at the NAPS site. Given there is no current plan to start construction, Dominion has requested waivers and the USACE has granted waivers for the surveys with the most recent waiver granted in 2018 (USACE. 2018). As presented in Section E3.7.6, Dominion has administrative controls in place at NAPS to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs.

As presented in Section E3.7.8.2, optimal habitat for one state-listed species, the Virginia Piedmont water boatman, is not located within the portions of the NAPS site utilized for operations. Occurrences of this species within these areas have not been observed and are not expected. Due to the lack of optimal habitat, and the unlikely probability of this species to occur on the NAPS site, the continued operation of NAPS is not likely to affect this species.

Suitable habitat for four state-listed species is located on the NAPS site, or the species are highly mobile, and may occur on the site. These species are: the loggerhead shrike; the little brown bat; Rafinesque's eastern big-eared bat; and the tri-colored bat.

Migratory movements or local flight patterns may result in the occurrence of the loggerhead shrike in the vicinity of the NAPS site. Habitat for this species may be located on portions of the NAPS site not utilized for operations. However, activities on the NAPS site are evaluated to ensure compliance under the MBTA. When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. Additionally, Dominion maintains policies and procedures for addressing every avian incident associated with Dominion facilities. These procedures include an investigation process, required reporting of each incident to the USFWS, and procedures for implementing corrective actions following each incident. This administrative practice is designed to identify and correct potential sources of injury or mortality to avian species (Dominion. 2009a). Compliance with all regulatory requirements associated with this species will continue to be an administrative control practiced by Dominion for the life of the NAPS facility. Adherence to these controls, as well as compliance with laws and regulations, will minimize the potential for impacts to this species. The continued operation of NAPS is not likely to impact this species.

Dominion contracted for a bat survey in 2016 for forested portions of the site where licensed NAPS Unit 3 would be located if built. No listed bats were captured. (GAI Consultants. 2016) Although listed bats were not captured during the 2016 survey, substandard habitat for the little brown bat, Rafinesque's eastern big-eared bat, and the tri-colored bat may be located on portions of the NAPS site not utilized for operations. Dominion has established guidance to ensure that potential impacts on the northern long-eared bat are considered prior to site maintenance activities that require tree clearing. The guidance addresses (1) hazardous tree removal; (2) existing right-of-way maintenance and expansion; (3) clearing of less than or equal to 10 acres of trees; and (4) clearing of greater than 10 acres of trees that are not in or adjacent to an existing right-of-way. For clearing of greater than 10 acres, Dominion coordinates with the USFWS prior to undertaking such a project. As presented in Section E3.4, noise levels at NAPS are anticipated to remain the same as under current operating conditions during the proposed SLR operating term. Continued operations at NAPS are not likely to impact bat species utilizing these areas. Dominion's compliance with federal, state, and local laws and regulations will minimize impacts to these species.

Dominion is not aware of any adverse impacts regarding threatened, endangered, or protected species attributable to the site. Maintenance activities necessary to support license renewal likely would be limited to previously disturbed areas on site, and no additional land disturbance has been identified for the purpose of SLR. In addition, there are no plans to alter plant operations during the proposed SLR term which would affect threatened, endangered, or protected species.

As presented in Section E3.7.6, Dominion has administrative controls in place at NAPS to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs. In addition, regulatory programs, such as those presented in Chapter E9.0 that the site is subject to, further serve to minimize impacts to any threatened, endangered, and protected species.

E4.6.6.4.2.2 Impacts on Designated Critical Habitat

As presented in Section E3.7.8.1, none of the federally listed species which are either threatened, endangered, or candidate species within Louisa and Spotsylvania counties have designated critical habitat. The federally endangered Atlantic sturgeon is known to inhabit the Pamunkey River downstream of these two counties and the NAPS site. The following discussion addresses the potential for impacts attributable to the proposed action to the Atlantic sturgeon's designated critical habitat, which begins more than 50 miles downstream of the North Anna Dam.

The physical features essential for the conservation of Atlantic sturgeon and thus features important for Atlantic sturgeon habitat were identified by NMFS (82 FR 39160). These four physical features are the following:

1. Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0 to 0.5 parts per thousand [ppt] range) for settlement of fertilized eggs, refuge, growth, and development of early life stages.
2. Aquatic habitat with a gradual downstream salinity gradient of 0.5 up to as high as 30 ppt and soft substrate (e.g., sand, mud) between the river mouth and spawning sites for juvenile foraging and physiological development.
3. Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, gear, etc.) between the river mouth and spawning sites necessary to support:
    i. Unimpeded movement of adults to and from spawning sites;
    ii. Seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary; and
    iii. Staging, resting, or holding of subadults or spawning condition adults.
4. Water, between the river mouth and spawning sites, especially in the bottom meter of the water column, with the temperature, salinity, and oxygen values that, combined, support:
    i. Spawning;

ii. Annual and interannual adult, subadult, larval, and juvenile survival; and

iii. Larval, juvenile, and subadult growth, development, and recruitment (e.g., 13°C to 26°C for spawning habitat and no more than 30°C for juvenile rearing habitat, and 6 milligrams per liter (mg/l) dissolved oxygen (DO) or greater for juvenile rearing habitat).

As presented in Section E3.7.8.1.5, the designated critical habitat area for the Atlantic sturgeon extends upstream from the York River into the Pamunkey River to the Nelson's Bridge Road (Route 615) bridge located in Hanover County northeast of Richmond, Virginia (82 FR 39160). This location is more than 50 miles downstream from the North Anna Dam (USGS. 2018c).

Regarding the potential for NAPS to affect the substrate conditions of the physical features 1 and 2 listed above, NAPS discharges to Lake Anna and releases downstream of the lake are controlled at the North Anna Dam. The lake and dam minimize the ability of NAPS operations to contribute to silting downstream. As for the salinity conditions of physical features 1, 2, and 4, NAPS is not located on an estuary and its operations do not impact the salinity conditions in Lake Anna or downstream locations. Dominion conducts annual biological studies in Lake Anna and in the North Anna River downstream of the North Anna Dam. The studies in the North Anna Reservoir and the WHTF record standard physicochemical measurements (water temperature, dissolved oxygen, pH, and conductivity). The data demonstrate expected seasonal changes in temperature and dissolved oxygen, while conductivity and pH were relatively stable. The data are consistent with historical trends and indicate that these water quality parameters in the North Anna Reservoir and the WHTF are within the values that support a healthy fishery in the immediate NAPS area. (Dominion. 2017b). As presented in Section E4.6.2.4, temperature recordings from Lake Anna monitoring stations and the North Anna River monitoring station 0.6 miles below the North Anna dam continue to fall within previous minimum and maximum temperatures and do not indicate an overall long-term warming trend. Therefore, adverse impacts to these water quality parameters would not be expected downstream. As for the physical features of water depth and physical barriers to passage, continued operations at NAPS do not require dredging or construction of barriers to passage downstream.

Beyond the physical features mentioned above that influence the quality of the Atlantic sturgeon's habitat, Dominion's new and significant information review addressed other Category 1 issues of aquatic resources and surface water quality and use. No new and significant information was identified that would significantly impact water quality and aquatic resources or directly or indirectly impact the designated critical habitat. These issues concern the use of surface water for open-cycle cooling, discharge of metals in cooling water, discharge of biocides and sanitary wastes, the potential for water quality impacts from non-cooling water discharges, the potential for spills and minor chemical spills, sedimentation of surface waters, and related concerns. The new and significant information review concluded that compliance with current and future VPDES regulatory requirements and permit conditions, and implementation of the SWPPP and BMPs, will ensure continued protection of aquatic resources.

The impingement and entrainment of organisms that comprise the Atlantic sturgeon's diet could also impact the quality of the designated critical habitat. As stated in Section E3.7.1.1, since 1987, Dominion biologists have conducted biological studies in the North Anna River. Abundance and species composition data for the North Anna River fish assemblage are collected using electrofishing surveys at four sample locations. Thirty species of fish representing eight families were collected by electrofishing in the North Anna River in 2018. Historically, (1997–2018), species richness (number of species present in the sample) in the North Anna River has remained high. (Dominion. 2018d) The most recent five years of abundance/density measures (i.e., CPUE) are summarized in Table E3.7-4 along with the historical mean. When comparing the current year's results with the cumulative mean, Dominion biologists have not identified adverse trends in the CPUE results (Dominion. 2014c; Dominion. 2015d; Dominion. 2016d; Dominion. 2017b; Dominion. 2018d). Shannon's diversity index and Pielou's evenness index scores were calculated for the years 1998–2018 for the North Anna River. Diversity scores have stayed consistent among years, ranging from 1.96-2.5 with an average score of 2.26. Evenness scores have also been consistent over the years, ranging from 0.6-0.8 with an average score of 0.7. (Dominion. 2018d) These annual studies indicate that NAPS operations are not having an adverse impact on the downstream fishery of the North Anna River. The designated critical habitat of the Atlantic sturgeon is located even further downstream.

Considering the above discussion and Dominion's adherence to permit conditions and regulatory requirements and commitment to comply with future permit conditions and regulatory requirements, the potential for NAPS operations to impact the physical features essential for Atlantic sturgeon habitat is minimized. Therefore, Dominion concludes that NAPS operations under the proposed action are not likely to adversely modify the Atlantic sturgeon designated critical habitat.

E4.6.6.4.2.3 Impacts on EFH

As presented in Section E3.7.8.5, no EFH exists at Lake Anna or the North Anna River through its confluence with the South Anna River and no habitat areas of particular concern (HAPCs) or EFH areas protected from fishing are located on or adjacent to NAPS. As discussed in Section E4.6.1.4, annual studies indicate that NAPS operations are not having an adverse impact on the downstream fishery of the North Anna River. There are no EFHs between the North Anna Dam and the North Anna River's confluence with the South Anna River farther downstream. Dominion's monitoring and trending of the North Anna River's fishery below the North Anna dam likewise demonstrated diversity to be rich and stable, with abundance fairly consistent. Therefore, no adverse impacts to downstream fisheries and prey availability for EFH fisheries attributable to NAPS operations are expected. Given Dominion's adherence to permit conditions and regulatory requirements and commitment to comply with future permit conditions and regulatory requirements, continued operation of the NAPS facility is not likely to adversely impact EFH, HAPCs, or EFH areas protected from fishing.

E4.6.6.4.2.4 Migratory Bird Treaty Act

In addition to the bald eagle and loggerhead shrike, several bird species that may visit the site are protected under the MBTA. As described in Section E3.7.8.4, Dominion has an internal avian protection guidance document. Currently, Dominion maintains an annual depredation permit authorizing take of a maximum of 70 black vultures, 20 turkey vultures, 40 Canada geese, and 25 herring gulls, and destruction of nests and eggs of 10 herring gull nests and five osprey nests at Dominion-owned properties in Maryland, North Carolina, Virginia, and West Virginia. (USFWS. 2018d) Other bird species that occur within the six-mile vicinity protected under the MBTA that are also identified as Category I (critical conservation need) or II (very high conservation need) in the Virginia WAP include: American black duck (*Anas rubripes*), American woodcock (*Scolopax minor*), cerulean warbler (*Dendroica cerulean*), common tern (*Sterna hirundo*), and northern saw-whet owl (*Aegolius acadicus*) (78 FR 65844; VDGIF. 2015; VDGIF-FWIS. 2020).

When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. As presented in Section E3.7.6, Dominion has administrative controls in place at NAPS to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs. In addition, regulatory programs, such as those presented in Chapter E9.0 that the site is subject to, further serve to minimize impacts to protected species. Adherence to these controls, as well as compliance with laws and regulations, will minimize the potential for impacts to MBTA-protected species. The continued operation of NAPS is not likely to impact these MBTA-protected species.

In an effort to obtain an independent review, the USFWS, VDGIF-FWIS, VNHP, and NMFS were also consulted. Based on this independent review, it was determined that there would be no effect on federally and state-listed threatened, endangered, and protected species as a result of renewing the NAPS OL. Copies of the consultation letters to the USFWS, VDGIF-FWIS, VDCR, and NMFS and any responses are provided in Attachment C.

In summary, no license renewal-related refurbishment activities have been identified. As presented above, the continued operation of the site would have no adverse effects to any federally or state-listed species, designated critical habitat, or EFH. Therefore, Dominion concludes that license renewal would have no effect on threatened, endangered, and protected species in the vicinity of NAPS, and mitigation measures beyond Dominion current management programs and existing regulatory controls are not warranted.

E4.7 HISTORIC AND CULTURAL RESOURCES

E4.7.1 FINDINGS FROM 10 CFR 51, SUBPART A, APPENDIX B, TABLE B-1

Continued operations associated with license renewal are expected to have no license renewal-related impacts as no refurbishment or construction activities have been identified. A Dominion administrative procedure ensures protection of historic properties in the event of excavation activities. The NHPA requires the federal agency to consult with the state historic preservation officer (SHPO) and appropriate Native American tribes to determine the potential effects on historic properties and mitigation, if necessary.

E4.7.2 REQUIREMENT [10 CFR 51.53(C)(3)(II)(K)]

All applicants shall identify any potentially affected historic or archaeological properties and assess whether any of these properties will be affected by future plant operations and any planned refurbishment activities in accordance with the NHPA.

E4.7.3 BACKGROUND [GEIS SECTION 4.7.1]

The NRC will identify historic and cultural resources within a defined APE. The license renewal APE is the area that may be impacted by ground-disturbing or other operational activities associated with continued plant operations and maintenance during the license renewal term and/or refurbishment. The APE typically encompasses the nuclear power plant site, its immediate environs, including viewshed, and the transmission lines within this scope of review. The APE may extend beyond the nuclear plant site and transmission lines when these activities may affect historic and cultural resources.

Continued operations during the license renewal term and refurbishment activities at a nuclear power plant can affect historic and cultural resources through (1) ground-disturbing activities associated with plant operations and ongoing maintenance (e.g., construction of new parking lots or buildings), landscaping, agricultural, or other use of plant property; (2) activities associated with transmission line maintenance (e.g., maintenance of access roads or removal of danger trees); and (3) changes to the appearance of nuclear power plants and transmission lines. Licensee renewal environmental reviews have shown that the appearance of nuclear power plants and transmission lines has not changed significantly over time; therefore, additional viewshed impacts to historic and cultural resources are not anticipated.

E4.7.4 ANALYSIS

E4.7.4.1 Refurbishment Activities

As presented in Section E2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no license renewal-related refurbishment impacts to historic and cultural resources, and no further analysis is required.

E4.7.4.2 Operational Activities

As presented in Section E3.8.5, there have been five previous cultural resource surveys conducted on the NAPS property. The cultural resources recorded on the NAPS property include the Collins Cemetery Site (054-5024), which has not been assessed for NRHP listing; a second cemetery (44LS0221), which is listed as potentially eligible by the SHPO; a third cemetery (44LS0227), which is listed as potentially eligible by the SHPO; a fourth cemetery (41LS0222), which is listed as potentially eligible by the SHPO; and the remains of a dwelling (44LS0226), which has not been evaluated by the SHPO. There are no additional recorded cultural resources on the approximately 1,800-acre NAPS property. No structures on the NAPS property have been evaluated for documentation through the HABS or HAER programs.

As presented in Section E3.8.6, although no license renewal-related ground-disturbing activities have been identified, Dominion has guidance in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. These consist of a historic resources consultation guidance document that protects known cultural resources, as well as unknown cultural resources. Dominion has established processes and procedures for all activities that require a federal permit or use federal funding when there is a potential for impact to cultural resources. Therefore, no adverse effects are anticipated to these sites during the NAPS proposed SLR operating term.

The area within a six-mile radius of the site, consisting of land on both banks of the North Anna River, is archaeologically sensitive (Table E3.8-1). Adverse impacts would only occur to such sites as a result of soil-intrusive activities. Because Dominion has no plans to conduct such soil-intrusive activities at any location outside of the property boundary under a renewed license, no adverse effects to these archaeological sites would occur.

There are also NRHP-listed aboveground historic properties within a six-mile radius of the site (Table E3.8-1). Because there is no ground disturbance or construction associated with the SLR, the viewshed of these resources will not be impacted.

As presented above, no license renewal-related refurbishment or construction activities have been identified. No offsite NRHP-listed historic properties will be adversely impacted as a result of continued operations of NAPS, and there are no plans to alter operations, expand existing facilities, or disturb additional land for the purpose of SLR. In addition, administrative procedural controls are in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. Finally, the Virginia SHPO concurred that the SLR of NAPS will have no adverse effect on historic properties (Attachment D). Therefore, Dominion concludes that there will be no adverse effects as a result of continued operation of NAPS during the proposed SLR operating term, and additional mitigation measures beyond Dominion's existing procedural administrative controls are not warranted.

E4.8 SOCIOECONOMICS

E4.8.1 EMPLOYMENT AND INCOME, RECREATION, AND TOURISM

E4.8.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Although most nuclear plants have large numbers of employees with higher than average wages and salaries, employment, income, recreation, and tourism impacts from continued operations and refurbishment associated with license renewal are expected to be SMALL.

E4.8.1.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.8.1.3 Background [GEIS Section 4.8.1.1]

Employees receive income from the nuclear power plant in the form of wages, salaries, and benefits. Employees and their families, in turn, spend this income on goods and services within the community, thereby creating additional opportunities for employment and income. In addition, people and businesses in the community receive income for the goods and services sold to the power plant. Payments for these goods and services create additional employment and income opportunities in the community. The measure of a community's ability to support the operational demands of a power plant depends on the ability of the community to respond to changing socioeconomic conditions.

Some communities experience seasonal transient population growth due to local tourism and recreational activities. Income from tourism and recreational activities creates employment and income opportunities in the communities around nuclear power plants.

Nevertheless, the effects of nuclear power plant operations on employment, income, recreation, and tourism are ongoing and have become well established during the current license term for all nuclear power plants. The impacts from power plant operations during the license renewal term on employment and income in the region around each nuclear power plant are not expected to change from what is currently being experienced. In addition, tourism and recreational activities in the vicinity of nuclear plants are not expected to change as a result of license renewal.

E4.8.1.4 Analysis

Information related to employment and income, and recreational facilities is presented in Sections E3.9.1 and E3.9.7. In addition, as presented in Section E2.5, there are no plans to add permanent workers to support plant operations during the license renewal term. Because the site is situated in a heavily forested area, it does not visually impact areas that have a high degree of visitor use or recreational areas locally. No license renewal-related refurbishment activities have been identified, as presented in Section E2.3. Therefore, no changes in employment and income, and recreation and tourism during the proposed SLR operating term are anticipated.

In the GEIS, the NRC determined that employment and income, and recreation and tourism impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a Category 1 issue (NRC. 2013a, Section 4.8.1.1). Based on Dominion's review, no new and significant information was identified as it relates to employment and income, and recreation and tourism, and further analysis is not required.

E4.8.2 TAX REVENUES

E4.8.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Nuclear plants provide tax revenue to local jurisdictions in the form of property tax payments, payments in lieu of tax (PILOT), or tax payments on energy production. The amount of tax revenue paid during the license renewal term as a result of continued operations and refurbishment associated with license renewal is not expected to change.

E4.8.2.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.8.2.3 Background [GEIS Section 4.8.1.2]

Nuclear power plants and the workers who operate them are an important source of tax revenue for many local governments and public school systems. Tax revenues from nuclear power plants mostly come from property tax payments or other forms of payments such as payments in lieu of (property) taxes, or PILOT payments, although taxes on energy production have also been collected from several nuclear power plants. County and municipal governments and public school districts receive tax revenue either directly or indirectly through state tax and revenue-sharing programs.

Counties and municipal governments in the vicinity of a nuclear power plant also receive tax revenue from sales taxes and fees from the power plant and its employees. Changes in the number of workers and the amount of taxes paid to county, municipal governments, and public schools can affect socioeconomic conditions in the counties and communities around the nuclear power plant.

A review of license renewal applications received by the NRC since the 1996 GEIS has shown that license renewal-related refurbishment activities, such as steam generator and vessel head replacement, have not had a noticeable effect on the assessed value of nuclear plants, thus changes in tax revenues are not anticipated from future license renewal-related refurbishment activities.

The primary impact of license renewal would be the continuation or change in the amount of taxes paid by nuclear power plant owners to local governments and public school systems. The impact of nuclear plant operations on tax revenues in local communities and the impact that the expenditure of tax revenues has on the region are not expected to change appreciably from the amount of taxes paid during the current license term. Tax payments during the license renewal term would be similar to those currently being paid by each nuclear plant.

E4.8.2.4 Analysis

Information related to tax revenues is presented in Section E3.9.5. No license renewal-related refurbishment activities have been identified. Dominion's annual property taxes are expected to remain relatively constant throughout the license renewal term.

In the GEIS, the NRC determined that tax revenue impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a Category 1 issue (NRC. 2013a, Section 4.8.1.2). Based on Dominion's review, no new and significant information was identified as it relates to tax revenues, and further analysis is not required.

E4.8.3 COMMUNITY SERVICES AND EDUCATION

E4.8.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to local community and educational services would be SMALL. With little or no change in employment at the licensee's plant, value of the power plant, payments on energy production, and PILOT payments expected during the license renewal term, community and educational services would not be affected by continued power plant operations.

E4.8.3.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.8.3.3 Background [GEIS Section 4.8.1.3]

Any changes in the number of workers at a nuclear plant will affect the demand for public services from local communities. Environmental reviews conducted by the NRC since the 1996 GEIS have shown, however, that the number of workers at relicensed nuclear plants has not changed significantly because of license renewal, so demand-related impacts on community services, including public utilities, are no longer anticipated from future license renewals.

In addition, refurbishment activities, such as steam generator and vessel head replacement, have not required the large numbers of workers and the months of time that were conservatively analyzed in the 1996 GEIS, so significant impacts on community services are no longer anticipated. Because of the relatively short duration of refurbishment-related activities, workers are not expected to bring families and school-age children with them; therefore, impacts from refurbishment on educational services are also no longer anticipated.

Taxes paid by nuclear power plant owners support a range of community services, including public water, safety, fire protection, health, and judicial, social, and educational services. In some communities, tax revenues from power plants can have a noticeable impact on the quality of services available to local residents. Although many of the community services paid for by tax revenues from power plants are used by plant workers and their families, the impact of nuclear plant operations on the availability and quality of community services and education is SMALL and is not expected to change as a result of license renewal.

E4.8.3.4 Analysis

Information related to community services and education is presented in Section E3.9.4. No license renewal-related refurbishment activities have been identified. In addition, as presented in Section E2.5, there are no plans to add workers to support plant operations during the proposed SLR operating term. As stated in Section E4.8.2.4, Dominion's annual property taxes are expected to remain relatively constant through the proposed SLR operating term, and no change is anticipated that would impact local community services and education.

In the GEIS, the NRC determined that community services and education impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a Category 1 issue (NRC. 2013a, Section 4.8.1.3). Based on Dominion's review, no new and significant information was identified as it relates to community services and education, and further analysis is not required.

E4.8.4 POPULATION AND HOUSING

E4.8.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to regional population and housing availability and value would be SMALL. With little or no change in employment at the licensee's plant expected during the license renewal term, population and housing availability and values would not be affected by continued power plant operations.

E4.8.4.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.8.4.3 Background [GEIS Section 4.8.1.4]

Socioeconomic impact analyses of resources (e.g., housing) affected by changes in regional population are based on employment trends at nuclear power plants. Population growth from increased employment and spending at a nuclear power plant is important because it is one of the main drivers of socioeconomic impacts. As previously discussed, however, employment levels at nuclear power plants are expected to remain relatively constant with little or no population growth or increased demand for permanent housing during the license renewal term. The operational effects on population and housing values and availability in the vicinity of nuclear power plants are not expected to change from what is currently being experienced, and no demand-related impacts are expected during the license renewal term.

The increased number of workers at nuclear power plants during regularly scheduled plant refueling and maintenance outages does create a short-term increase in the demand for temporary (rental) housing units in the region around each plant. However, because of the short duration and the repeated nature of these scheduled outages and the general availability of rental housing units (including portable trailers) in the vicinity of nuclear power plants, employment-related housing impacts have had little or no long-term impact on the price and availability of rental housing.

Refurbishment impacts would be similar to what is experienced during routine plant refueling and maintenance outages.

E4.8.4.4 Analysis

Information related to population and housing is presented in Section E3.9.2. No license renewal-related refurbishment activities have been identified. As presented in Section E2.5, there are no plans to add permanent workers to support plant operations during the proposed SLR operating term.

In the GEIS, the NRC determined that population and housing impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a Category 1 issue (NRC. 2013a, Section 4.8.1.4). Based on Dominion's review, no new and significant information was identified as it relates to population and housing needs, and further analysis is not required.

E4.8.5 TRANSPORTATION

E4.8.5.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to traffic volumes would be SMALL.

E4.8.5.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.8.5.3 Background [GEIS Section 4.8.1.5]

Transportation impacts depend on the size of the workforce, the capacity of the local road network, traffic patterns, and the availability of alternate commuting routes to and from the plant. Because most sites have only a single access road, there is often congestion on these roads during shift changes.

Transportation impacts are ongoing and have become well established during the current licensing term for all nuclear power plants. As previously presented, it is unlikely that the number of permanent operations workers would increase at a nuclear power plant during the license renewal term. In addition, refurbishment activities, such as steam generator and vessel head replacement, have not required the numbers of workers and the months of time conservatively estimated in the 1996 GEIS. Consequently, employment at nuclear power plants during the license renewal term is expected to remain unchanged.

E4.8.5.4 Analysis

Information related to transportation is presented in Section E3.9.6. No license renewal-related refurbishment activities have been identified. As presented in Section E2.5, there are no plans to add permanent workers to support plant operations during the SLR operating term. In addition, as presented in Section E3.9.6, roads in the immediate vicinity of the NAPS plant site would operate at acceptable LOSs.

In the GEIS, the NRC determined that transportation impacts from continued plant operations over the license renewal term would be SMALL for all nuclear plants and designated this as a

Category 1 issue (NRC. 2013a, Section 4.8.1.5). Based on Dominion's review, no new and significant information was identified as it relates to transportation, and further analysis is not required.

E4.9 HUMAN HEALTH

E4.9.1 MICROBIOLOGICAL HAZARDS TO THE PUBLIC (PLANTS THAT USE COOLING PONDS, LAKE, OR CANALS, OR THAT DISCHARGE TO A RIVER)

E4.9.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. These organisms are not expected to be a problem at most operating plants except possibly at plants using cooling ponds, lakes, or canals, or that discharge into rivers. Impacts would depend on site-specific characteristics.

E4.9.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(G)]

If the applicant's plant uses a cooling pond, lake, or canal or discharges into a river, an assessment of the impact of the proposed action on public health from thermophilic organisms in the affected water must be provided.

E4.9.1.3 Background [GEIS Section 4.9.1.1.3]

N. fowleri, which is the pathogenic strain of the free-living amoebae *Naegleria* spp., appears to be the most likely microorganism that may pose a public health hazard resulting from nuclear power plant operations. Increased populations of *N. fowleri* may have significant adverse impacts.

Since *Naegleria* concentrations in freshwater can be enhanced by thermal effluents, nuclear power plants that use cooling lakes, canals, ponds, or rivers experiencing low-flow conditions may enhance the populations of naturally occurring thermophilic organisms.

Changes in microbial populations and in the public use of water bodies might occur after the operating license is issued and the application for license renewal is filed. Other factors could also change, including the average temperature of the water, which could result from climate change that affected water levels and air temperature. Finally, the long-term presence of a power plant might change the natural dynamics of harmful microorganisms within a body of water.

E4.9.1.4 Analysis

As presented in Section E2.2, NAPS utilizes an open-cycle cooling system in which cooling water is withdrawn from Lake Anna, heated in the condensers, and returned to Lake Anna through the WHTF. The public has access to the areas impacted by the heated water from the cooling system, including the North Anna Reservoir and the WHTF. Activities in these areas include swimming, recreational boating, fishing, and residential housing. (Dominion. 2019c; LACA. 2019a)

The thermophilic pathogen amoeba *N. fowleri*, found in freshwater throughout the United States, was found in the NAPS WHTF following start-up of the plant in June 1978. In 1982, Dominion environmental personnel met with the state epidemiologist to determine whether *N. fowleri* at NAPS represented a public health risk. After consultation with other state and federal agencies, the risk of contracting primary amoebic meningoencephalitis was determined to be too low to justify any action by Dominion or state agencies. (NRC. 2002a, Section 4.1.4) Consultation with the Virginia Department of Health (VDH) was initiated in 2019 for SLR.

Studies of Lake Anna conducted in 2007 found *N. fowleri* was present at nine out of 16 sites tested during the summer, but that total amoeba counts, inclusive of *N. fowleri*, did not exceed 12 amebae per 50 ml. (Jamerson, et al. 2009; Marciano-Cabral, F. 2007).

In 2012, the VDH participated in a multi-state environmental study of *N. fowleri* with the Centers for Disease Control and Prevention (CDC). Of the samples collected at Lake Anna, one sediment sample tested positive by culture, but no water samples tested positive. The positive sediment sample was collected at the shore of the WHTF. There have been no known occurrences of PAM at Lake Anna. (CDC. 2012)

Lake Anna is not used as a source of potable water. Public use of the North Anna Reservoir includes swimming, recreational boating, fishing, and water skiing. Access to the WHTF is limited to adjacent private property owners. During the process leading to the reissuance of the NAPS VPDES permit, the VDH recommended that temperature measurements in the WHTF be made publicly available to allow local residents and water users to make informed temperature-based decisions, especially during warmer months when water temperatures are elevated. This recommendation was included in an October 13, 2013, letter from the VDH.

In response to the VDH's recommendation, Dominion used historical monitoring data to develop equations to predict water temperatures in Lagoons 2 and 3 based on actual measured temperatures in the discharge from the station to Lagoon 1. The measured discharge temperatures and predicted lagoon temperatures are posted every 15 minutes on Dominion's website at https://www.dominionenergy.com/company/making-energy/nuclear/north-anna-power-station/waste-heat-treatment-facility. Dominion's website also links to health risk information related to microbiological risks, such as thermophilic microorganisms, on the VDH's website at http://www.vdh.virginia.gov/content/uploads/sites/12/2016/04/Safely-Enjoy-Natural-Waters_v2.pdf.

In late summer and early fall of 2018, Lake Anna experienced harmful algae blooms in several different areas, including the WHTF. Harmful algae, or cyanobacteria, can cause skin rash and gastrointestinal illnesses. The blooms occur when warm water and nutrients combine to make conditions favorable for algae growth. In early September 2018, the Virginia Department of Health

(VDH) issued no-swimming advisories for three areas in Lake Anna that presented a moderate to high risk for human health effects, while another four areas merited public notification and warning. Dominion developed a sampling plan and initiated sampling based on the VDH’s sampling protocoland issued no-swimming advisories for four WHTF areas. With the end of the recreational swimming season on October 31, 2018, water sampling by the VDH was discontinued. (Dominion. 2019d; VDH. 2019a; VDH. 2019b)

In response to Dominion's request for consultation (Attachment F), VDH expressed concern that a harmful algae bloom could potentially impact the water quality at a downstream drinking water intake. VDH further stated that impact of the thermally enriched cooling water discharge from NAPS on algae blooms in Lake Anna is not known. In response, Dominion clarified that the locations of the observed algae blooms and the fact that no significant changes have been made to the station's cooling water system, indicate that the factors facilitating the algae blooms are not a result of station operations.

Thermophilic microorganisms thrive at temperatures of 122°F or more, with a tolerance minimum of 68°F and a maximum of 158°F (NRC. 2013a). NAPS discharge temperatures in summer are within the range of those known to permit the growth and reproduction of pathogenic microorganisms, but are below those considered optimal for thermophilic forms (Section E3.10.1).

Microbiological hazards resulting from public contact with potentially contaminated waters would not be an anticipated issue for SLR of NAPS, given the following:

- Field measurements show water temperatures in the WHTF and the North Anna Reservoir are below the optimum for growth of thermophilic microorganisms.
- NAPS, due to its wastewater disinfection practices, does not provide a seed source or inoculant that would stimulate population growth.
- Annual sampling for *E. coli* in Lake Anna during warm weather months.
- Field sampling has detected *N. fowleri* in low concentrations in some, but not all samples, and no case of PAM has been reported for Lake Anna.
- The extremely low occurrence of PAM in the United States, with annual infections ranging from 0 to 8, in spite of hundreds of millions of visits to freshwater swimming venues each year (CDC. 2019b).

Thus, human health impacts from microbiologic hazards during the proposed SLR operating term would be SMALL.

E4.9.2 ELECTRIC SHOCK HAZARDS

E4.9.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL, MODERATE, or LARGE. Electrical shock potential is of SMALL significance for transmission lines that are operated in adherence with the NESC. Without a review of conformance with NESC criteria of each nuclear power plant's in-scope transmission lines, it is not possible to determine the significance of the electrical shock potential.

E4.9.2.2 Requirement [10 CFR 51.53(c)(3)(ii)(H)]

If the applicant's transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents, an assessment of the impact of the proposed action on the potential shock hazard from the transmission lines must be provided.

E4.9.2.3 Background [GEIS Section 4.9.1.1.5]

Design criteria for nuclear power plants that limit hazards from steady-state currents are based on the NESC, adherence to which requires that utility companies design transmission lines so that the short-circuit current to ground produced from the largest anticipated vehicle or object is limited to less than 5 mA. With respect to shock safety issues and license renewal, three points must be made. First, in the licensing process for the earlier licensed nuclear plants, the issue of electrical shock safety was not addressed. Second, some plants that received operating licenses with a stated transmission line voltage may have chosen to upgrade the line voltage for reasons of efficiency, possibly without reanalysis of induction effects. Third, since the initial NEPA review for those utilities that evaluated potential shock situations under the provision of the NESC, land use may have changed, resulting in the need for a reevaluation of this issue. The electrical shock issue, which is generic to all types of electrical generating stations, including nuclear plants, is of SMALL significance for transmission lines that are operated in adherence with the NESC. Without a review of the conformance of each nuclear plant's transmission lines, within this scope of review with NESC criteria, it is not possible to determine the significance of the electrical shock potential generically.

E4.9.2.4 Analysis

As presented in Section E2.2.5 and depicted on Figure E2.2-5, the seven in-scope transmission lines are located completely within the NAPS property boundary, with three of the seven being underground. Thus, no induced shock hazards would exist for the public due to restricted site access.

As presented in Section E3.10.2, an analysis of the transmission lines distributing NAPS Units 1 and 2 generation to the grid conducted to support the current license renewal term determined that none of the seven transmission lines has the capacity to induce currents to the level of 5 mA rms in a vehicle parked beneath the lines (NRC. 2002a). Concerning the aboveground in-scope transmission lines, a 2018 investigation by Dominion confirmed that the steady-state discharging current in a worst-case scenario would be less than NESC standard of 5 mA rms.

Dominion adheres to NESC code compliance requirements for shock hazard avoidance through utilization of the Dominion engineering manual (Dominion. 2017c), the 2017 Dominion Blue Book, which establishes safety and efficiency requirements for commercial and residential connections to the system that must be followed by contractors, builders, engineers, etc. (Dominion. 2017d). These guidance documents ensure all necessary mitigation measures are incorporated for maintaining worker and visitor safety through design ground clearances and other shock prevention measures applicable to the in-scope transmission lines.

Given that: (1) for current license renewal term, the NRC determined that the human health impact from electric shock hazards was SMALL; (2) the in-scope transmission lines are NESC compliant (Dominion. 2017c; Dominion. 2017d); and (3) routine maintenance, surveillance, and training procedures for the in-scope transmission lines provide assurance design ground clearances will not change, the human health impact from electric shock hazards during the proposed SLR operating term would be SMALL.

E4.10 ENVIRONMENTAL JUSTICE

E4.10.1 MINORITY AND LOW-INCOME POPULATIONS

E4.10.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

Impacts to minority and low-income populations and subsistence consumption resulting from continued operations and refurbishment associated with license renewal will be addressed in plant-specific reviews. See the NRC's policy statement on the treatment of environmental justice matters in NRC regulatory and licensing actions (69 FR 52040).

E4.10.1.2 Requirement [10 CFR 51.53(c)(3)(ii)(N)]

Applicants shall provide information on the general demographic composition of minority and low-income populations and communities (by race and ethnicity) residing in the immediate vicinity of the plant that could be affected by the renewal of the plant's operating license, including any planned refurbishment activities, and ongoing and future plant operations.

E4.10.1.3 Background [GEIS Section 4.10.1]

Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant and exceeds the risk or exposure rate for the general population or for another appropriate comparison group. Disproportionately high environmental effects refer to impacts or risk of impact on the natural or physical environment in a minority or low-income community that are significant and appreciably exceed the environmental impact on the larger community. Such effects may include biological, cultural, economic, or social impacts. Minority and low-income populations are subsets of the general public residing around the site and all are exposed to the same risks and hazards generated from operating a nuclear power plant.

Continued reactor operations and other activities associated with license renewal could have an impact on air, land, water, and ecological resources in the region around each nuclear power plant site, which might create human health and environmental effects on the general population. Depending on the proximity of minority and low-income populations in relation to each nuclear plant, the environmental impacts of license renewal could have a disproportionate effect on these populations.

The location and significance of environmental impacts may affect population groups that are particularly sensitive because of their resource dependencies or practices (e.g., subsistence agriculture, hunting, or fishing) that reflect the traditional or cultural practices of minority and low-income populations. The analysis of special pathway receptors can be an important part of the identification of resource dependencies or practices. Special pathways take into account the levels of contaminants in native vegetation, crops, soils and sediments, surface water, fish, and game animals on or near the power plant sites in order to assess the risk of radiological exposure through subsistence consumption of fish, native vegetation, surface water, sediment, and local produce; the absorption of contaminants in sediments through the skin; and the inhalation of airborne particulates.

E4.10.1.4 Analysis

E4.10.1.4.1 Refurbishment Activities

As presented in Section E2.3, no license renewal-related refurbishment activities have been identified. Therefore, there would be no license renewal-related refurbishment impacts to minority and low-income populations, and no further analysis is applicable.

E4.10.1.4.2 Operational Activities

The consideration of environmental justice is required to assure that federal programs and activities will not have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations. Dominion's analyses of the Category 2 issues defined in 10 CFR 51.53(c)(3)(ii) determined that environmental impacts from the continued operation of NAPS during the proposed SLR operating term would either be SMALL or non-adverse. Therefore, high or adverse impacts to the general human population would not occur.

As described in Section E3.10.3, Dominion maintains an REMP. With this program, Dominion monitors important radiological pathways and considers potential radiation exposure to plant and animal life in the environment surrounding NAPS. The results of the program indicate NAPS has created no adverse environmental effects or health hazards. Therefore, no environmental pathways have been adversely impacted and are not anticipated to be impacted during the NAPS proposed SLR operating term.

Section E3.11.2 identifies the locations of minority and low-income populations as defined by NRR Office Instruction LIC-203 (NRC. 2013d). Section E3.11.3 describes the search for subsistence-like populations near NAPS, of which none were found. The figures accompanying Section E3.11.2 show the locations of minority and low-income populations within a 50-mile radius of NAPS. None of those locations, when considered in the context of impact pathways described in this chapter, are expected to be disproportionately impacted.

Therefore, no disproportionately high and adverse impacts or effects on members of the public, including minority, low-income, or subsistence populations, are anticipated as a result of SLR.

E4.11 WASTE MANAGEMENT

E4.11.1 LOW-LEVEL WASTE STORAGE AND DISPOSAL

E4.11.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment would remain SMALL during the license renewal term.

E4.11.1.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.11.1.3 Background [GEIS Section 4.11.1.1]

The NRC believes that the comprehensive regulatory controls in place and the low public doses achieved at reactors ensure that the radiological impacts on the environment will remain SMALL during the license renewal term. The maximum additional onsite land that may be required for LLW storage during the license renewal term and associated impacts would be SMALL. Nonradiological impacts on air and water would be negligible. The radiological and nonradiological environmental impacts of long-term disposal of LLW from any individual plant at licensed sites are SMALL. In addition, the NRC concludes that there is reasonable assurance that sufficient LLW disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

E4.11.1.4 Analysis

Dominion will continue to manage and store LLRW onsite as described in Section E2.2.6, in accordance with NRC regulations, and dispose of LLRW in NRC-licensed treatment and disposal facilities during the proposed SLR operating term. There are comprehensive regulatory controls in place and Dominion's compliance with these regulations and use of only licensed treatment and disposal facilities would allow the impacts to remain SMALL during the proposed SLR operating term. As presented in Section E3.10.3, Dominion's annual reports for 2013–2018 indicate that doses to members of the public were negligible and in accordance with NRC and EPA radiation protection standards. No new and significant information has been identified for this issue. The issue was also considered in the initial license renewal's new and significant review, and no new and significant information was found at that time ((NRC. 2002a, Section 6.1). Based on Dominion's finding of no new and significant information, further analysis is not required.

E4.11.2 ONSITE STORAGE OF SPENT NUCLEAR FUEL

E4.11.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

During the license renewal term, SMALL. The expected increase in the volume of spent nuclear fuel from an additional 20 years of operation can be safely accommodated onsite during the license renewal term with SMALL environmental impacts through dry or pool storage at all plants.

For the period after the licensed life for reactor operations, the impacts of onsite storage of spent nuclear fuel during the continued storage period are discussed in NUREG-2157 and as stated in § 51.23(b), shall be deemed incorporated into this issue.

E4.11.2.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.11.2.3 Background [GEIS Section 4.11.1.2 and NUREG-2157]

Spent nuclear fuel is currently stored at reactor sites either in spent fuel pools or in ISFSIs. The storage of spent fuel in spent fuel pools was considered for each plant in the safety and environmental reviews at the construction permit and operating license stage. This onsite storage of spent fuel and high-level waste is expected to continue into the foreseeable future.

Interim storage needs vary among plants, with older units likely to lose pool storage capacity sooner than newer ones. Given the uncertainties regarding the final disposition of spent fuel and HLW, it is expected that expanded spent fuel storage capacity will be needed at all nuclear power plants.

NUREG-2157, *Generic EIS for Continued Storage of Spent Nuclear Fuel* (NRC. 2014a, ES.12 and Table ES-3), concluded on a generic basis for all nuclear power plants that spent fuel can be stored onsite for 60 years following the license term with SMALL environmental effects.

E4.11.2.4 Analysis

The additional 20 years of spent nuclear fuel generated during the proposed SLR operating term would be stored in the spent fuel pools until adequately cooled and then transferred to dry storage at an ISFSI. The NRC-licensed design and operation of each of these storage options ensures that the increased volume in onsite storage can be safely accommodated with SMALL environmental effects. The issue was also considered in the initial license renewal's new and significant review, and no new and significant information was found at that time (NRC. 2002a, Section 6.1). Based on Dominion's finding of no new and significant information, further analysis is not required.

E4.11.3 OFFSITE RADIOLOGICAL IMPACTS OF SPENT NUCLEAR FUEL AND HIGH-LEVEL WASTE DISPOSAL

E4.11.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

For the high-level waste and spent-fuel disposal component of the fuel cycle, the EPA established a dose limit of 0.15 mSv (15 millirem) per year for the first 10,000 years and 1.0 mSv (100 millirem) per year between 10,000 years and 1 million years for offsite releases of radionuclides at the proposed repository at Yucca Mountain, Nevada.

The NRC concludes that the impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that t NRC concludes that the impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high-level waste disposal, this issue is considered the option of extended operation under 10 CFR 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high-level waste disposal, this issue is considered Category 1.

E4.11.3.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.11.3.3 Background [GEIS Section 4.11.1.3]

As a result of the *New York v. NRC* decision, and pending the issuance of a generic EIS and revised Waste Confidence Decision and Rule, the NRC has revised the Category 1 issue, "Offsite radiological impacts of spent nuclear fuel and high-level waste disposal." This issue pertained to the long-term disposal of spent nuclear fuel and high-level waste, including possible disposal in a deep geologic repository. Although the Waste Confidence Decision and Rule did not assess the impacts associated with disposal of spent nuclear fuel and high-level waste in a repository, it did reflect the NRC's confidence, at the time, in the technical feasibility of a repository and when that repository could have been expected to become available. Without the analysis in the Waste Confidence Decision, the NRC cannot assess how long the spent fuel will need to be stored onsite. Therefore, the NRC reclassifies this GEIS issue from a Category 1 issue with no assigned impact level to an "uncertain." Moreover, the ultimate disposal of spent nuclear fuel in a potential future geologic repository is a separate and independent licensing action that is outside the regulatory scope of license renewal.

E4.11.3.4 Analysis

As indicated in Section E4.11.3.3, the NRC's GEIS analysis of the issue was tied to rulemaking for the waste confidence decision, which was pending in 2013 when the license renewal GEIS was issued. As part of the NRC's NEPA actions associated with the waste confidence decision, the NRC reviewed the environmental impacts of away-from-reactor storage and the technical feasibility of disposal in a geologic repository in NUREG-2157, *Generic EIS for Continued Storage of Spent Nuclear Fuel* (NRC. 2014a, Section ES.7 and ES.16). In the final continued storage of nuclear spent fuel rulemaking, the listing and classification of license renewal issues found in 10 CFR 51, Subpart A, Appendix B, Table B-1 was revised to reclassify the impact determination for this issue as a Category 1 issue with no impact level assigned. This re-classification was upheld in May 2016 against petitions (81 FR 31532).

Dominion is aware of no new and significant information regarding these impacts. Offsite radiological impacts of spent nuclear fuel and high-level waste disposal were also considered in the initial license renewal's new and significant review, and no new and significant information was found at that time (NRC. 2002a, Section 6.1).

E4.11.4 MIXED WASTE STORAGE AND DISPOSAL

E4.11.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The comprehensive regulatory controls and the facilities and procedures in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal would not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are SMALL.

E4.11.4.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.11.4.3 Background [GEIS Section 4.11.1.4]

Mixed waste is regulated both by the EPA or the authorized state agency under RCRA and by the NRC or the agreement state agency under the Atomic Energy Act (AEA; Public Law 83-703). The waste is either treated onsite or sent offsite for treatment, followed by disposal at a permitted landfill. The comprehensive regulatory controls and the facilities and procedures in place at nuclear power plants ensure that the mixed waste is properly handled and stored and that doses to and exposure to toxic materials by the public and the environment are negligible at all plants. License renewal will not increase the small but continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts from the long-term disposal of mixed waste at any individual plant at licensed sites are considered SMALL for all sites.

E4.11.4.4 Analysis

Management of radioactive waste is presented in Section E2.2.6. Dominion has developed guidance documents for managing its hazardous waste streams, including mixed waste (Dominion. 2015b). Dominion inspects its waste management areas for compliance with applicable regulations and permits on a weekly basis using a facility waste inspection checklist. Addressed in Sections E9.3 and E9.5, Dominion's management of its waste streams is in compliance with applicable regulatory standards and has not resulted in any notices of violation for the 2013–2019 time frame. Dominion would continue to store and dispose of hazardous and nonhazardous waste in accordance with EPA and state regulations and dispose of the waste in appropriately permitted treatment and disposal facilities during the proposed SLR operating term. As indicated in the 2013 GEIS, continuation of existing systems and procedures to ensure proper storage and disposal would allow the impacts to be of SMALL magnitude. This issue was evaluated as a Category 1 issue in the initial license renewal's new and significant review and found to be bound by the GEIS conclusion of a SMALL impact (NRC. 2002a, Section 6.1). Based on Dominion's finding of no new and significant information, further analysis is not required.

E4.11.5 NONRADIOACTIVE WASTE STORAGE AND DISPOSAL

E4.11.5.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. No changes to systems that generate nonradioactive waste are anticipated during the license renewal term. Facilities and procedures are in place to ensure continued proper handling, storage, and disposal, as well as negligible exposure to toxic materials for the public and the environment at all plants.

E4.11.5.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.11.5.3 Background [GEIS Section 4.11.1.5]

The management of hazardous wastes generated at all of these facilities, both onsite and offsite, is strictly regulated by the EPA or the responsible state agencies per the requirements of RCRA.

As does any industrial facility, nuclear power plants and the rest of the uranium fuel cycle facilities also generate nonradioactive nonhazardous waste. These wastes are managed by following good housekeeping practices and are generally disposed of in local landfills permitted under RCRA Subtitle D regulations.

In the 1996 GEIS, the impacts associated with managing nonradioactive wastes at uranium fuel cycle facilities, including nuclear power plants, were found to be SMALL. It was indicated that no changes to nonradioactive waste generation would be anticipated for license renewal, and that systems and procedures are in place to ensure continued proper handling and disposal of the wastes at all plants.

E4.11.5.4 Analysis

Management of nonradioactive waste is presented in Section E2.2.4. Dominion has developed guidance documents for managing its nonradioactive waste streams including hazardous and nonhazardous wastes (Dominion. 2013d). In addition, Dominion inspects its waste management areas for compliance with applicable regulations on a weekly basis using a facility waste inspection checklist. As presented in Sections E9.3 and E9.5, Dominion's management of its waste streams is in compliance with applicable regulatory standards and has not resulted in any notices of violation for the 2013–2019 time frame. Dominion would continue to store and dispose of hazardous and nonhazardous wastes in accordance with EPA and state regulations and dispose of the wastes in appropriately permitted treatment and disposal facilities during the proposed SLR operating term. As indicated in the 2013 GEIS, continuation of existing systems and procedures to ensure proper storage and disposal would allow the impacts to be of SMALL magnitude. This issue was evaluated as a Category 1 issue in the initial license renewal's new and significant review and found to be bound by the GEIS conclusion of a SMALL impact (NRC. 2002a, Section 6.1). Based on Dominion's finding of no new and significant information, further analysis is not required.

E4.12 CUMULATIVE IMPACTS

E4.12.1 FINDINGS FROM 10 CFR 51, SUBPART A, APPENDIX B, TABLE B-1

Cumulative impacts of continued operations and refurbishment associated with license renewal must be considered on a plant-specific basis. Impacts would depend on regional resource characteristics, the resource-specific impacts of license renewal, and the cumulative significance of other factors affecting the resource.

E4.12.2 REQUIREMENT [10 CFR 51.53(C)(3)(II)(O)]

Applicants shall provide information about other past, present, and reasonably foreseeable future actions occurring in the vicinity of the nuclear plant that may result in a cumulative effect.

E4.12.3 BACKGROUND [GEIS SECTION 4.13]

Actions to be considered in cumulative impact analyses include new and continuing activities, such as license renewal, that are conducted, regulated, or approved by a federal agency. The cumulative impacts analysis takes into account all actions, however minor, since impacts from individually minor actions may be significant when considered collectively over time. The goal of the analysis is to identify potentially significant impacts to improve decisions and move toward more sustainable development.

For some resource areas (e.g., water and aquatic resources), the contributions of ongoing actions within a region to cumulative impacts are regulated and monitored through a permitting process (e.g., NPDES) under state or federal authority. In these cases, it may be assumed that cumulative impacts are managed as long as these actions (facilities) are in compliance with their respective permits.

E4.12.4 ANALYSIS

Cumulative impacts analysis involves determining if there is an overlapping or compounding of the anticipated impacts of the continued operation of NAPS Units 1 and 2 during the proposed SLR operating term and past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions. For the purposes of this analysis, present actions are those related to current operation of NAPS Units 1 and 2 and those actions by Dominion or other persons that are included in firm or funded plans or funded for implementation from now through the end of the current license term in 2038 (Unit 1). Future actions are those actions that will continue into the proposed SLR operating term, and that are reasonably foreseeable firm plans with funding or funding to allow implementation during the 20-year proposed SLR operating term (generally plans that have moved beyond the conceptual phase). These criteria are in line with Regulatory Guide 4.2, Supplement 1, Rev. 1 (NRC. 2013b), "Future actions are those that are 'reasonably foreseeable'; that is, they are ongoing (and will continue into the future), are funded for future implementation, are included in firm, near-term plans, or generally have a high probability of being implemented."

The assessment first determines if the impacts of the continued operation of NAPS Units 1 and 2 during the proposed SLR operating term and any refurbishment activities could temporally and/or spatially combine with the impacts of other actions. Impacts that are for a limited duration, such as those that result from construction activities, would have to overlap in time for the impacts to combine. Impacts that require proximity to combine would have to be close enough to combine and occur at the same time to combine. The required proximity is resource-area dependent and would involve an overlapping of regions of influence. Next, the assessment determines if any combined impacts would be significant. Significant cumulative impacts could stem from an impact that may be SMALL by itself but could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. If a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

Within the NAPS site, a third nuclear generating unit (NAPS Unit 3) was issued a combined license on June 2, 2017. Dominion has not made the decision to construct and operate NAPS Unit 3. The overlap of construction of NAPS Unit 3 with the SLR term is not firm or a matter of reasonable certainty. Nevertheless, to the extent that NAPS Units 3 construction and operation might be considered reasonable and foreseeable, the NRC previously assessed cumulative impacts of construction of NAPS Unit 3 and the operation of the three operating units. The past and present activities as well as the potential future development around Lake Anna were considered by the NRC in its assessment of cumulative impacts of the licensed NAPS Unit 3. Detailed discussions can be found in the early site permit EIS (NRC. 2006) and the construction and operating license SEIS (NRC. 2010). These cumulative assessments are applicable to a cumulative impacts assessment for this SLRA for NAPS and are primary resources for this cumulative assessment.

No major changes to NAPS Units 1 and 2 operations or plans for future expansion of plant infrastructure during the SLR term, are anticipated. Expansion of storage capacity for spent nuclear fuel (SNF) might be needed to accommodate SNF from the SLR term if the U.S. Department of Energy has not begun taking ownership of the SNF. An expansion of the ISFSI was not considered as a project in cumulative impacts analysis because the need had not yet been determined. Furthermore, plans and funding have not been identified for this yet to be determined need. However, for a future ISFSI expansion, Dominion would conduct a siting study to identify candidate sites within the NRC-licensed NAPS site. The site selection process would consider regulations for, and commitments to, the protection of protected species, wetlands, and cultural resources.

Past activities for consideration are mining in Louisa and Spotsylvania counties. The land inundated to become Lake Anna was formerly called "Gold Hill" and was the location of the Goodwin Mine, the third largest gold mine in the United States from 1830-1849 (SCDT. 2018). Prior to impoundment, the North Anna River was impacted by acid mine drainage from Contrary Creek, a major tributary, due to historical gold and pyrite ore mining. The impoundment diluted the acid-tainted water and mitigated the effects of the Contrary Creek pollutants. (NRC. 2002a, Section 2.2.5) The creation of Lake Anna has also mitigated most water quality impacts from Contrary Creek area runoff. Low-pH creek water is neutralized as it mixes with higher-pH reservoir water. Heavy metals are removed from the water column by adsorption to clay particles and the subsequent settling of these particles. Chemical precipitation (and co-precipitation with iron) may also remove zinc and copper ions from Contrary Creek water when it mixes with Lake Anna water. (NRC. 2006) Given this mitigation, the past mining activities' contribution to cumulative impacts are a component of Lake Anna's current water quality. The effects of past actions are already included in the description of the affected environmental in Chapter E3.0.

Continuing activities for the area surrounding the NAPS site would be those listed below. These ongoing activities were considered as present and future actions for the cumulative analysis.

- Recreational activities and operation of commercial marinas at Lake Anna
- Residential activities at Lake Anna
- Non-point discharges (i.e., run-off) into Lake Anna
- Recreational and conservation activities at Lake Anna State Park
- Rural, agricultural, residential activities in Louisa in the vicinity of NAPS
- Groundwater withdrawals in Louisa County
- Air emissions from stationary sources and vehicles

As indicated in Section E3.1.4, no new business developments or current business expansions have been announced for the vicinity of NAPS. To ascertain the potential for future development, the future land use maps for Louisa and Spotsylvania counties were consulted. The future land use maps show the majority of the land surrounding Lake Anna as designated residential. In addition to residential development at Lake Anna, the future land use maps for Louisa and Spotsylvania counties designate an area along Route 208 as it approaches Lake Anna as mixed use (Louisa County. 2016; Spotsylvania County. 2018b). Louisa County sought funds in a proposal to the VDOT submitted in 2016 for road improvements to Route 208, but this proposal was not selected for funding by the VDOT in 2018 (VDOT. 2019c). Spotsylvania County transportation improvement plans include widening Route 208 to three lanes (Spotsylvania County. 2016). Therefore, there is the potential for future commercial and industrial development in the vicinity of Lake Anna. Industrial or commercial development within the mixed growth areas would have to comply with applicable state requirements such as air permitting, aboveground and underground tank requirements, and VPDES permitting. Louisa County's zoning ordinance Section 86:455 requires that shoreline development applicants submit an application to Louisa County that includes an approval by Dominion.

The following sections address the potential for cumulative impacts by resource area.

E4.12.5 LAND USE AND VISUAL RESOURCES

The land use impact of NAPS was characterized as SMALL in Section E4.1 and land use changes that could be attributable to the continued operation of NAPS during the SLR term were anticipated. The NRC previously considered cumulative impacts to land use from construction and operation of NAPS Unit 3 and determined that the potential for significant impacts would occur in the three-county area of Louisa, Orange, and Spotsylvania counties, Virginia. While the construction and operation of NAPS Unit 3 along with the operation of NAPS Units 1 and 2 could encourage development, the NRC concluded that the counties' comprehensive land-use plans would control development (NRC. 2006, Section 7.1; (NRC. 2010, Section 7.1). Louisa, Orange, and Spotsylvania counties continue to have comprehensive plans that guide and recommend future land uses (Louisa County. 2016; Orange County. 2018; Spotsylvania County. 2018b). As presented in Section E2.5, the current operational workforce for NAPS resides primarily in Louisa County, followed by Orange County and then by Hanover County. Given Hanover County's ranking, Hanover County was also considered for cumulative impacts. Hanover County has an updated comprehensive plan that includes future land use and growth management (Hanover County. 2018). As discussed above, no future projects have been identified for the vicinity other than licensed NAPS Unit 3 (not built), and Dominion has no refurbishment planned for NAPS SLR. Land use would be guided by local comprehensive land use plans and any cumulative land use impacts from continued operation of NAPS along with NAPS Unit 3 and the potential for development in the four counties would be SMALL.

The continued use of existing structures associated with NAPS would not alter their visual impact. The plant would continue to be seen from Lake Anna and its shoreline. If built, the licensed NAPS Unit 3 would add to this viewscape, but because NAPS Unit 3 would be constructed near NAPS Units 1 and 2, the contrast with the existing landscape would be reduced. Other development along the Lake Anna shoreline would be controlled by Louisa County's and Spotsylvania County's comprehensive plans and zoning regulations. The cumulative impact to visual resources would be SMALL.

E4.12.6 AIR QUALITY AND NOISE

E4.12.6.1 Air Quality

As presented in Section E3.3.3, the regional air quality where NAPS is located has improved since the initial license renewal when the NAPS air quality control region was nonattainment for one-hour ozone. As of July 2018, all of the counties (Charles City, Chesterfield, Dinwiddie, Goochland, Greensville, Hanover, Henrico, New Kent, Powhatan, Prince George, Surry, Sussex) within the State Capital Intrastate Air Quality Control Region are in attainment of the NAAQSs [40 CFR 81.347]. NAPS Units 1 and 2 air pollutant emissions are minimal and stem from intermittent use and testing of diesel generators. Section E4.2.1 concluded that the impact to air quality from the continued operation of NAPS during the proposed SLR operating term is anticipated to be SMALL, as generically determined by the NRC for all nuclear power plants. The improved air quality rating for the area reflects cumulative air quality for past and present actions. The pending present actions and anticipated future actions along with continued operation of NAPS would not reverse that trend and would have a SMALL impact on cumulative air quality.

E4.12.6.2 Climate Change

The VIMS Center for Coastal Resources Management identified air temperature and carbon dioxide concentrations as two environmental factors that could reflect shifts in global climate (CCRM. 2016).

As presented in Table E3.3-3 for air temperature recorded at Richmond the highest daily maximum temperature recorded in a given month over the 88-year period of record has six monthly maximum temperatures after 1987 and six from prior years. Table E3.3-4 presents site-specific air temperatures for 1988–2017. The monthly average temperatures for NAPS for June, July, and August are 73.3.°F, 77.1°F, and 75.6°F. These temperatures fall about evenly between the mean daily minimum and maximum for Richmond's period of record of 97 years (June 63.8°F and 85.2°F, July 68.4°F and 88.6°F, and August 67.0°F and 86.6°F). As presented in Section E3.3.2, on average NAPS has slightly lower temperatures than Richmond. However, the deviation between the NAPS average temperatures and the Richmond average temperatures does not exceed 2°F.

The licensed NAPS Unit 3 if built would have thermal discharges from its cooling towers released to the atmosphere and to Lake Anna in its blowdown. The heated air from NAPS Unit 3's dry and wet towers would be released to the atmosphere where it would mix and entrain into the surrounding air mass. The analysis conducted at the ESP stage of licensing which also included the operation of dry cooling towers for a fourth generating unit indicated that increases in overall atmosphere temperature would be localized to the NAPS site and would not affect the atmospheric or ground temperatures beyond the NAPS site boundary. (Dominion. 2006a, Section 5.3.3.1) A confirmatory analysis for the NAPS Unit 3 cooling towers using the same methodology and manufacturer's data was conducted for the COLA stage. The COLA evaluation focused on the potential for fogging, icing, and salt deposition; effects that are dependent on the towers' thermal discharge to the atmosphere. The confirmatory analysis concluded that the plume impacts reported in the ESP-ER, associated with the main cooling towers, remain bounding for fogging, icing and salt deposition. (Dominion. 2016b, Section 5.3) The NRC determined that the air quality impacts of operating the cooling towers to be SMALL at both the ESP and COLA stages of licensing and also determined cumulative air quality impacts to be SMALL (NRC. 2006, Sections 5.2 and 7.2; NRC. 2010, Sections 5.2 and 7.2)

As mentioned above, the licensed NAPS Unit 3, if built, would have thermal discharges to Lake Anna in its blowdown. Thermal discharges can also influence air temperature at the surface and through evaporation. As discussed in Section E4.12.8.1, temperature monitoring data for Units 1 and 2 operations do not indicate an overall long-term warming trend. The thermal contribution of NAPS Unit 3, if built, would be insignificant. Thus, thermal discharges to Lake Anna would not be expected to significantly increase air temperature during the proposed SLR term.

With regard to carbon dioxide concentrations as a factor contributing to climate change, the fuel source for NAPS and the licensed NAPS Unit 3 does not produce carbon dioxide emissions or other GHG emissions. The continued operation of NAPS would avoid millions of tons of GHGs from a fossil fuel-fired alternative such as the NGCC presented in Chapter E7.0. The carbon dioxide emissions or other GHG emissions from NAPS and NAPS Unit 3 would stem from minor sources such as emergency diesel generators. The construction of licensed NAPS Unit 3 if built would result in carbon dioxide and GHG emissions from construction equipment and commuting workers for the duration of construction operations. The NRC considered the air quality impacts from construction of NAPS Unit 3 to be SMALL (NRC. 2010, Section 4.2).

Given that (1) the NRC's cumulative impact analysis of operation of NAPS and NAPS Unit 3 determined the cumulative impact to be SMALL and (2) Lake Anna temperature monitoring does not indicate a long-term warming trend, the potential cumulative impacts of thermal discharges originating from present and future actions combined with climate change would be SMALL. Furthermore, continued operation of NAPS, as well as the construction and operation of the licensed NAPS Unit 3, if built, would be a small contributor of GHG emissions. Thus, the cumulative impact on air quality from present and future actions combined with climate change would be SMALL.

E4.12.6.3 Noise

NAPS operations have a SMALL impact on the noise environment, as described in Section E4.3. Areas adjacent to NAPS are identified by the land use designations of agricultural, commercial, industrial, residential, and water (Louisa County. 2019b). If NAPS Unit 3 were constructed, there would be noise from construction equipment, vehicles, and other construction activities. These noise sources would be intermittent and last for the duration of the construction activities. The NRC concluded that noise levels would be reduced at the EAB (approximately 2,855 feet away) to less than the 65 dBA, a guidance level for impacts to human receptors, concluding impacts to be SMALL (NRC. 2010, Section 4.8.2). Construction noise was again considered in a subsequent revision to the COLA ER and noise levels were estimated at 60-80 dBA at 400 feet from the NAPS Unit 3 construction site (Dominion. 2016b, Table 10.4-2), which are not higher that those previously considered.

Noise associated with the operation of licensed NAPS Unit 3, if built, would result from sources such as cooling towers, motors, generators, and heavy trucks. Most of the anticipated operations-related noise would be associated with the cooling towers. Noise levels from the cooling towers were confirmed in a cooling tower noise study to be less than or equal to 65 dBA at the EAB (Dominion. 2016b).

Given that NAPS operations would have a SMALL impact on noise and the noise from construction and operation of the licensed NAPS Unit 3, if built, would attenuate to lower, insignificant impact levels at the site boundaries, cumulative noise impacts would be SMALL.

E4.12.7 GEOLOGY AND SOILS

Impacts to geology and soils could result from ground-disturbing activities and stormwater runoff. Through application of the NAPS site SWPPP and obtaining any necessary stormwater permits, Section E4.4 concluded that the impact of NAPS on geology and soils would be SMALL. Construction and operation of licensed NAPS Unit 3, if built, would require stormwater and water protection permits from the VDEQ (Dominion. 2016b, Table 1.2-1) The SWPPP would be modified as necessary to address NAPS Unit 3 activities and structures. The NRC previously determined the hydrological alterations and water quality impacts from the construction of NAPS Unit 3 to be SMALL and operation of NAPS Unit 3 would have SMALL impacts on hydrological alternations and water-quality (NRC. 2010, Sections 4.3.1, 4.3.3, 5.3.1, and 5.5.3). The NRC also determined that cumulative impacts to water quality from operation of NAPS and NAPS Unit 3 would be SMALL (NRC. 2010, Sections 4.3.1, 4.3.3, 5.3.1, 5.5.3, and 7.3).

Given that the NRC's previous determination of cumulative impacts from hydrological alterations and water quality would be SMALL and ground disturbances at the NAPS site and the surrounding area during the SLR term would be subject to VPDES stormwater permitting and applicable BMPs, the cumulative impact to geology and soils would be SMALL.

E4.12.8 WATER RESOURCES

Surface Water

Surface water use impacts for open-cycle cooling were generically determined to be SMALL [10 CFR 51, Subpart A, Appendix B, Table B-1], and Dominion did not identify any new and significant information for this environmental issue. Modifications for CWA 316(b) compliance as a result of 2016–2017 entrainment studies and related technology and economic analyses, if any, would be implemented during the current license renewal term, and, depending on the required modifications, could result in changes to water withdrawal volumes and consumption. Any modifications would be under a VDPES permit issued by the VDEQ, and water use impacts would be considered by the VDEQ prior to issuance of the permit.

The geographic area in which cumulative impacts on water use were evaluated includes the North Anna Reservoir, the WHTF, and the North Anna River downstream of the North Anna Dam. Licensing and permitting actions for NAPS Unit 3 included an instream flow incremental methodology study to assess impacts to Lake Anna and downstream of the North Anna Dam from the additional water consumption of licensed NAPS Unit 3, if built. The NRC concluded that water-use impacts caused by operation of the licensed NAPS Unit 3, if built, would remain SMALL in normal years and MODERATE in drought years.

The VDEQ also considered NAPS Unit 3's impact on downstream users and ecological communities. Downstream impacts are mitigated by the release of water through the North Anna Dam. The lake level contingency plan included within the VPDES permit currently balances the demands of lake and downstream water needs. Through the lake level contingency plan, criteria for the timing, duration, and magnitude of discharge flows from the North Anna Dam and triggers for alterations in the normal pool elevation and reduced releases are set (Attachment B). To balance the needs for water use at Lake Anna and downstream users and ecological communities, the VDEQ issued Virginia Water Protection Permit (VWP) #10-2001 for NAPS Unit 3's operation that authorizes operations water withdrawals and a three-inch rise in water elevation in Lake Anna (VDEQ. 2012). The permit establishes dam release requirements for operation of licensed NAPS Unit 3, if built, in addition to operation of NAPS Units 1 and 2. The VDEQ also issued a VWP #10-1496 authorizing construction of NAPS Unit 3 intake structures and water withdrawals for construction activities, setting a limit on water withdrawals (VDEQ. 2011).

As discussed in Section E3.6.3.1, use of Lake Anna water other than withdrawal by NAPS is non-consumptive. The NRC concluded that future development was unlikely to appreciably alter the hydrology of Lake Anna, and that cumulative water-use impacts would be SMALL except during drought periods when the impacts would be MODERATE and that resolution of any future conflicts over water use during drought periods would fall within the regulatory authority of the Commonwealth of Virginia (NRC. 2010, Section 7.3). Given that (1) the VDEQ issued a water protection permit for NAPS Unit 3 operations that established dam releases for lake elevations and (2) that future projects along Lake Anna's shoreline and in the vicinity would be subject to VDEQ regulations for water withdrawals and growth would be guided by Louisa and Spotsylvania future land use plans, present and future water would be bounded by previous cumulative water use impact assessments.

Water discharges to Lake Anna during the SLR term would be regulated under VPDES permits for NAPS and VPDES and VWP permits for the construction and operation of NAPS Unit 3. USACE CWA 404 permit 10-V1256/NOA-2008-2534 also authorizes and establishes conditions for dredging activities and shoreline and in water construction activities for NAPS Unit 3 (USACE. 2011).

The NRC's analysis of cumulative water quality for the operation of NAPS and NAPS Unit 3 considered the discharge flows and composition. The discharge rate from the licensed NAPS Unit 3, if built, would be small (<2%) relative to NAPS Units 1 and 2's discharge. NAPS Unit 3's thermal discharge contribution to thermal impacts on the WHTF, the North Anna Reservoir, and the North Anna River downstream of the dam would be insignificant. NAPS Unit 3's cooling towers would concentrate chemical constituents. The NRC evaluated the potential for two priority pollutants, copper and tributyltin, existing in the ambient water of Lake Anna at concentrations near or above the state water-quality criteria values to be concentrated by NAPS Unit 3's cooling towers. If built, the licensed NAPS Unit 3 would discharge effluents into the discharge canal that will likely exceed water-quality criteria for copper and tributyltin. These pollutants would be rapidly diluted in the discharge canal and downstream due to the larger volume flows from Units 1 and 2. The NRC concluded that the cumulative water-quality impacts associated with the licensed NAPS Unit 3 would be SMALL. (NRC. 2010, Section 7.3)

As presented in Section E3.10.1, water quality in Lake Anna is monitored by the Lake Anna Civic Association in conjunction with VDEQ during the summer months. Furthermore, any future development's water discharges and stormwater flows would also be subject to VDEQ permitting.

Given that (1) NAPS and NAPS Unit 3 would be subject to USACE and VDEQ permitting; (2) NAPS Unit 3's low flow relative to NAPS Unit's 1 and 2 would be rapidly diluted; (3) future projects along Lake Anna's shoreline and in the vicinity would be subject to VDEQ regulations for water discharges; and (4) growth would be guided by Louisa and Spotsylvania counties' future land use plans, present and future water would be bounded by previous cumulative water use impact assessments.

<u>Groundwater</u>

Three Category 1 issues concern groundwater use and contamination applicable to the proposed action during the SLR term:

- Groundwater contamination and use (non-cooling system impacts)
- Groundwater use conflicts (plants that withdraw less than 100 gallons per minute)
- Groundwater quality degradation resulting from water withdrawals

These were generically determined to be SMALL [10 CFR 51, Subpart A, Appendix B, Table B-1], and Dominion did not identify any new and significant information for this environmental issue.

The Category 2 issue of radionuclides in groundwater was determined to be SMALL in Section E4.5.5.4 for the proposed action during the SLR term.

Impacts to groundwater from licensed NAPS Unit 3, if built, would be connected to the five new domestic wells that would be drilled for the NAPS Unit 3 construction and operations (Dominion. 2016b, Section 4.2.1.2). These new wells would be subject to VDEQ and VDH permitting. Also, foundation excavations for NAPS Unit 3 could intrude on groundwater zones and require dewatering during construction. Dewatering systems used during construction would depress the water table in the vicinity. However, any drawdown in the water table from the wells and dewatering would be limited by the proximity of Lake Anna and the discharge canal (NRC. 2006, Section 4.3.1; NRC. 2010, Section 4.3.1)

The NAPS site has approved waste management, spill prevention practices, and stormwater BMPs in place to prevent and minimize any surface sources of contamination that could migrate into groundwater resources. If built, applicable procedures would be revised to address NAPS Unit 3 activities and structures. NAPS will continue to maintain, modifying it as necessary to include NAPS Unit 3 activities and structures, and implement its spill prevention, control, and countermeasures (SPCC) plan to prevent spills that would contaminate soils, groundwater, and surface water during the proposed SLR operating term.

As presented in Section E3.10.3, based on review of NAPS annual radioactive effluent release reports from years 2013–2017, NAPS is in compliance with radiation protection standards identified within: (1) Appendix I to 10 CFR 50; (2) 10 CFR 20; and (3) 40 CFR 190. As discussed in Section E3.6.4.2.1, one unplanned radioactive gaseous release was reported between 2012 and 2019. The unplanned release was a fraction of the allowable limit. In addition, to effluent monitoring, since 2007, NAPS has monitored groundwater for radionuclides under its GPI program (Section E3.6.2.4). The NAPS radiological groundwater monitoring program has detected tritium, but no plant-related gamma isotopes or hard-to-detect radionuclides since the groundwater monitoring program was initiated in 2007. As discussed in Section E3.6.4.2, actions are ongoing to investigate and mitigate potential tritium pathways to ground in the area of GWP-18.There are no other current or ongoing remediation activities or investigations occurring at NAPS (Section E9.4).

As presented above, development in the NAPS vicinity would be guided by future land use plans. Any groundwater withdrawals would be subject to VDEQ and VDH permitting requirements. Given Dominion's compliance with groundwater permitting, application of groundwater protection procedures and monitoring during the SLR term, and the NRC's cumulative assessment of groundwater use impacts from NAPS Unit 3, the cumulative impact to groundwater resources would be SMALL.

E4.12.8.1 Climate Change

As presented in Section E4.12.2, climate change can be influenced by a rise in surface water temperatures. Dominion considered the rise in lake temperatures that would be caused by licensed NAPS Unit 3 operations, if built, and found that the average temperature rise in Lake Anna would be less than 0.06ºC (0.1ºF). In 2006, the NRC independently reviewed the analyses and agreed with the assessment and in 2010 at the COLA stage considered the analysis still valid. The NRC further considered the contribution to cumulative thermal impacts on the WHTF, the North Anna Reservoir, and the North Anna River downstream of the dam and determined NAPS Unit 3 contribution to be insignificant ((NRC. 2010, Section 5.4.2.3 and Section 7.3). NAPS operates under a CWA 316(a) variance granted after a successful 316(a) demonstration was approved in 1986 and as a requirement of the variance, monitors temperature in the WHTF, the North Anna Reservoir, and below the dam in the North Anna River (Dominion. 2017b). The Lake Anna and North Anna River temperature recordings are presented in Section E3.7.3. The range of temperatures and between-station temperature trends recorded over 2013–2018 were within the range of previously reported minimum and maximum lake temperatures. Temperature data do not indicate an overall long-term warming trend in the reservoir.

As discussed above, water use cumulative impacts would be small. This small water use impact would not contribute significantly to impacts on water resources from regional climate change impacts. Furthermore, as the NRC discussed for the other Dominion nuclear plant in Virginia, Surry Power Station, annual precipitation data for the southeast does not exhibit an increasing or decreasing overall trend and climate change models suggest a 0-3% increase in annual mean precipitation for the region encompassing Virginia for the 2041–2070 period (NRC. 2019a).

E4.12.9 ECOLOGICAL RESOURCES

E4.12.9.1 Terrestrial

The impacts on terrestrial species during the proposed SLR operating term are described as SMALL in the GEIS, and no new and significant information for Category 1 terrestrial resource environmental issues was identified (Section E5.2). The continued operation of NAPS would be governed by NAPS procedures and plans. As presented in Section E9.6, Dominion has administrative controls in place at NAPS to ensure that operational changes or construction activities are reviewed, and the impacts minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. In addition, regulatory programs that the site is currently subject to, such as stormwater management, spill prevention, and herbicide usage, further serve to minimize impacts to terrestrial resources. With continued application of these programs and procedures, the land-based impacts would largely be confined to NAPS property and would have minimal opportunity to contribute to cumulative impacts offsite.

The cumulative impacts of construction and operation of NAPS Unit 3 were reviewed by the NRC. The region of influence included the NAPS site, areas around Lake Anna, and within the existing transmission line rights-of-way, including a NAPS to Ladysmith transmission line to be added within an existing right-of-way to support licensed NAPS Unit 3 (if built) operations. The NRC considered the construction and operation of NAPS Unit 3 along with operations at NAPS and continued development of land in the vicinity of NAPS and Lake Anna that results in the loss of wildlife habitat. The NRC concluded that cumulative impacts to terrestrial resources would be SMALL. (NRC. 2010, Section 7.4)

As presented in Section E4.6.6.4.2, habitat for federally and state listed bat species occurs onsite and in the vicinity of NAPS. Dominion contracted for a bat survey in 2016 for forested portions of the site where licensed NAPS Unit 3 would be located if built. No listed bats were captured. (GAI Consultants. 2016) Actions requiring the removal of trees by Dominion would require adherence to the USFWS 4(d) Rule which sets guidelines for incidental take and consultation with federal wildlife agencies (USFWS. 2018e). Dominion's compliance with federal, state, and local laws and regulations will prevent unlawful take of the federally listed northern long-eared bat. Continued operations of the NAPS facility are not likely to affect the northern long-eared bat.

The bald eagle is known to nest on the NAPS site and is protected under the BGEPA. The state-listed loggerhead shrike is protected under the MBTA. Habitat for this species may be located on portions of the NAPS site and the species may occur onsite. Activities on the NAPS site are evaluated to ensure compliance under the BGEPA and MBTA. When necessary, consultation with responsible agencies is conducted to maintain compliance with existing regulations. Additionally, Dominion maintains policies and procedures for addressing avian incidents associated with Dominion facilities. These procedures include an investigation process, required reporting of each incident to the USFWS, and procedures for implementing corrective actions following each incident. This administrative practice is designed to identify and correct potential sources of injury or mortality to avian species (Dominion. 2009a).

The only protected plant species identified for the NAPS vicinity is the small whorled pogonia. The species was not found on the NAPS site or in transmission line rights-of-way during 2010 and 2012 surveys. Dominion has a commitment for biennial surveys for small whorled pogonia tied to construction of NAPS Unit 3. Given there is no current plan to start construction, Dominion has requested waivers and the USACE has granted waivers for the surveys with the most recent waiver granted in 2018 (USACE. 2018).

Given the NRC's previous cumulative impacts assessment considered the continued development of land in the vicinity of NAPS and Lake Anna, and that no other new projects have been identified, the NRC's previous assessment remains valid. The more recent reviews of protected species in the vicinity indicate the potential for their occurrence onsite or in the vicinity of NAPS. As presented in Section E3.7.8, there is no designated critical habitat for these species. Dominion has administrative controls in place at NAPS to ensure that operational changes or construction activities are reviewed, and the impacts to terrestrial resources are minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. In addition, regulatory programs that the site is currently subject to, such as stormwater management, spill prevention, and herbicide usage, further serve to minimize impacts to terrestrial resources. Therefore, cumulative impacts to terrestrial ecological resources would be SMALL.

E4.12.9.2 Aquatic

For the purposes of this analysis, the geographic area of interest includes the North Anna Reservoir, the WHTF, and the North Anna River downstream of the North Anna Dam. The aquatic resources of these are discussed in Section E3.7, along with results of current biological surveys and temperature monitoring. The VDGIF manages the fisheries of the North Anna watershed, which includes Lake Anna and the North Anna River. The VDGIF monitors the abundance of fish species through annual electrofishing and net sampling and makes fish stocking decisions accordingly (Section E3.7.1.1). Results indicate Lake Anna is home to many species including recreationally important species such as largemouth bass, striped bass, and black crappie and forage species. Dominion also monitors the health of the Lake Anna fishery through annual biological sampling required under the NAPS VPDES permit. Dominion found annual sampling results and trends demonstrate a balanced, indigenous fish community exists in Lake Anna. Trending of abundance indicates no consistent downward trends. Dominion's monitoring and trending of the North Anna River's fishery below the North Anna Dam likewise demonstrated diversity to be rich and stable and abundance fairly consistent. (Dominion. 2017b) Aquatic resource impacts during the proposed SLR operating term due to entrainment, impingement, and thermal discharges were concluded to be SMALL in Sections E4.6.1 and E4.6.2.

The NRC assessed the cumulative impacts of construction and operation of the licensed NAPS Unit 3 along with interactions with past, present, and reasonably foreseeable future actions. The NRC considered the reasonably foreseeable future actions to include development that results in habitat loss and nonpoint pollution, recreational activity in or near the lake and river, potential alterations to the fish communities of Lake Anna resulting from changes in VDGIF management practices, increased fishing pressure, natural environmental stressors, and short- or long-term changes in precipitation and temperature. The NRC concluded that the cumulative impacts would be SMALL. (NRC. 2010, Section 7.5)

As presented in Section E3.7.8, no protected aquatic species are found in the North Anna Reservoir, the WHTF, and downstream of the North Anna Dam. Suitable or optimum habitat for protected species is not found in Lake Anna. Also, no EFH exists at Lake Anna or the North Anna River to its confluence with the South Anna River, and no HAPCs or EFH areas protected from fishing are located on or adjacent to NAPS. Dominion has administrative controls in place at NAPS to ensure that operational changes or construction activities are reviewed, and the impacts to aquatic resources are minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. In addition, regulatory programs that the site is currently subject to, such as stormwater management, spill prevention, and herbicide usage, further serve to minimize impacts.

Given the NRC's previous cumulative impacts assessment, no present or future projects/activities have been identified not considered by the NRC, recent desktop reviews of protected species in the vicinity do not indicate their presence onsite or in the vicinity of NAPS, and Dominion's administrative controls in place to continue during the SLR term, cumulative impacts to aquatic ecological resources would be SMALL.

E4.12.9.3 Climate Change

The National Wildlife Federation conducted a species vulnerability study specific to Virginia, modeling climate change to project impacts to classes of species and specific species. The study's modeling showed species at the southern extent of their range shifting northward out of Virginia, species at the northern edge of their range could expand their presence in Virginia, and species in the heart of their geographic range in Virginia having expanded ranges. This study indicates that species' vulnerability due to climate change is tied to changes in temperature and precipitation. (NWF. 2013)

As presented in Section E4.12.8.1, temperature monitoring in Lake Anna and in the North Anna River does not show long-term warming trends. Modeling for the licensed NAPS Unit 3 cooling towers indicated SMALL impacts from atmospheric evaporation and impacts would be localized. Given that current monitoring at NAPS and NAPS Unit 3's studies for operating its cooling towers do not indicate a significant contribution to trends in air temperature, precipitation, and water temperature from NAPS operations, the contribution to cumulative impacts to ecological communities from climate change is also anticipated to be SMALL.

E4.12.10 HISTORIC AND ARCHEOLOGICAL RESOURCES

As presented in Section E4.7, Dominion has administrative controls in place for management of cultural resources ahead of any future ground-disturbing activities at the plant. These consist of a historic resources consultation guidance document that protects known cultural resources, as well as unknown cultural resources. Established processes for all activities that require a federal permit or use federal funding address the potential for impacts to cultural resources. Therefore, no adverse effects are anticipated to these sites during the proposed SLR operating term. Section E4.7 also presented the potential for continued operation of NAPS to affect cultural resources in the surrounding area and concluded that no adverse effects are anticipated.

Cultural resource investigations were completed from 1969–2009. The investigations completed from 2006–2009 were conducted to support NAPS Unit 3 licensing. The findings of the investigations prior to 2006 within both the NAPS site boundary and the lake-bed area yielded few resources, and none that were discovered were recommended eligible for the NRHP. The 2006–2009 investigations included field investigations of the 500-kV Ladysmith transmission line, the added 96-acre plot west of the licensed NAPS Unit 3 area, and desktop investigations of the proposed heavy haul road route for transporting large components to the NAPS Unit 3 construction site. The investigations identified 11 isolated finds, 12 archaeological sites, and 36 architectural resources. Five of these resources and the three previously identified cemeteries were recommended as eligible for the NRHP. The NRC concluded that potential construction impacts on historic and cultural resources would be SMALL based on commitments to avoid the sites or evaluate the sites and develop management plans and practices for sites that cannot be avoided. The NRC also concluded that the cumulative historic and cultural resources impacts associated with the construction and operation of the licensed NAPS Unit 3 would remain SMALL. (NRC. 2010, Sections 2.9.2, 4.6, and 7.6)

Given that continued operation of NAPS and construction and operation of NAPS Unit 3, if built, would have NO ADVERSE EFFECT, they would not contribute to adverse cumulative impacts to historic and cultural resources.

E4.12.11 SOCIOECONOMICS

The proposed SLR does not include additional workers (Section E4.8), so the SMALL adverse impacts that are the result of workers' impact on community services, education, and infrastructure including transportation would continue. The tax payments from the operating plant (Section E4.8) would continue along with the economic contributions of the plant's workforce. The 2018 Dominion tax payments in Louisa County are approximately 19% of the county's overall property tax revenues (Section E3.9.5). The current non-outage NAPS plant workforce (onsite permanent full-time employees and contract workers) consists of 903 persons and includes approximately 175 badged temporary supplemental employees (see Table E2.5-1). Thus, it is anticipated that significant beneficial socioeconomic impacts would also continue during the proposed SLR operating term.

The NRC's cumulative impact assessment for NAPS Unit 3 concluded that socioeconomic impacts, including aesthetics and recreation impacts, could range from MODERATE ADVERSE to LARGE BENEFICIAL if Unit 3 were built (NRC. 2010, Section 7.6). No other large project was identified for the SLR term; therefore, the cumulative socioeconomic impacts determined by the NRC remain valid. The adverse socioeconomic impacts to community services and infrastructure would be distributed across the surrounding area where the construction workforce for NAPS Unit 3, if built, and the operational workforce for NAPS Units 1 and 2, and NAPS Unit 3 (if built), would reside. Currently, approximately 73% of the permanent and temporary badged NAPS workforce reside in Hanover, Henrico, Louisa, Orange and Spotsylvania counties (Table E2.5-1). Because the majority of the operating plant is located in Louisa County, it receives the larger beneficial impact from Dominion's property tax assessment for the operating units.

E4.12.12 HUMAN HEALTH

Radiological dose limits for protection of the public and workers have been developed by the EPA and the NRC to address the cumulative impacts of acute and long-term exposure to radiation and radioactive material. These dose limits are codified in 10 CFR 20 and 40 CFR 190. For this analysis, the region of influence is the surrounding 50-mile region.

As presented in Section E3.10.3, Dominion prepares annual radiological environmental operating reports and annual radiological effluent reports. The reports for 2013–2017 indicate that doses to members of the public were negligible and in accordance with NRC and EPA radiation protection standards, and radionuclides attributable to NAPS were not detected in the various environmental media and food products from the surrounding 25-mile area. Also, the direct radioactivity measured by thermoluminescent dosimetry, which also accounts for the ISFSI located on the NAPS site, has remained relatively constant over the years. The 2017 annual radiological environmental operating report concluded that the operation of NAPS has created no adverse environmental effects or health hazards. (NAPS. 2018c) The three-year (2014–2016) average annual occupational dose [total effective dose equivalent (TEDE)] was 0.093 rem for NAPS (NRC. 2018b, Table 4.6). The annual TEDE limit is five rems [10 CFR 20.1201(a)(1)].

There are no other operating, decommissioning, or proposed nuclear reactors, fuel cycle facilities, or radiological waste treatment and disposal facilities within the 50-mile region of NAPS (NRC. 2017b; NRC. 2018c; NRC. 2018d; NRC. 2018e; NRC. 2018f; NRC. 2019b).

Operating NAPS for an additional 20-year period would not cause an increase in annual radioactive effluent releases. The cumulative impact of NAPS and NAPS Unit 3 operation, including onsite dry storage of the accumulated SNF in the ISFSI, would be expected to be SMALL, because the plant and ISFSI are designed to maintain doses as low as reasonably achievable and all routine releases and occupational exposure would be subject to federal regulations.

As for nonradiological human health impacts, NAPS operations occur in areas restricted from the public and are carried out by NAPS workers under a comprehensive occupational safety program. The comprehensive occupational safety program at NAPS addresses occupational hazards and the average recordable injury and illness incident rate per 100 equivalent full-time workers for 2014–2017 is 0.3, which is comparable to the nuclear electric power generation industry's rate of 0.2 for 2017 (BLS. 2018). NAPS participates in OSHA's Voluntary Protection Program (OSHA. 2019a) which recognizes employers and workers in private industry and federal agencies who have implemented effective safety and health management systems and maintain injury and illness rates below National Bureau of Labor Statistics averages for their respective industries (OSHA. 2019b). To participate, employers undergo a rigorous onsite evaluation by a team of safety and health professionals and are re-evaluated every three to five years. NAPS is recognized at the "Star" level, which is defined as demonstrating exemplary achievement in the prevention and control of occupational safety and health hazards in the development, implementation, and continuous improvement of a safety and health management system. (OSHA. 2019b)

As discussed in Section E4.9.1.4, the microbiological impact to public health due to thermal discharge from NAPS is SMALL. The thermal discharge of NAPS Unit 3, if built, would not significantly elevate Lake Anna's water temperature and the health impacts of the addition of the licensed NAPS Unit 3, if built, would not be likely to increase populations of thermophilic microorganisms beyond the levels normally occurring (NRC. 2010 Sections 5.3.3 and 7.7). The NAPS in-scope transmission lines are also restricted from public access and do not pose a public human health risk. Compliance with NESC and NAPS procedures minimizes occupational risk from electrical shock hazards (Section E4.9.2.4). Therefore, cumulative impacts to human health from nonradiological hazards are not expected.

E4.12.13 WASTE MANAGEMENT

As presented in Section E4.11, the comprehensive regulatory controls in place for management of radiological waste and Dominion's compliance with these regulations and use of only licensed treatment and disposal facilities would allow the impacts to remain SMALL during the proposed SLR operating term. The NRC oversees the licensing of radiological waste treatment and disposal facilities. There are three facilities providing low-level radioactive waste disposal services in the United States (NRC. 2017b).

Dominion has programs in place to manage its hazardous and non-hazardous waste streams. Dominion also ensures that only licensed or permitted facilities are used for treatment and disposal of its waste streams. Continuation of existing systems and procedures to ensure proper storage and disposal during the proposed SLR operating term would allow the impacts to be SMALL. The other facilities within the 50-mile region of NAPS are also required to comply with appropriate EPA and state requirements for the management of radioactive and nonradioactive wastes. Thus, the cumulative waste management impact would be SMALL.

E4.13 IMPACTS COMMON TO ALL ALTERNATIVES: URANIUM FUEL CYCLE

E4.13.1 OFFSITE RADIOLOGICAL IMPACTS—INDIVIDUAL IMPACTS FROM OTHER THAN THE DISPOSAL OF SPENT FUEL AND HIGH-LEVEL WASTE

E4.13.1.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The impacts to the public from radiological exposures have been considered by the Commission in Table S-3 of this part. Based on information in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS), impacts to individuals from radioactive gaseous and liquid releases, including radon-222 and technetium-99, would remain at or below the NRC's regulatory limits.

E4.13.1.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.13.1.3 Background [GEIS Section 4.12.1.1]

The primary indicators of impact are the concentrations of radionuclides in the effluents from the fuel cycle facilities and the radiological doses received by a maximum exposed individual (MEI) on the site boundary or at some location away from the site boundary. The basis for establishing the significance of individual effects is the comparison of the releases in the effluents and the MEI doses with the permissible levels in applicable regulations. The analyses performed by the NRC in the preparation of Table S-3 and found in the 1996 GEIS indicate that as long as the facilities operate under a valid license issued by either the NRC or an agreement state, the individual effects will meet the applicable regulations. On the basis of these considerations, the NRC has concluded that the impacts on individuals from radioactive gaseous and liquid releases during the license renewal term would remain at or below the NRC's regulatory limits. Accordingly, the NRC concludes that offsite radiological impacts of the uranium fuel cycle (individual effects from sources other than the disposal of spent fuel and high-level waste) are SMALL.

E4.13.1.4 Analysis

This issue concerns the direct impacts from facilities involved in supplying nuclear fuel to nuclear power plants and disposing of radioactive waste. The issue was considered in Dominion's new and significant review as described in Chapter E5.0, and no new and significant information was identified as it relates to offsite radiological impacts—individual impacts from other than the disposal of spent fuel and high-level waste. The issue was also considered in the initial license renewal's new and significant review and no new and significant information was found at the time (Dominion. 2001, Table 4-2 and Section 5.1). Based on Dominion's finding of no new and significant information, further analysis is not required.

E4.13.2 OFFSITE RADIOLOGICAL IMPACTS—COLLECTIVE IMPACTS FROM OTHER THAN THE DISPOSAL OF SPENT FUEL AND HIGH-LEVEL WASTE

E4.13.2.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

There are no regulatory limits applicable to collective doses to the general public from fuel-cycle facilities. The practice of estimating health effects on the basis of collective doses may not be meaningful. All fuel-cycle facilities are designed and operated to meet the applicable regulatory limits and standards. The Commission concludes that the collective impacts are acceptable.

The Commission concludes that the impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective impacts of the uranium fuel cycle, this issue is considered Category 1.

E4.13.2.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.13.2.3 Background [GEIS Section 4.12.1.1]

There are no regulatory limits applicable to collective doses to the general public from fuel cycle facilities. All regulatory limits are based on individual doses. All fuel cycle facilities are designed and operated to meet the applicable regulatory limits.

As discussed in the 1996 GEIS, despite the lack of definitive data, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. The Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR 54 should be eliminated. Accordingly, while the

Commission has not assigned a single level of significance for the collective effects of the fuel cycle, this issue was considered Category 1.

E4.13.2.4 Analysis

This issue concerns the direct impacts from facilities involved in supplying nuclear fuel to nuclear power plants and disposing of radioactive waste. The issue was considered in Dominion's new and significant review and no new and significant information was identified as it relates to offsite radiological impacts – collective impacts from other than the disposal of spent fuel and high-level waste. The issue was also considered in the initial license renewal's new and significant review and no new and significant information was found at that time (Dominion. 2001, Table 4-2 and Section 5.1). Based on Dominion's finding of no new and significant information, further analysis is not required.

E4.13.3 NONRADIOLOGICAL IMPACTS OF THE URANIUM FUEL CYCLE

E4.13.3.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant would be SMALL.

E4.13.3.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.13.3.3 Background [GEIS Section 4.12.1.1]

Data on the nonradiological impacts of the fuel cycle are provided in Table S-3. These data cover land use, water use, fossil fuel use, and chemical effluents. The significance of the environmental impacts associated with these data was evaluated in the 1996 GEIS on the basis of several relative comparisons. It was noted that the impacts associated with uses of all of the above resources would be SMALL. Any impacts associated with nonradiological liquid releases from the fuel cycle facilities would also be SMALL. As a result, the aggregate nonradiological impact of the uranium fuel cycle resulting from the renewal of an operating license for a plant would be SMALL, and it was considered a Category 1 issue in the 1996 GEIS.

E4.13.3.4 Analysis

This issue concerns the direct impacts from facilities involved in supplying nuclear fuel to nuclear power plants and disposing of radioactive waste. The issue was considered in Dominion's new and significant review and no new and significant information was identified as it relates to nonradiological impacts of the uranium fuel cycle. The issue was also considered in the initial license renewal's new and significant review and no new and significant information was found at that time (Dominion. 2001, Table 4-2 and Section 5.1). Based on Dominion's finding of no new and significant information, further analysis is not required.

E4.13.4 TRANSPORTATION

E4.13.4.1 Findings from 10 CFR 51, Subpart A, Appendix B, Table B-1

SMALL. The impacts of transporting materials to and from uranium-fuel-cycle facilities on workers, the public, and the environment are expected to be SMALL.

E4.13.4.2 Requirement [10 CFR 51.53(c)(3)(iv)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.13.4.3 Background [GEIS Section 4.12.1.1]

The impacts associated with transporting fresh fuel to one 1,000 MWe model light-water reactor and with transporting spent fuel and radioactive waste (LLW and mixed waste) from that light water reactor are provided in Table S-4 in 10 CFR 51.52. Similar to Table S-3, and as indicated in 10 CFR 51.52, every environmental report prepared for the construction permit stage of a commercial nuclear power plant must contain a statement concerning the transport of fuel and radioactive waste to and from the reactor. A similar statement is also required in LRAs. Table S-4 forms the basis of such a statement.

In 1999, the NRC issued an addendum to the 1996 GEIS in which the agency evaluated the applicability of Table S-4 to future license renewal proceedings, given that the spent fuel is likely to be shipped to a single repository (as opposed to several destinations, as originally assumed in the preparation of Table S-4) and given that shipments of spent fuel are likely to involve more highly enriched fresh fuel (more than 4% as assumed in Table S-4) and higher-burnup spent fuel (higher than 33,000 MWd/MTU as assumed in Table S-4). In the addendum, the NRC evaluated the impacts of transporting the spent fuel from reactor sites to the candidate repository at Yucca Mountain and the impacts of shipping more highly enriched fresh fuel and higher-burnup spent fuel. On the basis of the evaluations, the NRC concluded that the values given in Table S-4 would still be bounding, as long as the (1) enrichment of the fresh fuel was 5% or less, (2) burnup of the spent fuel was 62,000 MWd/MTU or less, and (3) higher-burnup spent fuel (higher than 33,000 MWd/MTU) was cooled for at least five years before being shipped offsite.

E4.13.4.4 Analysis

As stated above, the NRC considered the impacts of this issue to be SMALL, provided three conditions were met. Dominion reviewed its plans and protocols for future fuel enrichment specifications, fuel loading plans, and spent fuel cooling with regard to the three Table S-4 conditions. Dominion anticipates the maximum enrichment of fuel to be used at NAPS during the proposed SLR operating term to be below 5% (NAPS. 2020, Section 4.5.2.1.2.1). For normal fuel batches, the average burnup level of the peak rod is not planned to exceed 60,000 MWd/MTU during the proposed SLR operating term ((NAPS. 2020, Section 4.5). Furthermore, as presented in Section E2.2.6, spent fuel is stored onsite in spent fuel pools for adequate cooling prior to transfer to onsite dry storage.

The three conditions discussed in Section E4.13.4.3 are met. Dominion's new and significant review included compliance with the criteria of Table S-4, and concludes that there is no new and significant information related to transportation impacts of the uranium fuel cycle. The issue was also considered in the initial license renewal's new and significant review and no new and significant information was found at that time (Dominion. 2001, Table 4-2 and Section 5.1). Based on Dominion's finding of no new and significant information, further analysis is not required.

E4.14 TERMINATION OF NUCLEAR POWER PLANT OPERATIONS AND DECOMMISSIONING

E4.14.1 FINDINGS FROM 10 CFR 51, SUBPART A, APPENDIX B, TABLE B-1

SMALL. License renewal is expected to have a negligible effect on the impacts of terminating operations and decommissioning on all resources.

E4.14.2 REQUIREMENT [10 CFR 51.53(C)(3)(IV)]

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware.

E4.14.3 BACKGROUND [GEIS SECTIONS 4.12.2 AND 4.12.2.1]

The impacts of decommissioning nuclear plants were evaluated in the *Generic Environmental Impact Statement for Decommissioning Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors* (NUREG-0586).

This section describes and discusses the environmental consequences of terminating nuclear power plant operations and decommissioning, but the only impacts attributable to the proposed action (license renewal) are the effects of an additional 20 years of operations on the impacts of decommissioning. The majority of the impacts associated with plant operations would cease with reactor shutdown; however, some impacts would remain unchanged, while others would continue at reduced or altered levels. Some new impacts might also result directly from terminating nuclear power plant operations.

Terminating nuclear power plant operations would result in the cessation of actions necessary to maintain the reactor, as well as a significant reduction in the workforce. The NRC presumes that terminating nuclear power plant operations would not immediately lead to the dismantlement of the reactor or other infrastructure, much of which would still be in use to support other units on site that continued to operate. Even for sites with just one unit, some facilities would remain in operation to ensure that the site was maintained in safe shutdown condition.

E4.14.4 ANALYSIS

Only the incremental increase in the impacts of termination of plant operations and decommissioning attributable to continued operation during the proposed SLR operating term is within the scope of this issue. However, the 2013 GEIS indicates that the timing of decommissioning does not substantially influence the environmental impacts of decommissioning. As noted in Sections E2.3 and E2.5, the proposal to continue operation during an SLR operating term does not include construction of additional plant structures that would require decommissioning and additional workers are not anticipated for the license term that would incrementally increase socioeconomic impacts of termination of plant operations.

Dominion would plan and conduct decommissioning activities in accordance with NRC-reviewed methods and evaluate anticipated environmental impacts to ensure that they are bounded by previously issued environmental assessments or are SMALL. Site restoration activities would be conducted in accordance with state and local regulations and permits, ensuring that environmental impacts would be SMALL.

The decommissioning impacts component of this issue was considered in the initial license renewal's new and significant review and no new and significant information was found at that time (Dominion. 2001, Table 4-2 and Section 5.1). The 2013 GEIS combined several Category 1 decommissioning issues in the 1996 GEIS and added consideration of termination of plant operations. No new and significant information has been identified for this issue. Based on Dominion's finding of no new and significant information, further analysis is not required.

E4.15 POSTULATED ACCIDENTS

E4.15.1 CATEGORY 1 ISSUE—DESIGN-BASIS ACCIDENTS

The following Category 1 issue related to postulated accidents was reviewed for new and significant information that could make the generic finding as described in the GEIS (NRC. 2013a) inapplicable to NAPS: Issue 65—Design-basis accidents.

The GEIS (NRC. 2013a) concluded that because a licensee is required to maintain the plant within acceptable design and performance criteria, including during any license renewal term, impacts from design-basis accidents would not be affected by changes in plant environment because such impacts (1) are based on calculated radioactive releases that are not expected to change, (2) are not affected by plant environment because they are evaluated for the hypothetical maximally exposed individual, and (3) have been previously determined acceptable. The GEIS also observes that additional experience has contributed to improved plant performance as measured by trends in plant-specific performance indicators, a reduction in operating events, and lessons learned that improve the safety of all the operating nuclear power plants. This is also confirmed by analysis which indicates that in many instances, improved plant performance and design features have resulted in reductions in initiating event frequency, core damage frequency, and containment failure frequency.

The NAPS review of new and significant information for the issue of design-basis accidents did not identify any new and significant information, and hence, no additional analysis is needed.

E4.15.2 CATEGORY 2 ISSUE—SEVERE ACCIDENTS

In 2001, NAPS submitted an application for OL renewal, which was approved in 2003. The original 40-year OLs for NAPS Units 1 and 2 were thereby extended out to 60 years. As part of this initial license renewal process, a detailed evaluation of potential severe accident mitigation alternatives (SAMAs) was performed. Of the 158 potential SAMAs identified in the initial license renewal, 107 were qualitatively screened (e.g., those that are only applicable to BWRs), and a detailed cost-benefit analysis was performed on the 51 SAMAs that could not be screened (Virginia Power. 2000). The cost-benefit analysis included development of a Level 3 probabilistic risk assessment (PRA) for NAPS, which was used to calculate conditional offsite doses and property damage for each of the PRA source term categories (STCs). By calculating the reduction in STC frequencies for each potential SAMA, the present value dollar benefit of each was determined, utilizing the guidance of NUREG/BR-0184 (NRC. 1997). The benefit was then compared to a cost estimate for each to complete the cost-benefit comparison. The conclusion of the analysis was that none of the proposed SAMAs was cost beneficial to NAPS.

Because a SAMA analysis for NAPS was performed as part of initial license renewal, a new SAMA analysis is not required as part of the SLR application. As part of the SLR process to renew the NAPS OL for another 20 years, the NAPS PRA is again examined for insights. The purpose is to determine if there is any new and significant information regarding the SAMA analyses that would affect the decision to renew the OLs. Over the course of plant operation, changes are made to the plant design, operation, and maintenance practices. Periodic updates to the NAPS PRA have ensured that the PRA includes the relevant changes and continues to reflect the current plant design and operation. PRA updates also include updates to the plant-specific initiating event and equipment data utilized, and improvements in state-of-the-art analysis of severe accidents.

Therefore, the PRA provides valuable insights into the risk significance of the plant changes over time.

The analyses below follow the draft NEI guidance (NEI. 2019) for determination of whether or not there is new and significant information regarding the SAMA analyses. For the NAPS SLR, the consideration of new and significant changes since the time of the initial license renewal is consistent with the GEIS (NRC. 2013a), Supplement 49 (NRC. 2014b). Section 5.3.9 of GEIS Supplement 49 states the following:

> *New information is significant if it provides a seriously different picture of the impacts of the Federal action under consideration. Thus, for mitigation alternatives such as SAMAs, new information is significant if it indicates that a mitigation alternative would substantially reduce an impact of the Federal action on the environment. Consequently, with respect to SAMAs, new information may be significant if it indicated a given cost-beneficial SAMA would substantially reduce the impacts of a severe accident or the probability or consequences (risk) of a severe accident occurring.*

The implication of this statement is that "significance" is not solely related to whether or not a SAMA is cost beneficial, but depends also on a SAMA's potential to significantly reduce risk to the public (NEI. 2019).

The following Category 2 issue (requirement) related to severe accidents has been defined by the NRC in 10 CFR 51.53(c)(3)(ii)(L):

> *If the staff has not previously considered severe accident mitigation alternatives for the applicant's plant in an environmental impact statement or related supplement or in an environmental assessment, a consideration of alternatives to mitigate severe accidents must be provided.*

The NRC finding regarding severe accidents is stated in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, as follows:

> *The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.*

The NRC has ruled that when a plant qualifies for the exception from the requirement to consider SAMAs in 10 CFR 51.53(c)(3)(ii)(L), the exception operates to designate this Category 2 issue as the "functional equivalent" of a Category 1 issue (NRC. 2013e). Accordingly, Dominion reviewed this issue for new and significant information that would cause the following generic conclusions in the GEIS (NRC. 2013a) concerning this issue to be inapplicable to NAPS.

1. The probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants.
2. License renewal ERs for plants for which SAMAs have been previously considered need not consider SAMAs.

The assessment process for new and significant information related to the first conclusion included (1) interviews with subject matter experts on the validity of the conclusions 2013 GEIS as they relate to NAPS; and (2) review of documents related to predicted impacts of severe accidents at NAPS. Consideration was given to developments in plant operation and accident analysis that could have changed the assumptions made concerning severe accident consequences after SAMAs were previously evaluated by the NRC for NAPS during initial license renewal (Dominion. 2001). Developments in the following areas included:

- New internal events information
- External events
- New source term information
- Power uprates
- Higher fuel burnup
- Other considerations including population increase and risk-beneficial plant changes implemented in response to recommendations from the Fukushima Daiichi Near Term Task Force.

No new and significant information was identified. Core damage frequency (CDF) from internal events has followed a decreasing trend at both NAPS units since the previous SAMA analysis was performed (Dominion. 2001). Physical changes in the plant (e.g., changes in the RCP seal design) have significantly reduced risk in all aspects of the PRA. Also, changes have been implemented at the site in response to Fukushima Daiichi Near Term Task Force recommendations and other plant-specific programs that are "risk-beneficial" but not all are credited in NAPS PRA models. Therefore, the NRC conclusion in the 2013 GEIS that "the probability-weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small" is considered appropriate for the NAPS SLR, is incorporated herein by reference, and no further analysis is needed.

Regarding the second conclusion, the subsections below describe the methodology and review of SAMAs to demonstrate there is no new and significant information.

E4.15.3 METHODOLOGY FOR EVALUATION OF NEW AND SIGNIFICANT SAMAS

E4.15.3.1 Overview

The evaluations of the NAPS SLR SAMAs are consistent with the NEI 17-04 methodology (NEI. 2019), which describes a three-stage process for determining whether there is any "new and significant" information relevant to a previous SAMA analysis. In Stage 1, the SLR applicant uses PRA risk insights and/or risk model quantifications to estimate the percent reduction in the maximum benefit (MB) associated with (1) all unimplemented "final plant-specific SAMAs"[1] for the analyzed plant and (2) those SAMAs identified as potentially cost beneficial for other U.S. nuclear power plants and which are applicable to but not already implemented at analyzed plant. Consistent with the NRC's rulings that new and significant information is that which "presents 'a seriously different picture' of the environmental impacts . . . compared to the previously issued final environmental impact statement," (NRC. 2016), the first stage examines whether these potentially cost-beneficial SAMAs might reduce severe accident risk substantially. If it can be demonstrated that none of these SAMAs being evaluated can reduce the MB by 50% or more, then the applicant may document the conclusion that there is no new and significant information relevant to the previous SAMA analysis. If one or more of those SAMAs are shown to reduce the MB by 50% or more, then the applicant must complete Stage 2 by developing updated averted cost-risk estimates for implementing those SAMAs. If the Stage 2 assessment confirms that one or more SAMAs reduce the MB by 50% or more, then the applicant must complete Stage 3 by performing a cost-benefit analysis for the "potentially significant" SAMAs identified in Stage 2. Applicants that are able to demonstrate through the Stage 1 screening process that there is no potentially significant new information are not required to perform the Stage 2 or Stage 3 evaluations. The application of the NEI 17-04 methodology is described in the following subsections.

E4.15.3.1.1 Definitions of New and Significant Information

"New" information pertains to data used in a SAMA analysis that have changed or become available since the time the preceding SAMA analysis was performed.

[1] As used in NEI 17-04, the term "final plant-specific SAMA" refers to the unimplemented SAMAs for which a cost-benefit analysis was performed in the initial license renewal, comparing plant-specific averted cost risk to projected implementation cost.

There are some inputs to the SAMA analysis that are expected to change, or to potentially change, for all plants. These inputs include the following:

- Updated Level 3 model consequence results, which may be impacted by multiple inputs, including, but not limited to, the following:
  - o Population
  - o Value of farm and non-farm wealth
  - o Core inventory (e.g., due to power uprate)
  - o Evacuation timing and speed
  - o Level 3 methodology updates
- NUREG/BR-0058 (NRC. 2004) cost-benefit methodology updates.

In addition, other changes that could be considered "new information" are dependent on plant activities or site-specific changes. These types of changes include the following:

- Identification of a new hazard.
- Updated plant risk model (e.g., a fire PRA that replaces the individual plant examination of external events [IPEEE] analysis).
  - o Impacts of plant changes that are included in the plant risk models will be reflected in the model results and do not need to be assessed separately.
- Non-modeled modifications/changes to the plant.
  - o Modifications determined to have no risk impact need not be included (e.g., replacement of the condenser vacuum pumps), unless they impact a specific input to SAMA (e.g., a new low-pressure turbine in the power conversion system that results in a greater net electrical output).

For risk model updates performed to reflect the latest PRA model state of the practice, it is noted that the actual physical plant risk may not have changed; however, because the best-estimate assessment or understanding of the risk has changed, it is considered new information.

The NAPS-R07i model was used to determine the level of significance of new information. This model includes internal events (including internal floods) and a seismic PRA which takes into account the 2011 Mineral, VA, earthquake. Consistent with the NEI methodology, this PRA model reflected the most up-to-date understanding of plant risk at the time of analysis (NEI. 2019) As noted above, the criterion established for a potential SAMA being "significant" is if the maximum benefit (MB) calculated for NAPS would be reduced by a factor of two or more if the SAMA were implemented. If it can be shown that a particular SAMA would not reduce the core damage frequency (CDF) or any of the significant Level 2 release category group frequencies in the model of record by more than a factor of two, then that particular SAMA could not reduce the MB by a factor of more than two. Therefore, that SAMA would not be considered potentially significant and would not be evaluated further in assessing the significance of new information. This criterion was applied to the SAMA screening evaluation presented in Section E4.15.4.

As seen in the subsequent sections, for NAPS, all SAMAs were screened out either qualitatively or quantitatively in accordance with the NEI 17-04 methodology. Therefore, the "Stage 2" NEI 17-04 was not required, and the Level 3 PRA was not updated. Existence of a SAMA that would reduce MB by 50% or more and also be potentially cost-beneficial, would indicate the existence of "new and significant" information relevant to the previous SAMA analysis.

E4.15.4 ANALYSIS

E4.15.4.1 Stage 1 Assessment: Overview

The list of candidate SAMAs for the NAPS SLR was developed from plant-specific and industry sources. For the plant-specific portion, the initial NAPS license renewal SAMA evaluation was examined to identify all final plant-specific SAMAs that were not found to be cost-beneficial in the initial license renewal. Evaluating these items is appropriate for determining if there is any new and significant information for NAPS and the PRA since the time of the initial license renewal in regard to the potential plant improvements.

For evaluation of the industry sources, the GEIS (NRC. 2013a) supplements were examined for SAMAs found to be potentially cost effective at plants similar to NAPS. SAMAs found to be potentially cost effective at similar plants (pressurized water reactors) were considered for their significance at NAPS (NRC. 2014b).

The list of SAMAs collected was evaluated qualitatively to screen any that are not applicable to NAPS, or already exist at NAPS. In addition, two other screening criteria were applied to eliminate SAMAs that have excessive cost. First, SAMAs were screened if they were found to reduce the NAPS MB by >50% in the initial NAPS license renewal, but also found not to be cost-effective due to high cost in the first license renewal. Second, SAMAs related to creating a containment vent were screened because this plant modification has been evaluated industry-wide and explicitly found to not be cost-effective in Westinghouse large/dry containments.

The remaining SAMAs were then grouped (if similar) based on similarities in mitigation equipment or risk-reduction benefits, and all were evaluated for the impact they would have on the NAPS CDF and significant STC group frequencies if implemented. If any of the SAMAs reduced the total CDF or at least one significant STC group frequency by at least 50%, then the SAMA would be retained for a full Level 3 PRA evaluation of the reduction in MB. As seen below, all SAMAs were screened as not significant without the need to perform a Level 3 update.

In terms of external event consideration, the NAPS-R07i model includes a seismic PRA, which is utilized in the quantitative screening. Regarding fires and other external events, it is conservative to estimate the percentage reduction in total MB by utilizing the internal events models, as they utilize the logic from the Level 1 PRA event trees. In most cases, the sequences result in the use of transient or loss of offsite power (LOOP) and/or station blackout (SBO) logic. Therefore, the percentage reduction in MB achieved by each SAMA would be similar to that of the internal events transient, LOOP, and SBO analyses. While this would yield some change to the specific contribution on each STC, the changes are not expected to be significant because of the use of the same supporting event tree logic.

From the first NAPS license renewal, the total MB calculated for the NAPS internal events model receives a significant contribution from interfacing systems loss-of-coolant accident (ISLOCA) and steam generator tube rupture (SGTR). The external events analysis, however, does not have any contribution from ISLOCA or SGTR-initiating events, although some contribution from induced SGTR would still apply to external events. Therefore, if external events were included, the absolute value reduction in MB of some SAMAs would be larger; however, there is confidence that the methodology of percentage reduction in MB due to internal events results in a conservative analysis.

E4.15.4.2 Stage 1 Assessment – Identification and Qualitative Screening

A total of 283 industry SAMAs were collected for evaluation in the NAPS SLR. All but 39 were qualitatively screened using the criteria discussed in Section E4.15.4.1.

Table E4.15-1 presents the 39 industry SAMAs that were not qualitatively screened, combined with the 51 NAPS-specific SAMAs selected for further evaluation. The first column presents number assigned to each SAMA for tracking purposes. The second column identifies the plant from which the SAMA originated (i.e., NAPS or an industry SAMA); the third column identifies the SAMA number from the source plant; the fourth column provides a description of the SAMA. The fifth column discusses the grouping of the SAMAs, and the sixth column identifies the name assigned to the SAMA group.

E4.15.4.3 Stage 1 Assessment – Quantitative Screening

This section presents the quantitative screening of the NAPS SAMAs. The NEI 17-04 methodology considers a potential SAMA to not be significant unless it reduces the MB by at least 50%. The Stage 1 quantitative screening process evaluates this using the criteria of total CDF and no STC frequency being reduced by at least 50%. Because the MB is the sum total of the contribution of each STC, if no STC decreases by at least 50%, then the total MB reduction cannot exceed 50%. However, the approach of evaluating every STC is not necessary to ensure the MB reduction is less than 50%. In reality, many individual STCs have a frequency that is insignificant, and while an insignificant STC could in theory be reduced by >50%, its impact on MB would be negligible. Additionally, many STCs have conditional offsite consequences that are negligible compared to the dominant STC groups (i.e., large, early release frequency [LERF] and large, late release frequency [LLRF]).

Therefore, the significant STC groups (i.e., LERF and LLRF) are examined for percentage reduction. If neither the total CDF, total LERF or total LLRF is reduced by >50%, then the MB is also not reduced by >50%. SAMAs screened in this manner will not be considered "significant" and will be conclusively screened as part of the Stage 1 assessment.

Table E4.15-2 presents the quantitative screening results from the bounding SAMA evaluations. The table presents the portion of the PRA model solved (internal events CDF, LERF, and LLRF, and seismic CDF, LERF, and LLRF), the truncation level applied to the quantification, the baseline CDF, LERF, and LLRF, and the results for each of the quantitative cases analyzed.

As seen in Table E4.15-2, none of the bounding quantitative screening evaluations resulted in a reduction of total CDF, total LERF, or total LLRF greater than 50%. The evaluations were selected conservatively to provide assurance that they are bounding. Of the results presented in Table E4.15-2, one case (EDG) yielded an internal events LLRF reduction of 57%. However, when combined with the seismic LLRF, the total LLRF reduction is less than 1% since the seismic LLRF is three orders of magnitude higher than the internal events LLRF, and it is relatively insensitive to diesel failures. It is also noted that the internal events LERF is an order of magnitude higher in frequency than the internal event LLRF. Since the internal events LERF reduces by less than 3% in the EDG case, this provides additional confidence that the total change in MB for the EDG case would be well below 50%.

E4.15.5 CONCLUSIONS

Appropriate qualitative screening criteria were applied to the industry SAMAs identified for consideration, eliminating many of the industry SAMAs from further consideration. For the remaining industry SAMAs and for the NAPS-specific SAMAs to evaluate, a series of bounding quantitative analyses were performed. These analyses demonstrated that none of the SAMAs considered for quantitative evaluation would reduce the NAPS MB by 50 or greater.

Therefore, it is concluded that no new and significant information relevant to the original SAMA analysis for NAPS exists, and no further analysis is needed.

Table E4.15-1 Grouping of Related SAMAs for Bounding Quantitative Evaluation

NAPS #	Plant	Plant SAMA #	SAMA Description	Grouped Assessment	Case Name
2	Arkansas Nuclear One-2	AC/DC-16	Emphasize steps in plant recovery procedure following SBO.	Quantitatively evaluate. The benefit of additional training and guidance in restoring offsite power after an SBO is determined.	OPR
315	North Anna	70	Emphasize steps in recovery of offsite power after an SBO.		
9	Beaver Valley 1,2	164	Provide procedural guidance to close the RCS loop stop valve to isolate a ruptured generator and provide a mechanical device to close (gag) a stuck-open steam generator safety valve.	Quantitatively evaluate to determine the maximum benefit of SAMAs associated with SGTRs. These SAMAs prevent or reduce releases through the ruptured tube.	NO-SGTR
275	Waterford 3	71	Manufacture a gagging device for a steam generator safety valve and develop a procedure or work order for closing a stuck open valve.		
193	Prairie Island 1, 2	Added	Purchase of a gagging device that could be used to close a stuck-open SG safety valve on the ruptured steam generator prior to core damage in SGTR events.		
143	Indian Point 3	18	Route the discharge from the MSSVs through a structure where spray water would condense the stream and remove fission products.		
240	Sequoyah 1, 2	Added	Purchase or manufacture a “gagging device” that could be used to close a stuck-open steam generator safety valve for a SGTR event prior to core damage.		
283	Wolf Creek	14	Install a permanent, dedicated generator for the NCP (similar to SAMA 1), and a motor-driven AFW pump and battery charger to address SBO events in which the TD AFW pump is unavailable.		
319	North Anna	84	Improved SGTR coping abilities.		
320	North Anna	86	Increase secondary side pressure capacity such that a SGTR would not cause the relief valves to lift.		
321	North Anna	87	Replace steam generators with new design.		

Table E4.15-1 Grouping of Related SAMAs for Bounding Quantitative Evaluation

NAPS #	Plant	Plant SAMA #	SAMA Description	Grouped Assessment	Case Name
87	Cook 1, 2	12	Create an independent RCP seal injection system, with dedicated diesel.	Quantitatively evaluate. These SAMAs would add redundancy to RCP seal cooling alternatives, or eliminate manual actions for RCP seal cooling, and reduce CDF from loss of seal cooling or an SBO.	RCP-SEAL
88	Cook 1, 2	13	Create an independent RCP seal injection system, without dedicated diesel.		
99	Cook 1, 2	184	Provide a means to ensure RCP seal cooling so that RCP seal LOCAs are precluded for SBO events.		
114	Farley 1, 2	11	Use existing hydro test pump for RCP seal injection.		
229	Sequoyah 1, 2	215	Provide a means to ensure reactor coolant pump seal cooling so that reactor coolant pump seal loss of coolant accidents are precluded for station blackout events.		
207	Salem 1, 2	11	Modify plant procedures to make use of other unit's PDP for RCP seal cooling.		
243	Three Mile Island-1	8	Automate reactor coolant pump trip on high motor bearing cooling temperature.		
284	North Anna	10	Create an independent RCP seal injection system, with dedicated diesel.		
285	North Anna	11	Create an independent RCP seal injection system, without dedicated diesel.		
131	Indian Point 2	21	Install additional pressure or leak monitoring instrumentation for ISLOCA.	Quantitatively evaluate. Determine the maximum benefit of SAMAs associated with ISLOCAs. Implementation of these SAMAs will reduce releases from ISLOCA event.	NO-ISLOCA
144	Indian Point 3	19	Install additional pressure or leak monitoring instrumentation for ISLOCA.		
322	North Anna	99	Ensure all ISLOCA releases are scrubbed.		
323	North Anna	101	Add a check valve downstream of the LHSI pumps on the cold leg injection line.		

Table E4.15-1 Grouping of Related SAMAs for Bounding Quantitative Evaluation

NAPS #	Plant	Plant SAMA #	SAMA Description	Grouped Assessment	Case Name
75	Calvert Cliffs 1, 2	34	Incorporate an alternate battery charging capability.	Quantitatively evaluate. Determine the maximum benefit of improved power capability.	EDG
113	Davis Besse	AC/DC-03	Add a portable, diesel-driven battery charger to existing DC system.		
133	Indian Point 2	28	Provide a portable diesel-driven battery charger.		
173	Palisades	1	Install an additional EDG.		
200	Salem 1, 2	5	Install portable diesel generators to charge station battery and circulating water batteries and replace PDP with air-cooled pump.		
201	Salem 1, 2	5A	Install portable diesel generators to charge station battery and circulating water batteries.		
213	Seabrook 1	157	Provide independent AC power source for battery chargers; for example, provide portable generator to charge station battery.		
260	Vogtle 1, 2	5	Install permanent, dedicated generator for one motor driven AFW pump and a battery charger.		
263	Waterford 3	1	Provide additional DC battery capacity.		
264	Waterford 3	2	Replace lead-acid batteries with fuel cells.		
267	Waterford 3	7	Install a gas turbine generator.		
311	North Anna	60	Provide additional DC battery capability.		
312	North Anna	61	Use fuel cells instead of lead-acid batteries.		
313	North Anna	64	Alternate battery charging capability.		
316	North Anna	73	Install gas turbine generators.		
317	North Anna	77	Provide a connection to alternate offsite power source (the nearby dam).		

Table E4.15-1 Grouping of Related SAMAs for Bounding Quantitative Evaluation

NAPS #	Plant	Plant SAMA #	SAMA Description	Grouped Assessment	Case Name
174	Palisades	3	Add a direct drive diesel-driven injection pump (DDDIP). This SAMA involves installing a non-safety-related DDDIP to supplement the turbine-driven AFW pump and reduce the risk of SBO scenarios.	Quantitatively evaluate. Determine the benefit of FW upgrades for both ATWS and non-ATWS events.	AFW-PMP
184	Palo Verde 1, 2, 3	12	Install an automatic transfer switch for the AFW pump AFB-P01 power supply.		
188	Point Beach 1, 2	169	Provide portable generators to be hooked up to turbine driven AFW after battery depletion (NRC determination that cost-beneficial).		
324	North Anna	106	Digital feedwater upgrade.		
325	North Anna	113	Provide portable generators to be hooked in to the turbine driven AFW, after battery depletion.		
326	North Anna	120	Create passive secondary side coolers.		
73	Callaway	188	Install a permanent, dedicated generator for the normal charging pump (NCP), and an MDAFW pump and battery charger to address SBO events in which the TDAFP is unavailable.	Quantitatively evaluate as two separate SAMAs, since they involve separate pieces of equipment for separate systems. First SAMA determines the benefit of HHSI pump improvements. Second SAMA determines the benefit of FW upgrades.	HHSI-PMP and AFW-PMP
283	Wolf Creek	14	Install a permanent, dedicated generator for the NCP (similar to SAMA 1), and a motor-driven AFW pump and battery charger to address SBO events in which the TD AFW pump is unavailable.		
329	North Anna	123	Provide capability for diesel driven, low pressure vessel makeup.	Quantitatively evaluate. Determine the benefit of HHSI pump improvements.	HHSI-PMP
330	North Anna	124/125	Provide an additional high-pressure injection pump with independent diesel.		

Table E4.15-1 Grouping of Related SAMAs for Bounding Quantitative Evaluation

NAPS #	Plant	Plant SAMA #	SAMA Description	Grouped Assessment	Case Name
209	Salem 1, 2	14	Expand anticipated transient without scram (ATWS) mitigation system actuation circuitry (AMSAC) function to include backup breaker trip on reactor protection system (RPS) failure.	Quantitatively evaluate. Determine the maximum benefit of SAMAs associated with ATWS events.	NO-ATWS
331	North Anna	143/144	Install MG set trip breakers in control room.		
93	Cook 1, 2	39	Create/enhance hydrogen igniters with independent power supply (GSI-189).	Quantitatively evaluate. The SAMA determines the benefit of eliminating containment failure due to hydrogen burn.	HYD
94	Cook 1, 2	40	Create a passive hydrogen ignition system.		
250	Three Mile Island-1	19	Install battery backed hydrogen igniters or a passive hydrogen ignition system.		
297	North Anna	37	Create/enhance hydrogen ignitors with independent power supply.		
298	North Anna	38	Create a passive hydrogen ignition system.		
306	North Anna	48	Provide containment inerting capability.		
301	North Anna	42	Enhance fire protection system and/or standby gas treatment system hardware and procedures.	This is a quantitative screening case in which the maximum possible benefit of scrubbing of fission products released into containment and cooling the reactor is evaluated.	SCB
309	North Anna	54	Provide a reactor vessel exterior cooling system.		
130	Indian Point 2	9	Create a reactor cavity flooding system.	Quantitatively evaluate. These SAMAs will help to significantly reduce or eliminate release frequency due to basemat melt through. Therefore, these SAMAs are screened in and the benefit of flooding the containment to cover molten debris is evaluated.	DEB
142	Indian Point 3	7	Create a reactor cavity flooding system.		
302	North Anna	43	Create a reactor cavity flooding system.		
303	North Anna	44	Creating other options for reactor cavity flooding.		

Table E4.15-1 Grouping of Related SAMAs for Bounding Quantitative Evaluation

NAPS #	Plant	Plant SAMA #	SAMA Description	Grouped Assessment	Case Name
296	North Anna	36	Install an unfiltered hardened containment vent.	Quantitatively evaluate. This SAMA determines the benefit of remove decay heat. The benefit will be bounded by determining the benefit of containment spray, which provides fission product scrubbing and decay heat removal.	CS
227	Sequoyah 1, 2	106	Install automatic containment spray pump header throttle valves.	Quantitatively evaluate. The maximum possible benefit is calculated for the SAMAs related to improved containment/recirc spray systems. Containment spray provides the benefits from fission product scrubbing as well as decay heat removal.	
273	Waterford 3	40	Use the fire water system as a backup source for the containment spray system.		
291	North Anna	30	Install containment spray throttle valves.		
292	North Anna	32	Develop an enhanced containment spray system.		
293	North Anna	33	Provide a dedicated existing containment spray system.		
307	North Anna	49	Use fire water spray pump for containment spray.		
308	North Anna	50	Install a passive containment spray system.		
288	North Anna	23	Improve SW pump alignments when a header is out for maintenance.	Quantitatively evaluate to determine the maximum benefit of SAMAs associated with SW headers.	SWH
314	North Anna	69	Develop procedures to repair or change out failed 4KV breakers.	Quantitatively evaluate. This SAMA is equivalent to modeled operator action to restore power to transfer buses in case of breaker failure. Determine the maximum benefit of SAMAs associated with breaker failure.	4KV

Table E4.15-1 Grouping of Related SAMAs for Bounding Quantitative Evaluation

NAPS #	Plant	Plant SAMA #	SAMA Description	Grouped Assessment	Case Name
318	North Anna	81	Put a fast-acting motor generator (MG) output breaker on both units.	Quantitatively evaluate to determine the maximum benefit of putting a fast-acting motor generator output breaker on both units.	NO-TRAN
328	North Anna	122	Condenser dump after SI.	Quantitively evaluate. Determine the maximum benefit of condenser dump after SI.	CND
333	North Anna	156	Secondary side guard pipes up to the MSIVs.	Quantitatively evaluate to determine the maximum benefit of SAMAs associated with MSLBs.	NO-MSLB
334	North Anna	157	Digital large break LOCA protection.	Quantitatively evaluate to determine the maximum benefit of SAMAs associated with LLOCAs.	NO-LLOCA

Table E4.15-2 Bounding Quantitative Reduction of CDF and Significant STC Group Frequencies

Gate	Truncation	Base Model Result	Case OPR	MB%	Case NO-SGTR	MB%	Case RCP-SEAL	MB%
Internal Events								
U1-CDF	1.00E-12	1.36E-06	1.29E-06	-5.48	1.33E-06	-2.14	1.36E-06	-0.22
U1-STC-LERF	1.00E-12	1.72E-07	1.70E-07	-0.62	1.45E-07	-15.26	1.71E-07	-0.24
U1-STC-LLRF	1.00E-12	2.42E-08	1.64E-08	-32.25	2.42E-08	0.00	2.33E-08	-3.47
Seismic								
U1-CDF-SEISMIC	1.00E-09	6.00E-05	6.00E-05	0.00	6.00E-05	0.00	5.98E-05	-0.33
U1-STC-SEIS-LERF	1.00E-10	1.58E-05	1.58E-05	0.00	1.58E-05	0.00	1.58E-05	-0.03
U1-STC-SEIS-LLRF	1.00E-10	3.53E-05	3.53E-05	0.00	3.53E-05	0.00	3.52E-05	-0.26
MB for Both Internal Events and Seismic								
CDF	—	6.14E-05	6.13E-05	-0.12	6.13E-05	-0.05	6.12E-05	-0.33
STC LERF	—	1.60E-05	1.60E-05	-0.01	1.60E-05	-0.16	1.60E-05	-0.03
STC LLRF	—	3.53E-05	3.53E-05	-0.02	3.53E-05	0.00	3.52E-05	-0.26

Table E4.15-2 Bounding Quantitative Reduction of CDF and Significant STC Group Frequencies

Gate	Truncation	Base Model Result	Case NO-ISLOCA	MB%	Case EDG	MB%	Case AFW-PMP	MB%
Internal Events								
U1-CDF	1.00E-12	1.36E-06	1.32E-06	-3.06	1.28E-06	-7.06	1.30E-06	-4.26
U1-STC-LERF	1.00E-12	1.72E-07	1.51E-07	-12.15	1.67E-07	-2.67	1.69E-07	-1.38
U1-STC-LLRF	1.00E-12	2.42E-08	2.42E-08	0.00	1.23E-08	-57.15	2.42E-08	-0.02
Seismic								
U1-CDF-SEISMIC	1.00E-09	6.00E-05	6.00E-05	0.00	5.99E-05	-0.17	6.00E-05	0.00
U1-STC-SEIS-LERF	1.00E-10	1.58E-05	1.58E-05	0.00	1.58E-05	-0.21	1.58E-05	0.00
U1-STC-SEIS-LLRF	1.00E-10	3.53E-05	3.53E-05	0.00	3.51E-05	-0.41	3.53E-05	0.00
MB for Both Internal Events and Seismic								
CDF MB	—	6.14E-05	6.13E-05	-0.07	6.12E-05	-0.32	6.13E-05	-0.09
STC LERF MB	—	1.60E-05	1.60E-05	-0.13	1.60E-05	-0.24	1.60E-05	-0.01
STC LLRF MB	—	3.53E-05	3.53E-05	0.00	3.51E-05	-0.45	3.53E-05	0.00

Table E4.15-2 Bounding Quantitative Reduction of CDF and Significant STC Group Frequencies

Gate	Truncation	Base Model Result	Case HHSI-PMP	MB%	Case NO-ATWS	MB%	Case CS	MB%
Internal Events								
U1-CDF	1.00E-12	1.36E-06	1.35E-06	-0.79	1.34E-06	-1.91	1.25E-06	-7.87
U1-STC-LERF	1.00E-12	1.72E-07	1.71E-07	-0.10	1.72E-07	-0.01	6.40E-08	-62.71
U1-STC-LLRF	1.00E-12	2.42E-08	2.41E-08	-0.19	2.40E-08	-0.67	2.38E-08	-1.66
Seismic								
U1-CDF-SEISMIC	1.00E-09	6.00E-05	6.00E-05	0.00	6.00E-05	0.00	5.99E-05	-0.17
U1-STC-SEIS-LERF	1.00E-10	1.58E-05	1.58E-05	0.00	1.58E-05	0.00	1.31E-05	-17.01
U1-STC-SEIS-LLRF	1.00E-10	3.53E-05	3.53E-05	-0.03	3.53E-05	0.00	3.03E-05	-14.03
MB for Both Internal Events and Seismic								
CDF MB	—	6.14E-05	6.14E-05	-0.02	6.13E-05	-0.04	6.12E-05	-0.34
STC LERF MB	—	1.60E-05	1.60E-05	0.00	1.60E-05	0.00	1.32E-05	-17.50
STC LLRF MB	—	3.53E-05	3.53E-05	-0.03	3.53E-05	0.00	3.03E-05	-14.03

Table E4.15-2 Bounding Quantitative Reduction of CDF and Significant STC Group Frequencies

Gate	Truncation	Base Model Result	Case SWH	MB%	Case 4KV	MB%	Case NO-TRAN	MB%
Internal Events								
U1-CDF	1.00E-12	1.36E-06	1.35E-06	-0.74	1.36E-06	-0.23	1.31E-06	-4.15
U1-STC-LERF	1.00E-12	1.72E-07	1.67E-07	-2.83	1.71E-07	-0.12	1.68E-07	-2.05
U1-STC-LLRF	1.00E-12	2.42E-08	2.42E-08	0.00	2.39E-08	-1.39	2.36E-08	-2.33
Seismic								
U1-CDF-SEISMIC	1.00E-09	6.00E-05	6.00E-05	0.00	6.00E-05	0.00	6.00E-05	0.00
U1-STC-SEIS-LERF	1.00E-10	1.58E-05	1.57E-05	-0.75	1.58E-05	0.00	1.58E-05	0.00
U1-STC-SEIS-LLRF	1.00E-10	3.53E-05	3.53E-05	0.00	3.53E-05	0.00	3.53E-05	0.00
MB for Both Internal Events and Seismic								
CDF MB	—	6.14E-05	6.14E-05	-0.02	6.14E-05	-0.01	6.13E-05	-0.09
STC LERF MB	—	1.60E-05	1.59E-05	-0.77	1.60E-05	0.00	1.60E-05	-0.02
STC LLRF MB	—	3.53E-05	3.53E-05	0.00	3.53E-05	0.00	3.53E-05	0.00

Table E4.15-2 Bounding Quantitative Reduction of CDF and Significant STC Group Frequencies

Gate	Truncation	Base Model Result	Case CND	MB%
Internal Events				
U1-CDF	1.00E-12	1.36E-06	1.36E-06	-0.05
U1-STC-LERF	1.00E-12	1.72E-07	1.71E-07	-0.16
U1-STC-LLRF	1.00E-12	2.42E-08	2.42E-08	0.00
Seismic				
U1-CDF-SEISMIC	1.00E-09	6.00E-05	6.00E-05	0.00
U1-STC-SEIS-LERF	1.00E-10	1.58E-05	1.58E-05	0.00
U1-STC-SEIS-LLRF	1.00E-10	3.53E-05	3.53E-05	0.00
MB for Both Internal Events and Seismic				
CDF MB	—	6.14E-05	6.14E-05	0.00
STC LERF MB	—	1.60E-05	1.60E-05	0.00
STC LLRF MB	—	3.53E-05	3.53E-05	0.00

Note: HHSI-PMP and AFW-PMP group was evaluated as two separate SAMA groups. SCB and DEB groups are bounded by CS group. HYD, No MSLB, and No LLOCA groups are insignificant contributors to CDF.

E5.0 ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION

The environmental report must contain any new and significant information regarding the environmental impacts of license renewal of which the applicant is aware. [10 CFR 51.53(c)(3)(iv)]

License renewal applicants are required to analyze only those issues the NRC has not resolved generically. While NRC regulations do not require an applicant's environmental report to contain analyses of the impacts of those Category 1 environmental issues that have been generically resolved [10 CFR 51.53(c)(3)(i)], the regulations do require that an applicant identify any new and significant information of which the applicant is aware. [10 CFR 51.53(c)(3)(iv)] The NRC has stated however that an applicant is not required to perform site-specific validation of GEIS conclusions (NUREG-1529).

E5.1 NEW AND SIGNIFICANT INFORMATION DISCUSSION

The NRC provides guidance on new and significant information in Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC. 2013b). In this guidance, new and significant information is defined as follows:

(1) Information that identifies a significant environmental impact issue that was not considered or addressed in the GEIS and, consequently, not codified in Table B-1, "Summary of Findings on NEPA Issues for License Renewal of Nuclear Plants," in Appendix B, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant," to Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)," of 10 CFR Part 51; or

(2) Information not considered in the assessment of impacts evaluated in the GEIS leading to a seriously different picture of the environmental consequences of the action than previously considered, such as an environmental impact finding different from that codified in Table B-1.

(3) Further, any new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity and/or scope (context) not previously recognized.

Based on available guidance and the definitions of SMALL, MODERATE, and LARGE impacts provided by the NRC in 10 CFR Part 51, Appendix B, Table B-1, Footnote 3, Dominion considers any new information regarding Category 1 issues with MODERATE or LARGE impacts would be significant. E4.0.2 presents the NRC's definitions of SMALL, MODERATE, and LARGE.

E5.2 DOMINION'S NEW AND SIGNIFICANT INFORMATION REVIEW PROCESS

The new and significant information assessment process meets or addresses regulatory guidance provided above.

Dominion's process is collectively carried out through its ongoing environmental planning, assessment, monitoring, and compliance activities performed by corporate and NAPS management and staff and ER-specific reviews. Dominion's team for the review of new and significant information has collective knowledge of the license renewal process, the site, licensing and permitting, environmental issues, the first license renewal of NAPS, the NEPA process, and nuclear industry activities. This team has implemented the in-house process for reviewing and evaluating environmental issues which could potentially be new and significant information.

Dominion's new and significant review included establishment of applicable and non-applicable Category 1 issues through:

- Review of the NAPS initial license renewal ER and NRC SEIS, and the GEIS Category 1 issues discussion;
- Identification and review of past or potential modifications to NAPS, including environmental impacts; and
- Identification and assessment of equipment and operations with the potential to result in changes in emissions, releases, discharge points, land use, noise levels, etc. considering environmental reviews since initial license renewal, and those anticipated during the proposed subsequent period of extended operations.

Dominion applied an investigative process for purposely seeking new information related to the Category I environmental issues through:

- Environmental review team discussions with Dominion and NAPS SMEs on the Category 1 issues as they relate to the plant;
- Review of permits and reference materials listed in Table E9.1-1 and E9.0 related to environmental issues at the plant, the environmental resource areas related to Category 1 issues, and information collected for the regulatory compliance status;
- Review of recent publicly available information since issuance of the license renewal GEIS, or information held by Dominion, particularly data or reports from the past five years, related to the resource area and each applicable Category 1 impact issue, as summarized in the appropriate section of this ER in E3.0;
- Consultations with state and federal agencies to determine if the agencies have concerns relevant to resource areas and NAPS operations;

- Review of environmental monitoring and reporting required by regulations related to the NAPS site and operations;
- Review of Dominion environmental programs and procedures related to the NAPS site and operations;
- Review of correspondence and permitting documentation as relating to oversight of NAPS facilities and operations by state and federal regulatory agencies (activities that would bring significant issues to the plant's attention), to identify site-specific environmental concerns; and
- Review of recent LRAs for issues relevant to this NAPS Units 1 and 2 SLR application.

In addition, Dominion is made aware of and stays abreast of new and emerging environmental issues and concerns on an ongoing basis through:

- Reviews of nuclear industry publications, operational experience, and participation in nuclear industry organizations such as the Edison Electric Institute, EPRI, and NEI;
- Routine interface with non-nuclear Dominion business units, such as power generation, transmission, and corporate;
- Contact with state and federal agencies with regulatory jurisdiction over environmental regulation;
- Development and periodic review of regulatory guidance procedures that address ongoing and emergent issues.

Information resulting from the information-seeking process was assessed to determine if it is new, and significant, applying the following considerations:

- Was the information included in or available for the GEIS analysis of the Category 1 issue?
- Was the information included in or available for the SEIS for NAPS initial license renewal?
- Does the information identify an environmental issue not generically considered in the GEIS, and consequently, not codified in 10 CFR 51 Appendix B Table B-1?
- Does the information present a seriously different picture of the environmental consequences of the action than previously considered leading to an impact finding different (i.e., MODERATE or LARGE) from that included in the GEIS or codified in regulation?
- Does the information involve a new activity or aspect associated with the nuclear power plant that can act upon the environment in a manner or an intensity (MODERATE or LARGE impact) and/or scope (context) not previously recognized?

As a result of this review, Dominion is aware of no new and significant information regarding the environmental impacts of SLR associated with NAPS. The findings in NUREG-1437, Revision 1 for the applicable Category 1 issues are therefore incorporated by reference. New and significant information review methodology and results applicable to the issue of severe accidents, which is the functional equivalent of a Category 1 issue for NAPS (NRC. 2013f), are addressed separately in Sections E4.15.2 and E4.15.3 of this ER.

E6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

E6.1 LICENSE RENEWAL IMPACTS

Chapter E4.0 incorporates by reference NRC findings for the 54 Category 1 issues that apply to NAPS, all of which have environmental impacts that are SMALL. The remainder of Chapter E4.0 analyzes the 17 Category 2 issues. Table E6.1-1 identifies the environmental impacts that renewal of the NAPS Units 1 and 2 OLs would have on resources associated with the Category 2 issues. In summary, Dominion has reviewed the environmental impacts of renewing the NAPS Units 1 and 2 OLs and has concluded that further mitigation measures beyond those discussed in Section E6.2 and listed in Table E6.1-1 of this ER to avoid, reduce the severity of, or eliminate adverse impacts are not warranted. This ER documents the basis for Dominion's conclusion.

Table E6.1-1 Environmental Impacts Related to SLR at NAPS

Resource Issue	ER Section	Environmental Impact
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	E4.5.1	No impact. Issue is not applicable because NAPS utilizes an open-cycle cooling system and does not utilize cooling ponds or cooling towers for condenser cooling purposes.
Groundwater Resources		
Groundwater use conflicts (plants that withdraw more than 100 gallons per minute) [10 CFR 51.53(c)(3)(ii)(C)]	E4.5.3	No impact. Issue is not applicable because NAPS does not withdraw more than 100 gallons per minute.
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	E4.5.2	No impact. Issue is not applicable because NAPS utilizes an open-cycle cooling system and cooling water is supplied by Lake Anna.
Groundwater quality degradation (plants with cooling ponds at inland sites) [10 CFR 51.53(c)(3)(ii)(D)]	E4.5.4	No impact. Issue is not applicable because NAPS uses an open-cycle cooling system and does not utilize cooling ponds.
Radionuclides released to groundwater [10 CFR 51.53(c)(3)(ii)(P)]	E4.5.5	SMALL impact. No unplanned radioactive liquid releases were reported between 2012 and 2017.

Table E6.1-1 Environmental Impacts Related to SLR at NAPS

Resource Issue	ER Section	Environmental Impact
Terrestrial Resources		
Effects on terrestrial resources (non-cooling system impacts) [10 CFR 51.53(c)(3)(ii)(E)]	E4.6.5	SMALL impact. No refurbishment or other license renewal-related construction activities have been identified; adequate management programs and regulatory controls in place to prevent impacts outside of previously disturbed areas.
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	E4.6.4	No impact. Issue is not applicable because NAPS utilizes an open-cycle cooling system and does not utilize cooling ponds or cooling towers for condenser cooling purposes.
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds) [10 CFR 51.53(c)(3)(ii)(B)]	E4.6.1	SMALL impact. Current impingement configuration and entrainment studies indicate that there is a SMALL impact to the Lake Anna fishery due to existing CWIS. The current VPDES permit reflects the existing determination under CWA Section 316(b). VDEQ will make another BTA determination during the upcoming permit reissuance and the results of that determination will be incorporated into the permit. Dominion will continue to comply with the current and future VPDES permit.
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds) [10 CFR 51.53(c)(3)(ii)(B)]	E4.6.2	SMALL impact. The NAPS discharge permit limits waste heat rejected to the WHTF from NAPS to 13.54 x 10^9 Btu/hr (VDEQ. 2014, pg. 9). The heat rejection limit is supported by a CWA 316(a) variance based on a successful 316(a) demonstration. This demonstration continues to be supported by annual biological studies and temperature readings and trending. Issuance of the NAPS VPDES permit indicates the VDEQ's conclusion that NAPS, in operating in conformance with the permit, would be in compliance with the CWA requirements.
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	E4.6.3	No impact. Issue is not applicable because NAPS utilizes an open-cycle cooling system and does not utilize cooling ponds or cooling towers for condenser cooling purposes.

Table E6.1-1 Environmental Impacts Related to SLR at NAPS

Resource Issue	ER Section	Environmental Impact
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat [10 CFR 51.53(c)(3)(ii)(E)]	E4.6.6	NO EFFECT. No refurbishment or other license-renewal related construction activities have been identified. The continued operation of the site would have no adverse effects on any federally or state-listed species. License renewal would have no effect on threatened, endangered, and protected species in the vicinity of NAPS.
Historic and Cultural Resources		
Historic and cultural resources [10 CFR 51.53(c)(3)(ii)(K)]	E4.7	While cultural resources are present at the NAPS site, no adverse effects have been identified. No refurbishment or other license-renewal related construction activities have been identified; administrative procedure ensures protection of these type resources in the event of excavation activities.
Human Health		
Microbiological hazards to the public (plants that use cooling ponds, lake, or canals, or that discharge to a river) [10 CFR 51.53(c)(3)(ii)(G)]	E4.9.1	SMALL impact. Conditions necessary for optimal growth of pathogens are limited by water temperatures in the WHTF and Lake Anna and wastewater disinfection practices. Field sampling has detected *N. fowleri* in low concentrations in some, but not all samples, and no case of PAM has been reported for Lake Anna. Annual sampling for *E. coli* in Lake Anna during warm weather months further reduce the risk to the public.
Electric shock hazards [10 CFR 51.53(c)(3)(ii)(H)]	E4.9.2	SMALL impact. The NRC determined electric shock potential for the evaluated lines was small and did not warrant mitigation measures. The in-scope transmission lines are NESC compliant.
Postulated Accidents		
Severe accidents [10 CFR 51.53(c)(3)(ii)(L)]	E4.15.2 E4.15.3	SMALL impact. Dominion reviewed SAMAs for new and significant information since the time of the initial NAPS license renewal that would alter the conclusions of the first NAPS SAMA analysis. No new and significant information was identified. Therefore, the conclusion of the 2013 GEIS that probability-weighted consequences from severe accidents remain SMALL for all plants is considered appropriate for the NAPS SLR.
Environmental Justice		
Minority and low-income populations [10 CFR 51.53(c)(3)(ii)(N)]	E4.10.1	No disproportionately high and adverse impacts or effects on minority and low-income populations identified.

Table E6.1-1 Environmental Impacts Related to SLR at NAPS

Resource Issue	ER Section	Environmental Impact
Cumulative Impacts		
Cumulative Impacts [10 CFR 51.53(c)(3)(ii)(O)]	E4.12	MODERATE ADVERSE to LARGE BENEFICIAL Impacts. SMALL for land use and visual resources, air quality and noise, geology and soils, ecological resources, human health, and waste management; SMALL to MODERATE for water resources; MODERATE ADVERSE to LARGE BENEFICIAL for Socioeconomics and no adverse effect on historic and cultural resources.

E6.2 MITIGATION

E6.2.1 REQUIREMENTS [10 CFR 51.45(C) AND 10 CFR 51.53(C)(3)(III)]

The environmental report must include an analysis that considers and balances . . . alternatives available for reducing or avoiding adverse environmental effects. [10 CFR 51.45(c)]

The report must contain a consideration of alternatives for reducing adverse impacts . . . for all Category 2 license renewal issues . . . . [10 CFR 51.53(c)(3)(iii)]

E6.2.2 DOMINION RESPONSE

NRC Regulatory Guide 4.2, Supplement 1, Revision 1, *Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications*, specifies that the applicant should identify any ongoing mitigation and should discuss the potential need for additional mitigation. However, applicants are only required to consider mitigation alternatives in proportion to the significance of the impact. (NRC. 2013a, page 8)

As discussed in Section E6.1, impacts associated with NAPS SLR do not require the implementation of additional mitigation measures. The permits and programs discussed in Chapter E9.0 (i.e., VPDES permit; stormwater program; air permit; spill prevention, control, and countermeasure [SPCC] program; hazardous waste management program; cultural resource protection plan; and environmental review programs) that currently mitigate the operational environmental impacts of NAPS are adequate. Therefore, additional mitigation measures are not sufficiently beneficial as to be warranted.

E6.3 UNAVOIDABLE ADVERSE IMPACTS

E6.3.1 REQUIREMENT [10 CFR 51.45(B)(2)]

The environmental report shall . . . discuss . . . any adverse environmental effects which cannot be avoided should the proposal be implemented . . . . [10 CFR 51.45(b)(2)]

E6.3.2 DOMINION RESPONSE

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit, because the facility is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have already occurred.

As previously discussed in Chapter E4.0 of this ER, no license renewal-related refurbishment or construction activities have been identified. Therefore, the environmental impacts to be evaluated for license renewal are those associated with continued operation during the renewal term.

Dominion adopts by reference NRC findings for the 54 Category 1 issues (NRC. 2013b) applicable to NAPS, including discussions of any unavoidable adverse impacts. In addition, Dominion identified the following site-specific unavoidable adverse impacts associated with license renewal:

- The majority of the land use at NAPS would continue to be designated as industrial until the plant is shut down and decommissioned (decommissioning can take up to 60 years after permanent shutdown of NAPS). Uranium mining associated with the nuclear fuel cycle also has offsite land use implications.
- Aquatic organisms would continue to be impinged and entrained at the intake structure but, as discussed in Section E4.6.1, these impacts were determined to be SMALL.
- Normal plant operations result in industrial wastewater discharges containing small amounts of water treatment chemical additives to Lake Anna at or below VDEQ-approved concentrations. Compliance with the VPDES permit would ensure that impacts remain SMALL.
- Operation of NAPS results in consumptive use of groundwater. However, annual average groundwater withdrawals are less than 100 gpm.
- Operation of NAPS results in consumptive use of Lake Anna water as a result of plant operations. As stated in Section E3.6.3.1, in 2017, NAPS withdrew about 2% of Lake Anna's conservation and active storage volume, most of which was returned to the lake.
- Operation of NAPS results in the generation of spent nuclear fuel and waste material, including LLRW, hazardous waste, and nonhazardous waste. However, specific plant design features in conjunction with a waste minimization program; employee safety training programs and work

procedures; and strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste ensure that the impact is SMALL.

- Operation of NAPS results in a very small increase in radioactivity in the air. The incremental radiation dose to the local population resulting from NAPS operations is typically less than the magnitude of the fluctuations that occur in natural background radiation. Doses to the members of the public from gaseous releases at NAPS would be well within the allowable limits of 10 CFR Part 20 and 10 CFR Part 50, Appendix I. Operation of NAPS also creates a very low probability of accidental radiation exposure to inhabitants of the area.

E6.4 IRREVERSIBLE OR IRRETRIEVABLE RESOURCE COMMITMENTS

E6.4.1 REQUIREMENT [10 CFR 51.45(B)(5)]

The environmental report shall . . . discuss . . . any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented. [10 CFR 51.45(b)(5)]

E6.4.2 DOMINION RESPONSE

The term "irreversible" applies to the commitment of environmental resources (e.g., permanent use of land) that cannot by practical means be reversed to restore the environmental resources to their former state. In contrast, the term "irretrievable" applies to the commitment of material resources (e.g., irradiated steel, petroleum) that, once used, cannot by practical means be recycled or restored for other uses.

The continued operation of NAPS for the period of extended operation will result in irreversible and irretrievable resource commitments, including the following:

- Uranium in the nuclear fuel consumed in the reactor that becomes high-level radioactive waste if the used fuel is not recycled through reprocessing.
- Land required for permanent storage or disposal of spent nuclear fuel, LLRWs generated as a result of plant operations, and sanitary waste generated from normal industrial operations.
- Elemental materials that will become radioactive.
- Materials used for the normal industrial operations of NAPS that cannot be recovered or recycled, or that are consumed or reduced to unrecoverable forms.

Other than the above, no license renewal-related refurbishment activities have been identified that would irreversibly or irretrievably commit significant environmental components of land, water, and air.

If NAPS ceases operations on or before the expiration of the current OLs, the likely power generation alternatives would require a commitment of resources for construction of the replacement plant as well as for fuel to run the plant. Significant resource commitments would also be required if transmission lines are needed to connect a replacement generation plant to the electrical grid.

E6.5 SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

E6.5.1 REQUIREMENT [10 CFR 51.45(B)(4)]

The environmental report shall . . . discuss . . . the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity . . . . [10 CFR 51.45(b)(4)]

E6.5.2 DOMINION RESPONSE

The current balance between short-term use and long-term productivity of the environment at the site has remained relatively constant since NAPS began operations. The final environmental statement (FES) for NAPS evaluated the relationship between the short-term uses of the environment and the maintenance and enhancement of the long-term productivity associated with the construction and operation of NAPS (NRC. 2002a, Section 9.1.3). The period of extended operation will not alter the short-term uses of the environment from the uses previously evaluated in the NAPS FES. The period of extended operation will postpone the availability of the site resources (land, air, water) for other uses. Denial of the application to renew the NAPS Units 1 and 2 OLs would lead to the shutdown of the plant and would alter the balance in a manner that depends on the subsequent uses of the site. For example, the environmental consequences of turning the site area occupied by NAPS into a park or an industrial facility after decommissioning are quite different. Extending NAPS operations would not alter, but only postpone, the potential long-term uses of the site that are currently possible.

In summary, no license renewal-related refurbishment activities have been identified that would alter the evaluation of the NAPS FES for the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity of these resources.

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E7.0 ALTERNATIVES TO THE PROPOSED ACTION

E7.1 NO ACTION ALTERNATIVE

The proposed action as described in Section E2.1 is for the NRC to renew the OLs for NAPS Units 1 and 2 for an additional 20 years. Therefore, the only other alternative under consideration by the NRC is the no-action alternative, which is their decision to not renew the NAPS OLs. If the NAPS OLs are not renewed, the 1,672-MWe of baseload power would not be available to meet Dominion’s electricity customers’ needs during the proposed SLR operating term from 2038–2058 (Unit 1) and 2040–2060 (Unit 2). Because Dominion is a regulated utility that must meet its customers’ long-term needs, and NAPS constitutes a significant block of long-term baseload capacity, it is reasonable to assume that a decision not to renew the NAPS licenses would necessitate the replacement of this capacity. Therefore, the no action alternative will identify replacement power sources for the loss of NAPS generation as a reasonably foreseeable consequence of no action.

In accordance with 10 CFR 51.53(c)(2), this ER will discuss a no-action alternative to the proposed license renewal and a range of replacement baseload power sources. A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the OLs of the reactors, or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactors’ OLs (NRC. 2013b). The replacement power alternative generation must also equal the baseload capacity previously supplied by the nuclear plant, and the alternative must reliably operate at or near the demonstrated capacity factor of NAPS.

The replacement power sources being considered under the no-action alternative are presented in Section E7.2.1. Section E7.2.2 will identify the no-action alternative power sources that were evaluated and were not considered reasonable power sources for the replacement of the NAPS generation.

E7.1.1 DECOMMISSIONING IMPACTS

The NRC's definition of decommissioning as stated in 10 CFR 20.1003 is the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits the following:

- Release of the property for unrestricted use and termination of the license.
- Release of the property under restricted conditions and termination of the license.

The decommissioning options evaluated by NRC include the following:

- Immediate dismantling soon after the facility closes (DECON).
- Safe storage and monitoring of the facility for a period of time that allows the radioactivity to decay, followed by dismantling and additional decontamination (SAFSTOR).
- Permanent entombment on the site in structurally sound material, such as concrete that is maintained and monitored (ENTOMB).

Decommissioning must be completed within a 60-year period following permanent cessation of operations and permanent removal of fuel.

Under the no-action alternative, Dominion would continue operating NAPS until the existing OLs expire. Upon expiration of the OLs, Dominion would initiate decommissioning procedures in accordance with NRC requirements. The NRC GEIS evaluated decommissioning environmental impacts for land use, visual resources, air quality, noise, geology and soils, hydrology, ecology, historic and cultural resources, socioeconomics, human health, environmental justice, and waste management and pollution prevention. Dominion considers the GEIS description of decommissioning impacts as representing the actions it would perform for the NAPS decommissioning. Therefore, Dominion relies on the NRC's conclusions regarding the environmental impacts of decommissioning NAPS.

Decommissioning and its associated impacts are not considered evaluation criteria used to proceed with the proposed action or select the no-action alternative. NAPS will have to be decommissioned eventually, regardless of the NRC decision on license renewal; license renewal will only postpone decommissioning for another 20 years. The GEIS states the timing of decommissioning does not change the environmental impacts associated with this activity. The NRC findings as described in 10 CFR 51, Subpart A, Appendix B, Table B-1 state that delaying decommissioning until after the renewal term would result in SMALL environmental impacts. Dominion relies on the NRC's findings. The primary criteria used to evaluate the proposed action and the no-action alternative are the power options available for replacement of NAPS generation.

Dominion concludes that the decommissioning impacts under the no-action alternative would not be substantially different from those following license renewal as identified in the GEIS.

Decommissioning impacts would be SMALL and could overlap with operation of a NAPS replacement.

E7.2 ENERGY ALTERNATIVES THAT MEET SYSTEM GENERATING NEEDS

In accordance with 10 CFR 51.53(c)(2), Dominion considered a range of alternatives to replace generation if the NAPS OLs are not renewed. Dominion considered each of the replacement alternatives identified in the NRC GEIS for license renewal (NRC. 2013a, Section 2.3). These alternatives were evaluated based on their ability to provide reliable baseload power, as well as other criteria, such as the ability to obtain state approvals and permits, and the ability to be operational prior to the expiration of the current NAPS OLs. Alternatives unable to replace NAPS baseload power were considered unreasonable. The following subsections will identify the replacement power sources considered as reasonable (Section E7.2.1), and power sources considered as unreasonable (Section E7.2.2).

E7.2.1 ENERGY ALTERNATIVES CONSIDERED AS REASONABLE

A reasonable alternative as described by the NRC must be technically feasible and commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs or expected to become commercially viable on a utility scale and operational prior to the expiration of the reactors' OLs. The replacement power alternative generation must also equal the baseload capacity previously supplied by the nuclear plant. The alternatives analysis identified the following power sources as meeting the NRC criteria for reasonableness in the replacement of NAPS generation during the proposed operating term:

- New ALWR nuclear plant at the NAPS site with net electricity generation comparable to NAPS.
- New SMR nuclear plant at the NAPS site with net electricity generation comparable to NAPS.

E7.2.1.1 New Nuclear ALWR Plant

The ALWR alternative is the licensed Unit 3 at NAPS. The NRC issued the COL for NAPS Unit 3 effective June 2, 2017. NAPS Unit 3 would provide 1,605 MWe of generation when in operation. This nuclear unit would provide additional baseload power for residential and industrial customers in the region. Dominion paused material development activities for NAPS Unit 3 following the receipt of the COL and continues to maintain the NAPS Unit 3 COL to provide an option for future development of a carbon-free source of baseload generation (Dominion. 2020a).

The cooling tower arrangement includes a dry cooling tower array and a round, wet/dry (hybrid) cooling tower that may operate independently or in series. The Unit 3 circulating water system would operate in either of two operating modes: energy conservation mode in which the dry cooling tower array is bypassed and cooling water is circulated directly to the hybrid tower, or maximum water conservation mode in which the dry cooling tower and hybrid cooling tower operate in series with dry cooling removing at least one-third of the heat. When the North Anna Reservoir level is at or above 250 feet msl and adequate reservoir discharge is being maintained, the energy conservation mode would be used. Below 250 feet msl, the maximum water conservation mode would be used. Cooled water would be recirculated back to the surface condenser to complete the closed-cycle cooling water loop. Make-up water to the circulating water system and service water cooling system would be obtained from the North Anna Reservoir. Blowdown would be discharged to WHTF discharge canal. (Dominion. 2006a, Section 3.4.1.1).

E7.2.1.2 New Nuclear SMR Plant

The new nuclear SMR plant alternative would be a cluster of SMR units comparable to the generation capacity of NAPS. The facility would be located at the NAPS site. The SMR units are assumed to utilize closed-cycle cooling from mechanical draft cooling towers connected to the existing intake and discharge structures. The existing transmission infrastructure is assumed to be sufficient.

E7.2.2 ENERGY ALTERNATIVES NOT CONSIDERED REASONABLE

The full range of energy alternatives as described in the GEIS include power sources that will require development of new generation and power alternatives that will not require new generation, such as purchased power (NRC. 2013a, Section 2.3). Dominion considered all the alternatives described in the GEIS for replacement of the NAPS generation. This section will address the energy alternatives that were not considered reasonable for additional evaluation.

E7.2.2.1 Alternatives Not Requiring New Generating Capacity

E7.2.2.1.1 Purchased Power

Purchased power to replace the loss of NAPS generation would be acquired from sources within the Dominion service area or require importing energy from outside the service area. The purchased power would be generated from fossil sources or intermittent renewables. Both sources would result in environmental impacts that occur in facilities currently generating power or at recently constructed facilities, such as coal-fired facilities in the region.

Fossil generation, renewable energy, or a mix of fossil and renewable generation would be potential sources of purchased power to replace NAPS generation. As discussed in Section E2.6.2, the VCEA and North Carolina's Clean Energy Plan establish barriers to development of fossil generation within Dominion's service area. Dominion's focus with regards to purchasing power is the acquisition of renewable sources, primarily in the form of solar non-utility generation (NUG). Reliance on solar NUGs to meet Dominion generation requirements if the NAPS OLs are not renewed would have considerable uncertainty and the transition to renewable sources mandated by the VCEA would increase the demand and competition for contracts. If the NAPS OLs are not renewed, Dominion could be required to contract for generation through additional NUGs or purchase power from a wholesale power generator. If required for such purchases, import energy into the service area would put additional demand on the transmission network. Planning for implementation of the VCEA, Dominion projects that the transmission import capacity would need to double by 2037 (Dominion. 2020a). Therefore, the environmental impacts associated with purchasing power could be substantial and exceed the impacts associated with the continued operation of NAPS.

Potential environmental impacts associated with purchased power would include those associated with the source of the generation and the transmission of the power into the Dominion service area. Fossil generation results in air emissions, water use and quality issues, and land use impacts associated with the plant footprint. Renewable energy generation, specifically solar and wind, has a large development footprint that can convert natural habitats to an industrial site. The conversion of forest and even agricultural lands to an industrial site can result in impacts to wildlife habitat that may adversely impact wildlife and plant species. Additional transmission capacity may be required to transport renewable or fossil generation in the region and this may result in impacts to communities and lands within and adjacent to the corridor. These impacts could include loss of sensitive habitat, visual and view shed impairment, wetlands and stream crossings. Purchasing power from NUGs or power generators is not considered a reasonable no-action alternative because Dominion would need to substantially increase its purchased power. This could potentially reduce the available baseload power from facilities owned and managed by Dominion, introducing uncertainties in energy reliability outside of Dominion's control.

E7.2.2.1.2 Plant Reactivation or Extended Service Life

The 2019 IRP identified 4,570 MW of generation that was retired or to be potentially retired between 2019 and 2025. The potential retirements are all fossil fuel-fired with the exception of an 83-MW biomass plant. (Dominion. 2019a, Appendix 3J). As discussed in Section E2.6.2, Virginia passed the VCEA, which is effective July 1, 2020, and mandates the retirement of all generation units that emit carbon dioxide as a byproduct of combustion by 2045 unless the retirement of a particular unit would threaten grid reliability and security. Dominion's 2020 IRP incorporates planning for retirement of its fossil fuel-fired fleet in Virginia. Further, as presented in Section E2.6.2, the North Carolina portions of its service territory also have generation portfolio requirements that minimize opportunities for plant reactivation or service life extension for its fossil fuel-fired generation in North Carolina. The reactivation or extending the service life of older fossil-fuel plants could stall Dominion's, Virginia's, and North Carolina's goals of decreasing carbon dioxide emissions. Therefore, plant reactivation and extended service life is not considered a reasonable alternative because of the environmental issues associated with the continued use of older generation sources.

E7.2.2.1.3 Conservation or Demand-Side Management

DSM includes demand response that shifts electricity from a peak-use period to times of lower demand, and energy efficiency or conservation programs that reduce the amount of electricity required for existing activities and processes. A DSM alternative would be required to reduce the baseload demand in Dominion's service area by 1,672 MWe to be considered a reasonable alternative.

Dominion projected the capacity reductions for 2035 for its DSM programs to be 383 MW (Dominion. 2020a). This reduction of baseload demand assumes NAPS is providing generation during this time period.

The Dominion DSM program does not reduce baseload generation enough to cover the loss of NAPS generation. In addition, with the potential loss of all its carbon dioxide emitting generation sources in Virginia by 2045, DSM will not be able to cover baseload demand without development of new generation facilities. Therefore, DSM is not considered a reasonable alternative.

E7.2.2.2 Alternatives Requiring New Generation Capacity

E7.2.2.2.1 Wind (Includes Energy Storage)

Onshore wind resources are limited in the eastern portion of the United States to select sites, such as mountain ridges in the Appalachian Mountains. Development of these sites would result in the building of roads and turbine tower support pads that would require tree and vegetation clearing. Environmental impacts to avian and bat species, fragmentation of forests, and stream and wetland areas would occur from the construction and operation of a wind facility in the Appalachian Mountains. Other construction and operation impacts would be sediment and erosion from the construction of road and tower pads, noise associated with construction activities and from the turbine blades during the operation of the wind facility, impacts to visual resources, and some short-term air quality impacts during construction from dust and equipment operations. Impacts on avian and bat species, forest habitats, land use, and visual resources from the development of a utility-scale wind power facility on a mountain ridge in western Virginia could range from MODERATE to LARGE.

The Virginia offshore wind resource is considered promising for the potential development of a large-scale offshore wind facility. Dominion is currently developing a 12-MW (nameplate) offshore wind facility to be online as early as 2021, as well as the first tranche of utility-scale offshore intermittent wind generation, 852 MW (nameplate) to be operational by 2026, with a second and third tranche of the same capacity planned for 2027 (Dominion. 2020a). Construction and operation of an offshore wind facility would cost substantially more compared to an onshore wind facility. Impacts associated with the construction and operation of an offshore wind facility would be focused on marine ecology, avian species, economic impacts to commercial fishing and recreational boating, and potential impacts to coastal wetlands and bays from transmission line development. Most of the impacts associated with offshore wind will occur during the construction phase and would continue into operation with potential impacts to marine and avian species. Environmental impacts associated with the construction and operation of a large utility-scale offshore wind facility could range from MODERATE to LARGE.

Wind is intermittent and therefore by itself is not capable of providing baseload power. For wind power to be viable as a discrete source of power generation that is available during peak hours, energy storage would need to be considered in the planning process and development of new energy storage facilities would need to address additional environmental impacts. Dominion has 16-MW and 14-MW battery storage pilot projects planned for 2021 and 2023, respectively (Dominion. 2020a). Energy storage to support discrete wind energy facilities for a reliable source of generation would have to be many times larger than the battery storage pilots.

Because of the limited onshore wind resources in the eastern United States, potentially large environmental impacts associated with development of an onshore or offshore facility, and the inability of wind power to provide baseload generation, wind power (with or without energy storage) is not considered a reasonable alternative to replace the baseload generation of NAPS.

Nonetheless, even if wind were considered to be reasonable, the impacts discussed above show that the impacts from wind (with or without energy storage) would be higher than the impacts for renewal of the NAPS OLs, summarized in Table E8.0-1, and therefore, wind (with or without energy storage) would not be superior to continued operation of NAPS.

E7.2.2.2.2 Solar (Includes Energy Storage)

Solar PV and concentrated solar power (CSP) are the two main types of solar technology used in electric power generation. Solar PV systems consist of interconnected PV cells that convert sunlight into electricity. CSP systems utilize mirrors to reflect and concentrate sunlight onto receivers to convert solar energy into thermal energy that in turn produces electricity. Solar generation is intermittent by nature, and the generation can fluctuate from hour to hour. This type of generation volatility on a large scale can create distribution and/or transmission instability.

Due to the amount of solar generating capacity required to replace the NAPS baseload generation and the lower efficiencies in producing electricity from solar power versus nuclear power, the amount of land required to install solar generation is larger than other alternatives being considered in this ER. The National Renewable Energy Laboratory (NREL) has estimated that current land use required for PV installations average 3.6 acres/gigawatt hours per year (GWh/yr), with a generation-weighted average of 3.1 acres/GWh/yr. CSP installations are estimated to average 2.7 acres/GWh/yr. (NREL. 2013) Dominion uses 10 acres per MW of PV solar facilities as a planning factor for development of PV solar facilities, requiring more than 16,000 acres total to replace the 1,672 MW net provided by NAPS. Furthermore, Dominion's planning assumption of approximately 25% generation capacity for solar facilities does not approach the generation capacities of nuclear facilities of 90% or more. Therefore, depending on the location of the solar facilities, the land use disturbances could result in MODERATE to LARGE impacts to resources such as wildlife habitats, vegetation, land use, and aesthetics.

For solar power to be viable as a discrete source of power generation, energy storage would need to be considered in the planning process and development of new energy storage facilities would need to address additional environmental impacts. As mentioned in Section E7.2.2.2.1, Dominion is planning battery storage pilot projects with a total storage capacity of 30 MW. Energy storage to support discrete solar energy facilities for reliable sources of generation would have to be many times larger than the battery storage pilots. As discussed earlier, battery storage is still at the developmental stage. Therefore, solar power combined with battery storage is currently not a reasonably feasible alternative to replace NAPS baseload capacity.

Because a discrete solar generation alternative is not a source of large amounts of energy that is reliably available at the system peak hours, and because of the potential environment impacts associated with the large land disturbances for this scale of solar power installation, this alternative, by itself or with energy storage, is not considered a reasonable alternative to replace the baseload generation of NAPS.

Nonetheless, even if solar were considered to be reasonable, the impacts discussed above show that the impacts from solar (with or without energy storage) would be higher than the impacts for renewal of the NAPS OLs, summarized in Table E8.0-1, and therefore, solar (with or without energy storage) would not be superior to continued operation of NAPS.

E7.2.2.2.3 Hydropower

Dominion considers the construction of new large-scale hydroelectric facilities unlikely to occur because of environmental siting and regulatory restrictions in its service area.

Construction of a new large-scale hydropower facility would require considerable siting considerations, such as the area that would be inundated to provide water storage for generation, as well as the overall environmental impacts associated with the development of the facility. The environmental impacts would be LARGE for land use, water resources, socioeconomics, ecology, and cultural resources. The VCEA places restrictions on the use of hydropower as a renewable energy source that meets the act's definition of a renewable portfolio standard eligible source. The hydropower resource must have been in operation by January 1, 2020, or Dominion must have entered into a contract to purchase power from a hydropower generation source by January 1, 2020 (56 VAC 585.5 C). Dominion projects generation of approximately 610 MWe of hydroelectric power total (2020 to 2035) at three facilities, two in North Carolina and one in Virginia {Dominion. 2020a). The lack of potential for large hydroelectric facilities and the environmental constraints associated with the development of a new hydropower facility make hydropower an unreasonable alternative to replace the NAPS generation.

Dominion is currently conducting feasibility studies for a potential pumped hydroelectric storage power station at a site in Tazewell County, Virginia. Dominion received approval from the U.S. Federal Energy Regulatory Commission for its preliminary permit application in 2017. (Dominion. 2020a).

E7.2.2.2.4 Geothermal

The NREL has not identified any viable sites for geothermal energy in the eastern United States (NREL. 2009). Therefore, geothermal energy is not considered a reasonable power source in the Dominion service area.

E7.2.2.2.5 Biomass

Biomass includes wood waste, municipal waste, manure, certain crops, and other types of waste residues used to create electricity. Dominion currently generates 51 MW of baseload biomass electricity (Dominion. 2019a). Most of the fuel used in this generation is wood waste. Wood-waste plants require a large land area for storage and processing, and, like coal generation, they produce ash that must be disposed of in a manner that does not pollute waterways and air. Therefore, environmental impacts associated with construction of a wood-waste plant would be MODERATE to LARGE, with the impact intensity level being dependent on the siting and proximity to a source of wood waste.

Biomass plants tend to be much smaller than nuclear or fossil fuel plants. To replace the NAPS baseload generation, it would take the construction of several biomass plants located near reliable fuel sources that continuously produce enough biomass to fuel the plants.

Utilizing municipal solid waste for electricity is also dependent on being close to large population centers that generate large amounts of waste. The largest municipal waste plant in the United States produces 224 MWe of baseload generation (ERC. 2016). Therefore, as in the case with wood waste, it would take more than seven of these facilities to match the current baseload generation of NAPS.

Agriculture-derived biomass includes residue from crops, manure, and crops specifically grown for conversion to fuel. Examples of crop residue include corn stover, which are the stalks, leaves, and husks of the plant, and wheat straw. The use of crop residue as a source of fuel is in the developmental phase and is not being used commercially. Use of manure for a fuel for generation of electricity is focused on small-scale facilities that would not be able to replace the NAPS generation. Therefore, crop residue and manure are not considered a reasonable alternative for replacing NAPS generation.

Energy crops include fast-growing trees, grasses, and algae. Corn and other crops are currently grown to produce ethanol for use in transportation. However, use of crops for large utility-based generation has not been implemented. Factors that would hinder use of crops for electricity generation include the large land area required to grow commercial crops, conversion of crops grown for food to a source of fuel for energy generation, and environmental factors such as increased pesticide and herbicide use. The GEIS states that a generation facility using crop as a fuel source would result in similar construction and operations-related impacts as a plant using wood waste as a fuel. Therefore, based on the large land areas required to grow commercial energy crops and the limits on the size and output of a facility that would use crops, energy crops are not a reasonable alternative for replacement of NAPS generation.

Overall, the construction and operation of a biomass plant of the size necessary to act as an alternative to NAPS would result in MODERATE environmental impacts to land use, water quality, ecological resources, and air quality.

Generating baseload generation from biomass sources is limited because of the need to site facilities near substantial fuel sources and impacts from constructing and operating the facility. In addition, biomass plants are unable to produce the large baseloads of electricity that nuclear and fossil fuel plants generate, without the construction of multiple smaller facilities.

The wood and energy crops fuel sources for biomass plants would also make a biomass plant a carbon dioxide emitting generation source. Given that the VCEA mandates the retirement of all generation units that emit carbon dioxide as a byproduct of combustion by 2045, this barrier further restricts the reasonableness of a biomass alternative. Therefore, biomass is not considered a reasonable alternative for replacing the baseload generation of NAPS.

E7.2.2.2.6 Fuel Cell

Fuel cells as a reliable generation alternative are not presently economically or technologically competitive with other alternatives. The Energy Information Administration (EIA) projects that fuel cells may cost $6,932 per installed kW (total overnight capital costs), which is higher than most generation technologies analyzed in this ER (EIA. 2017). This high cost is associated with the durability of fuel cells and the technology to convert natural gas to hydrogen.

E7.2.2.2.7 Ocean Wave and Current Energy

A 2011 EPRI study estimated the potential for ocean energy each year in Virginia at 7 terrawatt hours (TWH) along the outer shelf and 5 TWH along the inner shelf (EPRI. 2011). The technology to harness ocean energy is in its early stages of development and would not be feasible to replace NAPS generation in a time frame needed comparable to SLR. In addition, the potential for ocean energy on the Virginia inner and outer shelfs is marginal (EPRI. 2011). Only one pilot wave energy project is currently operating in the United States and the environmental impacts associated with these facilities have not yet been studied in any detail in the United States. With very minimal information available regarding the implementation of this technology in the United States, this alternative is not considered a reasonable alternative for replacement of the NAPS generation. Therefore, ocean wave and current energy is not considered a reasonable alternative in the necessary time frame for power supply.

E7.2.2.2.8 Oil

Oil-fired generation emits large amounts of carbon dioxide and other air pollutants, making it undesirable for utilities looking to reduce air pollutants and comply with regulations. As discussed in Section E2.6.2, Virginia passed the VCEA, which mandates the retirement of all generation units that emit carbon dioxide as a byproduct of combustion by 2045 unless the retirement of a particular unit would threaten grid reliability and security. Therefore, fossil fuel-fired generation alternatives were ruled out as reasonable generation alternatives due to these barriers to obtain state approvals and permits.

E7.2.2.2.9 Coal

For the past few years, Dominion has implemented a program to reduce coal-fired baseload generation in its service area, retiring and proposing to retire existing coal-fired generation. As discussed in Section E2.6.2, Virginia passed the VCEA, which mandates the retirement of all generation units that emit carbon dioxide as a byproduct of combustion by 2045 unless the retirement of a particular unit would threaten grid reliability and security. Therefore, fossil fuel-fired generation alternatives were ruled out as reasonable generation alternatives due to these barriers to obtain state approvals and permits.

E7.2.2.2.10 Coal-fired Integrated Gasification Combined Cycle

Coal-fired IGCC is a gasification process that produces synthetic natural gas from coal to use as a fuel in the combined cycle process. In this process, heat pressure and steam pyrolyze coal to produce syngas. The syngas is processed to remove contaminants, and then it is used in a combustion turbine plant to produce electricity. Carbon dioxide can be removed from the syngas prior to its use as fuel in the plant. IGCC plants would remove a larger quantity of criteria air pollutants than coal units. However, emissions of criteria pollutants would be slightly higher than gas-fired plants (Argonne National Laboratory. 2013).

IGCC technologies may be increasingly employed in the future as carbon capture and sequestration (CCS) is developed to remove carbon dioxide from fossil fuel use. Since carbon dioxide is removed from the syngas before it is used as fuel, CCS technology would be more economical to employ with IGCC than with standard coal-fired generation where the carbon is removed after combustion.

Currently, IGCC technologies have been installed on a very limited scale. The technology has not yet proven itself capable of providing reliable baseload power. Therefore, IGCC is not considered a reasonable alternative.

E7.2.2.2.11 Natural Gas-fired Plants

As discussed in Section E2.6.2, Virginia passed the VCEA, which mandates the retirement of all generation units that emit carbon dioxide as a byproduct of combustion by 2045 unless the retirement of a particular unit would threaten grid reliability and security. Natural gas-fired generation emits carbon dioxide and other air pollutants although less than other fossil fuel-fired units. Table E7.2-1 presents the estimated emissions for a natural gas combined cycle plant sized to provide the net generation of NAPS. Given the VCEA restriction on fossil fuel-fired generation beyond 2045, policy barriers to siting non-renewable generating sources in North Carolina which is also within Dominion's service territory, and the energy import capacity concerns presented in Section E7.2.2.1.1, a natural gas-fired alternative is not considered a reasonable generation alternative.

E7.2.3 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

The alternatives considered as reasonable replacement power sources are presented in this section. Two alternatives able to provide an approximate equivalent of 1,672 MWe of baseload generation to replace the baseload power from NAPS are considered reasonable alternatives. This section presents the potential environmental impacts that may occur if these alternatives were developed.

E7.2.3.1 New Nuclear ALWR Alternative

As described in Section E7.2.1.1, one of the new nuclear generation plant alternatives is the licensed NAPS Unit 3. This proposed facility would generate 1,605 MWe of electricity. The NRC issued the COL for NAPS Unit 3 effective June 2, 2017. As a replacement for Units 1 and 2, the additional transmission line (new line within NAPS to Ladysmith transmission corridor) proposed with NAPS Unit 3 would not be needed. The resource and issues data and analysis presented in this section rely on the NRC's *Environmental Impact Statement for an Early Site Permit (ESP) at the North Anna ESP Site* (NRC. 2006), the NRC's *Supplemental Environmental Impact Statement for the Combined License (COL) for the North Anna Power Station 3* (NRC. 2010), and the *North Anna Combined License Application - Applicant Environmental Report*, Revision 8 (Dominion. 2016b).

E7.2.3.1.1 Land Use

NAPS Unit 3 would be constructed on approximately 120 acres within the NAPS site boundary (NRC. 2010, Section 10.2.1). In addition, approximately 67.9 acres of land onsite (NRC. 2006, Section 4.1.1) and a 96-acre offsite parcel contiguous with the NAPS site boundary and owned by Dominion would be needed to support construction activities (Dominion. 2016b, Section 4.1.1).

NAPS Unit 3 would be sited at an existing industrial site that will require no new expansion outside the existing NAPS site for its permanent facilities. Construction support acreage includes land within site boundaries and land contiguous with the NAPS site boundary. In addition, some offsite land-use would occur from road improvements (e.g., repairs, widening, and/or filling in low areas) that would be required for NAPS Unit 3 to support the transport of the reactor pressure vessel and other large components to the site. These impacts are anticipated to be beneficial for the roads. The NRC concluded that the land use impacts resulting from NAPS Unit 3 would be SMALL for construction and operation. (NRC. 2006, Sections 4.1.1 and 5.1.1; NRC. 2010, Section 4.1.1 and 5.1.1).

E7.2.3.1.2 Visual Resources

Because the existing NAPS site is already industrialized, the construction of NAPS Unit 3 would not change the context of the site. Some temporary modifications to existing rail and road transportation routes are planned and these changes would alter the visual character of the landscape near the site. However, these changes would be temporary and after transportation of large components to the site is complete the modifications would be removed. The NRC concluded that impacts to visual resources during the construction of NAPS Unit 3 would be SMALL. (NRC. 2010, Section 4.5.1.4)

Dominion's visual impact study indicates that the impact to the public from NAPS Unit 3 would be similar to the visual impact from NAPS Units 1 and 2. The NRC concluded that operations related impacts on visual resources from NAPS Unit 3 would be SMALL rising to MODERATE no more than 10 percent of the time. (NRC. 2010, Section 5.5.1.4).

E7.2.3.1.3 Air Quality

Construction of NAPS Unit 3 would result in temporary impacts to air quality. These impacts would be primarily from fugitive dust generated from clearing and grubbing. In addition, emissions from equipment and vehicles would contain air pollutants such as CO, NO_x, SO_x, particulate matter, VOCs, and greenhouse gases. These vehicle and equipment air emissions would be intermittent and variable depending on the level of activity. Fugitive dust emissions would be mitigated via use of watering to reduce dust. Other mitigation could include carpooling to reduce the number of vehicles transporting workers to the site. Overall, air emissions from construction activities would be temporary and limited in duration. The NRC concluded that construction related air quality impacts would be SMALL (NRC. 2010, Section 4.2). A subsequent revision of the NAPS Unit 3 COLA ER (Dominion. 2016b, Section 4.4) did not indicate additional air quality impacts during construction.

Therefore, construction-related impacts on air quality under the NAPS Unit 3 nuclear alternative would be SMALL.

Air emissions during NAPS Unit 3 operation would be considered a minor source of air emissions and subject to conditions outlined in a VDEQ air permit. Air quality impacts from routine releases other than the cooling system would be limited to nonradiological pollutants emitted during the operation of the emergency generators and emissions from onsite service vehicles. Particulate emissions from the cooling towers would also be subject to the VDEQ permit conditions. The NRC concluded that air quality impacts from NAPS Unit 3 operations would be SMALL (NRC. 2010, Section 5.2). Also, the NRC more recently evaluated the impacts from cooling tower particulate emissions in the GEIS and considered these impacts to be SMALL (NRC. 2013a, Table 2.1.1).

GHGs associated with nuclear power are lower than fossil-fuel based energy sources. Nuclear power life-cycle GHG emissions are within the same order of magnitude as renewable energy sources (NRC. 2013a, Section 4.12.3). The new nuclear alternative would have greatly reduced GHG emissions from those of a fossil-fuel plant.

E7.2.3.1.4 Noise

Sources of noise during construction would include heavy equipment, compressors, hydraulic equipment, dump trucks, and other construction equipment. The NRC considered construction noise in the COLA SEIS including blasting. These noise sources would be intermittent and last for the duration of the construction activities. The NRC concluded that noise levels would be reduced at the EAB (approximately 2,855 feet away) to less than the 65 dBA, a guidance level for impacts to human receptors, concluding impacts to be SMALL (NRC. 2010, Section 4.8.2). Construction noise was again considered in a subsequent revision to the COLA ER and noise levels were estimated at 60-80 dBA at 400 feet from the NAPS Unit 3 construction site (Dominion. 2016b, Table 10.4-2), which are not higher that those previously considered.

Noise associated with the operation of NAPS Unit 3 would result from sources such as cooling towers, motors, generators, and heavy trucks. Most of the anticipated operations-related noise would be associated with the cooling towers. Noise levels from the cooling towers were confirmed in a cooling tower noise study to be less than or equal to 65 dBA at the EAB (Dominion. 2016b). Operations-related noise impacts were determined to be SMALL (NRC. 2010).

E7.2.3.1.5 Geology and Soils

Construction-related impacts to geology would be minimal, as materials such as stone and gravel used for construction of roads and buildings would be obtained from suppliers who use local or regional sources of these materials. Clearing and grubbing associated with the construction of NAPS Unit 3 would expose soils and make them susceptible to erosion. Drainage patterns would also be susceptible to change that can result in increased runoff to streams and lakes. Since ground disturbance would be more than one acre a VDEQ stormwater construction general permit would be required. This permit would require installation of BMPs to reduce stormwater runoff that transports sediment and other pollutants into local waterways. Once construction activity is completed, exposed soils would be stabilized. Therefore, construction-related impacts on geology and soils would be SMALL. Likewise, the NRC's Final Environmental Impact Statement (FEIS) for an ESP at NAPS (NRC. 2006, Table 4.6-1) indicated that erosion and sediment impacts would be small with the application of BMPs.

Operations-related impacts on geology and soils would be minimized by adherence to BMPs and permit conditions for management of stormwater originating from the site. Therefore, operations-related impacts would be SMALL.

E7.2.3.1.6 Hydrology (Surface Water and Groundwater)

E7.2.3.1.6.1 Surface Water

NAPS Unit 3 construction would impact two ephemeral streams, Streams B and C, during construction of the cooling towers. The impacts may temporarily and permanently alter these drainages, and some increased runoff may occur in these tributaries during construction of NAPS Unit 3. These stream impacts would be minimized by installation of BMPs to prevent erosion and pollutants from entering the waterways. NAPS Unit 3, as designed as an additional unit, would require the construction of new intake structure to draw water from Lake Anna. In addition, a new discharge structure would be constructed on the discharge canal. This discharge structure would be located adjacent to the discharge structure for Units 1 & 2. Dominion would obtain necessary USACE and VDEQ permits regarding wetlands impacts. The USACE permitting process ensures that impacts of construction are limited by requiring the appropriate construction BMPs. The NRC concluded that water-related impacts would be SMALL. (NRC. 2010, Section 4.3.1) Construction of these structures would result in temporary disturbances that would be mitigated through use of VDPES construction permit BMPs identified in the SWPPP. A subsequent revision of the NAPS Unit 3 COLA ER (Dominion. 2016b, Section 4.2.1.1) did not indicate additional water-related impacts during construction.

Construction activities could result in increased stormwater runoff from cleared sites, and spills and leaks from construction equipment. The stormwater construction general permit would require installation of BMPs and to mitigate the potential for stormwater runoff and erosion. These BMPs and waste management practices identified in the SWPPP would also capture and mitigate accidental spills from equipment and vehicles. Therefore, construction-related impacts on surface water use and quality under the NAPS Unit 3 nuclear alternative would be SMALL.

Operational impacts to surface water would be related to use of Lake Anna to supply circulating water, makeup water, fire-protection water, and demineralized water and discharges to Lake Anna.

The NRC also considered the results of an instream flow incremental methodology study addressing impacts to Lake Anna under maximum water conservation conditions prompted by a drop in lake levels. The NRC concluded that water-use impacts caused by operation of the NAPS Unit 3 would remain SMALL in normal years and MODERATE in drought years. Water discharges to Lake Anna would be regulated under a VPDES permit to protect water quality. Operations-related impacts on surface water use and quality would be SMALL with the exception of MODERATE impacts under drought conditions. (NRC. 2010, Sections 5.3.2.and 5.3.3).

E7.2.3.1.6.2 Groundwater

Foundation excavations may intrude on groundwater zones and require dewatering during construction. Dewatering systems used during construction would depress the water table in the vicinity. However, any drawdown in the water table would be limited by the proximity of Lake Anna and the discharge canal (NRC. 2006 Section 4.3.1).

Construction-related impacts to groundwater would be connected to the five new domestic wells that will be drilled for the NAPS Unit 3 operations (Dominion. 2016b, Section 4.2.1.2). These wells would be installed for potable water and two would be in service during the construction of NAPS Unit 3. The NRC considered impacts from these groundwater wells in the 2010 NAPS Unit 3 COL SEIS (NRC. 2010, Section 4.3.1). Pumping groundwater from these new wells will depress the water table in the vicinity of the wells. However, any drawdown in the water table would be limited by the proximity of Lake Anna and the discharge canal.

The NAPS site has approved waste management, spill prevention practices, and stormwater BMPs in place to prevent and minimize any surface sources of contamination that could migrate into groundwater resources. Therefore, operations-related impacts to groundwater use and quality under the NAPS Unit 3 nuclear alternative would be SMALL.

E7.2.3.1.7 Ecological Resources (Terrestrial and Aquatic)

E7.2.3.1.7.1 Terrestrial

Terrestrial ecology impacts from construction of NAPS Unit 3 would primarily occur from land disturbance. Some wildlife mortality is expected during construction. However, the mortality is not expected to affect long-term wildlife populations. Wildlife would disperse when construction is initiated to undisturbed adjacent habitats. Since NAPS is an industrialized site, it is assumed wildlife is acclimated to noise and the additional construction noise should not disrupt wildlife in adjacent habitats.

Construction of NAPS Unit 3 would result in the loss of approximately 120 acres of forested habitat. This habitat is relatively recent regrowth and is not known to have unique or sensitive plant species or communities. (NRC. 2010, Section 4.4.1) Due to the presence of potential habitat for the federally listed small whorled pogonia, follow-up plant-specific identification surveys were conducted on the site during the 2010 and 2012 flowering seasons. The small whorled pogonia was not present (Dominion. 2016b, Section 2.4.1.6). No important animal species are likely to occur within the area, and it represents a very small percentage of the similar habitat in the site vicinity (NRC. 2010, Section 4.4.1).

Construction would permanently disturb approximately 0.31 acres of non-tidal wetlands and 757 linear feet of ephemeral streams (Dominion. 2016b), slightly less than previously considered by the NRC in the COLA SEIS. This impact to waters of the U.S. would require a USACE Section 404 permit that requires installation of BMPs to protect waters and remediation of temporarily disturbed sites. These disturbed vegetation communities would be revegetated with native and non-evasive flora species appropriate for the site conditions (Dominion. 2016b)

The NRC reviewed the potential impacts of constructing NAPS Unit 3 on terrestrial ecological resources, including loss of habitat, loss of wetlands, noise, dust emissions, and avian collisions. Based on Dominion's implementation of construction mitigation measures, the NRC concluded that impact to terrestrial resources would be SMALL. The mitigation measures would include instituting construction BMPs for erosion and dust control, noise abatement, and proper equipment maintenance; restricting the timing of activities to minimize impacts to resources such as breeding birds; and adhering to applicable permit conditions. Dominion delineated the wetlands and streams on the construction site for NAPS Unit 3 and designed the current layout to minimize impacts to wetlands and streams. Water discharges and stormwater flows to Lake Anna during the SLR term would be regulated under VPDES permits for NAPS and VPDES and VWP permits for the construction and operation of NAPS Unit 3. The USACE CWA 404 permit 10-V1256/NOA-2008-2534 also authorizes and establishes conditions for dredging activities and shoreline and in-water construction activities for NAPS Unit 3 (USACE. 2011). Dominion would adhere to any permit conditions or mitigation requirements developed by the USACE or the VDEQ. (NRC. 2010, Section 4.4.1)

Operation of the cooling towers would cause some deposition of dissolved solids on surrounding vegetation and soils. Operational noise from the cooling towers could impact terrestrial wildlife, although the site has an existing background noise level that most wildlife should be acclimated to. Noise levels from the cooling towers were confirmed in a cooling tower noise study to be less than or equal to 65 dBA at the EAB (Dominion. 2016b).

The NRC considered potential impacts to terrestrial ecological resources of operating NAPS Unit 3, including salt drift; fogging; icing; noise; avian collisions; changes to shoreline, riparian, and wetland habitat. The NRC concluded that the operational impacts on terrestrial ecological resources of NAPS Unit 3 would be SMALL. (NRC. 2010, Section 5.4.1.6)

E7.2.3.1.7.2 Aquatic

Construction-related impacts to aquatic species would primarily be from land clearing and construction activities that could discharge sediment into Lake Anna. These sediment releases would be prevented or minimized by implementation of BMPs identified in SWPPP. Construction for intake structures and channel would utilize an existing cofferdam and no major modifications to the existing shoreline or dredging in the approach channel would be needed (NRC. 2010). This construction activity would result in increased sedimentation in Lake Anna. The increase in sedimentation would be temporary in duration, lasting only through the installation activities. Overall, the construction-related impacts to aquatic life under the ALWR nuclear alternative would be SMALL. The NRC's assessment construction-related impacts also considered the impacts to be SMALL with the application of VDPES permit requirements and BMPs (NRC. 2006, Section 4.4.2). A subsequent revision of the NAPS Unit 3 COLA ER (Dominion. 2016b, Section 4.3.2) did not indicate additional construction-related impacts to aquatic communities.

Aquatic life impacts resulting from operations is primarily-related to the intake and discharge structures. The NRC considered impingement and entrainment effects of operation of NAPS Unit 3. The addition of NAPS Unit 3 is expected to increase total impingement by approximately 3% and total entrainment by approximately 2% over the existing NAPS units. The NRC concluded that the impacts of both impingement and entrainment of NAPS Unit 3 operations in addition to the losses from Units 1 and 2 would be negligible. (NRC. 2010, Section 5.4.2).

Concentrations of chemicals and solids would be below VPDES permit discharge limits (Dominion. 2016b). In addition, NAPS Unit 3 would have no perceptible impact on temperature of the discharge water. Overall, the operations-related impacts on aquatic resources under the NAPS Unit 3 nuclear plant alternative would be SMALL as determined by the by the Dominion ER assessment.

The NRC considered the effects of shoreline erosion, scouring, increased turbidity, entrainment, impingement, and thermal impacts on the Lake Anna and the downstream communities, concluding the aquatic ecology impacts from the operation of NAPS Unit 3 would be SMALL (NRC. 2010, Section 5.4.2.5).

E7.2.3.1.7.3 Special Status Species

The NRC would remain the licensing agency under this alternative, and thus, the ESA would require the NRC to initiate consultation with the USFWS and NMFS if federally listed species or their habitat is present within the proposed project area.

No federally listed wildlife or plant species or their habitat are known to occur on the NAPS site Section E3.7.8. No federally listed fish species occur in Lake Anna and North Anna River. Several state-listed species (Table E3.7-5) could potentially occur at the NAPS site. These species are not known to inhabit the NAPS site and include the loggerhead shrike, three bat species, and an aquatic insect.

In a September 2009 letter, the VDCR informed the NRC of the presence of one rare plant species, Epling's hedge-nettle (*Stachys eplingii*) in a wetland area within the North Anna to Ladysmith ROW in western Caroline County. Although not currently listed by the Commonwealth, this species is considered critically imperiled in Virginia. The soils, topography, and habitats present within the ROW are not likely to support populations of other rare plants. Dominion's standard transmission line maintenance practices are designed to avoid impacts to wetlands and other sensitive habitat areas, and the NRC previously concluded in the initial NAPS license renewal that continued operation and maintenance of the transmission lines and ROWs would not adversely impact federally listed plant species. With the continuation of these maintenance practices, no change to the potential impact of operation and maintenance of the transmission lines or ROWs on these or any other threatened or endangered plant species are anticipated. (NRC. 2010, Section 5.4.3.1) Therefore, construction- and operations-related impacts to special status species are anticipated to have NO EFFECT.

E7.2.3.1.8 Historic and Cultural Resources

Cultural resource investigations were completed from 1969 to 2009. The investigations identified include three historic cemeteries, three historic archaeological sites, and an architectural resource that were recommended as eligible for the NRHP. The NRC concluded that potential construction impacts on historic and cultural resources would be SMALL based on commitments to avoid the sites or evaluate the sites and develop management plans and practices for sites that cannot be avoided. (NRC. 2010, Sections 2.9.2 and 4.6)

In April 2008, one potentially historic site was identified on the land parcel contiguous with the NAPS site that would be used for construction support. The site is a partially collapsed log cabin and its NRHP eligibility has not yet been determined. Construction activities would avoid cultural sites as a standard mitigation practice. VDHR's expectation is for Dominion to reinitiate consultation if avoidance is deemed impractical. (Dominion. 2016b, Section 4A.4)

There are cultural sites along the proposed large component transportation route and temporary modifications may be needed. Impacts resulting from the transport of large components are expected to be SMALL with implementation of mitigating measures. Mitigating measures include avoidance of sensitive areas whenever possible, rehabilitation of land, removal of debris, and restoration of damaged property to its original condition or as close as possible. (Dominion. 2016b, Section 4.1.3)

Construction and operation of the NAPS Unit 3 nuclear unit would have NO ADVERSE EFFECT on historic or archaeological resources.

E7.2.3.1.9 Socioeconomics

E7.2.3.1.9.1 Socioeconomic Issues Other than Transportation

The construction and operation of the NAPS Unit 3 nuclear alternative would create construction and power plant operations employment. The construction employment would be short-term and would provide a stimulus to the local economy. Plant operations employment would be long-term and would provide additional stimulus to the local economy.

The NRC considered the socioeconomic impacts from construction of two units in the ESP EIS that would last up to five years and need up to 5,000 workers. The NRC concluded that adverse socioeconomic impacts would range from SMALL to MODERATE and beneficial impacts range from SMALL to MODERATE. (NRC. 2006, Section 4.5) The NRC also considered the smaller construction workforce for a single unit, NAPS Unit 3 in the COL SEIS, and confirmed that the same range of impacts are expected (NRC. 2010, Section 4.5.5).

Dominion's revised COLA ER estimated that the peak construction workforce for NAPS Unit 3 would be approximately 2,500 to 4,100 workers (Dominion. 2016b). The temporary in-migration of workers would be estimated at 20% of the workforce. This number of workers would provide an economic stimulus to the local economy as the demand for housing and goods would increase.

The NRC also considered the smaller operations workforce of 500 workers for a single unit in the COL SEIS and confirmed that population-related impacts (e.g., impacts to public services such as education, medical, fire, and police services) would be SMALL and adverse. The NRC assessed that the socioeconomic impacts to recreation resources could range up to MODERATE during times of drought. The additional workers would purchase homes, goods, and services increasing the economic base of the region resulting in SMALL beneficial impacts to the region, but MODERATE to Louisa and Orange counties. The beneficial socioeconomic impact of tax payments would be SMALL to the region, but LARGE to Louisa County from property taxes for NAPS Unit 3. (NRC. 2010, Section 5.5).

E7.2.3.1.9.2 Transportation

The NRC considered the transportation impacts from construction of two units in the ESP EIS that would last up to five years and need up to 5,000 workers, and concluded that the temporary impacts of construction on transportation in the region would be SMALL to MODERATE with implementation of a traffic management plan and planned upgrades and improvements to the road systems in the region (NRC. 2006, Section 4.5.3.2). The employment of 4,100 construction workers combined with 1,000 NAPS site workers would add up to 2,850 vehicles on the local road system (Dominion. 2016b). This increase in traffic would increase traffic on the roads and congestion would be noticed by commuters. Increased use of the roads during construction could create some safety and maintenance issues. The work shifts during construction would be staggered, which could minimize some of the increased road use. Overall, construction-related traffic impacts under the NAPS Unit 3 nuclear alternative would be SMALL to MODERATE as determined by the NRC's previous analysis.

Traffic-related impacts would be reduced after construction of NAPS Unit 3. Transportation impacts would result from the approximately 500 workers, equipment and materials deliveries, and truck traffic, and be comparable to those from NAPS Units 1 and 2. Therefore, operations-related transportation impacts under the NAPS Unit 3 nuclear plant alternative are SMALL as determined by the NRC's previous analysis (NRC. 2006, Section 5.5.3.2).

E7.2.3.1.10 Human Health

Impacts on human health from construction of the NAPS Unit 3 nuclear alternative would be similar to those associated with a large industrial facility construction project. Compliance with OSHA worker protection rules would prevent safety-related accidents. The radiological human health impact on construction workers due to the proximity of Units 1 and 2 would be SMALL due to compliance with NRC regulations and adherence to ALARA principals. The NRC reviewed the human health and environmental impacts from radiological emission and waste in its license renewal GEIS and found the impacts to be SMALL (NRC. 2013a, Table 2.1.1). Therefore, the construction-related impacts on human health under the NAPS Unit 3 nuclear alternative would be SMALL.

The human health effects from the operation of NAPS Unit 3 would be similar to those of the existing NAPS Units 1 and 2. Therefore, the operations-related impacts on human health under the NAPS Unit 3 nuclear plant alternative would be SMALL.

E7.2.3.1.11 Environmental Justice

The closest minority populations exist within approximately 15 miles east-southeast of the site on Caroline County's boundary with Hanover County. Census block groups containing low-income populations are concentrated in the City of Richmond. (NRC. 2010, Section 2.10.1) Potential impacts on minority and low-income population from construction of the NAPS Unit 3 nuclear alternative would primarily be associated with socioeconomic effects. These impacts would consist of the short-term increase in worker expenditures at local businesses and potential rental housing shortages during the construction phase of the project. The increase in traffic on roads would likely result in some moderate impacts to traffic that could affect local minority and low-income populations. Environmental impacts to these populations would be minor and likely would result in no impacts to minority and low-income populations. Overall, the construction impacts to low income and minority populations under the NAPS Unit 3 nuclear alternative would be SMALL. The NRC concluded that environmental justice impacts would be SMALL in its ESP FEIS (NRC. 2006, Section 4.7)

No operations-related impacts to minority or low-income populations would occur from plant operations. Overall, the construction and operation of NAPS Unit 3 would not result in disproportionately high and adverse human health and environmental effects on minority and low-income population residing in the vicinity of the NAPS site. The NRC concluded that environmental justice impacts would be SMALL in its ESP FEIS (NRC. 2006, Section 5.7)

E7.2.3.1.12 Waste Management

The construction of the NAPS Unit 3 nuclear alternative would create sanitary and industrial waste. These wastes will be properly managed on site and disposed at an approved offsite treatment or disposal facility. Overall, waste impacts resulting from construction of NAPS Unit 3 would be SMALL.

During operations, the NAPS Unit 3 nuclear alternative would generate nonhazardous, hazardous, spent nuclear fuel, and radioactive waste. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. Dominion has internal recycling and waste minimization programs that would reduce waste volumes. Spent nuclear fuel would be managed on site in accordance with NRC and state regulations. This waste would be disposed of in permitted facilities. The NRC reviewed the impacts from nonradioactive and radioactive waste in the GEIS and determined the impacts to be SMALL (NRC. 2013a, Table 2.1-1). Dominion reviewed the impacts of hazardous and radioactive waste for NAPS Unit 3 and determined the impact to be SMALL (Dominion. 2016b, Table 10.4-2).

E7.2.3.2 New Nuclear SMR Alternative

The SMR option would consist of a cluster of SMR units with generation capacity comparable to NAPS generation. The facility would be located in the NAPS Unit 3 footprint and utilize the existing transmission infrastructure and intake and discharge structures. Mechanical draft cooling towers would be constructed to provide closed-cycle cooling.

E7.2.3.2.1 Land Use

SMR designs require less land than conventional nuclear power plants (DOE. 2018). One of the SMR design developers, NuScale, indicates that the land requirement of a SMR cluster of 1,000 MW is less than 20% of that required for a 1,000 MW conventional nuclear plant (NuScale. 2018). Therefore, the land requirement for a cluster of SMRs would be less than for the ALWR alternative. Dominion assumes that the SMR plant would be constructed within the onsite areas reviewed by NRC for construction of NAPS Unit 3 and as most recently depicted in Revision 8 of the NAPS Unit 3 COLA ER (Dominion. 2016b, Figure 1.1-1). The NRC considered land use impacts for the construction of NAPS Unit 3 onsite and concluded the impact to be SMALL since the construction would take place within the site boundaries (NRC. 2006, Table 4-1; NRC. 2010, Section 4.11).

Because the existing NAPS facility is an industrial site, the construction and operation of the SMR plant would not change land use in the surrounding area. Overall, the land use impacts associated with the construction and operation of the SMR plant would be SMALL.

E7.2.3.2.2 Visual Resources

During the construction phase of the project, the SMR plant site would be cleared of structures and vegetation. A portion of the 200 acres considered for construction of NAPS Unit 3 are assumed as the site for locating the SMR plant, which requires a smaller footprint. NAPS Unit 3's 200 acres includes approximately 120 acres of developed land and 80 acres of forested land. Construction activities could be more visible from Lake Anna, depending on the clearing's proximity to the shoreline. Because the site currently has an existing power plant, the ongoing construction activity associated with the SMR plant would be similar in scope to the existing industrial character of the site. Therefore, visual impacts during construction under the SMR plant alternative would be SMALL.

During operations, the tallest structures at SMR plant alternative would be the mechanical draft cooling towers and reactor and turbine buildings. The facility would be visible from offsite locations from and around Lake Anna, but not out of context with the developed site and the existing NAPS facility. Overall, the addition of an SMR plant would not significantly alter the viewshed at the NAPS site. Visual impacts associated with the operation of an SMR plant would be SMALL.

E7.2.3.2.3 Air Quality

Construction activities and operations would result in similar air quality as the ALWR alternative. The mechanical draft cooling towers would also have air emissions and atmospheric effects from drift and plumes. Drift that leaves the top of the tower will reflect the same water chemistry as that of the circulating water. The water chemistry would be controlled by Dominion and would be in accordance with the restrictions defined in the plant's VPDES permit for use of water treatment chemicals and discharge limits.

When the small droplets within the drift or plumes are released into the air, evaporation occurs, leaving behind the solids that were once dissolved. Plumes and draft have the effect of introducing fine particulate matter (PM) into the atmosphere. PM emissions (e.g., PM_{10} and $PM_{2.5}$) are regulated air emissions. The dissolved solids from both drift and plumes could also be deposited on the surrounding land. Atmospheric effects of plumes could include icing, fogging, and shadowing. Impacts of drift and plumes would be expected to be localized to onsite. Potential offsite impacts, if any, would be SMALL.

E7.2.3.2.4 Noise

Construction activities and operations would result in similar noise levels as the ALWR alternative. Noise impacts associated with plant operations would include noise from cooling tower, transformers, turbines, pumps, and compressors. Dominion does not expect noise impacts from the operation of the SMR plant to be greater than those associated with NAPS. Therefore, operations-related noise impacts associated with the SMR plant would be SMALL.

E7.2.3.2.5 Geology and Soils

Construction-related impacts to geology would be minor as the excavation associated with plant installation should not damage geologic formations. In addition, materials such as stone and gravel used in the construction of the plant and associated infrastructure would be obtained from local or regional sources. Commercial stone and gravel sources typically sell material obtained from local quarries and other sources. Therefore, construction-related impacts to geology would be SMALL. No geological impacts are expected during the operation of the plant.

Construction-related impacts to soil would occur during land clearing and the construction of the plant. The exposure of soils during clearing and grubbing will increase the risk of erosion from precipitation and high wind events. Soils excavated and removed during clearing and construction would be stockpiled onsite for use as backfill after construction is completed. Because the ground disturbance would exceed one acre, Dominion would obtain a stormwater construction general permit from VDEQ. This is a general permit for construction activities that require installation of BMPs to minimize erosion and sediment loss resulting from precipitation. Overall, with the installation and implementation of BMPs, construction-related impacts to soils would be SMALL.

Land disturbance activities initiated during the operation of the SMR plant would comply with applicable VDEQ regulations for stormwater permitting. The NAPS SWPPP would be modified to address the SMR plant operation. Soil impacts related to the operation of the plant would be SMALL.

E7.2.3.2.6 Hydrology (Surface Water and Groundwater)

E7.2.3.2.6.1 Surface Water

The construction-related impacts to surface water include those related to construction of the plant and infrastructure that would alter surface drainage features. The clearing of vegetation on the NAPS site may also alter drainage features that convey runoff from the site. These impacts would be minimized by the implementation of BMPs identified in the stormwater construction general permit SWPPP. Adherence to the BMPs would also minimize stormwater runoff from the construction site. Minimizing runoff from the construction site would prevent releases of sediment into Lake Anna during construction. The BMPs would also prevent releases of oils and other chemicals used during construction into Lake Anna. Construction impacts on surface water would be SMALL.

Dominion assumes the NAPS intake and discharge structures will be used, with some modification. The SMR replacement alternative would require approximately double the amounts of surface water use estimated for the smaller Clinch River SMR plant. The normal water withdrawal and consumption rate for the Clinch River SMR plant envelope was 18,423 gpm and 12,808 gpm for the 800 MW facility, respectively (NRC. 2018g, Table 3-5). This amount would be greater than the cooling water withdrawal estimated for NAPS Unit 3's closed-loop hybrid cooling system that employs hybrid cooling depending on operating conditions (22,260 gpm under normal lake levels and 15,376 gpm under drought conditions). That design was chosen because its withdrawal and discharge volumes allow Lake Anna to serve as the cooling water source for three operating units, which would no longer be the case under this replacement power alternative. (NRC. 2010, Section 5.3.2)

The SMR plant's cooling towers would require substantially less cooling water withdrawal than Units 1 and 2 but would increase consumptive use. When both Units 1 and 2 are operating, eight circulating water pumps draw water from Lake Anna at a maximum rate of 1.9 million gpm. The cooling water is entirely returned to the WHTF; however, there is some consumptive use due to induced evaporative losses from the WHTF and the North Anna Reservoir. (NRC. 2006, Section 2.6.1.2) Like the surface water use impact of NAPS, the impact of an SMR alternative under the new nuclear alternative would be SMALL.

E7.2.3.2.6.2 Groundwater

The SMR alternative is assumed to require foundation dewatering comparable to the ALWR alternative as well as similar quantities of groundwater during construction and operation. Construction-related impacts to groundwater could also occur from spills which are not properly mitigated and thereby transport contaminants through the soil to the groundwater. Groundwater quality would be protected by implementation of a SPCC and BMPs as with the ALWR alternative. Construction-related impacts to groundwater impacts would be SMALL.

Operations-related impacts under the SMR plant alternative would be minor and mitigated through use of BMPs that collect stormwater from the industrial site. In addition, waste management and spill mitigation would minimize the spread of contaminants through the soil into the groundwater. Therefore, SMR plant operations-related impacts on groundwater use and quality would be SMALL.

E7.2.3.2.7 Ecological Resources (Terrestrial and Aquatic)

E7.2.3.2.7.1 Terrestrial

Terrestrial ecology impacts resulting from the construction of the SMR plant would primarily result from land clearing and development at the NAPS site and the noise and emissions from construction activities. The onsite areas previously considered for NAPS Unit 3 and assumed as the site for locating the SMR plant would include developed land (approximately 120 acres) and forested land (80 acres). The forested area is vegetated with trees (conifers and hardwoods), shrubs, and herbaceous plant species. This undisturbed natural habitat acts as a buffer from the industrial character of the NAPS site. The clearing of a portion of this vegetation would displace wildlife that would disperse to adjacent undisturbed habitats. In addition, some wildlife mortality would occur, primarily with species associated with the soil profile of the forest. Wildlife using the adjacent undisturbed habitat may also disperse during construction due to noise generated from equipment and vehicles. After completion of the SMR plant, undeveloped land would be revegetated with native and non-native plant species. It is expected that some wildlife that can live with human disturbance would reoccupy this reclaimed land.

In the ESP EIS (NRC. 2006, Section 4.4.1), the NRC reviewed the potential impacts of constructing two nuclear units (Units 3 and 4) on terrestrial ecological resources, including loss of habitat, loss of wetlands, noise, dust emissions, and avian collisions. Based on implementation of construction BMPs for erosion and dust control, noise abatement, proper equipment maintenance, restricting the timing of activities to minimize impacts to resources such as breeding birds, and adherence to applicable permit conditions, the NRC concluded that the overall impact of construction-related activities on terrestrial ecological resources would be SMALL. Likewise, Dominion would implement appropriate BMPs for construction of the SMR and therefore, construction of the SMR would result in SMALL impacts to terrestrial resources.

Operational impacts on terrestrial resources would be like those occurring with the operation of NAPS. Air emissions associated with the plant may cause some impacts to vegetation adjacent to the plant. However, this impact is expected to be SMALL. In addition, structures could result in some avian collisions and mortality. Overall, the terrestrial resources impact associated with the operation of the SMR plant would be SMALL.

E7.2.3.2.7.2 Aquatic

Construction impacts on aquatic resources would be minor because BMPs would be used to minimize impacts from shoreline construction to modify existing intake structures, no dredging of the intake channel is anticipated as was the case for NAPS Unit 3 construction, and surface water discharges to aquatic habitat would be minimized through installation of BMPs identified in the SWPPP. The SWPPP BMPs would also eliminate or minimize potential spills and releases associated with the construction of the plant. Dominion assumes the installation and proper placement of BMPs during construction of the SMR plant would result in SMALL impacts to aquatic resources.

As presented in Section E7.2.3.2.6.1, the SMR plant would require less water to be withdrawn from Lake Anna than is required for NAPS, but greater than the withdrawal level of NAPS Unit 3. The water withdrawals would result in entrainment of aquatic organisms. The larger volume withdrawals of NAPS were determined to be SMALL given that Lake Anna continues to have healthy fish and benthic organism communities (see Section E4.6). The NRC considered the lower withdrawal levels of NAPS Unit 3 to have a negligible increase over the aquatic ecology resources impact of Units 1 and 2 (NRC. 2010, Section 5.4.2). In addition, the SMR plant cooling system discharge would have similar chemical discharges as NAPS and would be subject to a VPDES permit. Therefore, the impact to aquatic ecology resources would be SMALL.

E7.2.3.2.7.3 Special Status Species

No federally listed wildlife or plant species or their habitat are known to occur on the NAPS site. No federally listed aquatic species occur in Lake Anna and the North Anna River downstream of NAPS within the six-mile vicinity. (Section E3.7.8). The northern long-eared bat could occur within the NAPS site. Dominion contracted a bat survey in 2016 for forested portions of the site where the licensed NAPS Unit 3 would be located if built. No listed bats were captured. (GAI Consultants. 2016) The impact on special status species due to constructing the SMR plant alternative would be similar to those associated with the ALWR plant alternative presented in Section E7.2.3.1.7.3. NO EFFECT is expected for special status species.

E7.2.3.2.8 Historic and Cultural Resources

The SMR plant would be sited within the existing NAPS property. Cultural resource investigations at NAPS have identified cultural resources as identified in Section E3.8.5. The NRC's consideration of NAPS Unit 3 cultural impacts concluded that the potential construction impacts on historic and cultural resources would be SMALL based on commitments to avoid the sites or evaluate the sites and develop management plans for sites that cannot be avoided. The NRC considered the potential for impacting a proposed transmission corridor and other construction staging and transportation routes that would be needed for NAPS Unit 3 construction. (NRC. 2010) The land required for an SMR plant is much smaller and thus would potentially allow greater opportunities for avoidance of cultural sites. Dominion would develop management plans and practices for sites that cannot be avoided.

Operations of the SMR plant would not result in impacts to cultural resources. The cultural resource survey conducted before construction would identify any sites and they would be avoided or if not avoided, management plans and practices for sites that cannot be avoided would be in affect during SMR plant operations.

Because cultural resources, both historic and archaeological, would be avoided or protected during both the SMR plant construction and operations, NO ADVERSE EFFECT would occur.

E7.2.3.2.9 Socioeconomics

E7.2.3.2.9.1 Socioeconomic Issues Other than Transportation

Regarding the socioeconomic impacts of the SMR alternative, the workforce size and tax payments were considered. The SMR alternative would require an operations workforce similar in size to the current workforce and that projected for NAPS Unit 3. The workforce for the 800 MWe Clinch River SMR facility was estimated at 500 workers (NRC. 2018g, Table 3-5). A review of the economics of SMR facilities estimated the operations workforce at 500 for a 1,000 MW facility (SMR Start. 2017). The operational plant on the same property would also pay similar tax amounts; thus, the SMR alternative would have similar socioeconomic impacts as NAPS and the ALWR alternative. Because the reactors would not require onsite construction as do ALWRs, the size of the construction workforce and duration of construction could be less than that of the ALWR alternative. The estimated peak construction workforce for the Tennessee Valley Authority's proposed Clinch River SMR is 3,300 workers (NRC. 2018g, Table 3-2), which is comparable to NAPS Unit 3 under the ALWR alternative. Therefore, the socioeconomic impact of construction would be SMALL to MODERATE adverse impacts on community services, housing, and transportation and SMALL to MODERATE beneficial impacts on the economy. As with the ALWR alternative, the property taxes paid for the SMR would have a LARGE beneficial impact on Louisa County.

E7.2.3.2.9.2 Transportation

As presented in Section E7.2.3.1.9.2, the estimated peak construction workforce for the SMR plant is comparable to the ALWR alternative. Construction-related traffic impacts under the SMR alternative would likewise be SMALL to MODERATE.

Traffic-related impacts would be reduced after construction. Transportation impacts would include some minor increase in NAPS site worker road use from the increase of 500 workers, a slight increase in equipment and materials deliveries, and a minor increase in maintenance truck traffic. Therefore, operations-related transportation impacts under the SMR alternative would be SMALL.

E7.2.3.2.10 Human Health

The construction and operations workforces would have similar radiological and occupational risk as under the ALWR alternative. Compliance with OSHA worker protection rules would prevent safety-related accidents. The radiological human health impact on construction workers due to the proximity of Units 1 and 2 would be SMALL due to compliance with NRC regulations and adherence to ALARA principles. Compliance with NRC regulations and adherence to ALARA principles would continue during operations. Therefore, the construction- and operations-related impacts on human health under the SMR alternative would be SMALL.

E7.2.3.2.11 Environmental Justice

As for the ALWR nuclear alternative, the construction and operation of an SMR plant would not result in disproportionately high and adverse human health and environmental effects on minority and low-income population residing in the vicinity of the NAPS site.

E7.2.3.2.12 Waste Management

Waste types and levels generated from construction and operations of the SMR plant would be similar to the ALWR alternative with the exception of spent nuclear fuel, which could be less for the SMR alternative. The SMR designs considered for the Clinch River ESP EIS[1] used an operational parameter of 24 months between refueling (NRC. 2018g, Table 3-5) rather than the 18-month fuel outage for conventional LWRs.

The construction of the SMR nuclear alternative would create sanitary and industrial waste that would be properly managed on site and disposed at an approved offsite treatment or disposal facility. Overall, waste impacts resulting from construction of the SMR plant would be SMALL.

During operations, the SMR alternative would generate nonhazardous, hazardous, spent nuclear fuel, and radioactive waste. The nonhazardous and hazardous waste would be managed in compliance with state regulations and disposed of in permitted facilities. Dominion has internal recycling and waste minimization programs that would reduce waste volumes. Spent nuclear fuel would be managed on site in accordance with NRC regulations. This waste would be disposed of in permitted facilities. Operational impacts on waste management would be SMALL.

[1] Various SMR technologies were considered to develop a plant parameters envelope.

Table E7.2-1 Comparison of Annual NGCC Plant Air Emissions

Emission	Emission Factors[b]	Permitted Greensville Plant[c]
Sulfur dioxide	219 tons	62 tons
Nitrogen oxides[a]	837 tons	445 tons
Carbon monoxide	1,930 tons	1,120 tons
Particulate matter	425 tons	277 tons
Volatile organic compounds	135 tons	777 tons
Carbon dioxide	7.08 million tons	6.9 million tons

a. Assumes a 90% reduction in emissions due to operation of air pollution control equipment (selective catalytic reduction).

b. See EPA AP-42 formulas and sources table below.

c. (VDEQ. 2016)

EPA AP-42 Formulas and Sources

Annual gas consumption (ft^3)	Plant size in MW x heat rate, 7,649 Btu/kWh x 1,000 x (1/heat content = 1,034 Btu/ft^3) x hours in a year						
Heat content of natural gas 2018 = 1,034 Btu/ft3 (EIA. 2018b)							
Heat rate = 7,649 Btu/kWh (EIA. 2018c)							
Annual MMBtu = (annual gas consumption x fuel heating average value)/1,000,000							
Emission factor for processed natural gas (lbs/MMBtu)	CO_2	NO_X	CO	PM	SO_2	VOC	N_2O
	110	0.13	0.03	0.0066	0.0034	0.0021	0.003
Annual emissions (tons) = (emission factor) x (annual MMBtu)/2000							
Air emission factors (EPA. 2000, Tables 3.1-1 and 3.1-2a)							
CO_2 = carbon dioxide; NO_x = nitrogen oxides; CO = carbon monoxide; PM = total filterable particulates; SO_2 = sodium chloride; VOC = volatile organic carbon; NO_2 = nitrous oxide							

E7.3 ALTERNATIVES FOR REDUCING ADVERSE IMPACTS

E7.3.1 ALTERNATIVES CONSIDERED

As noted in 10 CFR 51.53(c)(3)(iii), "The report must contain a consideration of alternatives for reducing adverse impacts, as required by 51.45(c), for all Category 2 license renewal issues in Appendix B to Subpart A of this part." A review of the environmental impacts associated with the Category 2 issues in Chapter E4.0 identified no significant adverse effects that would require consideration of additional alternatives. Therefore, Dominion concludes that the impacts associated with renewal of the NAPS OLs would not require consideration of alternatives for reducing adverse impacts as specified in NRC Regulatory Guide 4.2, Supplement 1, Revision 1 (NRC. 2013b, Section 7.2). This determination assumes the existing mitigation measures presented in Section E6.2 adequately minimize and avoid environmental impacts associated with operating NAPS.

E7.3.2 ENVIRONMENTAL IMPACTS OF ALTERNATIVES FOR REDUCING ADVERSE IMPACTS

No additional alternatives were considered by Dominion to reduce impacts. As determined in Chapter E4.0, the adverse impact identified for the continued operation of NAPS was determined to be SMALL. NAPS continues to have beneficial socioeconomic impacts as discussed in Section E3.9.

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E8.0 COMPARISON OF THE ENVIRONMENTAL IMPACT OF SUBSEQUENT LICENSE RENEWAL WITH THE ALTERNATIVES

To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form . . . . [10 CFR 51.45(b)(3)]

The proposed action is renewal of the NAPS Units 1 and 2 OLs, which would preserve the option to continue to operate NAPS to provide reliable baseload power and meet Dominion's future system generating needs throughout the proposed 20-year SLR operating term. Chapter E4.0 analyzes the environmental impacts of the proposed action. The proposed action is compared to the no-action alternative, which includes both the termination of operations and decommissioning of NAPS and replacement of its baseload generating capacity with energy alternatives considered reasonable. The termination of operations and decommissioning impacts are presented in the GEIS (NRC. 2013a, Section 14.12.2), and decommissioning impacts are analyzed in the GEIS on decommissioning, NUREG-0586, Supplement 1 (NRC. 2002b). The energy alternatives component of the no-action alternative is described, and its impacts analyzed, in Chapter E7.0.

Table E8.0-1 summarizes the environmental impacts of the proposed action and the alternatives deemed reasonable for comparison purposes. Table E8.0-2 summarizes the locations and plant features used in the alternatives analysis. Table E8.0-3 provides a more detailed comparison of environmental impacts. The environmental impacts compared in Tables E8.0-1 and E8.0-3 are Category 1 and 2 issues that apply to the proposed action or issues that the GEIS identified as major considerations in an alternatives analysis.

As shown in Tables E8.0-1, E8.0-2, and E8.0-3, there are Intentionally Blankno reasonable (technically feasible and commercially viable) alternatives superior to that of the continued operation of NAPS, providing approximately 1,672 MWe of reliable baseload power generation. The continued operation of NAPS would create significantly less environmental impact than the construction and operation of new alternative generating capacity. In addition, the continued operation of NAPS will have a significant positive economic impact on Louisa County through tax revenues paid by Dominion for NAPS. Continued employment of plant workers will continue to provide economic benefits to the communities surrounding the station.

Table E8.0-1 Environmental Impacts Comparison Summary

Impact Area[(a)]	Proposed Action	No-Action Alternative		
		Termination of Operations and Decommissioning	New Nuclear Plant ALWR Alternative	New Nuclear Plant SMR Alternative
Land Use	SMALL	SMALL	SMALL	SMALL
Visual Resources	SMALL	SMALL	SMALL (MODERATE no more than 10% of the time)	SMALL
Air Quality	SMALL	SMALL	SMALL	SMALL
Noise	SMALL	SMALL	SMALL	SMALL
Geology and Soils	SMALL	SMALL	SMALL	SMALL
Surface Water	SMALL	SMALL	SMALL (MODERATE during drought conditions)	SMALL
Groundwater	SMALL	SMALL	SMALL	SMALL
Terrestrial	SMALL	SMALL	SMALL	SMALL
Aquatic	SMALL	SMALL	SMALL	SMALL
Special Status Species	NO EFFECT	(b)	NO EFFECT	NO EFFECT
Historic and Cultural	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO ADVERSE EFFECT	NO ADVERSE EFFECT

Table E8.0-1 Environmental Impacts Comparison Summary

Impact Area[(a)]	Proposed Action	No-Action Alternative: Termination of Operations and Decommissioning	New Nuclear Plant ALWR Alternative	New Nuclear Plant SMR Alternative
Socioeconomics	SMALL	Termination: MODERATE to LARGE; Decommissioning: SMALL	Construction: SMALL to MODERATE adverse and SMALL to MODERATE beneficial Operations: SMALL adverse and SMALL to LARGE beneficial	Construction: SMALL to MODERATE adverse and SMALL to MODERATE beneficial Operations: SMALL adverse and SMALL to LARGE beneficial
Transportation	SMALL	SMALL	Construction: SMALL to MODERATE Operations: SMALL	Construction: SMALL to MODERATE Operations: SMALL
Human Health	SMALL	SMALL	SMALL	SMALL
Environmental Justice	No disproportionately high and adverse effects	(b)	No disproportionately high and adverse effects	No disproportionately high and adverse effects
Waste Management	SMALL	SMALL	SMALL	SMALL

a. As defined in 10 CFR 51, Subpart A, Appendix B, Table B-1, Footnote 3:

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

b. NUREG-0586 Supplement 1 (NRC. 2002b), the decommissioning GEIS, identifies this resource area as requiring a site-specific analysis based on site conditions at the time of decommissioning, as well as the proposed decommissioning method and activities. Decommissioning NAPS would at a minimum occur after the expiration of the current license term. The magnitude of impacts could vary widely based on site-specific conditions at the time and analysis of special status species and/or their habitat(s), a consideration of their presence or their habitats' presence, and environmental justice analysis, the potential for disproportionately high and adverse impacts from the impacts of decommissioning being experienced by minority or low-income populations as determined by the most recent USCB decennial census data when the alternative is implemented. Thus, Dominion cannot forecast a level of impact for this resource area.

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Table E8.0-2 Alternatives Features Comparison Summary

Feature	New Nuclear Plant ALWR Alternative	New Nuclear Plant SMR Alternative
Summary of Alternative	One unit nuclear plant for a total of 1,605 net MWe (Section E7.2.1.1).	Cluster of SMR units with generation capacity comparable to NAPS generation (Section E7.2.1.2).
Location	NAPS Unit 3 (Section E7.2.1.1).	NAPS Unit 3 site (Section E7.2.1.2).
Cooling System	Closed-cycle hybrid cooling system (cooling towers) using wet and dry cooling depending on operating conditions; some infrastructure upgrades may be required (Section E7.2.1.1).	Closed-cycle cooling with mechanical draft cooling towers; some infrastructure upgrades may be required (Section E7.2.1.2).
Land Requirements	120 acres for the plant (Section E7.2.3.1.1).	Adequate land provided by onsite NAPS Unit 3 site (Section E7.2.3.2.1).
Workforce	2,500 to 4,100 during peak construction; 500 during operations (Section E7.2.3.1.9).	3,300 during peak construction; 500 during operations (Section E7.2.3.2.9).

Table E8.0-3 Environmental Impacts Comparison Detail

Land Use	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR 51, Subpart A, Appendix B, Table B-1 for the following: Onsite land use Offsite land use
Termination of operations and decommissioning	**SMALL:** Temporary onsite land use changes during decommissioning are anticipated to be comparable to changes that occur during construction and operations and would not require additional land. Temporary changes in onsite land use would not change the fundamental use of the reactor site. (NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**SMALL (MODERATE no more than 10% of the time):** NAPS Unit 3 would be sited at the NAPS site and will require no new expansion outside the existing NAPS site for its permanent facilities. Construction support within site boundaries and land contiguous with the NAPS site boundary. Some offsite land-use would occur from road improvements (e.g., repairs, widening, and/or filling in low areas) to transport of the reactor pressure vessel and other large components to the site.
New nuclear plant SMR alternative	**SMALL:** Constructed within the NAPS site boundaries and would not change the fundamental use of the site.

Table E8.0-3 Environmental Impacts Comparison Detail

Visual Resources	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue finding for aesthetic impacts in 10 CFR 51, Subpart A, Appendix B, Table B-1.
Termination of operations and decommissioning	**SMALL:** Terminating nuclear power plant operations would not change the visual appearance of the nuclear power plant until demolition of structures. Decommissioning activities would be localized and reduced with implementation of BMPs. (NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**SMALL:** Construction and operations activities would appear similar to ongoing onsite industrial activities. Visible from Lake Anna, but not out of context with the developed site and the existing NAPS facility.
New nuclear plant SMR alternative	**SMALL:** Construction and operations activities would appear similar to ongoing onsite industrial activities. Visible from Lake Anna, but not out of context with the developed site and the existing NAPS facility.

Table E8.0-3 Environmental Impacts Comparison Detail

Air Quality	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR 51, Subpart A, Appendix B, Table B-1 for the following: Air quality impacts (all plants) Air quality effects of transmission lines
Termination of operations and decommissioning	**SMALL:** After termination of operations, air emissions from the nuclear power plant would continue, but at greatly reduced levels. The most likely impact of decommissioning on air quality is degradation by fugitive dust. Use of BMPs, such as seeding and wetting, can be used to minimize fugitive dust. (NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**SMALL:** Construction impacts would be temporary; operations impacts would be minor, and emissions being maintained within federal and state regulatory limits.
New nuclear plant SMR alternative	**SMALL:** Construction impacts would be temporary; operations impacts would be minor, and emissions being maintained within federal and state regulatory limits.

Table E8.0-3 Environmental Impacts Comparison Detail

Noise	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue finding for noise impacts in 10 CFR 51, Subpart A, Appendix B, Table B-1.
Termination of operations and decommissioning	**SMALL:** During decommissioning, noise would generally be far enough away from sensitive receptors outside the plant boundaries that the noise would be attenuated to nearly ambient levels and would be scarcely noticeable offsite. Noise abatement procedures could also be used during decommissioning in order to reduce noise. (NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations would be similar to those currently associated with NAPS.
New nuclear plant SMR alternative	**SMALL:** Noise impacts from construction activities would be intermittent and last only through the duration of construction; noise impacts during operations would be similar to those currently associated with NAPS.

Table E8.0-3 Environmental Impacts Comparison Detail

Geology and Soils	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue finding for geology and soils in 10 CFR 51, Subpart A, Appendix B, Table B-1.
Termination of operations and decommissioning	**SMALL:** Termination of nuclear plant operations is not expected to impact geology and soils. Erosion problems could be mitigated by using BMPs during decommissioning. Site geologic resources would not be affected by decommissioning. (NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.
New nuclear plant SMR alternative	**SMALL:** Construction activities would be localized and minimized with implementation of BMPs; land disturbance activities during operations would be conducted in compliance with a stormwater permit and associated BMPs.

Table E8.0-3 Environmental Impacts Comparison Detail

Surface Water	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR 51, Subpart A, Appendix B, Table B-1 for the following: Surface water use and quality (non-cooling system impacts) Altered current patterns at intake and discharge structures Altered thermal stratification of lakes Scouring caused by discharged cooling water Discharge of metals in cooling system effluent Discharge of biocides, sanitary waste, and minor chemical spills Surface water use conflicts (plants with once-through cooling systems) Effects of dredging on surface water quality Temperature effects on sediment transport capacity
Termination of operations and decommissioning	**SMALL:** The NRC concluded that the impacts on water use and water quality from decommissioning would be SMALL for all plants. (NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**SMALL (MODERATE during drought conditions):** Construction impacts would be minimized through implementation of BMPs; during operations, impacts to surface water would be related to use of Lake Anna to supply makeup water to the hybrid cooling system designed to minimize water demand and consumption and water discharges to Lake Anna would be regulated under a VPDES permit to protect water quality.
New nuclear plant SMR alternative	**SMALL:** Construction impacts would be minimized through implementation of BMPs; during operations, closed loop cooling requiring makeup water from Lake Anna and water discharges would be regulated under a VPDES permit to protect water quality.

Table E8.0-3 Environmental Impacts Comparison Detail

Groundwater	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue finding for groundwater contamination and use (non-cooling system impacts); groundwater use conflicts (plants that withdraw less than 100 gpm); and groundwater quality degradation resulting from water withdrawals in 10 CFR 51, Subpart A, Appendix B, Table B-1. **SMALL**[(a)] (radionuclides released to groundwater): No unplanned radioactive liquid releases were reported between 2012 and 2019. Water from station uses continues to be processed and monitored in compliance with licensing and permitting, Dominion concludes that impacts from radionuclides to groundwater are SMALL and do not warrant additional mitigation measures beyond Dominion’s existing groundwater monitoring program.
Termination of operations and decommissioning	**SMALL:** Decommissioning activities include some that may affect groundwater quality through the infiltration of water used for various purposes (e.g., cooling of cutting equipment, decontamination spray, and dust suppression). BMPs are expected to be employed as appropriate to collect and manage these waters. Groundwater chemistry may change as rainwater infiltrates through rubble. The increased pH could promote the subsurface transport of radionuclides and metals. However, this effect is expected to occur only over a short distance as a function of the buffering capacity of soil. Offsite transport of groundwater contaminants is not expected. (NRC. 2013a)
New nuclear plant ALWR alternative	**SMALL:** During construction and operations, any drawdown in the water table from dewatering activities would be limited by the proximity of Lake Anna and the discharge canal; BMPs and SPCC plans would minimize impacts to groundwater quality as a result of stormwater runoff and spills during construction and operation.
New nuclear plant SMR alternative	**SMALL:** During construction and operations, any drawdown in the water table from dewatering activities would be limited by the proximity of Lake Anna and the discharge canal; BMPs and SPCC plans would minimize impacts to groundwater quality as a result of stormwater runoff and spills during construction and operation.

a. Category 2 issue requiring site-specific evaluation.

Table E8.0-3 Environmental Impacts Comparison Detail

Terrestrial	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR 51, Subpart A, Appendix B, Table B-1 for the following: Exposure of terrestrial organisms to radionuclides Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds) Bird collisions with plant structures and transmission lines Transmission line right-of-way management impacts on terrestrial resources Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock) **SMALL**[a] (effects on terrestrial resources—non-cooling system impacts): No license renewal-related refurbishment or other license renewal-related construction activities have been identified; adequate management programs and regulatory controls in place to protect onsite important terrestrial ecosystems.
Termination of operations and decommissioning	**SMALL:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect terrestrial biota, but at a reduced level of impact. Areas disturbed or used to support decommissioning are within the operational areas of the site and are also within the protected area. Decommissioning activities conducted within the operational areas are not expected to have a detectable impact on important terrestrial resources. (NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**SMALL:** Construction of NAPS Unit 3 would result in the loss of approximately 120 acres of forested habitat. Construction would disturb 0.31 acres of wetlands and 757 linear feet of ephemeral streams. Operation of the cooling towers would cause some deposition of dissolved solids on surrounding vegetation; noise from the cooling tower could also impact wildlife species; the cooling towers could also result in avian collisions.
New nuclear plant SMR alternative	**SMALL:** Construction on the NAPS Unit 3 site would utilize developed land and perhaps some forested land. Implementation of construction BMPs for erosion and dust control, noise abatement, proper equipment maintenance, restricting the timing of activities to minimize impacts to resources such as breeding birds, and adherence to applicable permit conditions would minimize impacts operation of the cooling towers would cause some deposition of dissolved solids on surrounding vegetation; noise from the cooling tower could also impact wildlife species; the cooling towers could also result in avian collisions.

a. Category 2 issue requiring site-specific evaluation.

Table E8.0-3 Environmental Impacts Comparison Detail

Aquatic	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR 51, Subpart A, Appendix B, Table B-1 for the following: Entrainment of phytoplankton and zooplankton (all plants) Infrequently reported thermal impacts (all plants) Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication Effects of nonradiological contaminants on aquatic organisms Exposure of aquatic organisms to radionuclides Effects of dredging on aquatic organisms Effects on aquatic resources (non-cooling system impacts) Impacts of transmission line right-of-way management on aquatic resources Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses **SMALL**[(a)] (impingement and entrainment of aquatic organisms—plants with once-through cooling systems or cooling ponds)**:** Dominion monitors the health of the Lake Anna fishery and found annual sampling results and trends demonstrate a balanced, indigenous fish community exists in Lake Anna. VDGIF also monitors the abundance of fish species and reviews the results of annual sampling and considers trends in the diversity and abundance of the fishery. For the 2003 to 2015 period, VDGIF characterized the community structure for fish in Lake Anna to be relatively stable. The intake structure has been previously approved as the best technology available by the VDEQ. The 2016–2017 entrainment studies will be utilized by VDEQ to determine if the current operational methods to prevent entrainment at NAPS are sufficient to meet newer best technology available requirements. **SMALL(a)** (thermal impacts on aquatic organisms—plants with once-through cooling systems or cooling ponds)**:** The thermal discharge associated with NAPS discharge has been demonstrated to be protective of the Lake Anna fishery and this demonstration continues to be supported by annual biological studies and temperature readings and trending.
Termination of operations and decommissioning	**SMALL:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect aquatic biota, but at a reduced level of impact. Some aquatic organisms may have become established in the mixing zone because of the warmer environment, and these organisms likely would be adversely affected as the water temperature cooled and the original conditions were restored within the body of water. The NRC concluded that for facilities at which the decommissioning activities would be limited to existing operational areas, the potential impacts on aquatic resources would be SMALL. (NRC. 2013a, Section 4.12.2.1)

Table E8.0-3 Environmental Impacts Comparison Detail

Aquatic	
New nuclear plant ALWR alternative	**SMALL:** Implementation of BMPs would minimize impacts on aquatic ecosystems during construction. Aquatic life impacts resulting from operations is primarily related to the intake and discharge structures. NAPS Unit 3's closed-cycle cooling system would result impingement and entrainment of aquatic organisms. When considering the addition of the NAPS Unit 3, the NRC characterized the NAPS Unit 3 impact to be negligible over NAPS Units 1 and 2's impact. Concentrations of chemical and solids would be below VPDES permit discharge limits. In addition, NAPS Unit 3 would have no perceptible impact on temperature of the discharge water.
New nuclear plant SMR alternative	**SMALL:** Implementation of BMPs would minimize impacts on aquatic ecosystems during construction; during operations, cooling water makeup for the cooling towers would be withdrawn from Lake Anna; discharges would be governed under a VPDES permit.

a. Category 2 issue requiring site-specific evaluation.

Table E8.0-3 Environmental Impacts Comparison Detail

Special Status Species	
Proposed action	**NO EFFECT:** No license renewal-related refurbishment or other license renewal-related construction activities have been identified. The proposed SLR would have no effect on threatened, endangered, and protected species and EFH in the vicinity of NAPS.
Termination of operations and decommissioning	**Site Specific:** The termination of nuclear power plant operations would reduce some impacts and eliminate others. Impacts from systems that continue operating to support other units (i.e., where the license term for each unit does not end at the same time) on the plant site may continue to affect aquatic biota, but at a reduced level of impact. Some aquatic organisms may have become established in the mixing zone because of the warmer environment, and these organisms likely would be adversely affected as the water temperature cooled and the original conditions were restored within the body of water. The magnitude of impacts could vary widely based on site-specific conditions at the time of decommissioning and the presence or absence of special status species and habitats when the alternative is implemented. (NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**NO EFFECT:** No federally listed wildlife or plant species or their habitat(s) are known to occur on the NAPS site or Lake Anna. No state-listed plant species have been identified at the NAPS site.
New nuclear plant SMR alternative	**NO EFFECT:** No federally listed wildlife or plant species or their habitat(s) are known to occur on the NAPS site or Lake Anna. No state-listed plant species have been identified at the NAPS site.

Table E8.0-3 Environmental Impacts Comparison Detail

Historic and Cultural Resources	
Proposed action	**NO ADVERSE EFFECT:** No license renewal-related refurbishment or construction activities identified; administrative controls ensure protection of cultural resources in the event of excavation activities.
Termination of operations and decommissioning	**NO ADVERSE EFFECT:** The termination of nuclear plant operations would not affect historic or cultural resources. The NRC conducted an analysis of the potential effects of decommissioning on historic and archaeological (cultural) resources and found that the potential onsite impacts at sites where the disturbance of lands would not go beyond the operational areas would be SMALL. (NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**NO ADVERSE EFFECT:** Cultural resource investigations at the NAPS site have identified three historic cemeteries, three historic archaeological sites, and an architectural resource that were recommended eligible for the NRHP cultural sites. Construction would avoid the sites or evaluate the sites and develop management plans and practices for sites that cannot be avoided.
New nuclear plant SMR alternative	**NO ADVERSE EFFECT:** Cultural resource investigations at the NAPS site have identified three historic cemeteries, three historic archaeological sites, and an architectural resource that were recommended eligible for the NRHP cultural sites. Construction would avoid the sites or evaluate the sites and develop management plans and practices for sites that cannot be avoided.

Table E8.0-3 Environmental Impacts Comparison Detail

Socioeconomics	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR 51, Subpart A, Appendix B, Table B-1 for the following: Employment and income, recreation and tourism Tax revenues Community services and education Population and housing Transportation
Termination of operations and decommissioning	When a nuclear power plant is closed and decommissioned, most of the important socioeconomic impacts will be associated with the plant closure rather than with the decommissioning process (NRC. 2002b, Section 4.3.12). **MODERATE to LARGE:** Terminating nuclear plant operations would have a noticeable adverse impact on socioeconomic conditions in the region around the nuclear power plant. There would be immediate socioeconomic impacts from the loss of jobs. The impacts from the loss or reduction of tax revenue due to the termination of plant operations on community and public education services could range from SMALL to LARGE. (NRC. 2013a, Section 4.12.2.1) The tax payments attributable to NAPS are approximately 19% of the property tax revenues of Louisa County (Section E3.9.5). The plant staff residing in Louisa County, approximately 325 (Section E2.5), is a small percentage of Louisa County's employed population of 3,272 (Section E3.9.1). Therefore, the loss of jobs would affect a small percentage of the population, but the tax revenue loss would have a noticeable and potentially destabilizing impact on Louisa County. **SMALL**: Decommissioning itself has no impact on the tax base and no detectable impact on the demand for public services. The impacts of decommissioning on socioeconomics are neither detectable nor destabilizing; therefore, the impacts on socioeconomics are SMALL. (NRC. 2002b, Section 4.3.12.3 and 4.3.12.4)

Table E8.0-3 Environmental Impacts Comparison Detail

Socioeconomics	
New nuclear plant ALWR alternative	**SMALL to MODERATE (construction)**: The construction employment would be up to 5 years and would provide a stimulus to the local economy (beneficial impact) as well as include demands in community services (adverse impact). **SMALL to LARGE (operations, beneficial):** Plant operations employment would be long-term and would provide additional stimulus to the local economy. **SMALL (exception of MODERATE to recreation component of socioeconomic impacts during drought conditions) (operations, adverse):** The increase in population would not result in additional stress on existing public services such as education, medical, fire, and police services. The additional workers would purchase homes, goods and services, and pay property and sales taxes, which increase the economic base of the region. **SMALL to MODERATE (construction traffic):** Construction would increase traffic on the roads and congestion would be noticed by commuters. Increased use of the roads during construction could create some safety and maintenance issues. **SMALL (operations traffic):** Transportation impacts would decrease after construction and the comparable to the existing unit’s impacts resulting from the approximately 500 workers, equipment and materials deliveries, and truck traffic.
New nuclear plant SMR alternative	**SMALL to MODERATE (construction):** The size of the construction workforce and duration of construction could be less than that of the ALWR option. Construction provide a stimulus to the local economy (beneficial impact) as well as include demands in community services (adverse impact). **SMALL to LARGE (operations, beneficial) SMALL (operations, adverse):** The SMR option would require an operations workforce similar in size to the current workforce and NAPS Unit 3. The operational plant on the same property would also pay similar tax amounts. **SMALL to MODERATE (construction traffic):** Construction would increase traffic on the roads and congestion would be noticed by commuters. Increased use of the roads during construction could create some safety and maintenance issues. **SMALL (operations traffic):** Transportation impacts would decrease after construction and the comparable to the existing unit’s impacts resulting from the approximately 500 workers, equipment and materials deliveries, and truck traffic.

Table E8.0-3 Environmental Impacts Comparison Detail

Human Health	
Proposed action	**SMALL**: Adopting by reference the Category 1 issue findings in 10 CFR 51, Subpart A, Appendix B, Table B-1 for the following: Radiation exposures to the public Radiation exposures to plant workers Human health impact from chemicals Microbiological hazards to plant workers Physical occupational hazards **SMALL**[(a)] (microbiological hazards to the public [plants that use cooling ponds, lake, or canals, or that discharge to a river]): Microbiological hazards to public are considered to be small given that ongoing, continuous field measurements show water temperatures in the WHTF and the North Anna Reservoir are below the optimum for growth of thermophilic microorganisms; NAPS, due to its wastewater disinfection practices, does not provide a seed source or inoculant that would stimulate thermophilic microorganism population growth; and field sampling has detected *N. fowleri,* but not in numbers that would suggest a public health problem. **SMALL**[(a)] (electric shock hazards): Transmission lines located entirely within the NAPS property and the potential for a steady-state discharging current from the aboveground lines is less than the NESC standard of 5 mA rms. Dominion adheres to NESC code compliance requirements for shock hazard avoidance and maintains worker and visitor safety through design ground clearances and other shock prevention measures.
Termination of operations and decommissioning	**SMALL:** The human health impacts from physical, chemical, and microbiological hazards during the termination of plant operations and decommissioning would be SMALL for all plants. (NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction; human health impacts during operation would be similar to NAPS. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principals.
New nuclear plant SMR alternative	**SMALL:** Compliance with OSHA worker protection rules would control impacts on workers at acceptable levels during construction; human health impacts during operation would be similar to NAPS. The radiological human health impact would be SMALL due to compliance with NRC regulations and adherence to ALARA principals.

a. Category 2 issue requiring site-specific evaluation.

Table E8.0-3 Environmental Impacts Comparison Detail

Environmental Justice	
Proposed action	**No disproportionately high and adverse impacts to minority and low-income populations:** The closest low-income and minority populations are 8 and 15 miles, respectively, from the NAPS center point (E3.11.2). There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the proposed action.
Termination of operations and decommissioning	Termination of power plant operations and the resulting loss of jobs, income, and tax revenue could have a disproportionate effect on minority and low-income populations (NRC. 2013a, Section 4.12.2). **Site Specific:** The determination of whether the minority or low-income populations are disproportionately highly and adversely impacted by facility decommissioning activities needs to be made on a site-by-site basis because their presence and their socioeconomic circumstances will be site specific (NRC. 2002b, Section 4.3.13.3). The closest low-income and minority populations are 8 and 15 miles, respectively, from the NAPS center point (E3.11.2).
New nuclear plant ALWR alternative	**No disproportionately high and adverse impacts to minority and low-income populations:** The closest low-income and minority populations are 8 and 15 miles, respectively, from the NAPS center point (E3.11.2). Impacts during construction would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the operation of a new nuclear plant alternative.
New nuclear plant SMR alternative	**No disproportionately high and adverse impacts to minority and low-income populations:** The closest low-income and minority populations are 8 and 15 miles, respectively, from the NAPS center point (E3.11.2). Impacts during construction would be temporary and likely would result in no disproportionately high and adverse impacts to minority and low-income populations. There are no known pathways by which disproportionately high and adverse impacts could be imposed on minority or low-income populations from the operation of a new nuclear plant alternative.

Table E8.0-3 Environmental Impacts Comparison Detail

Waste Management	
Proposed action	**SMALL:** Adopting by reference the Category 1 issue findings in 10 CFR 51, Subpart A, Appendix B, Table B-1 for the following: Low-level waste storage and disposal Onsite storage of spent nuclear fuel Offsite radiological impacts of spent nuclear fuel and high-level waste disposal Mixed waste storage and disposal Nonradioactive waste storage and disposal
Termination of operations and decommissioning	**SMALL:** After termination of nuclear plant operations, there would be a period before the beginning of decommissioning when the reactor would be placed in a cold shutdown condition and maintained. The quantities of waste generated would be smaller than the quantities generated during either operations or decommissioning. The impacts associated with the management of LLRW, hazardous waste, mixed waste, and nonradioactive and nonhazardous waste during operations and decommissioning would be SMALL.(NRC. 2013a, Section 4.12.2.1)
New nuclear plant ALWR alternative	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.
New nuclear plant SMR alternative	**SMALL:** Construction-related waste would be properly characterized and disposed of at permitted offsite facilities; during operations, nonhazardous, hazardous, and radioactive wastes would be managed in compliance with federal and state regulations and disposed of in permitted facilities.

E9.0 STATUS OF COMPLIANCE

The ER shall list all federal permits, licenses, approvals, and other entitlements which must be obtained in connection with the proposed action and shall describe the status of compliance with these requirements. The ER shall also include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land use regulations, and thermal and other water pollution limitation or requirements which have been imposed by the federal, state, regional, and local agencies having responsibility for environmental protection. [10 CFR 51.45(d)]

E9.1 NAPS AUTHORIZATIONS

Table E9.1-1 provides a summary of authorizations held by NAPS for current plant operations. Authorizations in this context include any permits, licenses, approvals, or other entitlements that would continue to be in place, as appropriate, throughout the period of extended operation given their respective renewal schedules. Table E9.1-2 lists additional environmental authorizations and consultations related to the renewal of the NAPS Units 1 and 2 OLs.

Table E9.1-1 Environmental Authorizations for Current NAPS Operations

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
SECC	Omnibus Low-Level Radioactive Waste Interstate Compact Consent Act (1980 and amended in 1985)	Authorization to export waste	None	Updated annually	Export of LLRW outside the region
NRC	Atomic Energy Act, 10 CFR 50	NAPS license to operate Unit 1	NPF-4	4/1/2038	Operation of NAPS Unit 1
NRC	Atomic Energy Act, 10 CFR 50	NAPS license to operate Unit 2	NPF-7	8/21/2040	Operation of NAPS Unit 2
NRC	10 CFR 72	ISFSI	SNM-2507	6/30/2058	Operation of a dry storage ISFSI
USFWS	MBTA 50 CFR 13 50 CFR 21.41	Depredation permit	MB705136-0	3/31/2020	Authorization for selective take of migratory birds
VDEQ	Coastal Zone Management Act Section 307(c)(3)(A)	Consistency determination with the Virginia Coastal Management Program	Concurrence letter, B. Rayfield, VDEQ to A. Tomabene, Dominion, RE: Federal Consistency Certification, North Anna Power Station Units 1 and 2 Subsequent License Renewal, Dominion Energy Virginia, Louisa and Spotsylvania Counties, DEQ 19-124F, December 23, 2019.	NA	Certification that NAPS complies with the Virginia Coastal Management Program

Table E9.1-1 Environmental Authorizations for Current NAPS Operations

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
VDEQ	CAA, 9 VAC 5-80-50 through 9 VAC 5-80-300 and 9 VAC 5-140-10 through 9 VAC 5-140-900	Stationary source permit to operate	Registration number: 40726	Operating under a permit shield	Operation of emergency diesel generators
VDEQ	40 CFR 280; 9VAC25-580-10	Underground storage tanks registration for VA regulated tanks	Registration numbers: PNA-7, -8, -9, -10, -11	Various	Operation of underground storage tanks
VDEQ	9VAC25-91-10	Aboveground tanks > 660 gallons registration	Facility ID-301265, Owner ID-31021, ODCP No. FC-06-7030	10/2022	Operation of aboveground storage tanks
VDEQ	CWA, Section 402; 9VAC25-790	VPDES permit	VA0052451	Administratively continued	Authorization for wastewater discharges
VDEQ	9VAC25-880-60.A.1	Long-term maintenance agreement of permanent stormwater management facilities	NA	NA	Maintenance of detention basins #1, #2, #3, #4A, #4B, and the ISFSI retention basin
VDEQ	18VAC160-20	Authorization to operate a wastewater treatment plant	VA0052451-01	NA	Wastewater treatment plant certificate to operate
VDH[a]	12 VAC 5-590-260 Waterworks Regulations of the Virginia Department of Health	Waterworks operation permit (NANIC well)	2109610	NA	Authorization of operate a Class V non-transient non-community waterworks

Table E9.1-1 Environmental Authorizations for Current NAPS Operations

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
VDH[(a)]	12 VAC 5-590-260 Waterworks Regulations of the Virginia Department of Health	Waterworks operation permit (station wells)	2109600	NA	Authorization of operate a Class V non-transient non-community waterworks
DOT	40 CFR 107 Subpart G	Registration	4929 (issued to Virginia Electric and Power Company)	None	Hazardous materials shipments
EPA		Small quantity waste generator	VAD065376279	NA	Hazardous waste generator registration

a) VDH. 1991; VDH. 2014

SECC: Southeast Compact Commission for Low Level Radioactive Waste Management

Table E9.1-2 Environmental Authorizations and Consultations for NAPS License Renewal

Agency	Authority	Requirement	Remarks
U.S. Nuclear Regulatory Commission	Atomic Energy Act [42 USC 2011 *et seq*.]	License renewal	Applicant for federal license must submit an ER in support of license renewal application.
U.S. Fish and Wildlife Service	Endangered Species Act Section 7 [16 USC 1536]	Consultation	Requires federal agency issuing a license to consult with the USFWS, and NMFS if applicable, regarding federally protected species.
Virginia Department of Agriculture and Consumer Services	Endangered Species Act Section 7 [16 USC 1536]	Consultation	Requires federal agency issuing a license to consult with the USFWS, and NMFS if applicable, regarding federally protected species. During its review for the initial license renewal, the USFWS requested that state agencies be contacted to provide input to support a timely and thorough review of potential impacts to threatened and endangered species and important habitats.
Virginia Department of Game and Inland Fisheries	Endangered Species Act Section 7 [16 USC 1536]	Consultation	Requires federal agency issuing a license to consult with the USFWS, and NMFS if applicable, regarding federally protected species. During its review for the initial license renewal, the USFWS requested that state agencies be contacted to provide input to support a timely and thorough review of potential impacts to threatened and endangered species and important habitats.
Virginia Department of Conservation and Recreation Division of Natural Heritage	Endangered Species Act Section 7 [16 USC 1536]	Consultation	Requires federal agency issuing a license to consult with the USFWS, and NMFS if applicable, regarding federally protected species. During its review for the initial license renewal, the USFWS requested that state agencies be contacted to provide input to support a timely and thorough review of potential impacts to threatened and endangered species and important habitats.
Virginia Department of Environmental Quality	Clean Water Act, Section 401 (33 USC 1341)	Certification	Requires an applicant to provide the federal licensing agency with water quality certification or waiver from the state where the applicant's discharge would occur.

Table E9.1-2 Environmental Authorizations and Consultations for NAPS License Renewal

Agency	Authority	Requirement	Remarks
Virginia Department of Environmental Quality	Federal Coastal Zone Management Act (16 USC 1451)	Certification	Requires applicant to provide certification to the federal agency issuing the license that license renewal would be consistent with the federally-approved state coastal zone management program. Based on its review of the proposed activity, the state must concur with or object to the applicant's certification.
Virginia Department of Historic Resources	National Historic Preservation Act Section 106	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation officer.
Chereonhaka (Nottoway) Tribe	National Historic Preservation Act Section 110	Consultation	Requires federal agency issuing a license to consider cultural impacts and consult with SHPO and/or tribal historic preservation officer.
Chickahominy Tribe			
Chickahominy Tribe			
Chickahominy Indians Eastern Division			
The Delaware Nation			
Mattaponi Tribe			
Nansemond Indian Tribal Association			
Nottoway Tribe			
Pamunkey Tribal Government			
Patawomeck Tribe			
Rappahannock Tribe			
Upper Mattaponi Tribe			
Catawba Indian Tribe			
Monacan Indian Nation			

E9.2 STATUS OF COMPLIANCE

NAPS has established control measures in place to ensure compliance with the authorizations listed in Table E9.1-1, including monitoring, reporting, and operating within specified limits. NAPS environmental compliance coordinators are primarily responsible for monitoring and ensuring that the site complies with its environmental permits and applicable regulations. Monitoring and sampling results associated with environmental programs are submitted to appropriate agencies, as specified in the permits and/or governing regulations.

E9.3 NOTICES OF VIOLATIONS

Based on review of records over the seven-year period 2013–2019 of various environmental programs and permits that NAPS is subject to and complies with, there have been no federal (i.e., agencies other than the NRC), state, or local regulatory notices of violations issued to the facility.

E9.4 REMEDIATION ACTIVITIES

An underground fuel oil leak from the leaking 2H B fuel oil feed line occurred in December 2016. The amount of fuel oil that leaked was not quantified. All of the fuel oil lines that feed to the plant's emergency and station blackout diesel generators were replaced in 2017 after this incident. There are no ongoing remediation activities for nonradiological spills occurring prior to 2013.

As discussed in Section E3.6.4.2.1, no unplanned radioactive liquid releases were reported between 2012 and 2019. (NAPS. 2018b, Attachment 8) The NAPS radiological groundwater monitoring program results in 2019 documented tritium concentrations ranging from 825 (GWP-3) to 12,930 (GWP-18) picocuries per liter. As discussed in Section E3.6.4.2.1, the NAPS radiological groundwater monitoring program has detected tritium, but no plant-related gamma isotopes or hard-to-detect radionuclides in the last five years of monitoring. As discussed in Section E3.6.4.2, actions are ongoing to investigate and mitigate potential tritium pathways to ground in the area of GWP-18.

There are no other current or ongoing remediation activities or investigations occurring at NAPS.

E9.5 FEDERAL, STATE, AND LOCAL REGULATORY STANDARDS: DISCUSSION OF COMPLIANCE

E9.5.1 ATOMIC ENERGY ACT

Radioactive waste stream handling procedures are presented in Section E2.2.6. As a generator of both LLRW and spent fuel, NAPS is subject to and complies with provisions and requirements of the Low-Level Radioactive Waste Policy Amendment Act of 1985 and the Nuclear Waste Policy Act of 1982, as subsequently amended.

E9.5.2 CLEAN AIR ACT

E9.5.2.1 Air Permit

NAPS holds stationary source permit No. 40726 to operate five emergency diesel generators. In addition, the permit lists equipment with insignificant emissions including four emergency diesel generators and one diesel generator for North Anna Dam. (VDEQ. 2019b) Operation of these air emission sources is maintained within the emission, opacity, fuel sulfur content, fuel type, and hour limits established in the permit. As required by the air permit, records are maintained onsite and available for inspection by VDEQ. NAPS is in compliance with this permit.

E9.5.2.2 Chemical Accident Prevention Provisions [40 CFR 68]

NAPS is not subject to the risk management plan requirements described in 40 CFR 68 because the amount of regulated chemicals present onsite do not exceed the threshold quantities specified in 40 CFR 68.130.

E9.5.2.3 Stratospheric Ozone [40 CFR 82]

Under Title VI of the CAA, the EPA is responsible for several programs that protect the stratospheric ozone layer. Regulations promulgated by the EPA to protect the ozone layer are contained in 40 CFR 82. Refrigeration appliances and motor vehicle air conditioners are regulated under Sections 608 and 609 of the CAA, respectively. A number of service practices, refrigerant reclamation, technician certification, and other requirements are covered by these programs. NAPS is in compliance with Section 608 of the CAA as amended in 1990 and the implementing regulations codified in these regulations. The program to manage stationary refrigeration appliances at NAPS is described in Dominion fleet and station administrative procedures (Dominion. 2014b).

In compliance with Section 609 of the CAA, motor vehicle air conditioners serviced onsite are serviced by certified technicians, and refrigerants are captured for reclamation.

E9.5.3 CLEAN WATER ACT

E9.5.3.1 Water Quality (401) Certification

Federal CWA Section 401 requires applicants for a federal license to conduct an activity that might result in a discharge into navigable waters provide the licensing agency with a certification from the state that the discharge will comply with applicable CWA requirements [33 USC 1341]. The Commonwealth of Virginia has EPA authorization to implement the NPDES within the state for facilities such as NAPS. Therefore, the NRC requires a water quality certification from the state or other appropriate documentation, such as a waiver or statement that 401 certification does not apply (NRC. 2018h). Virginia's Administrative Code exempts both surface water withdrawal and discharge from the state's VWP/401 certification requirements because the withdrawal was in place prior to July 1, 1989 (see VA Code § 62.1-44, 15:22B; 9 VAC 25-210-60) and the discharge is authorized under a valid state-issued VPDES permit (see 9 VAC 25-210-60.2). Virginia State Water Control Board regulations require that each VPDES permit include conditions necessary to conform to Section 401 of the CWA (9VAC25-31-220 [D][3]). NAPS has a valid VPDES permit (Attachment B) which contains permit requirements, special conditions, effluent limitations, and monitoring requirements in order to meet applicable water quality standards. Dominion is coordinating with the VDEQ to obtain a waiver or statement that 401 certification does not apply.

E9.5.3.2 VPDES Permit

VPDES Permit No. VA0052451, issued by the VDEQ, authorizes the discharge of cooling water, process water, treated sanitary wastewater, intake screen wash water, and stormwater to state waters (i.e., Lake Anna). The permit has been administratively continued (Attachment B). An application for renewal of the permit was submitted on October 15, 2018, and an addendum was submitted on March 12, 2019 (Dominion. 2018e; Dominion. 2019e).

As presented in Section E3.6.1.2.1, there are 10 external outfalls (seven industrial process wastewater and three stormwater) and 18 internal outfalls (16 industrial process wastewater and two stormwater) identified in the VPDES permit. Monitoring results associated with these outfalls are submitted in discharge monitoring reports to the VDEQ at the frequency specified in the permit. NAPS has maintained compliance with the VPDES permit over the years from 2013–2019.

To support the CWA 316(a) variance approval, the VPDES permit requires temperature and biological monitoring (fish population surveys) of the North Anna Reservoir, the WHTF, and the North Anna River. There are no plant operations or modifications planned for the proposed SLR operating term that would alter the thermal discharge. (Attachment B)

The VPDES permit also governs releases from the North Anna Dam. Dominion shall at all times provide a minimum release from the North Anna Dam of 40 cfs except if the lake level reaches 248 msl. Then the releases can be reduced. The minimum release rate is 20 cfs. The permit requires Dominion to operate the skimmer gates in accordance with standard operating procedures. Changes to the standard operating procedures should be submitted to VDEQ for approval prior to implementation. (Attachment B)

VPDES permit regulation 9VAC25-31-165.C requires existing facilities with cooling water intake structures to meet the requirements under §316(b) of the CWA. The facility includes a cooling water intake structure governed by §316(b) of the CWA, which requires that the location, design, construction and capacity of the cooling water intake structures reflect the "best technology available for minimizing adverse environmental impact." The application for renewal addressed applicable §316(b) requirements, including the results of the entrainment studies and the 316(b) §122.21(r)(2)-(13) submittal (Dominion. 2018e; Dominion. 2019e).

Construction activities resulting in land disturbance of greater than one acre must apply for permit coverage under the VDEQ construction general permit number VAR10, which grants authorization to discharge under the Virginia Stormwater Management Program (VSMP) and the Virginia Stormwater Management Act. NAPS will comply with this general permit should any construction activities be required at the site.

E9.5.3.3 Industrial Stormwater Discharge

As presented in Section E3.6.1.2.2, stormwater discharges associated with industrial activities at NAPS are regulated and controlled through VPDES Permit No. VA0052451 issued by the VDEQ. NAPS samples stormwater runoff at VPDES Outfalls 014, 022, 024, 025, and 027 on a quarterly basis and conducts visual examinations as specified in the permit. NAPS is also required to develop, maintain, and implement a stormwater pollution prevention plan for the facility that identifies potential sources of pollution that would reasonably be expected to affect the quality of stormwater and identify the BMPs that will be used to prevent or reduce the pollutants in stormwater discharges (Attachment B). NAPS is in compliance with the terms and conditions of the VPDES permit as it relates to the stormwater program.

E9.5.3.4 Sanitary Wastewaters

Sanitary wastewater is collected and treated in the onsite sewage treatment plant, where it is treated and then discharged to Internal Outfall 111, a subsurface discharge into the cooling water discharge canal, which then discharges to Lake Anna through Outfall 001 (NAPS. 2018b, Form 2C). Discharge of treated sanitary wastewater from NAPS is regulated by the NAPS VPDES Permit No. VA0052451 (Attachment B). Authorization for NAPS to operate the sewage treatment plant was granted by the VDEQ under Certificate to Operate No. VA0052451-01 (VDEQ. 1997). NAPS also has septic systems serving the NANIC and the security training building.

NAPS is required to employ or contract at least one Class IV licensed wastewater works operator for the sewage treatment facility. The license must be issued in accordance with Title 54.1 of the Code of Virginia and the regulations of the Board for Waterworks and Wastewater Works Operators and Onsite Sewage Professionals (Attachment B). NAPS maintains onsite certified wastewater operators; therefore, the site is in compliance with this program.

E9.5.3.5 Spill Prevention, Control, and Countermeasures

The EPA's Oil Pollution Prevention Rule became effective January 10, 1974, and was published under the authority of Section 311(j)(1)(C) of the Federal Water Pollution Control Act. The regulation has been published in 40 CFR 112, and facilities subject to the rule must prepare and implement an SPCC plan to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines. NAPS is subject to this rule and has a written SPCC plan that identifies and describes the procedures, materials, equipment, and facilities that are utilized at the station to minimize the frequency and severity of oil spills in order to meet the requirements of this rule (Dominion. 2017e).

E9.5.3.6 Reportable Spills [40 CFR 110]

NAPS is subject to the reporting provisions of 40 CFR 110 as it relates to the discharge of oil in such quantities as may be harmful pursuant to Section 311(b)(4) of the Federal Water Pollution Control Act. Any discharges of oil in such quantities that may be harmful to the public health or welfare or the environment must be reported to the U.S. Coast Guard (USCG) National Response Center. Based on review of site records from 2012–2018, no spills reportable under 40 CFR 110 occurred.

E9.5.3.7 Facility Response Plan

NAPS is not subject to the facility response plan risk requirements described in 40 CFR 112.20 because the facility does not transfer oil over water to or from vessels and does not store oil in quantities greater than one million gallons.

E9.5.3.8 Section 404 Permit

None of the current operations at NAPS require a Section 404 permit. The station would comply with regulatory requirements imposed by the USACE as it relates to performing future activities in federal jurisdictional wetland areas when appropriate.

E9.5.4 SAFE DRINKING WATER ACT

As the operator of a non-transient non-community waterworks, NAPS is subject to the Safe Drinking Water Act. State governments, such as Virginia's, are approved to implement these rules and drinking water standards for the EPA through waterworks regulations. Title 12 of VAC, Chapter 590 (12VAC5-590) regulates the operation of public waterworks in Virginia. NAPS maintains two waterworks operation permits issued by the Virginia Department of Health, Office of Drinking Water. These permits authorize the operation of public waterworks in accordance of Part 2 of the waterworks regulations. NAPS waterworks is classified as a Class V non-transient non-community waterworks. The VDEQ (Permits No. 2109600 and 2109610) allows a maximum withdrawal of 169,200 gpd (117.50 gpm). (VDH. 1991, VDH. 2014) NAPS maintains compliance with these permits.

As described in Section E3.6.3.2, Groundwater Use, the NAPS waterworks consists of three drilled wells fed to three hydro-pneumatic tanks (VDH. 2014). A separately permitted well (NANIC) provides the water supply for the North Anna Nuclear Information Center. Treatment for this well includes water softener and ultraviolet disinfection. (VDH. 1991) Dominion was granted a monitoring waiver for volatile fumigants, Diquat through 2022, and cyanide through 2028 (VDH. 2019c).

E9.5.5 ENDANGERED SPECIES ACT

Potential impacts on federally and state-listed species were considered in Dominion's review and analysis in Section E4.6, and it was concluded that none would be adversely affected and no designated critical habitat would be adversely modified as a result of SLR.

Section 7 of the ESA requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of species that are listed, or proposed for listing, as endangered or threatened. Depending on the action involved, the ESA requires consultation with the USFWS, and with the NMFS if marine or anadromous species could be affected. Although Dominion invited comment from the USFWS (Attachment C) during the development of this ER, a more structured consultation process with these agencies may be initiated by the NRC per Section 7 of the ESA.

E9.5.6 MIGRATORY BIRD TREATY ACT

The MBTA makes it unlawful to pursue, hunt, take, capture, kill, or sell birds listed, and grants protection to any bird parts, including feathers, eggs, and nests. Currently, Dominion maintains a depredation permit authorizing take of a maximum of 70 black vultures, 20 turkey vultures, 40 Canada geese, and 25 herring gulls and destruction of nests and eggs of 10 herring gull nests and five osprey nests at Dominion-owned properties in Maryland, North Carolina, Virginia, and West Virginia. (USFWS. 2018d)

E9.5.7 BALD AND GOLDEN EAGLE PROTECTION ACT

The BGEPA prohibits the take, transport, sale, barter, trade, import and export, and possession of eagles, making it illegal for anyone to collect eagles and eagle parts, nests, or eggs without a USFWS permit. Bald eagles are known to nest on the NAPS site; therefore, consultation with the USFWS would be conducted prior to new activities or maintenance activities in close proximity to a nest to ensure compliance with the BGEPA. There are currently no BGEPA permitting requirements associated with NAPS operations.

E9.5.8 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

As presented in Section E3.7.8.5, no EFH exists at Lake Anna or the North Anna River. No habitat areas of particular concern (HAPCs) or EFH areas protected from fishing are located on or adjacent to NAPS. There is no EFH between the North Anna Dam and the North Anna River's confluence with the South Anna River farther downstream. Therefore, there are no Magnuson-Stevens Fishery Conservation and Management Act restrictions applicable to NAPS operations.

E9.5.9 MARINE MAMMAL PROTECTION ACT

The Marine Mammal Protection Act prohibits, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. There are currently no Marine Mammal Protection Act permitting requirements associated with NAPS operations.

E9.5.10 COASTAL ZONE MANAGEMENT ACT

The federal Coastal Zone Management Act (16 USC 1451 et seq.) imposes requirements on an applicant for a federal license to conduct an activity in or that could have reasonable foreseeable effects on any land or water use or natural resources of a state's coastal zone. The act requires the applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal zone management program and provide a copy to the state for concurrence ([16 USC 1456(c)(3)(A)]). Virginia has a federally approved coastal management program and an SLR is a new federal action. NAPS, located in Louisa County, is not within the Virginia coastal zone designated as Tidewater Virginia as defined by 28VAC2-100 (Attachment B). However, Spotsylvania County and the associated portion of Lake Anna within Spotsylvania County are included within the Virginia coastal zone. Therefore, Dominion is required to provide a CZMA certification to the Commonwealth of Virginia for the proposed NAPS SLR project.

Dominion developed a CZMA consistency certification for the project. The certification demonstrates the project is consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Zone Management Program (VCP) and will be conducted in a manner consistent with the program. VDEQ responded with a letter dated December 23, 2019, concurring that the proposed action is consistent with the Virginia Coastal Zone Management Program provided all applicable permits and approvals are obtained as further described in the letter. Attachment E includes a copy of Dominion's and VDEQ's correspondence regarding a certification of compliance with Virginia's coastal zone policies. Therefore, NAPS has fulfilled the regulatory requirement to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved VCP for the Virginia coastal zone.

E9.5.11 NATIONAL HISTORIC PRESERVATION ACT

Potential impacts on historic properties are presented in Section E4.7. As presented in Section E3.8.6, cultural resources on the NAPS site are protected by Dominion's historic resources consultation guidance (Dominion. 2009b) and Dominion's CRDP, which is specifically applicable to Surry Power Station and NAPS. The guidance document and the CRDP ensure that cultural resources are protected from unauthorized removal and that, in the event ground disturbance is required in these areas, coordination with the VDHR (serving as Virginia's SHPO) is conducted. The guidance protects known cultural resources, as well as unknown cultural resources, by establishing a process for all activities that require a federal permit, use federal funding, or have the potential to impact historic resources.

Section 106 of the NHPA [54 USC 306108] requires federal agencies having the authority to license any undertaking, prior to issuing the license, to consider the effect of the undertaking on historic properties and to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. Council regulations provide for establishing an agreement with any SHPO to substitute state review for council review [35 CFR 800.7]. Although not required of an applicant by federal law or NRC regulation, Dominion has chosen to invite comments by the SHPO, and has received the agency's response. Attachment D includes a copy of Dominion correspondence with the SHPO regarding potential effects that NAPS SLR might have on historic or cultural resources.

E9.5.12 RESOURCE CONSERVATION AND RECOVERY ACT

E9.5.12.1 Nonradioactive Waste

As a generator of hazardous and nonhazardous wastes, NAPS is subject to and complies with the Resource Conservation and Recovery Act (RCRA) and specific VDEQ regulations contained in 9VAC20-81 (Solid Waste Management Regulations). NAPS is classified as a small quantity generator of hazardous waste; therefore, hazardous waste routinely makes up only a small percentage of the total waste generated. As a small quantity generator of hazardous waste, NAPS also maintains a hazardous waste generator identification number (Table E9.1-1).

Dominion maintains an electronic waste management database known as the Waste Disposal Management System (WDMS). Dominion tracks waste disposal, including hazardous waste, within this database. The only wastes not included in this database are used kitchen grease, recycled paper, scrap metal, and domestic garbage. Dominion is able to check trends in disposal and recycling efforts by using the information in the database and can make informed decisions about more appropriate future disposal and recycling opportunities. (Dominion. 2015b)

For most hazardous waste records, the regulations require that records be retained for at least three years from the date the hazardous waste, for which the record pertains, is last shipped offsite.

It is a Dominion BMP to maintain most records for a minimum of five years in accordance with the Dominion record retention schedule. (Dominion. 2015b)

E9.5.12.2 Reportable Spills [9VAC20-60-262 (adoption of 40 CFR 262)]

NAPS is subject to the reporting provisions of 9VAC20-60-262.34(d)(5)(iv)(C) as it relates to a fire, explosion, or other release of hazardous waste, which could threaten human health outside the facility boundary or when the facility has knowledge that a spill has reached surface water. Any such events must be reported to the national response center. Based on review of site records from 2013–2018, no reportable spills of hazardous waste have occurred.

E9.5.12.3 Mixed Waste

Radioactive materials are regulated by the NRC under the Atomic Energy Act of 1954, and hazardous waste is regulated by the EPA under the RCRA of 1976. Management of radioactive waste is presented in Section E2.2.6. Dominion has developed guidance documents for managing its hazardous waste streams, including mixed waste. In addition, Dominion inspects its waste management areas for compliance with applicable regulations and permits on a weekly basis using a facility waste inspection checklist. (Dominion. 2015b) Dominion's management of its waste streams is in compliance with applicable regulatory standards and has not resulted in any notices of violation for the 2013–2019 time frame. Dominion would continue to store and dispose of hazardous waste in compliance with EPA and state regulations, and dispose of the waste in appropriately permitted treatment and disposal facilities during the proposed SLR operating term.

NAPS does not routinely generate mixed waste and there was no generation of mixed waste during 2013–2017. No mixed waste is currently stored onsite. Also, Dominion has not claimed the mixed waste storage exemption in 40 CFR 266, Subpart N. NAPS will continue to utilize existing systems and procedures to ensure proper storage and disposal.

E9.5.12.4 Underground Storage Tanks [§62.1-44.34:19]

NAPS has five state-regulated underground storage tanks onsite. Two 10,000-gallon gasoline tanks are maintained on the site. The other underground storage tanks are a 10,000-gallon diesel fuel tank, a 6,000-gallon waste oil tank, and a 600-gallon diesel fuel tank. The tanks are registered as required.

E9.5.12.5 Aboveground Storage Tanks (9 VAC 25-91)

NAPS has numerous aboveground storage tanks holding diesel fuel, fuel oil, used oil, lube oil, used lube oil, hydraulic oil, motor oil, and cooking oil. The aggregate tank volume is 252,190 gallons. The aboveground storage tanks are addressed in the NAPS oil discharge contingency plan as required. Aboveground storage tanks of greater than 660-gallon capacity are required to be registered with the state. NAPS has eight aboveground storage tanks of greater than 660 gallons and these are registered with the state as required.

E9.5.12.6 Reportable Spills [§62.1-44.34:19]

NAPS is subject to the reporting provisions of State Water Control Law §62.1-44.34:19 (Article 11) as it relates to discovering the release of a regulated substance from an underground storage tank containing a petroleum product. Any such events must be reported to the VDEQ.

The only reportable spill occurring 2013–2018 was an underground fuel oil leak from the leaking 2H B fuel oil feed line which occurred in December 2016. The amount of fuel oil that leaked was not quantified. All the fuel oil lines that feed to the plant's emergency and station blackout diesel generators were replaced in 2017 after this incident. There are no ongoing remediation activities for reportable spills that occurred prior to 2013.

E9.5.13 POLLUTION PREVENTION ACT

In accordance with RCRA Section 3002(b) and 40 CFR 262.27, a small or large quantity generator must certify to the appropriate statement on the uniform hazardous waste manifest required to accompany each hazardous waste shipment that there is a waste minimization program. NAPS is meeting this requirement as procedural measures are in place to minimize hazardous waste generated to the maximum extent practical.

E9.5.14 FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT

Commercially available EPA-registered herbicides (e.g., Ranger PRO® and Roundup®) insecticides (e.g., Advion Ant Gel and Phantom Termiticide/Insecticide), and rodenticides (e.g., Contrac®) are applied by licensed pesticide contractors on an as-needed basis. Because only contractors who have obtained a license as specified in 2VAC5-685 (VDACS. 2018) conduct insecticide/herbicide/rodenticides applications onsite, NAPS is in compliance with the requirements of this act.

E9.5.15 TOXIC SUBSTANCES CONTROL ACT

The Toxic Substances Control Act of 1976 regulates PCBs [40 CFR 761] and asbestos [40 CFR 763]. NAPS does not have any transformers or capacitors with PCBs remaining onsite. The only PCB material at NAPS is in fluorescent lamp ballasts manufactured prior to the PCB ban in 1979. These lamp ballasts are occasionally taken out of service and require disposal. Dominion maintains a log of PCB waste. Any asbestos removal and disposal on the site are managed in accordance with the Dominion asbestos management procedure and conducted by a qualified asbestos vendor. NAPS is in compliance with all PCB and asbestos regulations applicable to the facility.

E9.5.16 HAZARDOUS MATERIALS TRANSPORTATION ACT

Because NAPS ships hazardous materials that are regulated by the DOT offsite, the facility is subject to and complies with the applicable requirements of the Hazardous Materials Transportation Act described in 49 CFR, including the requirement to possess a current hazardous materials certificate of registration (Table E9.1-1).

E9.5.17 EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT

NAPS is subject to and complies with Section 312 of the Emergency Planning and Community Right-to-Know Act that requires annual submittal of an emergency and hazardous chemical inventory report (Tier II) to the local emergency planning commission, the state emergency response committee, and the local fire department. NAPS submitted its Tier II report to the Virginia Emergency Response Council, the Louisa County Local Emergency Response Council, the Louisa Volunteer Fire Department, and Mineral Volunteer Fire Department. The reported chemicals included blasting sand, boric acid, carbon dioxide, ethylene glycol, fuel oil No. 2, unleaded gasoline, gravel, Halon 1301, hydrazine, hydrogen peroxide, ion-exchange resin, lead-acid batteries, liquid alum, natural sand, liquid nitrogen, hydraulic oil, lubricating oil, soda ash, sodium bicarbonate, sodium chloride, sodium hydroxide, and soft lead.

E9.5.18 COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT

NAPS is subject to the hazardous substance release and reporting provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as subsequently amended. Any release of reportable quantities of listed hazardous substances to the environment requires a notification to the USCG National Response Center, the VDEQ, and the Virginia Department of Emergency Management, as appropriate, and subsequent written follow-up within 15 days of the release. Based on a review of records over the seven-year period 2013–2019, there have been no releases at NAPS that have triggered this notification requirement.

E9.5.19 FARMLAND PROTECTION POLICY ACT

The FPPA only applies to federal programs. The term "federal program" under this act does not include federal permitting or licensing for activities on private or non-federal lands. Therefore, because license renewal is considered a federal licensing activity and NAPS is located on non-federal lands, the FPPA is not applicable.

E9.5.20 FEDERAL AVIATION ACT

Coordination with the Federal Aviation Administration (FAA) is required when it becomes necessary to ensure that the highest structures associated with a project do not impair the safety of aviation.

Submission of a letter of notification (with accompanying maps and project description) to the FAA would result in a written response from the FAA certifying that no hazard exists or recommending project changes and/or the installation of warning devices such as lighting.

At NAPS, the site elevation is dominated by the 191-foot-high containment structure and the about 160-foot high meteorological tower (the sensors at the upper level are mounted at 158.8 feet and the total height of the tower would be slightly higher). No license renewal-related construction activities have been identified; therefore, no new notifications to the FAA are required.

E9.5.21 OCCUPATIONAL SAFETY AND HEALTH ACT

OSHA governs the occupational safety and health of the construction workers and the operations staff. NAPS and its contractors comply with OSHA's requirements, as these are incorporated in the site's occupational health and safety practices.

E9.5.22 STATE WATER WITHDRAWAL REPORTING

In accordance with 9VAC25-200-10, et seq., the VDEQ requires that all major water withdrawers keep accurate records of water withdrawals within their facilities and report such withdrawals to the state on an annual basis. NAPS withdraws surface water exempt from permitting requirements, but reports based on the monthly average flow reported in the facility's monthly discharge monitoring report. NAPS permitted groundwater withdrawals are reported based on well records. NAPS is in compliance with these reporting requirements.

E9.5.23 LOUISA COUNTY ZONING REQUIREMENTS

The Louisa County Comprehensive Plan identifies the NAPS property as industrial (Louisa County. 2019c). The Louisa County zoning ordinance does not include established maximum permissible sound limits for receiving land use categories. Louisa County zoning ordinance provisions prescribe minimal side and rear yards of 100 feet to residential or agricultural district (see Section E3.4). NAPS is in compliance with this zoning ordinance.

E9.6 ENVIRONMENTAL REVIEWS

Dominion has an environmental management system in place to ensure that environmentally sensitive areas at NAPS, if present, are adequately protected during site operations and project planning (Dominion. 2018f).

These controls, which encompass nonradiological environmental resource areas such as land use, air quality, surface water and groundwater, terrestrial and aquatic ecology, historic and cultural resources, and waste management and pollution prevention, consist of the following:

- Appropriate local, state, and/or federal permits are obtained or modified as necessary.
- BMPs, including for stormwater, are implemented to protect wetlands, natural heritage areas, and sensitive ecosystems.
- Appropriate agencies are consulted on matters involving federally and state-listed threatened, endangered, and protected species; BMPs are implemented to minimize impacts to these species.
- Appropriate agencies are consulted on matters involving cultural resources, and appropriate BMPs are implemented to minimize impacts to such resources.

In summary, Dominion's administrative controls ensure that appropriate local, state, and/or federal permits are obtained or modified as necessary, that cultural resources and threatened and endangered species are protected if present, and that other regulatory issues are adequately addressed as necessary.

E9.7 ALTERNATIVES

The discussion of alternatives in the ER shall include a discussion of whether alternatives will comply with such applicable environmental quality standard and requirements [10 CFR 51.45 (d)].

The alternatives presented in Chapter E7.0 would be constructed and operated to comply with applicable environmental quality standards and requirements. While alternative generation would be developed and operated compliant with standards and requirements, additional environmental impacts associated with siting, construction, and operation would be realized. Continued compliant operation of NAPS would not result in these additional impacts.

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Attachment A: NRC NEPA Issues for License Renewal

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NRC NEPA Issues for License Renewal of Nuclear Power Plants

NRC NEPA Issues for License Renewal of Nuclear Power Plants

Dominion has prepared this environmental report in accordance with the requirements of U.S. Nuclear Regulatory Commission (NRC) regulation 10 CFR 51.53. The NRC included in the regulation the list of 78 National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants that were identified in the 2013 GEIS (Appendix B to Subpart A of 10 CFR Part 51, Table B-1).

The following table lists the 78 issues from 10 CFR Part 51, Appendix B, Table B-1, and identifies the section in this environmental report in which Dominion addresses each issue.

Table A-1. North Anna Power Station Environmental Report Cross-Reference of License Renewal NEPA Issues

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
	Land Use			
1	Onsite land use	1	E4.1.1	4.2.1.1/4-6
2	Offsite land use	1	E4.1.2	4.2.1.1/4-7
3	Offsite land use in transmission line rights-of-way[c]	1	E4.0.1	4.2.1.1/4-6
	Visual Resources			
4	Aesthetic impacts	1	E4.1.3	4.2.1.2/4-9
	Air Quality			
5	Air quality (all plants)	1	E4.2.1	4.3.1.1/4-14
6	Air quality effects of transmission lines	1	E4.2.2	4.3.1.1/4-14
	Noise			
7	Noise impacts	1	E4.3	4.3.1.2/4-19
	Geologic Impacts			
8	Geology and soils	1	E4.4	4.4/4-29
	Surface Water Resources			
9	Surface water use and quality (non-cooling system impacts)	1	E4.0.1/E5.2	4.5.1.1/4-30
10	Altered current patterns at intake and discharge structures	1	E4.0.1/E5.2	4.5.1.1/4-36
11	Altered salinity gradients[c]	1	E4.0.1	4.5.1.1/4-36
12	Altered thermal stratification of lakes	1	E4.0.1/E5.2	4.5.1.1/4-37
13	Scouring caused by discharged cooling water	1	E4.0.1/E5.2	4.5.1.1/4-38
14	Discharge of metals in cooling system effluent	1	E4.0.1/E5.2	4.5.1.1/4-38
15	Discharge of biocides, sanitary wastes, and minor chemical spills	1	E4.0.1/E5.2	4.5.1.1/4-39
16	Surface water use conflicts (plants with once-through cooling systems)	1	E4.0.1/E5.2	4.5.1.1/4-40
17	Surface water use conflicts (plants with cooling ponds, or cooling towers using makeup water from a river)[c]	2	E4.5.1	4.5.1.1/4-41
18	Effects of dredging on surface water quality	1	E4.0.1/E5.2	4.5.1.1/4-42

No.	Issue[(a)]	Category	ER Section	GEIS Cross Reference (Section/Page)[(b)]
19	Temperature effects on sediment transport capacity	1	E4.0.1/E5.2	4.5.1.1/4-43
	Groundwater Resources			
20	Groundwater contamination and use (non-cooling system impacts)	1	E4.0.1/E5.2	4.5.1.2/4-45
21	Groundwater use conflicts (plants that withdraw <100 gpm)	1	E4.0.1/E5.2	4.5.1.2/4-47
22	Groundwater use conflicts (plants that withdraw >100 gpm)[(c)]	2	E4.5.3	4.5.1.2/4-48
23	Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river)[(c)]	2	E4.5.2	4.5.1.2/4-48
24	Groundwater quality degradation resulting from water withdrawals	1	E4.0.1/E5.2	4.5.1.2/4-49
25	Groundwater quality degradation (plants with cooling ponds in salt marshes)[(c)]	1	E4.0.1	4.5.1.2/4-50
26	Groundwater quality degradation (plants with cooling ponds at inland sites)[(c)]	2	E4.5.4	4.5.1.2/4-51
27	Radionuclides released to groundwater	2	E4.5.5	4.5.1.2/4-51
	Terrestrial Resources			
28	Effects on terrestrial resources (non-cooling system impacts)	2	E4.6.5	4.6.1.1/4-59
29	Exposure of terrestrial organism to radionuclides	1	E4.0.1/E5.2	4.6.1.1/4-61
30	Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds)	1	E4.0.1/E5.2	4.6.1.1/4-64
31	Cooling tower impacts on vegetation (plants with cooling towers)[(c)]	1	E4.0.1	4.6.1.1/4-69
32	Bird collisions with plant structures and transmission lines	1	E4.0.1/E5.2	4.6.1.1/4-70
33	Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river)[(c)]	2	E4.6.4	4.6.1.1/4-75
34	Transmission line ROW management impacts on terrestrial resources	1	E4.0.1/E5.2	4.6.1.1/4-75
35	Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	1	E4.0.1/E5.2	4.6.1.1/4-80

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
	Aquatic Resources			
36	Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds)	2	E4.6.1	4.6.1.2/4-87
37	Impingement and entrainment of aquatic organisms (plants with cooling towers)[c]	1	E4.0.1	4.6.1.2/4-92
38	Entrainment of phytoplankton and zooplankton (all plants)	1	E4.0.1/E5.2	4.6.1.2/4-93
39	Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds)	2	E4.6.2	4.6.1.2/4-94
40	Thermal impacts on aquatic organisms (plants with cooling towers)[c]	1	E4.0.1	4.6.1.2/4-96
41	Infrequently reported thermal impacts (all plants)	1	E4.0.1/E5.2	4.6.1.2/4-97
42	Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication	1	E4.0.1/E5.2	4.6.1.2/4-100
43	Effects of non-radiological contaminants on aquatic organisms	1	E4.0.1/E5.2	4.6.1.2/4-103
44	Exposure of aquatic organisms to radionuclides	1	E4.0.1/E5.2	4.6.1.2/4-105
45	Effect of dredging on aquatic organisms	1	E4.0.1/E5.2	4.6.1.2/4-107
46	Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river)[c]	2	E4.6.3	4.6.1.2/4-109
47	Effects on aquatic resources (non-cooling system impacts)	1	E4.0.1/E5.2	4.6.1.2/4-110
48	Impacts of transmission line ROW management on aquatic resources	1	E4.0.1/E5.2	4.6.1.2/4-112
49	Losses from predation, parasitism, and disease among organisms exposed to sub-lethal stresses	1	E4.0.1/E5.2	4.6.1.2/4-110
	Special Status Species and Habitats			
50	Threatened, endangered, and protected species and essential fish habitat	2	E4.6.6	4.6.1.3/4-115
	Historic and Cultural Resources			
51	Historic and cultural resources	2	E4.7	4.7.1/4-122

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
	Socioeconomics			
52	Employment and income, recreation and tourism	1	E4.8.1	4.8.1.1/4-127
53	Tax revenues	1	E4.8.2	4.8.1.1/4-128
54	Community services and education	1	E4.8.3	4.8.1.1/4-129
55	Population and housing	1	E4.8.4	4.8.1.1/4-130
56	Transportation	1	E4.8.5	4.8.1.1/4-131
	Human Health			
57	Radiation exposures to the public	1	E4.0.1/E5.2	4.9.1.1.1/4-140
58	Radiation exposures to plant workers	1	E4.0.1/E5.2	4.9.1.1.1/4-136
59	Human health impacts from chemicals	1	E4.0.1/E5.2	4.9.1.1.2/4-147
60	Microbiological hazards to the public (plants that use cooling ponds, lake, or canals or that discharge to a river)[d]	2	E4.9.1	4.9.1.1.3/4-149
61	Microbiological hazards to plant workers	1	E4.0.1/E5.2	4.9.1.1.3/4-149
62	Chronic effects of electromagnetic fields	NA	E4.0.3	4.9.1.1.4/4-150
63	Physical occupational hazards	1	E4.0.1/E5.2	4.9.1.1.5/4-156
64	Electric shock hazards	2	E4.9.2	4.9.1.1.5/4-156
	Postulated Accidents			
65	Design-basis accidents	1	E4.0.1/E5.2	4.9.1.2/4-158
66	Severe accidents	2	E4.15	4.9.1.2/4-158
	Environmental Justice			
67	Minority and low-income populations	2	E4.10.1	4.10.1/4-167
	Waste Management			
68	Low-level waste storage and disposal	1	E4.11.1	4.11.1.1/4-171
69	Onsite storage of spent nuclear fuel	1	E4.11.2	4.11.1.2/4-172
70	Offsite radiological impacts of spent nuclear fuel and high-level waste disposal	1	E4.11.3	4.11.1.3/4-175
71	Mixed waste storage and disposal	1	E4.11.4	4.11.1.4/4-178
72	Non-radioactive waste storage and disposal	1	E4.11.5	4.11.1.5/4-179
	Cumulative Impacts			
73	Cumulative impacts	2	E4.12	4.13/4-243

No.	Issue[a]	Category	ER Section	GEIS Cross Reference (Section/Page)[b]
	Uranium Fuel Cycle			
74	Offsite radiological impacts–individual impacts from other than the disposal of spent fuel and high-level waste	1[e]	E4.13.1	4.12.1.1/4-193
75	Offsite radiological impacts–collective impacts from other than the disposal of spent fuel and high-level waste	1	E4.13.2	4.12.1.1/4-194
76	Non-radiological Impacts of the uranium fuel cycle	1	E4.13.3	4.12.1.1/4-194
77	Transportation	1	E4.13.4	4.12.1.1/4-196
	Termination of Nuclear Power Plant Operations and Decommissioning			
78	Termination of plant operations and decommissioning	1	E4.14	4.12.2.1/4-201

a. 10 CFR 51, Subpart A, Appendix A, Table B-1 (issue numbers added to facilitate discussion).

b. Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437, Rev 1).

c. The issue is not applicable to NAPS; it concerns a plant feature or operation that NAPS does not have or utilize.

d. Wording from [10 CFR 51.53(c)(3)(ii)(G)]

e. SECY-14-0072 (July 21, 2014).

NA = not applicable (the categorization and impact finding definitions do not apply to the issue).

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Attachment B: VPDES Permit

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COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Molly Joseph Ward
Secretary of Natural Resources

NORTHERN REGIONAL OFFICE
13901 Crown Court, Woodbridge, Virginia 22193
(703) 583-3800 Fax (703) 583-3821
www.deq.virginia.gov

David K. Paylor
Director

Thomas A. Faha
Regional Director

May 8, 2014

Ms. Cathy C. Taylor
Director - Electric Environmental Services
Dominion Resources Services, Inc.
5000 Dominion Boulevard
Glen Allen, VA 23060

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Re: Reissuance of Virginia Pollutant Discharge Elimination System (VPDES) Permit No. VA0052451
Dominion – North Anna Power Station, Louisa County

Dear Ms. Taylor:

The Department of Environmental Quality (DEQ) has approved the enclosed effluent limitations and monitoring requirements for the above-referenced permit. Copies of your permit and fact sheet are enclosed.

A Discharge Monitoring Report (DMR) form is no longer included in the reissuance package. DEQ has launched an electronic DMR (e-DMR) program that allows you to submit the effluent monitoring data electronically, and we expect every permittee to use e-DMR as permits are issued or reissued. The first electronic DMR submittal is based on a reissuance date of May 2014:

Monitoring Frequency	Monitoring Start Date	First DMR Due Date
Monthly	June 1, 2014	July 10, 2014
Quarterly	July 1, 2014	January 10, 2015
Semi-Annual	July 1, 2014	January 10, 2015
Annual	January 1, 2015	January 10, 2016

Please reference the effluent limits in your permit and report monitoring results in e-DMR to the same number of significant digits as are included in the permit limits for the parameter. The regional contact for e-DMR is Rebecca Vice; she can be reached at (703) 583-3922 or by e-mail at Rebecca.Vice@deq.virginia.gov. Answers to frequently asked questions about the e-DMR system, including the e-DMR registration process, are available at the following website:
http://www.deq.virginia.gov/Programs/Water/PermittingCompliance/ElectronicDMRsubmissions.aspx.

Please note that compliance with the permit's requirements for use and disposal of sewage sludge do not relieve you of your responsibility to comply with federal requirements set forth in 40 CFR Part 503. Until DEQ seeks and is granted authority to administer the Part 503 regulations by EPA, treatment works treating domestic sewage should continue to work directly with EPA to comply with them.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have thirty days from the date of service (the date you actually received this decision or the date it was mailed to you, whichever occurred first) within which to appeal this decision by filing a notice of appeal in accordance with the Rules of the Supreme Court of Virginia with the Director, Department of Environmental Quality. In the event that this decision is served on you by mail, three days are added to that period.

Alternately, any owner under §§ 62.1-44.16, 62.1-44.17, and 62.1-44.19 of the State Water Control Law aggrieved by any action of the State Water Control Board taken without a formal hearing, or by inaction of the Board, may demand in writing a formal hearing of such owner's grievance, provided a petition requesting such hearing is filed with the Board. Said petition must meet the requirements set forth in §1.23(b) of the Board's Procedural Rule No. 1. In cases involving actions of the Board, such petition must be filed within thirty days after notice of such action is mailed to such owner by certified mail.

A Reliability Class II is assigned to this facility and this facility has Class IV licensed operator requirements.

If you have questions about the permit, please contact Susan Mackert at (703) 583-3853, or by Email at susan.mackert@deq.virginia.gov.

Respectfully,

Bryant Thomas
Water Permits & Planning Manager

Enc.: Permit for VA0052451
Fact Sheet for VA0052451

cc: DEQ-Water, OWPP
EPA-Region III, 3WP12
Department of Health, Culpeper/Lexington
Water Compliance, NRO

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Permit No. **VA0052451**
Effective Date: **May 8, 2014**
Expiration Date: **May 7, 2019**

AUTHORIZATION TO DISCHARGE UNDER THE
VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM
AND THE VIRGINIA STATE WATER CONTROL LAW

In compliance with the provisions of the Clean Water Act as amended and pursuant to the State Water Control Law and regulations adopted pursuant thereto, the following owner is authorized to discharge in accordance with the information submitted with the permit application, and with this permit cover page, Part I – Effluent Limitations and Monitoring Requirements, and Part II – Conditions Applicable To All VPDES Permits, as set forth herein.

Owner Name:	Virginia Electric and Power Company
Facility Name:	Dominion – North Anna Power Station
County:	Louisa
Facility Location:	1022 Haley Drive, Mineral, VA 23117

The owner is authorized to discharge to the following receiving stream:

Stream Name:	Lake Anna
River Basin:	York River
River Subbasin:	Not Applicable
Section:	3
Class:	III
Special Standards:	None

Thomas A. Faha

Thomas A. Faha
Director, Northern Regional Office
Department of Environmental Quality

May 8, 2014
Date

A. Effluent Limitations and Monitoring Requirements

1. Outfall 001 – Waste Heat Treatment Facility at Dike 3

a. There shall be no discharge of floating solids or visible foam in other than trace amounts.

b. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 001. Such discharges shall be limited and monitored by the permittee as specified below.

c. Samples and measurements shall be taken at Dike 3 prior to subsurface discharge to Lake Anna.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/W	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/W	Grab
Total Residual Chlorine (TRC)(3)	0.011 mg/L	0.011 mg/L	NA	NA	1/M	Grab
Temperature	NL (°C)	NA	NA	NL (°C)	1/W	IS
Total Nitrogen(4)	NL (mg/L)	NA	NA	NA	1/6M	Calculated
Total Kjeldahl Nitrogen (TKN)	NL (mg/L)	NA	NA	NA	1/6M	Grab
Nitrate+Nitrite (NO_2+NO_3)	NL (mg/L)	NA	NA	NA	1/6M	Grab
Total Phosphorus	NL (mg/L)	NA	NA	NA	1/6M	Grab
Chronic Toxicity – *C. dubia* (TU_c)(5)	NA	NA	NA	NL	1/YR	Grab
Chronic Toxicity – *P. promelas* (TU_c)(5)	NA	NA	NA	NL	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is 2335.8 MGD.
(3) See Part I.B.2.
(4) Total Nitrogen is the sum of Total Kjeldahl Nitrogen and NO_2+NO_3 and shall be calculated from the results of those tests.
(5) See Part I.C for whole effluent toxicity requirements.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
IS = Immersion stabilization.

1/W = Once every week.
1/M = Once every month.
1/6M = Once every 6 months.
1/YR = Once every year.

1/6M = The semi-annual monitoring period shall be January 1 – June 30 and July 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (July 10 and January 10, respectively).

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

2. Outfall 009 – Settling Pond

a. There shall be no discharge of floating solids or visible foam in other than trace amounts.

b. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 009. Such discharges shall be limited and monitored by the permittee as specified below.

c. Samples shall be taken at the discharge to Lake Anna.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	2/M	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	2/M	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/3M	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/3M	Grab

(1) See Part I.B.4.
(2) Average flow is 0.576 MGD.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
2/M = Twice every month.
1/3M = Once every three months.

1/3M = The quarterly monitoring periods shall be January 1 – March 31, April 1 – June 30, July 1 – September 30, and October 1 – December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (April 10, July 10, October 10 and January 10, respectively).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

3. Outfall 013 – Turbine Building Sumps - #1 and #2

a. There shall be no discharge of floating solids or visible foam in other than trace amounts.

b. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 013. Such discharges shall be limited and monitored by the permittee as specified below.

c. Samples shall be collected during non-storm events.

d. Outfall 013 is substantially identical to Outfall 104. Discharge data from Outfall 104 may be submitted to represent Outfall 013.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average[(1)]	Daily Maximum[(1)]	Minimum	Maximum[(1)]	Frequency	Sample Type
Flow[(2)] (MGD)	NL	NA	NA	NL	1/M	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/M	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/M	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/M	Grab

(1) See Part I.B.4.
(2) Average flow is intermittent.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.

1/M = Once every month.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.
Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

4. Outfall 016 – Intake Screen Wash Water

a. There shall be no discharge of floating solids or visible foam in other than trace amounts.

b. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 016. Such discharges shall be limited and monitored by the permittee as specified below.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average[1]	Daily Maximum[1]	Minimum	Maximum[1]	Frequency	Sample Type
Flow[2] (MGD)	NL	NA	NA	NL	1/YR	Estimate

[1] See Part I.B.4.
[2] Average flow is 3.744 MGD.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

5. Outfall 020 – Reverse Osmosis Reject

a. There shall be no discharge of floating solids or visible foam in other than trace amounts.

b. During the period beginning with the permit's effective date and lasting until the expiration date or until Unit 3 construction is initiated, whichever comes first, the permittee is authorized to discharge from Outfall Number 020. The initiation of Unit 3 construction will not commence until a certificate of public convenience and necessity is received from the Virginia State Corporation Commission. Such discharges shall be limited and monitored by the permittee as specified below.

c. Samples shall be taken prior to subsurface discharge to Lake Anna.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	2/M	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	2/M	Grab
Total Residual Chlorine (TRC)(3)	NL	4.0 mg/L	NA	NA	2/M	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/3M	Grab

(1) See Part I.B.4.
(2) Average flow is 0.216 MGD.
(3) See Part I.B.2.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.

2/M = Twice every month.
1/3M = Once every three months.

1/3M = The quarterly monitoring periods shall be January 1 – March 31, April 1 – June 30, July 1 – September 30, and October 1 – December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (April 10, July 10, October 10 and January 10, respectively).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

6. Outfall 020 – Reverse Osmosis Reject and Reverse Osmosis Backwash

a. There shall be no discharge of floating solids or visible foam in other than trace amounts.

b. During the period beginning with initiation of Unit 3 construction and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 020. The initiation of Unit 3 construction will not commence until a certificate of public convenience and necessity is received from the Virginia State Corporation Commission. Such discharges shall be limited and monitored by the permittee as specified below.

c. Samples shall be taken prior to subsurface discharge to Lake Anna.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	2/M	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	2/M	Grab
Total Residual Chlorine (TRC)(3)	NL	4.0 mg/L	NA	NA	2/M	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/3M	Grab or 24H-C
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/3M	Grab

(1) See Part I.B.4.
(2) Average flow is 0.716 MGD.
(3) See Part I.B.2.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.

2/M = Twice every month.
1/3M = Once every three months.

1/3M = The quarterly monitoring periods shall be January 1 – March 31, April 1 – June 30, July 1 – September 30, and October 1 – December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (April 10, July 10, October 10 and January 10, respectively).

24H-C = A flow proportional composite sample collected manually or automatically, and discretely or continuously, for the entire discharge of the monitored 24-hour period. Where discrete sampling is employed, the permittee shall collect a minimum of twenty-four (24) aliquots for compositing. Discrete sampling may be flow proportioned either by varying the time interval between each aliquot or the volume of each aliquot. Time composite samples consisting of a minimum twenty-four (24) grab samples obtained at hourly or smaller intervals may be collected where the permittee demonstrates that the discharge flow rate (gallons per minute) does not vary by ≥10% or more during the monitored discharge. An alternative 24-hour composite sampling approach may be approved by DEQ.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

7. Outfall 021 – Reverse Osmosis Drain Line

a. There shall be no discharge of floating solids or visible foam in other than trace amounts.

b. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 021. Such discharges shall be limited and monitored by the permittee as specified below.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average[(1)]	Daily Maximum[(1)]	Minimum	Maximum[(1)]	Frequency	Sample Type
Flow[(2)] (MGD)	NL	NA	NA	NL	1/3M	Estimate

[(1)] See Part I.B.4.
[(2)] Average flow is intermittent.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
1/3M = Once every three months.

1/3M = The quarterly monitoring periods shall be January 1 – March 31, April 1 – June 30, July 1 – September 30, and October 1 – December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (April 10, July 10, October 10 and January 10, respectively).

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

8. Outfall 028 – Beyond Design Basis Pumps / Portable Emergency Water Supply Pumps

a. There shall be no discharge of floating solids or visible foam in other than trace amounts.

b. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 028. Such discharges shall be limited and monitored by the permittee as specified below.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average[(1)]	Daily Maximum[(1)]	Minimum	Maximum[(1)]	Frequency	Sample Type
Flow[(2)] (MGD)	NL	NA	NA	NL	1/3M	Estimate

(1) See Part I.B.4.
(2) Average flow is 0.014 MGD.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.

1/3M = Once every three months.

1/3M = The quarterly monitoring periods shall be January 1 – March 31, April 1 – June 30, July 1 – September 30, and October 1 – December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (April 10, July 10, October 10 and January 10, respectively).

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

9. Outfall 101 – Condenser Cooling Water

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 101. Such discharges shall be limited and monitored by the permittee as specified below.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average[(1)]	Daily Maximum[(1)]	Minimum	Maximum[(1)]	Frequency	Sample Type
Flow[(2)] (MGD)	NL	NA	NA	NL	1/D	Calculated and Recorded
Temperature – Inlet Condenser Waterbox	NL (^{O}F)	NL (^{O}F)	NA	NA	1/D	Recorded
Temperature – Outlet Condenser Waterbox	NL (^{O}F)	NL (^{O}F)	NA	NA	1/D	Recorded
Heat Rejection	NA	NA	NA	$13.54x10^9$ BTU/hr	1/D	Calculated

(1) See Part I.B.4.
(2) Average flow is 1838.8 MGD.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
1/D = Once every day.

Heat Rejection =
1. The value reported as the daily maximum flow for the report period shall be the intake flow rate which occurred on the day that the maximum heat rejected was calculated from Units 1 and/or 2; and
2. Calculations are to be included with the monthly DMR.

A. Effluent Limitations and Monitoring Requirements

10. Outfall 103 – Process Water Clarifier

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 103. Such discharges shall be limited and monitored by the permittee as specified below.

b. pH shall be monitored in the cooling water discharge canal prior to discharge to the Waste Heat Treatment Facility. All other samples shall be taken from the sample tap at the clarifier building prior to the pipe discharge to the tunnel.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/YR	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/YR	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/YR	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is 0.312 MGD.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

11. Outfall 104 – Turbine Building Sumps – 1, 2, and 3

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 104. Such discharges shall be limited and monitored by the permittee as specified below.
b. Outfall 104 is substantially identical to Outfall 013. Discharge data from Outfall 104 may be submitted to represent Outfall 013.
c. pH shall be monitored in the cooling water discharge canal prior to discharge to the Waste Heat Treatment Facility. All other samples shall be taken prior to mixing with storm water.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/YR	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/YR	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/YR	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is 0.288 MGD.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

12. Outfall 105 – Bearing Cooling Tower Blowdown

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 105. Such discharges shall be limited and monitored by the permittee as specified below.

b. pH shall be monitored in the cooling water discharge canal prior to discharge to the Waste Heat Treatment Facility. All other samples shall be taken at the sample tap before entering the tunnel at the turbine building basement.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/M	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/M	Grab
Free Available Chlorine(3)	0.2 mg/L	0.5 mg/L	NA	NA	1/M	Grab
Total Chromium	0.2 mg/L	0.2 mg/L	NA	NA	1/3M	Grab
Total Zinc	1.0 mg/L	1.0 mg/L	NA	NA	1/3M	Grab
126 Priority Pollutants(4) (Appendix A of 40 CFR Part 423)	Non-Detectable	Non-Detectable	NA	NA	1/3M	Grab

(1) See Part I.B.4.
(2) Average flow is 0.84 MGD.
(3) See Part I.B.2.
(4) See Part I.G.4.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.

1/M = Once every month.
1/3M = Once every three months.

1/3M = The quarterly monitoring periods shall be January 1 – March 31, April 1 – June 30, July 1 – September 30, and October 1 – December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (April 10, July 10, October 10 and January 10, respectively).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

13. Outfall 107 – Bearing Cooling Tower Lake-to-Lake Operations

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 107. Such discharges shall be limited and monitored by the permittee as specified below.

b. Samples shall be taken at the sample tap before entering the tunnel at the turbine building basement.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/YR	Estimate
Total Residual Chlorine (TRC)	NA	4.0 mg/L	NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is intermittent.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.

1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

14. Outfall 108 – Service Water Overflow

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 108. Such discharges shall be limited and monitored by the permittee as specified below.

b. pH shall be monitored in the cooling water discharge canal prior to discharge to the Waste Heat Treatment Facility. All other samples shall be taken at the sample tap before entering the tunnel at the turbine building basement.

c. Outfall 108 is substantially identical to Outfall 115. Discharge data from Outfall 108 may be submitted to represent Outfall 115.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/YR	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/YR	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/YR	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is intermittent.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard Units.

1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

15. Outfall 109 – Hot Well Drain (Unit 1)

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 109. Such discharges shall be limited and monitored by the permittee as specified below.

b. pH shall be monitored in the cooling water discharge canal prior to discharge to the Waste Heat Treatment Facility. All other samples shall be taken before discharge to the tunnel.

c. Outfall 109 is substantially identical to Outfall 110. Discharge data from Outfall 109 may be submitted to represent Outfall 110.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/YR	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/YR	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/YR	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is intermittent.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

16. Outfall 110 – Hot Well Drain (Unit 2)

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 110. Such discharges shall be limited and monitored by the permittee as specified below.

b. pH shall be monitored in the cooling water discharge canal prior to discharge to the Waste Heat Treatment Facility. All other samples shall be taken before discharge to the tunnel.

c. Outfall 110 is substantially identical to Outfall 109. Discharge data from Outfall 109 may be submitted to represent Outfall 110.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/YR	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/YR	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/YR	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is intermittent.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

17. Outfall 111 – Sewage Treatment Plant (0.030 MGD)

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 111. Such discharges shall be limited and monitored by the permittee as specified below.

b. There shall be no discharge of floating solids or visible foam in other than trace amounts.

c. Samples shall be collected at the effluent V-notch weir prior to subsurface discharge to the cooling water discharge canal.

Parameter	Discharge Limitations						Monitoring Requirements	
	Monthly Average[(1)]		Weekly Average[(1)]		Minimum	Maximum[(1)]	Frequency	Sample Type
Flow[(2)] (MGD)	NL		NA		NA	NL	1/D	Estimate
pH	NA		NA		6.0 S.U.	9.0 S.U.	1/M	Grab
Biochemical Oxygen Demand (BOD_5)	30 mg/L	3.4 kg/day	45 mg/L	5.1 kg/day	NA	NA	1/M	Grab
Total Suspended Solids (TSS)	30 mg/L	3.4 kg/day	45 mg/L	5.1 kg/day	NA	NA	1/M	Grab
Total Residual Chlorine (after contact tank)[(3),(4)]	NA		NA		1.0 mg/L	NA	1/D	Grab
Influent Biochemical Oxygen Demand (BOD_5)[(5)]	NL (mg/L)		NL (mg/L)		NA	NA	1/YR	Grab
Influent Total Suspended Solids (TSS)[(5)]	NL (mg/L)		NL (mg/L)		NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) The design flow is 0.030 MGD.
(3) See Part I.B.1.
(4) TRC monitoring is only required if chlorination is used in the wastewater treatment process.
(5) The VPDES Permit Regulation at 9VAC25-31-30 and 40 CFR Part 133 require that the facility achieve at least 85% removal for BOD and TSS. This permit requires influent BOD and TSS monitoring on an annual basis to demonstrate 85% removal.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.

1/D = Once every day.
1/M = Once every month.
1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

18. Outfall 112 – Steam Generator Blowdown (Unit 1)

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 112. Such discharges shall be limited and monitored by the permittee as specified below.

b. pH shall be monitored in the cooling water discharge canal prior to discharge to the Waste Heat Treatment Facility. All other samples shall be taken at the sample tap before entering the tunnel at the turbine building basement (Unit 1 side).

c. Outfall 112 is substantially identical to Outfall 113. Discharge data from Outfall 112 may be submitted to represent Outfall 113.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/YR	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/YR	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/YR	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is 0.204 MGD.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

19. Outfall 113 – Steam Generator Blowdown (Unit 2)

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 113. Such discharges shall be limited and monitored by the permittee as specified below.

b. pH shall be monitored in the cooling water discharge canal prior to discharge to the Waste Heat Treatment Facility. All other samples shall be taken at the sample tap before entering the tunnel at the turbine building basement (Unit 2 side).

c. Outfall 113 is substantially identical to Outfall 112. Discharge data from Outfall 112 may be submitted to represent Outfall 113.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/YR	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/YR	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/YR	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is 0.204 MGD.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

20. Outfall 114 – Service Water Tie-On Vault Drain

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 114. Such discharges shall be limited and monitored by the permittee as specified below.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/YR	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/YR	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/YR	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is intermittent.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

21. Outfall 115 – Service Water High Capacity Blowdown

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 115. Such discharges shall be limited and monitored by the permittee as specified below.
b. Outfall 115 is substantially identical to Outfall 108. Discharge data from Outfall 108 may be submitted to represent Outfall 115.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	1/YR	Estimate
pH	NA	NA	6.0 S.U.	9.0 S.U.	1/YR	Grab
Oil and Grease (O&G)	15 mg/L	20 mg/L	NA	NA	1/YR	Grab
Total Suspended Solids (TSS)	30 mg/L	100 mg/L	NA	NA	1/YR	Grab

(1) See Part I.B.4.
(2) Average flow is intermittent.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
S.U. = Standard units.
1/YR = Once every year.

1/YR = The annual monitoring period shall be January 1 - December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (January 10).

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

22. Outfall 116 – Vacuum Priming Pump

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 116. Such discharges shall be limited and monitored by the permittee as specified below.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average (1)	Daily Maximum (1)	Minimum	Maximum (1)	Frequency	Sample Type
Flow (2) (MGD)	NL	NA	NA	NL	1/6M	Estimate

(1) See Part I.B.4.
(2) Average flow is 0.0576 MGD.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
1/6M = Once every six months.

1/6M = The semi-annual monitoring periods shall be January 1 – June 30 and July 1 – December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (July 10 and January 10, respectively).

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

23. Outfall 117 – Salt Storage Pond

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 117. Such discharges shall be limited and monitored by the permittee as specified below.

b. Discharge from the Salt Storage Pond to Lake Anna is prohibited.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average(1)	Daily Maximum(1)	Minimum	Maximum(1)	Frequency	Sample Type
Flow(2) (MGD)	NL	NA	NA	NL	Contingent	Estimate

(1) See Part I.B.4.

(2) Average flow is intermittent.

MGD = Million gallons per day.

NA = Not applicable.

NL = No limit; monitor and report.

Contingent = Monitoring of this outfall is only required if a discharge occurs. The reporting frequency shall be on an annual basis (1/YR). The annual monitoring period shall be January 1 through December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

Salt Storage Pond Requirements:

In the case of a storm event(s) that could result in an overflow of the salt storage pond, the permittee is authorized to pump water from the salt storage pond to the discharge canal via Outfall 117. Any discharge from the salt storage pond to Lake Anna is prohibited.

A. Effluent Limitations and Monitoring Requirements

24. Outfall 118 – Beyond Design Basis Pumps / Portable Emergency Water Supply Pumps

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge from Outfall Number 118. Such discharges shall be limited and monitored by the permittee as specified below.

Parameter	Discharge Limitations				Monitoring Requirements	
	Monthly Average[(1)]	Daily Maximum[(1)]	Minimum	Maximum[(1)]	Frequency	Sample Type
Flow[(2)] (MGD)	NL	NA	NA	NL	1/3M	Estimate

(1) See Part I.B.4.
(2) Average flow is 0.014 MGD.

MGD = Million gallons per day.
NA = Not applicable.
NL = No limit; monitor and report.
1/3M = Once every three months.

1/3M = The quarterly monitoring periods shall be January 1 – March 31, April 1 – June 30, July 1 – September 30, and October 1 – December 31. The DMR shall be submitted no later than the 10th day of the month following the monitoring period (April 10, July 10, October 10 and January 10, respectively).

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

A. Effluent Limitations and Monitoring Requirements

25. Outfalls 014, 022, 024, 025, and 027 - Storm Water

a. During the period beginning with the permit's effective date and lasting until the expiration date, the permittee is authorized to discharge storm water from Outfalls 014, 022, 024, 025, and 027. Such discharges shall be monitored and managed in accordance with Part 1.F.

There shall be no discharge of industrial process water from Outfall 014, 022, 024, 025, and 027.

B. Additional Monitoring Requirements, Quantification Levels and Compliance Reporting

1. Additional Total Residual Chlorine (TRC) Limitations and Monitoring Requirements (Outfall 111 Only)

   a. The permitee shall monitor TRC at the outlet of the chlorine contact tank once per day by grab sample.

   b. No more than three (3) of the total number of monthly samples taken at the outlet of the chlorine contact tank shall be less than 1.0 mg/L for any one calendar month.

   c. No TRC sample collected at the outlet of the chlorine contact tank shall be less than 0.6 mg/L.

   d. If chlorine disinfection is not used, *E. coli* shall be limited and monitored by the permittee as specified below:

	Discharge Limitations Monthly Average	Monitoring Frequency Requirements	Sample Type
E. coli	126 n/100ml Geometric Mean	1/W	Grab Between 10 AM & 4 PM

   This *E. coli* requirement, if applicable, shall substitute for the TRC requirements delineated elsewhere in Part I.

2. Additional Total Residual Chlorine (TRC) Limitations and Monitoring Requirements (Outfall 105 Only)

   a. Neither free available chloring nor total residual chlorine may be discharged from any single generating unit for more than two hours per day, unless the permittee demonstrates to the Department of Environmental Quality (DEQ) that discharge for more than two hours is required for macroinvertebrate control. If the permittee is dechlorinating, the two hour requirement is nullified.

   b. Simultaneous multi-unit chlorination is permitted.

3. Quantification Levels

   a. The quantification levels (QL) below are applicable to the compliance monitoring required in Part I.A of the permit. The QL shall be less than or equal to the following concentrations:

Characteristic	Quantification Level
Chromium	25 µg/L
TRC	0.10 mg/L
TSS	1.0 mg/L
Zinc (Outfall 001 Only)	26 µg/L
Zinc (Outfall 105 Only)	1.0 mg/L

   b. The QL is defined as the lowest concentration used to calibrate a measurement system in accordance with the procedures published for the method. The permittee shall use any method in accordance with Part II. A of this permit.

   c. It is the responsibility of the permittee to ensure that proper quality assurance/quality control (QA/QC) protocols are followed during the sampling and analytical procedures. QA/QC information shall be documented to confirm that appropriate analytical procedures have been used and the required QLs have been attained.

4. <u>Compliance Reporting for parameters in Part I.A</u>.

   a. Monthly Average – Compliance with the monthly average limitations and/or reporting requirements for the parameters listed in Part I.B.3.a of this permit condition shall be determined as follows: All concentration data below the QL used for the analysis (QL must be less than or equal to the QL listed in Part I.B.3.a above) shall be treated as zero. All concentration data equal to or above the QL used for the analysis (QL must be less than or equal to the QL listed in Part I.B.3.a above) shall be treated as it is reported. An arithmetic average shall be calculated using all reported data for the month, including the defined zeros. This arithmetic average shall be reported on the Discharge Monitoring Report (DMR) as calculated. If all data are below the QL used for the analysis (QL must be less than or equal to the QL listed in Part I.B.3.a above), then the average shall be reported as "<QL". If reporting for quantity is required on the DMR and the reported monthly average concentration is <QL, then report "<QL" for the quantity. Otherwise use the reported concentration data (including the defined zeros) and flow data for each sample day to determine the daily quantity and report the monthly average of the calculated daily quantities.

   b. Daily Maximum - Compliance with the daily maximum limitations and/or reporting requirements for the parameters listed in Part I.B.3.a of this permit condition shall be determined as follows: All concentration data below the QL used for the analysis (QL must be less than or equal to the QL listed in Part I.B.3.a above) shall be treated as zero. All concentration data equal to or above the QL used for the analysis (QL must be less than or equal to the QL listed in Part I.B.3.a above) shall be treated as reported. An arithmetic average shall be calculated using all reported data, including the defined zeros, collected within each day during the reporting month. The maximum value of these daily averages thus determined shall be reported on the DMR as the Daily Maximum. If all data are below the QL used for the analysis (QL must be less than or equal to the QL listed in Part I.B.3.a above), then the maximum value of the daily averages shall be reported as "<QL". If reporting for quantity is required on the DMR and the reported daily maximum is <QL, then report "<QL" for the quantity. Otherwise use the reported daily average concentrations (including the defined zeros) and corresponding daily flows to determine daily average quantities and report the maximum of the daily average quantities during the reporting month.

   c. Maximum Weekly Average (Outfall 111 Only) - Compliance with the weekly average limitations and/or reporting requirements for the parameters listed in Part I.B.3.a of this permit condition shall be determined as follows: All concentration data below the QL used for the analysis (QL must be less than or equal to the QL listed in Part I.B.3.a above) shall be treated as zero. All concentration data equal to or above the QL used for the analysis (QL must be less than or equal to the QL listed in Part I.B.3.a above) shall be treated as reported. An arithmetic average shall be calculated using all reported data, including the defined zeros, collected within each complete calendar week and entirely contained within the reporting month. The maximum value of the weekly averages thus determined shall be reported on the DMR. If all data are below the QL used for the analysis (QL must be less than or equal to the QL listed in Part I.B.3.a above), then the weekly average shall be reported as "<QL". If reporting for quantity is required on the DMR and the reported weekly average concentration is <QL, then report "<QL" for the quantity. Otherwise use the reported concentration data (including the defined zeros) and flow data for each sample day to determine the daily quantity and report the maximum weekly average of the calculated daily quantities.

   d. Single Datum - Any single datum required shall be reported as "<QL" if it is less than the QL used in the analysis (QL must be less than or equal to the QL listed in Part I.B.3.a above). Otherwise the numerical value shall be reported.

e. Significant Digits - The permittee shall report at least the same number of significant digits as the permit limit for a given parameter. Regardless of the rounding convention used (i.e., 5 always rounding up or to the nearest even number) by the permittee, the permittee shall use the convention consistently, and shall ensure that consulting laboratories employed by the permittee use the same convention.

f. Heat Rejection - Heat rejected rate submitted monthly shall be a calculation of the maximum heat directed to the waste heat treatment facility from Units 1 and/or 2. The following calculation shall be used to determine heat rejection:

$$Q = \frac{C_p m(\Delta T)}{24 \text{ hr}}$$

Where Q = Heat Rejection, BTU/Hour
C_p = Heat Capacity (Specific Heat) of pure water
= 1.0 BTU/pound ^{o}F
m = Mass of Water
= flow rate (MGD) x specific gravity of pure water
= flow rate (MGD) x 8.34 pounds/gallon
ΔT = Temperature at outlet waterbox – temperature of intake waterbox, ^{o}F

C. Whole Effluent Toxicity Program Requirements

1. Biological Monitoring for Outfall 001

a. In accordance with the schedule in Part I.C.2. below, the permittee shall conduct annual chronic toxicity tests for the duration of the permit. The permittee shall collect grab samples of effluent from Outfall 001.

The chronic tests to use are:

Chronic 3-Brood Static Renewal Survival and Reproduction Test using *Ceriodaphnia dubia*

Chronic 7-Day Static Renewal Survival and Growth Test using *Pimephales promelas*

These chronic tests shall be conducted in such a manner and at sufficient dilutions (minimum of five dilutions) to determine the "No Observed Effect Concentration" (NOEC) for survival and reproduction or growth. Results which cannot be quantified (i.e., a "less than" NOEC value) are not acceptable and a retest shall be performed. The NOEC as determined by hypothesis testing shall be converted to TU_c (Chronic Toxic Units) for DMR reporting where $TU_c = 100/NOEC$. Report the LC_{50} at 48 hours and the IC_{25} with the NOEC's in the test report.

b. The permittee may provide additional samples to address data variability. These data shall be reported. Test procedures and reporting shall be in accordance with the WET testing methods cited in 40 CFR 136.3.

c. The test dilutions shall bracket and include the following endpoint:

Chronic NOEC $\geq$ 100%; equivalent to a $TU_c \leq 1.0$

d. The test data will be evaluated statistically for reasonable potential at the conclusion of the test period. The data may be evaluated sooner if requested by the permittee or if toxicity has been noted. Should evaluation of the data indicate that a limit is warranted, a WET limit and compliance schedule will be required.

e. The permit may be modified or revoked and reissued to include pollutant specific limits in lieu of a WET limit should it be demonstrated that toxicity is due to specific parameters. The pollutant specific limitation shall control the toxicity of the effluent.

f. Should the permittee conduct toxicity testing of the effluent prior to the compliance date listed in the schedule in Part I.C.2. below, the results of the test and the test report shall be reported with the DMR for the month following the receipt of the testing results. In no case shall this exceed 45 days from the completion of the test or the report submission date below, whichever may occur first.

2. Reporting Schedule

The permittee shall monitor during the specified period; shall report the results on the DMR; and shall supply one copy of the toxicity test report specified in this Whole Effluent Toxicity Program in accordance with the following schedule:

Period	Sampling Period	DMR/Report Submission Dates
Annual 1	January 1, 2015 – December 31, 2015	January 10, 2016
Annual 2	January 1, 2016 – December 31, 2016	January 10, 2017
Annual 3	January 1, 2017 – December 31, 2017	January 10, 2018
Annual 4	January 1, 2018 – December 31, 2018	January 10, 2019

D. Lake Level Management and Lake Anna Dam Flow Release Conditions

1. This VPDES permit shall govern releases from the Lake Anna Dam until such time as the permittee has notified DEQ of its intent to implement a permanent increase of three inches in the normal target pool elevation of Lake Anna to support a new unit (Unit 3) and implements the increase. Upon implementation of the permanent increase of three inches in the normal target pool elevation of Lake Anna, VWP permit number 10-2001 shall supersede this section and govern flow releases from the Lake Anna Dam.

2. Except as provided in Part I.D.4 below, the permittee shall at all times provide a minimum release from the Lake Anna dam of 40 cfs.

3. Skimmer gate operations and adjustments shall be performed in accordance with Station Operating Procedures (SOP). The SOP shall reflect the use of both engineering calculations and the flow gaging station on the North Anna River downstream of the Lake Anna dam (USGS 01670400), with the target of achieving the flow releases identified in this section. The permittee shall update the SOP and submit for approval a summary description of the SOP procedures for skimmer gate adjustments to target flow releases of 40 cfs and below to the DEQ – Northern Regional Office by August 8, 2014. Once approved, the summary description of the SOP procedures shall be an enforceable part of the permit. Any changes to the SOP procedures for skimmer gate adjustments that relate to flow releases shall be submitted for approval to the DEQ - Northern Regional Office through an updated summary description of the SOP procedures prior to implementing the proposed changes.

4. When the level in Lake Anna reaches 248 feet above mean sea level (msl), the permittee shall begin reducing releases below the 40 cfs minimum in accordance with the following conditions:

   a. Minimum release rates shall not drop below 20 cfs.

   b. Prior to reducing Lake Anna Dam releases from 40 cfs to 20 cfs, the permittee shall provide a minimum of 72 hours advance notice to the Department of Environmental Quality – Northern Regional Office, and the downstream users and lake stakeholders identified below:

      - Hanover County Public Utilities
      - Bear Island Paper Company
      - Engel Farms, Incorporated
      - Pamunkey Indian Tribal Government
      - Virginia Department of Game and Inland Fisheries
      - Lake Anna Civic Association

   c. Skimmer gate adjustments shall be performed in accordance with Station Operating Procedures as described in Part I.D.3 above.

   d. When transitioning between dam releases of 40 cfs and 20 cfs, the releases shall be stepped down in increments of approximately 5 cfs with at least a 72-hour period following each incremental change, and prior to any subsequent reduction.

   e. During the period in which releases are reduced below 40 cfs, conditions in the North Anna River shall be monitored in accordance with the North Anna River Monitoring Plan – Low Flow Conditions previously submitted by the permittee and approved by DEQ.

      The permittee shall update and submit for approval the North Anna River Monitoring Plan – Low Flow Conditions to the DEQ - Northern Regional Office by November 8, 2014. Once approved, the plan shall be an enforceable part of the permit. Any future changes to the plan must be submitted for approval to the DEQ - Northern Regional Office 60 days prior to implementing the proposed changes.

   f. Upon the lake level returning to greater than 248 feet msl, releases from the dam shall return to 40 cfs. Releases shall be stepped up in approximate 5 cfs increments with a 24-hour period between each increase, unless lake level is increasing rapidly due to significant inflow to the lake.

   g. If any downstream user identifies an adverse effect at any time during flow reductions and notifies the DEQ – Northern Regional Office of the adverse effect, DEQ shall make a timely investigation. If after notice to the permitee and affected downstream users, DEQ finds an adverse effect from the flow reduction the permittee shall increase releases from the Lake Anna Dam when directed by DEQ. Releases shall be stepped up in approximate 5 cfs increments with a 24-hour period between each increase, until the flow reaches 40 cfs or DEQ finds that the adverse effect has been eliminated.

   h. Adverse effect is defined as the inability to withdraw and/or discharge water for proper operation of facilities, or impairment of water quality.

5. The existing gaging station on the North Anna River downstream of the Lake Anna dam (USGS 01670400) shall remain operational such that flow data are acceptable to be published by the U.S. Geological Survey (USGS). This may be achieved through a cooperative agreement with the USGS for the costs of operation and maintenance of the existing gaging station.

6. The permittee shall install and operate technology to measure and record the water elevation at the Lake Anna dam by May 8, 2015. The lake level recording technology shall, at a minimum, have a measurement accuracy of 0.05 feet and minimize the effects of wave action on water elevation measurements. Lake level measurements shall be recorded at least daily. The procedures for operation and maintenance of the lake level monitoring and recording instrumentation shall be incorporated into the facility's Operation and Maintenance Manual. Installation and operation shall not contravene those requirements established within Part I.G.2.a of VWP Permit 10-2001.

E. Post 316(a) Monitoring

1. In accordance with the original 316(a) study submittal and the biological and temperature sampling conducted since then, and to support 316(a) variance approval, the permittee shall continue to conduct temperature and biological monitoring of Lake Anna, the Waste Heat Treatment Facility, and the North Anna River.

2. The permittee shall review the existing Post 316(a) Monitoring Plan and notify the DEQ - Northern Regional Office, in writing, whether it is still accurate and complete by November 8, 2014. If the Post 316(a) Monitoring Plan is no longer accurate and complete, a revised Post 316(a) Monitoring Plan shall be submitted for approval to the DEQ - Northern Regional Office by November 8, 2014. The approved plan is an enforceable part of the permit. Any future changes to the plan must be submitted for approval to the DEQ - Northern Regional Office at least 60 days prior to implementation.

3. Temperature monitoring shall occur at a minimum of eleven (11) stations; three in the WHTF, seven in Lake Anna, and one in the North Anna River. Fixed continuous temperature recorders shall be used at each location to record hourly temperature in degrees Celsius at a depth of one meter for all of the stations except at the station in Lake Anna closest to Dike 3 which shall be placed at a depth of three meters. Temperature recorders shall be field verified and calibrated annually.

4. Biological monitoring shall include fish population surveys.

5. The permittee shall submit the results for the preceding year's monitoring by May 31 of each year. The permittee shall submit with the annual report an analysis of the data and recommendations for changes to the study design as appropriate.

F. Storm Water Management

1. General Storm Water Special Conditions

   a. Quarterly Visual Examination of Storm Water Quality

      1. The permittee shall perform and document a quarterly visual examination of a storm water discharge associated with industrial activity from the three industrially influenced outfalls listed in Part I.A.20, except discharges exempted below. The examination(s) shall be made at least once in each of the following three-month periods: January through March, April through June, July through September, and October through December. The visual examination shall be made during normal working hours, where practicable, when considerations for safety and feasibility allow. If no storm event resulted in runoff from the facility during a monitoring quarter, the permittee is excused from visual monitoring for that quarter provided that documentation is included with the monitoring records indicating that no runoff occurred. The documentation shall be signed and certified in accordance with Part II.K (Signatory Requirements) of this permit.

2. Visual examinations shall be made of samples collected within the first 30 minutes (or as soon thereafter as practical, but not to exceed three hours) of when the runoff or snowmelt begins discharging from the facility. The examination shall document observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen and other obvious indicators of storm water pollution. The examination shall be conducted in a well-lit area. No analytical tests are required to be performed on the samples. All samples (except snowmelt samples) shall be collected from the discharge resulting from a storm event that results in an actual discharge from the site (defined as a "measurable storm event"), and that occurs at least 72 hours from the previously measurable storm event. The 72-hour storm interval is waived if the permittee is able to document that less than a 72-hour interval is representative for local storm events during the sampling period. Where practicable, the same individual should carry out the collection and examination of discharges for the entire permit term. If no qualifying storm event resulted in runoff during normal working hours from the facility during a monitoring quarter, the permittee is excused from visual monitoring for that quarter provided that documentation is included with the monitoring records indicating that no qualifying storm event occurred during normal working hours that resulted in storm water runoff during that quarter. The documentation shall be signed and certified in accordance with Part II.K (Signatory Requirements) of this permit.

3. The visual examination reports shall be maintained on-site with the Storm Water Pollution Prevention Plan (SWPPP). The report shall include the outfall location, the examination date and time, examination personnel, the nature of the discharge (i.e., runoff or snow melt), visual quality of the storm water discharge (including observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of storm water pollution), and probable sources of any observed storm water contamination.

4. If the facility has two or more outfalls that discharge substantially identical effluents, based on similarities of the industrial activities, significant materials, size of drainage areas, and storm water management practices occurring within the drainage areas of the outfalls, the permittee may conduct visual monitoring on the effluent of just one of the outfalls and report that the observations also-apply to the substantially identical outfall(s), provided that the permittee includes in the storm water pollution prevention plan a description of the location of the outfalls and explains in detail why the outfalls are expected to discharge substantially identical effluents. In addition, for each outfall that the permittee believes is representative, an estimate of the size of the drainage area (in square feet) and an estimate of the runoff coefficient of the drainage area (i.e., low (under 40 percent), medium (40 to 65 percent), or high (above 65 percent)) shall be provided in the plan.

5. When the permittee is unable to conduct the visual examination due to adverse climatic conditions, the permittee shall document the reason for not performing the visual examination and retain this documentation onsite with the records of the visual examinations. Adverse weather conditions that may prohibit the collection of samples include weather conditions that create dangerous conditions for personnel (such as local flooding, high winds, hurricane, tornadoes, electrical storms, etc.) or otherwise make the collection of a sample impracticable (drought, extended frozen conditions, etc.).

b. <u>Allowable Non-Storm Water Discharges</u>

1. The following non-storm water discharges are authorized by this permit provided the non-storm water component of the discharge is in compliance with this VPDES permit:

   a) Discharges from fire fighting activities;
   b) Fire hydrant flushings;
   c) Potable water including water line flushings;
   d) Uncontaminated air conditioning or compressor condensate;
   e) Irrigation drainage;

f) Landscape watering provided all pesticides, herbicides and fertilizers have been applied in accordance with manufacturer's instructions;
g) Pavement wash waters where no detergents are used and no spills or leaks of toxic or hazardous materials have occurred (unless all spilled material has been removed);
h) Routine external building wash down which does not use detergents;
i) Uncontaminated ground water or spring water;
j) Foundation or footing drains where flows are not contaminated with process materials; and
k) Incidental windblown mist from cooling towers that collects on rooftops or adjacent portions of the facility, but NOT intentional discharges from the cooling tower (e.g., "piped" cooling tower blowdown or drains).

2. Except for flows from fire fighting activities, the Storm Water Pollution Prevention Plan shall include:

   a) Identification of each allowable non-storm water source;
   b) The location where the non-storm water is likely to be discharged; and
   c) Descriptions of appropriate BMPs for each source.

3. If mist blown from cooling towers is included as one of the allowable non-storm water discharges from the facility, the permittee shall specifically evaluate the discharge for the presence of chemicals used in the cooling tower. The evaluation shall be included in the SWPPP.

c. <u>Releases of Hazardous Substances or Oil in Excess of Reportable Quantities</u>

The discharge of hazardous substances or oil in the storm water discharge(s) from the facility shall be prevented or minimized in accordance with the storm water pollution prevention plan for the facility. This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill. This permit does not relieve the permittee of the reporting requirements of 40 CFR 110, 40 CFR 117 and 40 CFR 302 or § 62.1-44.34:19 of the Code of Virginia. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR 110, 40 CFR 117 or 40 CFR 302 occurs during a 24-hour period:

1. The permittee is required to notify the Department in accordance with the requirements of Part II.G (Reports of Unauthorized Discharges) of this permit as soon as he or she has knowledge of the discharge;

2. Where a release enters a municipal separate storm sewer system (MS4), the permittee shall also notify the owner of the MS4; and

3. The storm water pollution prevention plan required by this permit shall be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the plan shall be modified where appropriate.

2. <u>Storm Water Pollution Prevention Plan</u>

A storm water pollution prevention plan (SWPPP) for the facility was required to be developed and implemented under the previous permit. The existing storm water pollution prevention plan shall be reviewed and modified, as appropriate, to conform to the requirements of this section. Permittees shall implement the provisions of the storm water pollution prevention plan as a condition of this permit.

The storm water pollution prevention plan requirements of this permit may be fulfilled, in part, by incorporating by reference other plans or documents such as a spill prevention control and countermeasure (SPCC) plan developed for the facility under Section 311 of the Clean Water Act, or best management practices (BMP) programs otherwise required for the facility, provided that the incorporated plan meets or exceeds the plan requirements of Part I.F.2.b (Contents of the Plan). All plans incorporated by reference into the storm water pollution prevention plan become enforceable under this permit. If a plan incorporated by reference does not contain all of the required elements of the SWPPP of Part I.F.2.b the permittee shall develop the missing SWPPP elements and include them in the required plan.

a. Deadlines for Plan Preparation and Compliance

1. Measures That Require Construction. In cases where construction is necessary to implement measures required by the plan, the plan shall contain a schedule that provides compliance with the plan as expeditiously as practicable, but no later than 3 years after the effective date of this permit. Where a construction compliance schedule is included in the plan, the schedule shall include appropriate nonstructural and/or temporary controls to be implemented in the affected portion(s) of the facility prior to completion of the permanent control measure.

b. Contents of the Plan

The contents of the SWPPP shall comply with the requirements listed below. The plan shall include, at a minimum, the following items:

1. Pollution Prevention Team. The plan shall identify the staff individuals by name or title that comprise the facility's storm water pollution prevention team. The pollution prevention team is responsible for assisting the facility or plant manager in developing, implementing, maintaining, revising, and ensuring compliance with the facility's SWPPP. Specific responsibilities of each staff individual on the team shall be identified and listed.

2. Site Description. The plan shall include the following:

   a) Activities at the Facility. A description of the nature of the industrial activities at the facility.

   b) General Location Map. A general location map (e.g., USGS quadrangle or other map) with enough detail to identify the location of the facility and the receiving waters within one mile of the facility.

   c) Site Map. A site map identifying the following:

      (i) The size of the property (in acres);

      (ii) The location and extent of significant structures and impervious surfaces (roofs, paved areas and other impervious areas);

      (iii) Locations of all storm water conveyances including ditches, pipes, swales, and inlets, and the directions of storm water flow (use arrows to show which ways storm water will flow);

      (iv) Locations of all existing structural and source control BMPs;

      (v) Locations of all surface water bodies, including wetlands;

      (vi) Locations of potential pollutant sources identified under Part I.F.2.b.3;

      (vii) Locations where significant spills or leaks identified under Part I.F.2 b.4 have occurred;

(viii) Locations of the following activities where such activities are exposed to precipitation: fueling stations; vehicle and equipment maintenance and/or cleaning areas; loading/unloading areas; locations used for the treatment, storage or disposal of wastes; liquid storage tanks; processing and storage areas; access roads, rail cars and tracks; transfer areas for substances in bulk; and machinery;

(ix) Locations of storm water outfalls and an approximate outline of the area draining to each outfall, and location of municipal storm sewer systems, if the storm water from the facility discharges to them;

(x) Location and description of all non-storm water discharges;

(xi) Location of any storage piles containing salt used for deicing or other commercial or industrial purposes;

(xii) Locations and sources of runon to the site from adjacent property, where the runon contains significant quantities of pollutants. The permittee shall include an evaluation with the SWPPP of how the quality of the storm water running onto the facility impacts the facility's storm water discharges; and

(xiii) Storage tanks, scrap yards, general refuse areas; short and long term storage of general materials (including, but not limited to: supplies, construction materials, paint equipment, oils, fuels, used and unused solvents, cleaning materials, paint, water treatment chemicals, fertilizer, and pesticides); landfills; construction sites; and stock pile areas (such as coal or limestone piles).

d) Receiving Waters and Wetlands. The name of all surface waters receiving discharges from the site, including intermittent streams, dry sloughs, and arroyos. Provide a description of wetland sites that may receive discharges from the facility.

3. Summary of Potential Pollutant Sources. The plan shall identify each separate area at the facility where industrial materials or activities are exposed to storm water. Industrial materials or activities include, but are not limited to: material handling equipment or activities, industrial machinery, raw materials, industrial production and processes, intermediate products, byproducts, final products, and waste products. Material handling activities include, but are not limited to: the storage, loading and unloading, transportation, disposal, or conveyance of any raw material, intermediate product, final product or waste product. For each separate area identified, the description shall include:

a) Activities in Area. A list of the activities (e.g., material storage, equipment fueling and cleaning, cutting steel beams); and

b) Pollutants. A list of the associated pollutant(s) or pollutant constituents (e.g., crankcase oil, zinc, sulfuric acid, cleaning solvents, etc.) for each activity. The pollutant list shall include all significant materials handled, treated, stored or disposed that have been exposed to storm water in the three years prior to the date this SWPPP was prepared or amended. The list shall include any hazardous substances or oil at the facility.

4. Spills and Leaks. The SWPPP shall clearly identify areas where potential spills and leaks that can contribute pollutants to storm water discharges can occur and their corresponding outfalls. The plan shall include a list of significant spills and leaks of toxic or hazardous pollutants that actually occurred at exposed areas, or that drained to a storm water conveyance during the three-year period prior to the date this SWPPP was prepared or amended. The list shall be updated if significant spills

or leaks occur in exposed areas of the facility during the term of the permit. Significant spills and leaks include releases of oil or hazardous substances in excess of reportable quantities.

5. Sampling Data. The plan shall include a summary of existing storm water discharge sampling data taken at the facility. The summary shall include, at a minimum, any data collected during the previous permit term.

6. Storm Water Controls.

   a) BMPs shall be implemented for all the areas identified in Part I.F.2.b.3 (Summary of Potential Pollutant Sources) to prevent or control pollutants in storm water discharges from the facility. All reasonable steps shall be taken to control or address the quality of discharges from the site that may not originate at the facility. The SWPPP shall describe the type, location and implementation of all BMPs for each area where industrial materials or activities are exposed to storm water. Selection of BMPs shall take into consideration:

      1. That preventing storm water from coming into contact with polluting materials is generally more effective, and less costly, than trying to remove pollutants from storm water;

      2. BMPs generally shall be used in combination with each other for most effective water quality protection;

      3. Assessing the type and quantity of pollutants, including their potential to impact receiving water quality, is critical to designing effective control measures;

      4. That minimizing impervious areas at the facility can reduce runoff and improve groundwater recharge and stream base flows in local streams (however, care shall be taken to avoid ground water contamination);

      5. Flow attenuation by use of open vegetated swales and natural depressions can reduce in-stream impacts of erosive flows;

      6. Conservation or restoration of riparian buffers will help protect streams from storm water runoff and improve water quality; and

      7. Treatment interceptors (e.g., swirl separators and sand filters) may be appropriate in some instances to minimize the discharge of pollutants.

   b) Control Measures. The permittee shall implement the following types of BMPs to prevent and control pollutants in the storm water discharges from the facility, unless it can be demonstrated and documented that such controls are not relevant to the discharges (e.g., there are no storage piles containing salt).

      (i) Good Housekeeping. The permittee shall keep clean all exposed areas of the facility that are potential sources of pollutants to storm water discharges. Typical problem areas include areas around trash containers, storage areas, loading docks, and vehicle fueling and maintenance areas. The plan shall include a schedule for regular pickup and disposal of waste materials, along with routine inspections for leaks and conditions of drums, tanks and containers. The introduction of raw, final or waste materials to exposed areas of the facility shall be minimized to the maximum extent practicable. The generation of dust, along with off-site vehicle tracking of raw, final or waste materials, or sediments, shall be minimized to the maximum extent practicable.

(ii) Eliminating and Minimizing Exposure. To the extent practicable, industrial materials and activities shall be located inside, or protected by a storm-resistant covering to prevent exposure to rain, snow, snowmelt, and runoff. Note: Eliminating exposure at all industrial areas may make the facility eligible for the "Conditional Exclusion for No Exposure" provision of 9VAC25-31-120 E, thereby eliminating the need to have a permit.

(iii) Preventive Maintenance. The permittee shall have a preventive maintenance program that includes regular inspection, testing, maintenance and repairing of all industrial equipment and systems to avoid breakdowns or failures that could result in leaks, spill and other releases. This program is in addition to the specific BMP maintenance required under Part I.F.2.c (Maintenance of BMPs).

(iv) Spill Prevention and Response Procedures. The plan shall describe the procedures that will be followed for preventing and responding to spills and leaks.

(a) Preventive measures such as barriers between material storage and traffic areas, secondary containment provisions, and procedures for material storage and handling.

(b) Response procedures shall address notification of appropriate facility personnel, emergency agencies, and regulatory agencies, and procedures for stopping, containing and cleaning up spills. Measures for cleaning up hazardous material spills or leaks shall be consistent with applicable RCRA regulations at 40 CFR Part 264 and 40 CFR Part 265. Employees who may cause, detect or respond to a spill or leak shall be trained in these procedures and have necessary spill response equipment available. If possible, one of these individuals shall be a member of the Pollution Prevention Team.

(c) Contact information for individuals and agencies that shall be notified in the event of a spill shall be included in the SWPPP, and in other locations where it will be readily available.

(v) Routine Facility Inspections. Facility personnel who possess the knowledge and skills to assess conditions and activities that could impact storm water quality at the facility, and who can also evaluate the effectiveness of BMPs shall regularly inspect all areas of the facility where industrial materials or activities are exposed to storm water. These inspections are in addition to, or as part of, the comprehensive site evaluation required under Part I.F.2.d. At least one member of the Pollution Prevention Team shall participate in the routine facility inspections.

The inspection frequency shall be specified in the plan based upon a consideration of the level of industrial activity at the facility, but shall be a minimum of quarterly unless more frequent intervals are specified elsewhere in the permit or written approval is received from the Department for less frequent intervals. At least once each calendar year, the routine facility inspection shall be conducted during a period when a storm water discharge is occurring.

Any deficiencies in the implementation of the SWPPP that are found shall be corrected as soon as practicable, but not later than within 30 days of the inspection, unless permission for a later date is granted in writing by the Director. The results of the inspections shall be documented in the SWPPP, along with the date(s) and description(s) of any corrective actions that were taken in response to any deficiencies or opportunities for improvement that were identified.

(v) Employee Training. The permittee shall implement a storm water employee training program for the facility. The SWPPP shall include a schedule for all types of necessary training, and shall document all training sessions and the employees who received the training. Training shall be provided for all employees who work in areas where industrial materials or activities are exposed to storm water, and for employees who are responsible for implementing activities identified in the SWPPP (e.g., inspectors, maintenance personnel, etc.). The training shall cover the components and goals of the SWPPP, and include such topics as spill response, good housekeeping, material management practices, BMP operation and maintenance, etc. The SWPPP shall include a summary of any training performed.

(vi) Sediment and Erosion Control. The plan shall identify areas at the facility that, due to topography, land disturbance (e.g., construction, landscaping, site grading), or other factors, have a potential for soil erosion. The permittee shall identify and implement structural, vegetative, and/or stabilization BMPs to prevent or control on-site and off-site erosion and sedimentation. Flow velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel if the flows would otherwise create erosive conditions.

(vii) Management of Runoff. The plan shall describe the storm water runoff management practices (i.e., permanent structural BMPs) for the facility. These types of BMPs are typically used to divert, infiltrate, reuse, or otherwise reduce pollutants in storm water discharges from the site. Structural BMPs may require a separate permit under § 404 of the CWA and the Virginia Water Protection Permit Program Regulation (9VAC25-210) before installation begins.

7. Additional Storm Water Pollution Prevention Plan Requirements

In addition to the requirements found in Part I.F.2.b.1 through Part I.F.2.b.6, the SWPPP shall include the following items:

a. Good housekeeping measures.

1. Delivery vehicles. The plan shall describe measures that prevent or minimize contamination of storm water runoff from delivery vehicles arriving on the plant site. At a minimum the permittee shall consider the following:
   a) Develop procedures for the inspection of delivery vehicles arriving on the plant site, and ensure overall integrity of the body or container; and
   b) Develop procedures to deal with leakage/spillage from vehicles or containers.
2. Fuel oil unloading areas. The plan shall describe measures that prevent or minimize contamination of precipitation/surface runoff from fuel oil unloading areas. At a minimum the permittee shall consider using the following measures, or an equivalent:
   a) Use of containment curbs in unloading areas;
   b) During deliveries, having station personnel familiar with spill prevention and response procedures present to ensure that any leaks/spills are immediately contained and cleaned up; and
   c) Use of spill and overflow protection (e.g., drip pans, drip diapers, and/or other containment devices placed beneath fuel oil connectors to contain potential spillage during deliveries or from leaks at the connectors).

3. Chemical loading/unloading areas. The permittee shall describe and implement measures that prevent or minimize the contamination of precipitation/surface runoff from chemical loading/unloading areas. At a minimum the permittee shall consider using the following measures (or their equivalents):

   a) Use of containment curbs at chemical loading/unloading areas to contain spills;

   b) During deliveries, having station personnel familiar with spill prevention and response procedures present to ensure that any leaks/spills are immediately contained and cleaned up; and

   c) Covering chemical loading/unloading areas, and storing chemicals indoors.

4. Miscellaneous loading/unloading areas. The permittee shall describe and implement measures that prevent or minimize the contamination of storm water runoff from loading and unloading areas. The permittee shall consider the following, at a minimum (or their equivalents):

   a) Covering the loading area;

   b) Grading, berming, or curbing around the loading area to divert runon; or

   c) Locating the loading/unloading equipment and vehicles so that leaks are contained in existing containment and flow diversion systems.

5. Liquid storage tanks. The permittee shall describe and implement measures that prevent or minimize contamination of storm water runoff from aboveground liquid storage tanks. At a minimum the permittee shall consider employing the following measures (or their equivalents):

   a) Use of protective guards around tanks;

   b) Use of containment curbs;

   c) Use of spill and overflow protection; and

   d) Use of dry cleanup methods.

6. Large bulk fuel storage tanks. The permittee shall describe and implement measures that prevent or minimize contamination of storm water runoff from large bulk fuel storage tanks. At a minimum the permittee shall consider employing containment berms (or its equivalent). The permittee shall also comply with applicable state and federal laws, including Spill Prevention Control and Countermeasures (SPCC).

7. Spill reduction measures. The permittee shall describe and implement measures to reduce the potential for an oil/chemical spill, or reference the appropriate section of their SPCC plan. The Station shall inspect their above ground storage tanks in accordance with the facility's SPCC plan.

8. Oil bearing equipment in switchyards. The permittee shall describe and implement measures to prevent or minimize contamination of surface runoff from oil bearing equipment in switchyard areas. The permittee shall consider the use of level grades and gravel surfaces to retard flows and limit the spread of spills, and the collection of storm water runoff in perimeter ditches.

9. Residue hauling vehicles. All residue hauling vehicles shall be inspected for proper covering over the load, adequate gate sealing and overall integrity of the container body. Vehicles without load coverings or adequate gate sealing, or with leaking containers or beds shall be repaired as soon as practicable.

10. Areas adjacent to disposal ponds or landfills. The permittee shall describe and implement measures that prevent or minimize contamination of storm water runoff from areas adjacent to disposal ponds or landfills. The permittee shall develop procedures to:

a) Reduce ash residue which may be tracked on to access roads traveled by residue trucks or residue handling vehicles; and

b) Reduce ash residue on exit roads leading into and out of residue handling areas.

11. Landfills, scrapyards, surface impoundments, open dumps, general refuse sites. The plan shall address and include appropriate BMPs for landfills, scrapyards, surface impoundments, open dumps and general refuse sites.

12. Vehicle maintenance activities. For vehicle maintenance activities performed on the plant site, the permittee shall use applicable BMPs.

13. Material storage areas. The permittee shall describe and implement measures that prevent or minimize contamination of storm water runoff from material storage areas (including areas used for temporary storage of miscellaneous products, and construction materials stored in lay-down areas). The permittee shall consider the use of the following measures (or their equivalents): flat yard grades; runoff collection in graded swales or ditches; erosion protection measures at steep outfall sites (e.g., concrete chutes, riprap, stilling basins); covering lay-down areas; storing materials indoors; and covering materials temporarily with polyethylene, polyurethane, polypropylene, or hypalon. Storm water runon may be minimized by constructing an enclosure or building a berm around the area.

c. Maintenance

All BMPs identified in the SWPPP shall be maintained in effective operating condition. Storm water BMPs identified in the SWPPP shall be observed during active operation (i.e., during a storm water runoff event) to ensure that they are functioning correctly. Where discharge locations are inaccessible, nearby downstream locations shall be observed. The observations shall be documented in the SWPPP.

The SWPPP shall include a description of procedures and a regular schedule for preventive maintenance of all BMPs, and shall include a description of the applicable back-up practices that are in place should a runoff event occur while a BMP is off-line. The effectiveness of nonstructural BMPs shall also be maintained by appropriate means (e.g., spill response supplies available and personnel trained, etc.).

If site inspections required by Part I.F.2.b.6.b(v) (Routine Facility Inspections) or Part I.F.2.d (Comprehensive Site Compliance Evaluation) identify BMPs that are not operating effectively, repairs or maintenance shall be performed before the next anticipated storm event. If maintenance prior to the next anticipated storm event is not possible, maintenance shall be scheduled and accomplished as soon as practicable. In the interim, back-up measures shall be employed and documented in the SWPPP until repairs or maintenance is complete.

Documentation shall be kept with the SWPPP of maintenance and repairs of BMPs, including the date(s) of regular maintenance, date(s) of discovery of areas in need of repair or replacement, and for repairs, date(s) that the BMP(s) returned to full function, and the justification for any extended maintenance or repair schedules.

d. Comprehensive Site Compliance Evaluation

The permittee shall conduct comprehensive site compliance evaluations at least once a year. The evaluations shall be done by qualified personnel who possess the knowledge and skills to assess conditions and activities that could impact storm water quality at the facility, and who can also evaluate the effectiveness of BMPs. The personnel conducting the evaluations may be either facility employees or outside constituents hired by the facility.

1. Scope of the Compliance Evaluation. Evaluations shall include all areas where industrial materials or activities are exposed to storm water, as identified in Part I.F.2.b.3. The personnel shall evaluate:

   a) Industrial materials, residue or trash that may have or could come into contact with storm water;

   b) Leaks or spills from industrial equipment, drums, barrels, tanks or other containers that have occurred within the past three years;

   c) Off-site tracking of industrial or waste materials or sediment where vehicles enter or exit the site;

   d) Tracking or blowing of raw, final or waste materials from areas of no exposure to exposed areas;

   e) Evidence of, or the potential for, pollutants entering the drainage system;

   f) Evidence of pollutants discharging to surface waters at all facility outfalls, and the condition of and around the outfall, including flow dissipation measures to prevent scouring;

   g) Review of training performed, inspections completed, maintenance performed, quarterly visual examinations, and effective operation of BMPs; and

   h) Results of both visual and any analytical monitoring done during the past year shall be taken into consideration during the evaluation.

2. Based on the results of the evaluation, the SWPPP shall be modified as necessary (e.g., show additional controls on the map required by Part I.F.2.b.2.c; revise the description of controls required by Part I.F.2.b.6 to include additional or modified BMPs designed to correct problems identified). Revisions to the SWPPP shall be completed within 30 days following the evaluation, unless permission for a later date is granted in writing by the Director. If existing BMPs need to be modified or if additional BMPs are necessary, implementation shall be completed before the next anticipated storm event, if practicable, but not more than 60 days after completion of the comprehensive site evaluation, unless permission for a later date is granted in writing by the Department.

3. Compliance Evaluation Report. A report shall be written summarizing the scope of the evaluation, name(s) of personnel making the evaluation, the date of the evaluation, and all observations relating to the implementation of the SWPPP, including elements stipulated in Part I.F.2.d.1.a through Part I.F.2.d.1.f above. Observations shall include such things as: the location(s) of discharges of pollutants from the site; location(s) of previously unidentified sources of pollutants; location(s) of BMPs that need to be maintained or repaired; location(s) of failed BMPs that need replacement; and location(s) where additional BMPs are needed. The report shall identify any incidents of noncompliance that were observed. Where a report does not identify any incidents of noncompliance, the report shall contain a certification that the facility is in compliance with the SWPPP and this permit. The report shall be signed in accordance with Part II. K (Signatory Requirements) of this permit and maintained with the SWPPP.

4. Where compliance evaluation schedules overlap with routine inspections required under Part I.F.2.b.6.b(v), the annual compliance evaluation may be used as one of the routine inspections.

e. Signature and Plan Review

1. Signature/Location. The SWPPP shall be signed in accordance with Part II.K (Signatory Requirements) of this permit, dated, and retained on-site at the facility covered by this permit in accordance with Part II.B.2 (Records) of this permit. All other changes to the SWPPP, and other permit compliance documentation, shall be signed and dated by the person preparing the change or documentation.

2. Availability. The permittee shall make the SWPPP, annual site compliance evaluation report, and other information available to the Department upon request.

3. Required Modifications. The Director may notify the permittee at any time that the SWPPP, BMPs, or other components of the facility's storm water program do not meet one or more of the requirements of this permit. The notification shall identify specific provisions of the permit that are not being met, and may include required modifications to the storm water program, additional monitoring requirements, and special reporting requirements. The permittee shall make any required changes to the SWPPP within 60 days of receipt of such notification, unless permission for a later date is granted in writing by the Director, and shall submit a written certification to the Director that the requested changes have been made.

f. Maintaining an Updated SWPPP

1. The permittee shall review and amend the SWPPP as appropriate whenever:

   a) There is construction or a change in design, operation, or maintenance at the facility that has a significant effect on the discharge, or the potential for the discharge, of pollutants from the facility;

   b) Routine inspections or compliance evaluations determine that there are deficiencies in the BMPs;

   c) Inspections by local, state, or federal officials determine that modifications to the SWPPP are necessary;

   d) There is a spill, leak or other release at the facility; or

   e) There is an unauthorized discharge from the facility.

2. SWPPP modifications shall be made within 30 calendar days after discovery, observation or event requiring a SWPPP modification. Implementation of new or modified BMPs (distinct from regular preventive maintenance of existing BMPs described in Part I.F.2.b.6.b(iii) shall be initiated before the next storm event if possible, but no later than 60 days after discovery, or as otherwise provided or approved by the Director. The amount of time taken to modify a BMP or implement additional BMPs shall be documented in the SWPPP.

3. If the SWPPP modification is based on a release or unauthorized discharge, include a description and date of the release, the circumstances leading to the release, actions taken in response to the release, and measures to prevent the recurrence of such releases. Unauthorized releases and discharges are subject to the reporting requirements of Part II.G (Reports of Unauthorized Discharges) of this permit.

G. Other Requirements and Special Conditions

1. Operation and Maintenance (O&M) Manual Requirement
The permittee shall maintain a current Operations and Maintenance (O&M) Manual for the facility that is in accordance with Virginia Pollutant Discharge Elimination System Regulations, 9VAC25-31.

The O&M Manual and subsequent revisions shall include the manual effective date and meet Part II.K.2 and Part II.K.4 Signatory Requirements of the permit. Any changes in the practices and procedures followed by the permittee shall be documented in the O&M Manual within 90 days of the effective date of the changes. The permittee shall operate the treatment works in accordance with the O&M Manual and shall make the O&M manual available to Department personnel for review during facility inspections. Within 30 days of a request by DEQ, the current O&M Manual shall be submitted to the DEQ-NRO for review and approval.

The O&M manual shall detail the practices and procedures which will be followed to ensure compliance with the requirements of this permit. This manual shall include, but not necessarily be limited to, the following items, as appropriate:

a. Permitted outfall locations and techniques to be employed in the collection, preservation, and analysis of effluent, storm water and sludge samples;
b. Procedures for measuring and recording the duration and volume of industrial wastewater discharged;
c. Discussion of Best Management Practices, if applicable;
d. Procedures for handling, storing, and disposing of all wastes, fluids, and pollutants that will prevent these materials from reaching state waters;
e. Discussion of treatment works design, treatment works operation, routine preventative maintenance of units within the treatment works, critical spare parts inventory and record keeping;
f. A plan for the management and/or disposal of waste solids and residues;
g. List of facility, local and state emergency contacts; and
h. Procedures for reporting and responding to any spills and/or overflows.

2. Water Quality Criteria Monitoring (Outfall 001)
In addition to the compliance monitoring required in Part I.A.1 of the permit, the permittee shall monitor the effluent at Outfall 001 for the substances noted in Appendix B, "Water Quality Criteria Monitoring" according to the indicated analysis number, quantification level, sample type and frequency. Monitoring shall be conducted annually. Using Appendix B as the reporting form, the data shall be submitted in accordance with the schedule in Part I.C.2. Monitoring and analysis shall be conducted in accordance with 40 CFR Part 136 or alternative EPA approved methods. It is the responsibility of the permittee to ensure that proper QA/QC protocols are followed during the sample gathering and analytical procedures. The DEQ will use these data for making specific permit decisions in the future. This permit may be modified or, alternatively, revoked and reissued to incorporate limits for any of the substances listed in Appendix B.

3. Water Quality Criteria Reopener (Outfall 001)
Should effluent monitoring indicate the need for any water quality-based limitations, this permit may be modified or alternatively revoked and reissued to incorporate appropriate limitations.

4. 126 Priority Pollutants (Outfall 105)
In addition to the compliance monitoring required in Part I.A.10 of the permit, the permittee shall monitor the effluent at Internal Outfall 105 for the substances listed in Appendix A to 40 CFR Part 423. Any and all 126 priority pollutants listed in Appendix A to 40 CFR Part 423, contained in the chemicals added for cooling tower maintenance, shall be non-detectable in the blowdown discharge water. In accordance with Part I.A.10 of the permit, sampling for these pollutants (except total chromium and total zinc) shall be conducted quarterly.

This monitoring requirement may be waived if the permittee submits engineering calculations which demonstrate that the regulated pollutants are not detectable in the final discharge by the analytical methods in 40 CFR Part 136.

The permittee shall notify the DEQ-Northern Regional Office of any process change in the cooling tower, which may affect the quality of the associated discharge water.

5. <u>95% Capacity Reopener (Outfall 111)</u>
A written notice and a plan of action for ensuring continued compliance with the terms of this permit shall be submitted to the DEQ-Northern Regional Office (DEQ-NRO) when the monthly average flow influent to the sewage treatment plant reaches 95 percent of the design capacity authorized in this permit for each month of any three consecutive month period. The written notice shall be submitted within 30 days and the plan of action shall be received at the DEQ-NRO no later than 90 days from the third consecutive month for which the flow reached 95 percent of the design capacity. The plan shall include the necessary steps and a prompt schedule of implementation for controlling any current or reasonably anticipated problem resulting from high influent flows. Failure to submit an adequate plan in a timely manner shall be deemed a violation of this permit.

6. <u>Indirect Dischargers (Outfall 111)</u>
The permittee shall provide adequate notice to the Department of the following:
   a. Any new introduction of pollutants into the treatment works from an indirect discharger which would be subject to Section 301 or 306 of Clean Water Act and the State Water Control Law if it were directly discharging those pollutants; and

   b. Any substantial change in the volume or character of pollutants being introduced into the treatment works by a source introducing pollutants into the treatment works at the time of issuance of this permit.

   c. Adequate notice shall include information on (i) the quality and quantity of effluent introduced into the treatment works, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the treatment works.

7. <u>CTC and CTO Requirement (Outfall 111)</u>
In accordance with *Sewage Collection and Treatment* regulation (9VAC25-790), the permittee shall obtain a Certificate to Construct (CTC) and a Certificate to Operate (CTO) from the Department of Environmental Quality prior to constructing wastewater treatment works and operating the treatment works, respectively. Non-compliance with the CTC or CTO shall be deemed a violation of the permit.

8. <u>Licensed Operator Requirement (Outfall 111)</u>
The permittee shall employ or contract at least one Class IV licensed wastewater works operator for this facility. The license shall be issued in accordance with Title 54.1 of the Code of Virginia and the regulations of the Board for Waterworks and Wastewater Works Operators. The permittee shall notify the Department in writing whenever he is not complying, or has grounds for anticipating he will not comply with this requirement. The notification shall include a statement of reasons and a prompt schedule for achieving compliance.

9. Reliability Class (Outfall 111)
The Sewage Collection and Treatment Regulations at 9VAC25-790 require sewage treatment works to achieve a certain level of reliability in order to protect water quality and public health in the event of component or system failure. Reliability means a measure of the ability of the treatment works to perform its designated function without failure or interruption of service. Overflow criteria, such as period of discharge, are utilized solely for the establishment of reliability classification for design purposes and are not to be construed as authorization for or defense of an unpermitted discharge to state waters. The treatment works design shall provide for satisfactory operation during power failures, flooding, peak loads, equipment failure, and maintenance shut-down (in accordance with the requirements of the appropriate reliability class). Such design features include: (i) additional electrical power sources; (ii) additional flow storage capacity; and (iii) additional treatment unit operations, which provide for alternate operation in accordance with the issued certificate permit requirements.

a. The 0.030 MGD permitted treatment works shall meet Reliability Class II;
b. The installation of any new pump station(s) shall require Reliability Class I; and
c. The permittee shall be responsible for implementing and maintaining adequate safeguards to prevent the discharge of untreated wastewater and/or partially treated wastewater to Lake Anna that has not been treated in accordance with the requirements of this permit.

10. Sludge Reopener (Outfall 111)
The Board may promptly modify or revoke and reissue this permit if any applicable standard for sewage sludge use or disposal promulgated under Section 405(d) of the Clean Water Act is more stringent than any requirements for sludge use or disposal in this permit, or controls a pollutant or practice not limited in this permit.

11. Sludge Use and Disposal (Outfall 111)
The permittee shall conduct all sewage sludge use or disposal activities in accordance with the Sludge Management Plan (SMP) approved with the issuance of this permit. Any proposed changes in the sewage sludge use or disposal practices or procedures followed by the permittee shall be documented and submitted for DEQ-NRO approval 90 days prior to the effective date of the changes. Upon approval, the revised SMP becomes an enforceable part of the permit. The permit may be modified or alternatively revoked and reissued to incorporate limitations or conditions necessitated by substantive changes in sewage sludge use or disposal practices.

12. Materials Handling/Storage
Any and all product, materials, industrial wastes, and/or other wastes resulting from the purchase, sale, mining, extraction, transport, preparation, and/or storage of raw or intermediate materials, final product, by-product or wastes, shall be handled, disposed of, and/or stored in such a manner so as not to permit a discharge of such product, materials, industrial wastes, and/or other wastes to State waters, except as expressly authorized.

13. Notification Levels
The permittee shall notify the Department as soon as they know or have reason to believe:
a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in this permit, if that discharge will exceed the highest of the following notification levels:
    (1) One hundred micrograms per liter;
    (2) Two hundred micrograms per liter for acrolein and acrylonitrile; five hundred micrograms per liter for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter for antimony;
    (3) Five times the maximum concentration value reported for that pollutant in the permit application; or

(4) The level established by the Board.

b. That any activity has occurred or will occur which would result in any discharge, on a nonroutine or infrequent basis, of a toxic pollutant, which is not limited in this permit, if that discharge will exceed the highest of the following notification levels:
   (1) Five hundred micrograms per liter;
   (2) One milligram per liter for antimony;
   (3) Ten times the maximum concentration value reported for that pollutant in the permit application; or
   (4) The level established by the Board.

14. Polychlorinated Biphenyl
There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid. Compliance with this requirement will be determined using EPA test method 608 (as referenced in 40 CFR Part 136).

15. Liquid Radioactive Discharge
All limitations and monitoring requirements for liquid radioactive waste discharges shall be regulated by the Nuclear Regulatory Commission in accordance with regulations as set forth in 10 CFR Part 20 and 10 CFR Part 50.

16. Use of Chemical Additives
a. The use of chlorine or other biocide other than these identified in the current application, for any purpose other than disinfection at the sewage treatment plant, is prohibited without prior notification to DEQ, Northern Regional Office.

b. At least thirty days prior to using any chemical additives not identified in the permit application, the permittee shall notify DEQ, Northern Regional Office, in writing, of the following:

   (1) chemical additives to be employed and their purposes, and MSDS for each proposed additive;

   (2) schedule of additive usage; and

   (3) wastewater treatment and/or retention to be provided during the use of additives.

c. Should the addition of treatment chemicals significantly alter the characteristics of the effluent, or if their usage becomes persistent or continuous, this permit may be modified or, alternatively, revoked and reissued to include appropriate limitations or conditions

17. Discharge of Wastewater from Particle Separators
The permittee is authorized to discharge wastewaters generated by the operation of particle separators for supply wells 4 and 6 and the operation of the particle separator and sand filter for the supply well serving the North Anna Nuclear Information Center. Wastewater from these treatment units will be land applied in the vicinity of each of the supply wells. As a result of the nature of the wastewater, the permeability of the area soils and the substantial distance of travel to the nearest surface waters, no discharge to or impact upon State waters is anticipated. There are no monitoring or reporting requirements for these discharges. Should the physical characteristics or volume of wastewater change substantially, the permittee shall notify the DEQ, Northern Regional Office in writing in advance of any such change in operation.

18. Debris Collection
Wastes such as solids, sludges, or other pollutants removed from or resulting from treatment or control of wastewaters, or facility operations, including all debris collected on the intake trash racks, shall be disposed of in a manner to prevent any of the removed substances, or runoff from such substances, from entering waters of the State.

19. 316(b) Special Condition
The facility includes a cooling water intake structure governed by §316(b) of the Clean Water Act which requires that the location, design, construction and capacity of the cooling water intake structures reflect the "best technology available (BTA) for minimizing adverse environmental impact". The North Anna – May, 1985 environmental report on impingement and entrainment studies conducted at the facility indicated minimal or no adverse environmental impact. This permit may be reopened to address compliance with Clean Water Act §316(b) through requirements including but not limited to those specified in EPA regulations in 40 CFR Part 125 Subpart J when finalized.

20. PCB Monitoring
The permittee shall conduct PCB monitoring at the facility's intake, in the discharge canal prior to flow entering the WHTF, and at Outfall 001. The permittee shall conduct the sampling and analysis in accordance with the requirements specified below. At a minimum:

a. Monitoring and analysis shall be conducted in accordance with the most current version of EPA Method 1668 or other equivalent methods capable of providing low-detection level, congener specific results. Any equivalent method shall be submitted to DEQ-NRO for review and approval prior to sampling and analysis. It is the responsibility of the permittee to ensure that proper QA/QC protocols are followed during the sample gathering and analytical procedures. The sampling protocol shall be submitted to DEQ-NRO for review and approval prior to the first sample collection.

b. The permittee shall collect two (2) samples within the first three (3) years after the permit reissuance date of May 8, 2014.

c. Each sample shall consist of a minimum 2 liter volume. The sample type, either a grab or automated composite, shall be at the discretion of the permittee.

d. The data shall be submitted to DEQ-NRO by the due date of the DMR for the month following receipt of the results. The permittee shall submit the results electronically. The submittal shall include the unadjusted and appropriately qualified individual PCB congener analytical results. Additionally, laboratory and field QA/QC documentation and results shall be reported. Total PCBs are to be computed as the summation of the reported, quantified congeners.

21. Total Maximum Daily Load (TMDL) Reopener
This permit shall be modified or alternatively revoked and reissued if any approved wasteload allocation procedure, pursuant to Section 303(d) of the Clean Water Act, imposes wasteload allocations, limits or conditions on the facility that are not consistent with the permit requirements.

22. Snow and Ice Control Materials. The permittee shall manage the salt storage facility and salt storage pond in accordance with the following:

a. Snow and Ice Control Materials
   1. The use of snow and ice control materials shall be in accordance with manufacturer's instructions.
   2. All snow and ice control equipment and spreaders shall be maintained in accordance with manufacturer's instructions.
   3. There shall be no washing of snow and ice control equipment and/or spreaders that will cause a discharge to the salt storage pond.
   4. Storage piles of snow and ice control materials shall remain enclosed to prevent exposure to precipitation.

b. Salt Storage Pond Maintenance
   1. A minimum of one foot of freeboard shall be maintained in the salt storage pond.
   2. The permittee shall record freeboard levels at least weekly, or more often as necessary, to prevent a discharge to Lake Anna. Records shall include the date and time of the freeboard observation and shall be maintained on site. Records shall be made available to DEQ upon request.

c. Salt Storage Pond Discharge
   1. In the case of a storm event(s) that could result in an overflow of the salt storage pond, the permittee is authorized to pump water from the salt storage pond to the discharge canal via Outfall 117. This activity is authorized to provide adequate storage in the salt pond to prevent a discharge to Lake Anna.
   2. In the event of a discharge from Outfall 117, the permittee shall record the number of days water was pumped from the salt storage pond and the volume discharged. This information shall be submitted with the DMR for the month in which the discharge took place.

d. Storm Water Pollution Prevention
   1. The Storm Water Pollution Prevention Plan (SWPPP) shall be updated to include the salt storage facility and salt storage pond.
   2. Monthly inspections of the salt storage facility shall be conducted. Inspections shall include, but are not limited to, salt storage and handling areas and an evaluation of all BMPs (roofs, housekeeping, pond integrity, etc.).
   3. Employees engaged in snow and ice control shall receive annual training on storm water pollution prevention.

23. Storm Water Sampling. The permittee shall conduct Form 2F Part VII monitoring for storm water Outfall 027 and submit the results to DEQ-NRO by May 8, 2017.

CONDITIONS APPLICABLE TO ALL VPDES PERMITS

A. Monitoring

1. Samples and measurements taken as required by this permit shall be representative of the monitored activity.
2. Monitoring shall be conducted according to procedures approved under Title 40 Code of Federal Regulations Part 136 or alternative methods approved by the U.S. Environmental Protection Agency, unless other procedures have been specified in this permit.
3. The permittee shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals that will insure accuracy of measurements.
4. Samples taken as required by this permit shall be analyzed in accordance with 1VAC30-45, Certification for Noncommercial Environmental Laboratories, or 1VAC30-46, Accreditation for Commercial Environmental Laboratories.

B. Records

1. Records of monitoring information shall include:
   a. The date, exact place, and time of sampling or measurements;
   b. The individual(s) who performed the sampling or measurements;
   c. The date(s) and time(s) analyses were performed;
   d. The individual(s) who performed the analyses;
   e. The analytical techniques or methods used; and
   f. The results of such analyses.

2. Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years, the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period of retention shall be extended automatically during the course of any unresolved litigation regarding the regulated activity or regarding control standards applicable to the permittee, or as requested by the Board.

C. Reporting Monitoring Results

1. The permittee shall submit the results of the monitoring required by this permit not later than the 10th day of the month after monitoring takes place, unless another reporting schedule is specified elsewhere in this permit. Monitoring results shall be submitted to:

   Department of Environmental Quality - Northern Regional Office (DEQ-NRO)
   13901 Crown Court
   Woodbridge, VA 22193

   Monitoring results shall be reported on a Discharge Monitoring Report (DMR) or on forms provided, approved or specified by the Department.

2. If the permittee monitors any pollutant specifically addressed by this permit more frequently than required by this permit using test procedures approved under Title 40 of the Code of Federal Regulations Part 136 or using other test procedures approved by the U.S. Environmental Protection Agency or using

procedures specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or reporting form specified by the Department.

3. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

D. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Board may require the permittee to furnish, upon request, such plans, specifications, and other pertinent information as may be necessary to determine the effect of the wastes from this discharge on the quality of state waters, or such other information as may be necessary to accomplish the purposes of the State Water Control Law. The permittee shall also furnish to the Department upon request, copies of records required to be kept by this permit.

E. Compliance Schedule Reports

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Unauthorized Discharges

Except in compliance with this permit, or another permit issued by the Board, it shall be unlawful for any person to:

1. Discharge into state waters sewage, industrial wastes, other wastes, or any noxious or deleterious substances; or
2. Otherwise alter the physical, chemical or biological properties of such state waters and make them detrimental to the public health, or to animal or aquatic life, or to the use of such waters for domestic or industrial consumption, or for recreation, or for other uses.

G. Reports of Unauthorized Discharges

Any permittee who discharges or causes or allows a discharge of sewage, industrial waste, other wastes or any noxious or deleterious substance into or upon state waters in violation of Part II.F.; or who discharges or causes or allows a discharge that may reasonably be expected to enter state waters in violation of Part II.F., shall notify the Department of the discharge immediately upon discovery of the discharge, but in no case later than 24 hours after said discovery. A written report of the unauthorized discharge shall be submitted to the Department, within five days of discovery of the discharge. The written report shall contain:

1. A description of the nature and location of the discharge;
2. The cause of the discharge;
3. The date on which the discharge occurred;
4. The length of time that the discharge continued;
5. The volume of the discharge;
6. If the discharge is continuing, how long it is expected to continue;
7. If the discharge is continuing, what the expected total volume of the discharge will be; and
8. Any steps planned or taken to reduce, eliminate and prevent a recurrence of the present discharge or any future discharges not authorized by this permit.

Discharges reportable to the Department under the immediate reporting requirements of other regulations are exempted from this requirement.

H. Reports of Unusual or Extraordinary Discharges

If any unusual or extraordinary discharge including a bypass or upset should occur from a treatment works and the discharge enters or could be expected to enter state waters, the permittee shall promptly notify, in no case later than 24 hours, the Department by telephone after the discovery of the discharge. This notification shall provide all available details of the incident, including any adverse affects on aquatic life and the known number of fish killed. The permittee shall reduce the report to writing and shall submit it to the Department within five days of discovery of the discharge in accordance with Part II.I.2. Unusual and extraordinary discharges include but are not limited to any discharge resulting from:

1. Unusual spillage of materials resulting directly or indirectly from processing operations;
2. Breakdown of processing or accessory equipment;
3. Failure or taking out of service some or all of the treatment works; and
4. Flooding or other acts of nature.

I. Reports of Noncompliance

The permittee shall report any noncompliance which may adversely affect state waters or may endanger public health.

1. An oral report shall be provided within 24 hours from the time the permittee becomes aware of the circumstances. The following shall be included as information which shall be reported within 24 hours under this paragraph:
   a. Any unanticipated bypass; and
   b. Any upset which causes a discharge to surface waters.

2. A written report shall be submitted within 5 days and shall contain:
   a. A description of the noncompliance and its cause;
   b. The period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and
   c. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

   The Board may waive the written report on a case-by-case basis for reports of noncompliance under Part II.I. if the oral report has been received within 24 hours and no adverse impact on state waters has been reported.

3. The permittee shall report all instances of noncompliance not reported under Parts II, I.1.or I.2., in writing, at the time the next monitoring reports are submitted. The reports shall contain the information listed in Part II.I.2.

NOTE: The immediate (within 24 hours) reports required in Parts II, G., H. and I. may be made to the Department's Northern Regional Office at (703) 583-3800 (voice) or (703) 583-3821 (fax). For reports outside normal working hours, leave a message and this shall fulfill the immediate reporting requirement. For emergencies, the Virginia Department of Emergency Services maintains a 24-hour telephone service at 1-800-468-8892.

J. Notice of Planned Changes

1. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

   a. The permittee plans alteration or addition to any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced:

      1) After promulgation of standards of performance under Section 306 of Clean Water Act which are applicable to such source; or
      2) After proposal of standards of performance in accordance with Section 306 of Clean Water Act which are applicable to such source, but only if the standards are promulgated in accordance with Section 306 within 120 days of their proposal;

   b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations nor to notification requirements specified elsewhere in this permit; or

   c. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

2. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

K. Signatory Requirements

1. All permit applications shall be signed as follows:

   a. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
      1) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or

      2) The manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second-quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or

   c. For a municipality, state, federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a public agency includes:

      1) The chief executive officer of the agency, or
      2) A senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

2. All reports required by permits, and other information requested by the Board shall be signed by a person described in Part II.K.1., or by a duly authorized representative of that person. A person is a duly authorized representative only if:

    a. The authorization is made in writing by a person described in Part II.K.1.;

    b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.); and

    c. The written authorization is submitted to the Department.

3. Changes to authorization. If an authorization under Part II.K.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part II.K.2. shall be submitted to the Department prior to or together with any reports, or information to be signed by an authorized representative.

4. Certification. Any person signing a document under Parts II, K.1. or K.2. shall make the following certification:

    "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

L. Duty to Comply

The permittee shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the State Water Control Law and the Clean Water Act, except that noncompliance with certain provisions of this permit may constitute a violation of the State Water Control Law but not the Clean Water Act. Permit noncompliance is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.
The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under Section 405(d) of the Clean Water Act within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if this permit has not yet been modified to incorporate the requirement.

M. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee shall apply for and obtain a new permit. All permittees with a currently effective permit shall submit a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Board. The Board shall not grant permission for applications to be submitted later than the expiration date of the existing permit.

N. Effect of a Permit

This permit does not convey any property rights in either real or personal property or any exclusive privileges, nor does it authorize any injury to private property or invasion of personal rights, or any infringement of federal, state or local law or regulations.

O. State Law

Nothing in this permit shall be construed to preclude the institution of any legal action under, or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any other state law or regulation or under authority preserved by Section 510 of the Clean Water Act. Except as provided in permit conditions on "bypassing" (Part II.U.), and "upset" (Part II.V.) nothing in this permit shall be construed to relieve the permittee from civil and criminal penalties for noncompliance.

P. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Sections 62.1-44.34:14 through 62.1-44.34:23 of the State Water Control Law.

Q. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes effective plant performance, adequate funding, adequate staffing, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

R. Disposal of Solids or Sludges

Solids, sludges or other pollutants removed in the course of treatment or management of pollutants shall be disposed of in a manner so as to prevent any pollutant from such materials from entering state waters.

S. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

T. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

U. Bypass

1. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Parts II, U.2. and U.3.

2. Notice
   a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, prior notice shall be submitted, if possible at least ten days before the date of the bypass.
   b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Part II.I.

3. Prohibition of bypass.
   a. Bypass is prohibited, and the Board may take enforcement action against a permittee for bypass, unless:
      1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
      2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
      3) The permittee submitted notices as required under Part II.U.2.

   b. The Board may approve an anticipated bypass, after considering its adverse effects, if the Board determines that it will meet the three conditions listed above in Part II.U.3.a.

V. Upset

1. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of Part II.V.2. are met. A determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is not a final administrative action subject to judicial review.

2. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that the permittee can identify the cause(s) of the upset;
   b. The permitted facility was at the time being properly operated;
   c. The permittee submitted notice of the upset as required in Part II.I.; and
   d. The permittee complied with any remedial measures required under Part II.S.

3. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

W. **Inspection and Entry**

The permittee shall allow the Director, or an authorized representative, upon presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act and the State Water Control Law, any substances or parameters at any location.

For purposes of this section, the time for inspection shall be deemed reasonable during regular business hours, and whenever the facility is discharging. Nothing contained herein shall make an inspection unreasonable during an emergency.

X. Permit Actions

Permits may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

Y. Transfer of Permits

1. Permits are not transferable to any person except after notice to the Department. Except as provided in Part II.Y.2., a permit may be transferred by the permittee to a new owner or operator only if the permit has been modified or revoked and reissued, or a minor modification made, to identify the new permittee and incorporate such other requirements as may be necessary under the State Water Control Law and the Clean Water Act.

2. As an alternative to transfers under Part II.Y.1., this permit may be automatically transferred to a new permittee if:
   a. The current permittee notifies the Department at least 30 days in advance of the proposed transfer of the title to the facility or property;
   b. The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them; and
   c. The Board does not notify the existing permittee and the proposed new permittee of its intent to modify or revoke and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Part II.Y.2.b.

Z. Severability

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

Appendix A --126 Priority Pollutants

001 Acenaphthene
002 Acrolein
003 Acrylonitrile
004 Benzene
005 Benzidine
006 Carbon tetrachloride (tetrachloromethane)
007 Chlorobenzene
008 1,2,4-trichlorobenzene
009 Hexachlorobenzene
010 1,2-dichloroethane
011 1,1,1-trichloreothane
012 Hexachloroethane
013 1,1-dichloroethane
014 1,1,2-trichloroethane
015 1,1,2,2-tetrachloroethane
016 Chloroethane
018 Bis(2-chloroethyl) ether
019 2-chloroethyl vinyl ether (mixed)
020 2-chloronaphthalene
021 2,4, 6-trichlorophenol
022 Parachlorometa cresol
023 Chloroform (trichloromethane)
024 2-chlorophenol
025 1,2-dichlorobenzene
026 1,3-dichlorobenzene
027 1,4-dichlorobenzene
028 3,3-dichlorobenzidine
029 1,1-dichloroethylene
030 1,2-trans-dichloroethylene
031 2,4-dichlorophenol
032 1,2-dichloropropane
033 1,2-dichloropropylene (1,3-dichloropropene)
034 2,4-dimethylphenol
035 2,4-dinitrotoluene
036 2,6-dinitrotoluene
037 1,2-diphenylhydrazine
038 Ethylbenzene
039 Fluoranthene
040 4-chlorophenyl phenyl ether
041 4-bromophenyl phenyl ether
042 Bis(2-chloroisopropyl) ether
043 Bis(2-chloroethoxy) methane
044 Methylene chloride (dichloromethane)
045 Methyl chloride (dichloromethane)
046 Methyl bromide (bromomethane)
047 Bromoform (tribromomethane)
048 Dichlorobromomethane
051 Chlorodibromomethane
052 Hexachlorobutadiene
053 Hexachloromyclopentadiene
054 Isophorone
055 Naphthalene
056 Nitrobenzene
057 2-nitrophenol
058 4-nitrophenol
059 2,4-dinitrophenol
060 4,6-dinitro-o-cresol
061 N-nitrosodimethylamine
062 N-nitrosodiphenylamine
063 N-nitrosodi-n-propylamin
064 Pentachlorophenol
065 Phenol
066 Bis(2-ethylhexyl) phthalate
067 Butyl benzyl phthalate
068 Di-N-Butyl Phthalate
069 Di-n-octyl phthalate
070 Diethyl Phthalate
071 Dimethyl phthalate
072 1,2-benzanthracene (benzo(a) anthracene
073 Benzo(a)pyrene (3,4-benzo-pyrene)
074 3,4-Benzofluoranthene (benzo(b) fluoranthene)
075 11,12-benzofluoranthene (benzo(b) fluoranthene)
076 Chrysene
077 Acenaphthylene
078 Anthracene
079 1,12-benzoperylene (benzo(ghi) perylene)
080 Fluorene
081 Phenanthrene
082 1,2,5,6-dibenzanthracene (dibenzo(,h) anthracene)
083 Indeno (,1,2,3-cd) pyrene (2,3-o-pheynylene pyrene)
084 Pyrene
085 Tetrachloroethylene
086 Toluene
087 Trichloroethylene
088 Vinyl chloride (chloroethylene)
089 Aldrin
090 Dieldrin
091 Chlordane (technical mixture and metabolites)
092 4,4-DDT
093 4,4-DDE (p,p-DDX)
094 4,4-DDD (p,p-TDE)
095 Alpha-endosulfan
096 Beta-endosulfan
097 Endosulfan sulfate
098 Endrin
099 Endrin aldehyde
100 Heptachlor
101 Heptachlor epoxide (BHC-hexachlorocyclohexane)
102 Alpha-BHC
103 Beta-BHC
104 Gamma-BHC (lindane)
105 Delta-BHC (PCB-polychlorinated biphenyls)
106 PCB-1242 (Arochlor 1242)
107 PCB-1254 (Arochlor 1254)
108 PCB-1221 (Arochlor 1221)
109 PCB-1232 (Arochlor 1232)
110 PCB-1248 (Arochlor 1248)
111 PCB-1260 (Arochlor 1260)
112 PCB-1016 (Arochlor 1016)
113 Toxaphene
114 Antimony
115 Arsenic
116 Asbestos
117 Beryllium
118 Cadmium
119 Chromium
120 Copper
121 Cyanide, Total
122 Lead
123 Mercury
124 Nickel
125 Selenium
126 Silver
127 Thallium
126 Silver
128 Zinc
129 2,3,7,8-tetrachloro-dibenzo-p-dioxin (TCDD)

APPENDIX B - Outfall 001
DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY CRITERIA MONITORING

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL (1)	REPORTING RESULTS	SAMPLE TYPE (2)	SAMPLE FREQUENCY
METALS						
7440-36-0	Antimony, dissolved	(3)	640		G or C	1/YR
7440-38-2	Arsenic, dissolved	(3)	90		G or C	1/YR
7440-43-9	Cadmium, dissolved	(3)	0.39		G or C	1/YR
16065-83-1	Chromium III, dissolved (7)	(3)	25		G or C	1/YR
18540-29-9	Chromium VI, dissolved (7)	(3)	6.4		G or C	1/YR
7440-50-8	Copper, dissolved	(3)	2.8		G or C	1/YR
7439-92-1	Lead, dissolved	(3)	3.4		G or C	1/YR
7439-97-6	Mercury, dissolved	(3)	0.46		G or C	1/YR
7440-02-0	Nickel, dissolved	(3)	6.8		G or C	1/YR
7440-22-4	Silver, dissolved	(3)	0.42		G or C	1/YR
7440-28-0	Thallium, dissolved	(4)	(5)		G or C	1/YR
7440-66-6	Zinc, dissolved	(3)	26		G or C	1/YR
PESTICIDES/PCB'S						
309-00-2	Aldrin	608	0.05		G or C	1/YR
57-74-9	Chlordane	608	0.2		G or C	1/YR
2921-88-2	Chlorpyrifos (synonym= Dursban)	(4)	(5)		G or C	1/YR
72-54-8	DDD	608	0.1		G or C	1/YR
72-55-9	DDE	608	0.1		G or C	1/YR
50-29-3	DDT	608	0.1		G or C	1/YR
8065-48-3	Demeton	(4)	(5)		G or C	1/YR
333-41-5	Diazinon	(4)	(5)		G or C	1/YR
60-57-1	Dieldrin	608	0.1		G or C	1/YR
959-98-8	Alpha-Endosulfan	608	0.1		G or C	1/YR
33213-65-9	Beta-Endosulfan	608	0.1		G or C	1/YR
1031-07-8	Endosulfan Sulfate	608	0.1		G or C	1/YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL (1)	REPORTING RESULTS	SAMPLE TYPE (2)	SAMPLE FREQUENCY
72-20-8	Endrin	608	0.1		G or C	1/YR
7421-93-4	Endrin Aldehyde	(4)	(5)		G or C	1/YR
86-50-0	Guthion	(4)	(5)		G or C	1/YR
76-44-8	Heptachlor	608	0.05		G or C	1/YR
1024-57-3	Heptachlor Epoxide	(4)	(5)		G or C	1/YR
319-84-6	Hexachlorocyclohexane Alpha-BHC	608	(5)		G or C	1/YR
319-85-7	Hexachlorocyclohexane Beta-BHC	608	(5)		G or C	1/YR
58-89-9	Hexachlorocyclohexane Gamma-BHC or Lindane	608	(5)		G or C	1/YR
143-50-0	Kepone	(8)	(5)		G or C	1/YR
121-75-5	Malathion	(4)	(5)		G or C	1/YR
72-43-5	Methoxychlor	(4)	(5)		G or C	1/YR
2385-85-5	Mirex	(4)	(5)		G or C	1/YR
56-38-2	Parathion	(4)	(5)		G or C	1/YR
11096-82-5	PCB 1260	608	1.0		G or C	1/YR
11097-69-1	PCB 1254	608	1.0		G or C	1/YR
12672-29-6	PCB 1248	608	1.0		G or C	1/YR
53469-21-9	PCB 1242	608	1.0		G or C	1/YR
11141-16-5	PCB 1232	608	1.0		G or C	1/YR
11104-28-2	PCB 1221	608	1.0		G or C	1/YR
12674-11-2	PCB 1016	608	1.0		G or C	1/YR
1336-36-3	PCB Total	608	7.0		G or C	1/YR
8001-35-2	Toxaphene	608	5.0		G or C	1/YR
BASE NEUTRAL EXTRACTABLES						
83-32-9	Acenaphthene	625	10.0		G or C	1/YR
120-12-7	Anthracene	625	10.0		G or C	1/YR
92-87-5	Benzidine	(4)	(5)		G or C	1/YR
56-55-3	Benzo (a) anthracene	625	10.0		G or C	1/YR
205-99-2	Benzo (b) fluoranthene	625	10.0		G or C	1/YR
207-08-9	Benzo (k) fluoranthene	625	10.0		G or C	1/YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL (1)	REPORTING RESULTS	SAMPLE TYPE (2)	SAMPLE FREQUENCY
50-32-8	Benzo (a) pyrene	625	10.0		G or C	1/YR
111-44-4	Bis 2-Chloroethyl Ether	(4)	(5)		G or C	1/YR
108-60-1	Bis 2-Chloroisopropyl Ether	(4)	(5)		G or C	1/YR
117-81-7	Bis-2-cthylhexyl phthalate	625	10.0		G or C	1/YR
85-68-7	Butyl benzyl phthalate	625	10.0		G or C	1/YR
91-58-7	2-Chloronaphthalene	(4)	(5)		G or C	1/YR
218-01-9	Chrysene	625	10.0		G or C	1/YR
53-70-3	Dibenz(a,h)anthracene	625	20.0		G or C	1/YR
84-74-2	Dibutyl phthalate (synonym= Di-n-Butyl Phthalate)	625	10.0		G or C	1/YR
95-50-1	1,2-Dichlorobenzene	624	10.0		G or C	1/YR
541-73-1	1,3-Dichlorobcnzcne	624	10.0		G or C	1/YR
106-46-7	1,4-Dichlorobenzene	624	10.0		G or C	1/YR
91-94-1	3,3-Dichlorobenzidine	(4)	(5)		G or C	1/YR
84-66-2	Diethyl phthalate	625	10.0		G or C	1/YR
131-11-3	Dimethyl phthalate	(4)	(5)		G or C	1/YR
121-14-2	2,4-Dinitrotolucnc	625	10.0		G or C	1/YR
122-66-7	1,2-Diphenylhydrazine	(4)	(5)		G or C	1/YR
206-44-0	Fluoranthene	625	10.0		G or C	1/YR
86-73-7	Fluorene	625	10.0		G or C	1/YR
118-74-1	Hexachlorobenzene	(4)	(5)		G or C	1/YR
87-68-3	Hexachlorobutadiene	(4)	(5)		G or C	1/YR
77-47-4	Hexachlorocyclopentadiene	(4)	(5)		G or C	1/YR
67-72-1	Hexachloroethane	(4)	(5)		G or C	1/YR
193-39-5	lndeno(1,2,3-cd)pyrene	625	20.0		G or C	1/YR
78-59-1	lsophorone	625	10.0		G or C	1/YR
98-95-3	Nitrobenzene	625	10.0		G or C	1/YR
62-75-9	N-Nitrosodimethylamine	(4)	(5)		G or C	1/YR
621-64-7	N-Nitrosodi-n-propylamine	(4)	(5)		G or C	1/YR
86-30-6	N-Nitrosodiphenylamine	(4)	(5)		G or C	1/YR
129-00-0	Pyrene	625	10.0		G or C	1/YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL (1)	REPORTING RESULTS	SAMPLE TYPE (2)	SAMPLE FREQUENCY
120-82-1	1,2,4-Trichlorobenzcne	625	10.0		G or C	1/YR
VOLATILES						
107-02-8	Acrolein	(4)	(5)		G	1/YR
107-13-1	Acrylonitrile	(4)	(5)		G	1/YR
71-43-2	Benzene	624	10.0		G	1/YR
75-25-2	Bromoform	624	10.0		G	1/YR
56-23-5	Carbon Tetrachloride	624	10.0		G	1/YR
108-90-7	Chlorobenzene (synonym= monochlorobenzene)	624	50.0		G	1/YR
124-48-1	Chlorodibromomethane	624	10.0		G	1/YR
67-66-3	Chloroform	624	10.0		G	1/YR
75-09-2	Dichloromethane (synonym= methylene chloride)	624	20.0		G	1/YR
75-27-4	Dichlorobromomethane	624	10.0		G	1/YR
107-06-2	1,2-Dichloroethane	624	10.0		G	1/YR
75-35-4	1,1-Dichloroethylene	624	10.0		G	1/YR
156-60-5	1,2-trans-dichloroethyJene	(4)	(5)		G	1/YR
78-87-5	1;2.-Dichloropropane	(4)	(5)		G	1/YR
542-75-6	1,3-Dichloropropene	(4)	(5)		G	1/YR
100-41-4	Ethylbenzene	624	10.0		G	1/YR
74-83-9	Methyl Bromide	(4)	(5)		G	1/YR
79-34-5	1,1,2,2-Tetrachloroethanc	(4)	(5)		G	1/YR
127-18-4	Tetrachloroethylene	624	10.0		G	1/YR
10-88-3	Toluene	624	10.0		G	1/YR
79-00-5	1,1,2-Trichloroethane	(4)	(5)		G	1/YR
79-01-6	Trichloroethylene	624	10.0		G	1/YR
75-01-4	Vinyl Chloride	624	10.0		G	1/YR
ACID EXTRACTABLES (6)						
95-57-8	2-Chlorophenol	625	10.0		G or C	1/YR
120-83-2	2,4 Dichlorophenol	625	10.0		G or C	1/YR
105-67-9	2,4 Dimethylphenol	625	10.0		G or C	1/YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL (1)	REPORTING RESULTS	SAMPLE TYPE (2)	SAMPLE FREQUENCY
51-28-5	2,4-Dinitrophenol	(4)	(5)		G or C	1/YR
534-52-1	2-Methyl-4,6-Dinitrophenol	(4)	(5)		G or C	1/YR
25154-52-3	Nonylphenol	(4)	(5)		G or C	1/YR
87-86-5	Pentachlorophenol	625	50.0		G or C	1/YR
108-95-2	Phenol	625	10.0		G or C	1/YR
88-06-2	2,4,6-Trichlorophenol	625	10.0		G or C	1/YR
MISCELLANEOUS						
57-12-5	Cyanide, Free	(4)	10.0		G	1/YR
7783-06-4	Hydrogen Sulfide	(4)	(5)		G or C	1/YR
471-34-1	Hardness (mg/L as $CaC0_3$)	(4)	(5)		G or C	1/YR

Name of Principal Executive Officer or Authorized Agent/Title

Signature of Principal Officer or Authorized Agent/Date

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. Sec. 1001 and 33 U.S.C. Sec. 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

FOOTNOTES:

(l) Quantification level (QL) is defined as the lowest concentration used for the calibration of a measurement system when the calibration is in accordance with the procedures published for the required method.

The quantification levels indicated for the metals are actually Specific Target Values developed for this permit. The Specific Target Value is the approximate va1ue that may initiate a wasteload allocation analysis. Target values are not wasteload allocations or effluent limitations. The Specific Target Values are subject to change based on additional information such as hardness data, receiving stream flow, and design flows.

Units for the quantification level are micrograms/liter unless otherwise specified.

Quality control and quality assurance information shall be submitted to document that the required quantification level has been attained.

(2) Sample Type

G =Grab= An individual sample collected in less than 15 minutes. Substances specified with "grab" sample type shall only be collected as grabs. The permittee may analyze multiple grabs and report the average results provided that the individual grab results are also reported. For grab metals samples, the individual samples shall be filtered and preserved immediately upon collection.

C = Composite= A 24-hour composite unless otherwise specified. The composite shall be a combination of individual samples, taken proportional to flow, obtained at hourly or smaller time intervals. The individual samples may be of equal volume for flows that do not vary y +/- 10 percent over a 24-hour period.

(3) A specific analytica1 method is not specified; however a target value for each metal has been established. An appropriate method to meet the target value shall be selected from the following list of EPA methods (or any approved method presented in 40 CFR Part 136). If the test result is less than the method QL, a "<[QL]" shall be reported where the actual analytical test QL is substituted for [QL].

Metal	Analytical Method
Antimony	1638; 1639
Arsenic	1632; 206.5
Chromium (8)	1639
Cadmium	1637; 1638; 1639; 1640
Chromium VI	1639; 218.6 Rev 3.3
Copper	1638; 1640
Lead	1637; 1638; 1640
Mercury	1631; 245.7 Rev 2.0
Nickel	1638; 1639; 1640
Selenium	1638; 1639
Silver	1638
Zinc	1638; 1639

(4) Any approved method presented in 40 CFR Part 136.

(5) The QL is at the discretion of the permittee. For any substances addressed in 40 CFR Part 136, the permittee shall use one of the approved methods in 40 CFR Part 136.

(6) Testing for phenols requires continuous extraction.

(7) Both Chromium III and Chromium VI may be measured by the total chromium analysis. If the result of the total chromium analysis is less than or equal to the lesser of the Chromium III or Chromium VI method QL, the results for both Chromium III and Chromium VI can be reported as "<[QL]", where the actual analytical test QL is substituted for [QL].

(8) The lab may use SW846 Method 8270D provided the lab has an Initial Demonstration of Capability, has passed a PT for Kepone, and meets the acceptance criteria for Kepone as given in Method 8270D

Attachment C: Threatened and Endangered Species Consultation Letters North Anna Power Station, Units 1 and 2

Intentionally Blank

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1645

July 3, 2019

Ms. Julie Crocker, Endangered Species Coordinator
National Marine Fisheries Service (NMFS)
Greater Atlantic Regional Fisheries Office
Protected Resources Division
55 Republic Drive
Gloucester, MA 01930

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Ms. Crocker:

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040 to midnight on August 21, 2060.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER will address the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), and important plant and animal habitats, including critical habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act.

This letter seeks input from the National Marine Fisheries Service (NMFS) regarding such effects in the vicinity of NAPS. Also, as part of the renewal process, the NRC may request a consultation with your agency regarding the license renewal. The time frame for the NRC consultation request is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input from you regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the station's environs and any questions or additional information necessary for the consultation process. Figures depicting the station site and the vicinity within a 6-mile radius of the station are enclosed, and a brief discussion of the station and its operations during the extended period of operation is provided below.

NAPS is located approximately 40 miles north-northwest of Richmond, Virginia on a peninsula on the southern shore of Lake Anna in Louisa County, Virginia, and is situated approximately five miles upstream from the North Anna Dam. The NAPS site and exclusion area comprise 1803 acres, of which about 760 acres are covered by the waters of Lake Anna and the Waste Heat Treatment Facility (WHTF). In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those located within the NAPS site boundary.

There are no marine or anadromous species known to occur near the NAPS site or within counties occurring in a 6-mile radius of the site (Louisa and Spotsylvania Counties) that are currently federally or state listed as threatened or endangered.

During the license renewal term, Dominion proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities anticipated at the NAPS site during the subsequent license renewal period. Currently, Dominion does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion does not anticipate the continued operation of NAPS to adversely affect the environment, sensitive species, or habitats.

As stated above, this letter seeks your input on our proposed continued operation of NAPS on listed marine species and important aquatic habitats within the environs of the station. We appreciate your notifying us of your comments and any information or actions required of Dominion to assist in the preparation of our assessment and to facilitate NRC's consultation. Dominion plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

Sincerely,

Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

Figure NAPS Site
Figure NAPS 6-mile Vicinity

Figure NAPS Site

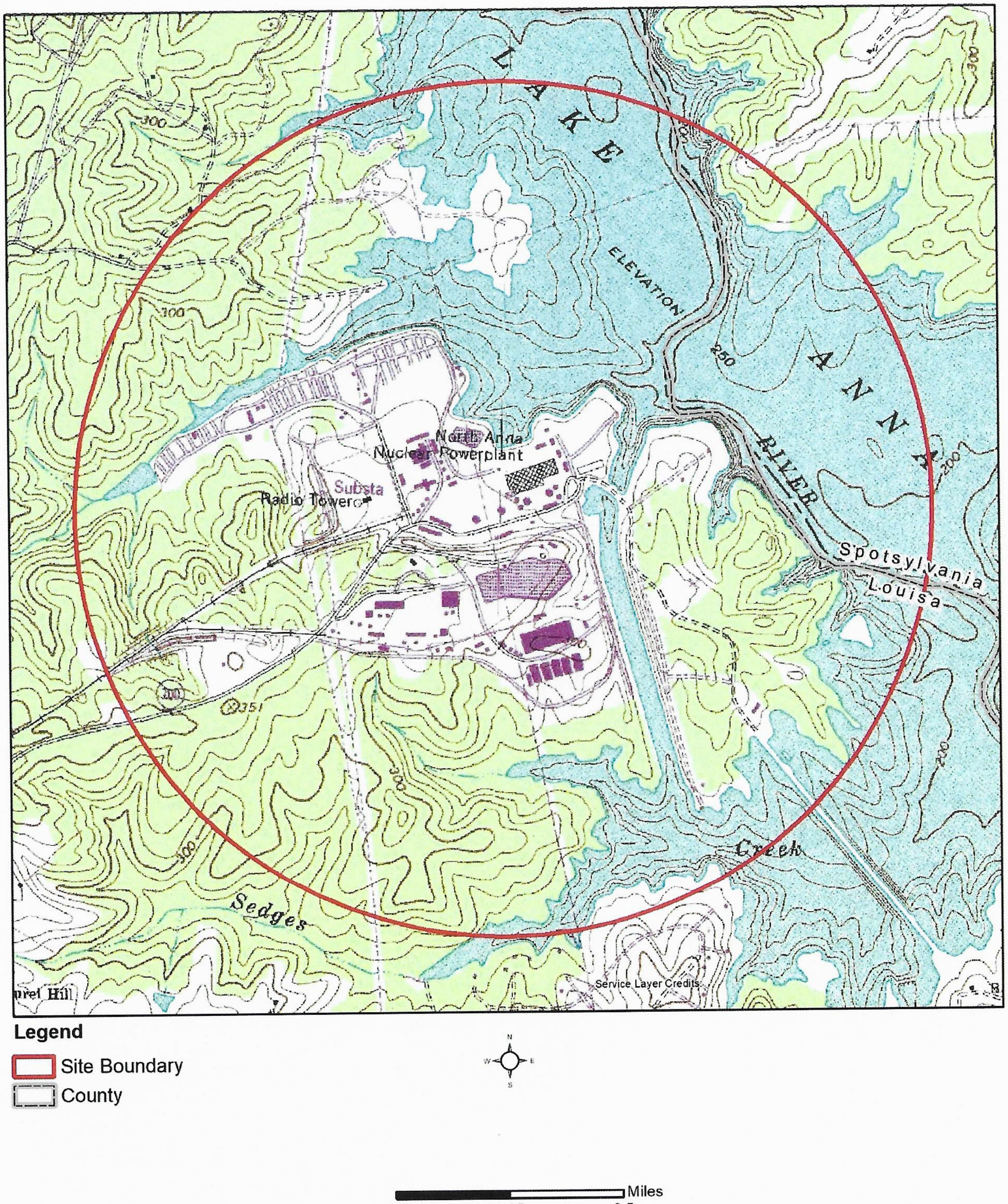
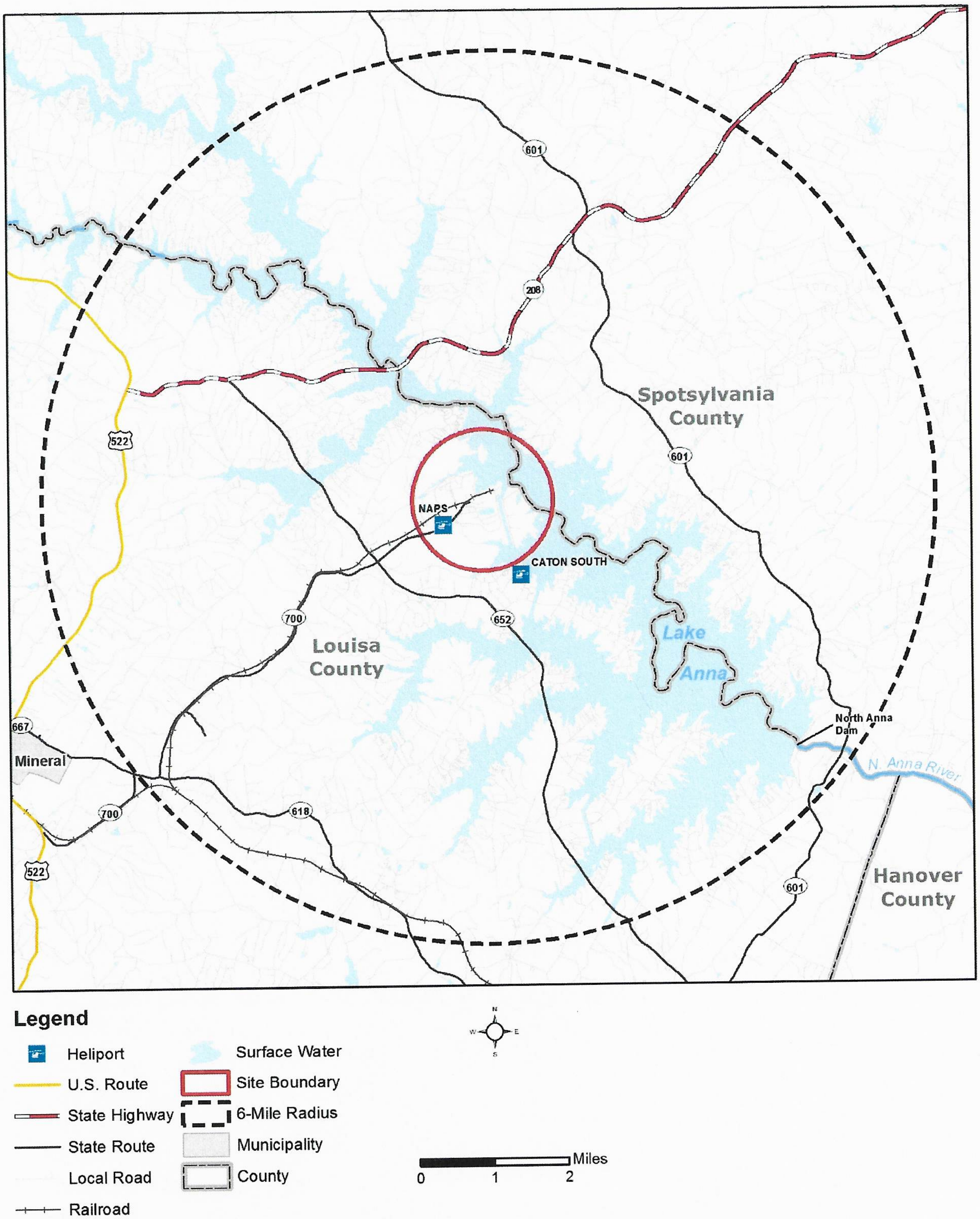


Figure NAPS 6-mile Vicinity



Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-NMFS 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1652

July 3, 2019

Ms. Cindy Schultz
U.S. Fish and Wildlife Service
Ecological Services
Virginia Field Office
6669 Short Lane
Gloucester, Virginia 23061

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Ms. Shultz:

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040 to midnight on August 21, 2060.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER will address the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), and important plant and animal habitats, including critical habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act.

This letter seeks input from the U.S. Fish and Wildlife Service (USFWS) regarding such effects in the vicinity of NAPS. Also, as part of the renewal process, the NRC may request a consultation with your agency regarding the license renewal. The time frame for the NRC consultation request is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input from you regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the station's environs and any questions or additional information necessary for the consultation process. Figures depicting the station site and the vicinity within a 6-mile radius of the station and a table of listed species in the station's vicinity are enclosed, and a brief discussion of the station and its operations during the extended period of operation is provided below.

NAPS is located approximately 40 miles north-northwest of Richmond, Virginia on a peninsula on the southern shore of Lake Anna in Louisa County, Virginia, and is situated approximately five miles upstream from the North Anna Dam. The NAPS site and exclusion area comprise 1803 acres, of which about 760 acres are covered by the waters of Lake Anna and the Waste Heat Treatment Facility (WHTF). In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those located within the NAPS site boundary.

Species potentially occurring near the NAPS site, or within Louisa and Spotsylvania Counties (counties occurring in a 6-mile radius of the site) that are currently federally or state listed (or proposed for listing) as threatened or endangered are included in the enclosed table.

During the license renewal term, Dominion proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities anticipated at the NAPS site during the subsequent license renewal period. Currently, Dominion does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion does not anticipate the continued operation of NAPS to adversely affect the environment, sensitive species, or habitats.

As stated above, this letter seeks your input on our proposed continued operation of NAPS on listed species and important habitats within the environs of the station. We appreciate your notifying us of your comments and any information or actions required of Dominion to assist in the preparation of our assessment and to facilitate NRC's consultation. Dominion plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

Sincerely,

Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

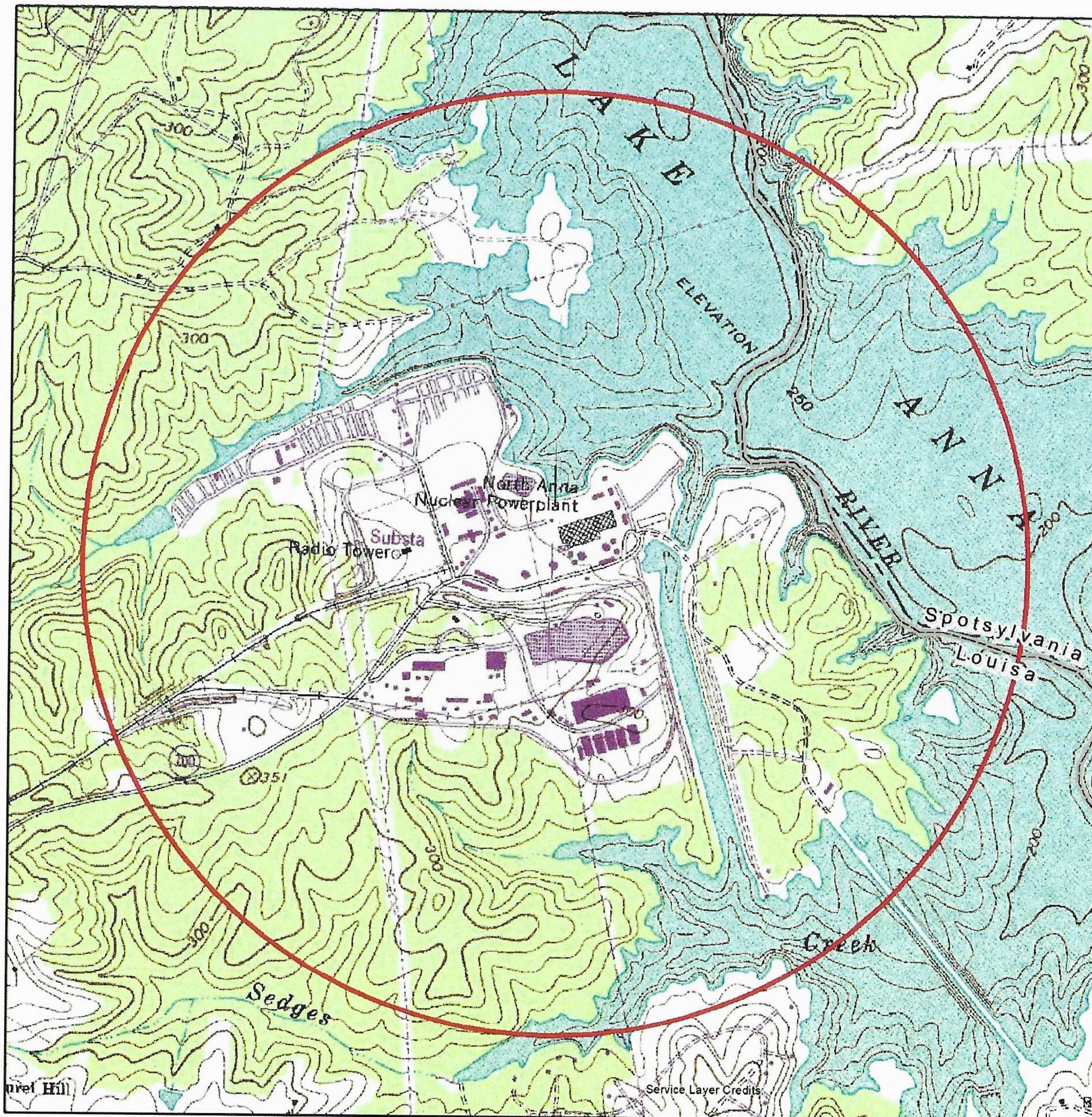
Table of Protected Species Potentially Occurring in the NAPS Vicinity
Figure NAPS Site
Figure NAPS 6-mile Vicinity

Table of Protected Species Potentially Occurring in the NAPS Vicinity

Common Name	Scientific Name	Federal Legal Status	State Legal Status
Birds			
Bald eagle	*Haliaeetus leucocephalus*	DL	None
Loggerhead shrike	*Lanius ludovicianus*	--	ST
Bivalvia (mussels)			
Dwarf wedgemussel	*Alasmidonta heterodon*	FE	SE
James spinymussel	*Pleurobema collina*	FE	SE
Green floater	*Lasmigona subviridis*	UR	ST
Yellow lance	*Elliptio lanceolata*	FT	None
Heteroptera (true bugs)			
Virginia Piedmont water boatman	*Sigara depressa*	SOC	SE
Mammals			
Little brown bat	*Myotis lucifugus*	--	SE
Northern long-eared bat	*Myotis septentrionalis*	FT	ST
Tri-colored bat	*Perimyotis subflavus*	--	SE
Vascular Plants			
Small whorled pogonia	*Isotria medeoloides*	FT	SE

FE= federally endangered; FT = federally threatened; DL = delisted; UR = under review
SE = state endangered; ST = state threatened; SOC = species of concern
83 FR 14189
USFWS website, T&E Species by county (Louisa and Spotsylvania Counties)
VDCR website, Species by County Report (Louisa and Spotsylvania Counties)
VDGIF-Fish and Wildlife Information Service (FWIS) website, Listed Species Information Report

Figure NAPS Site



Legend

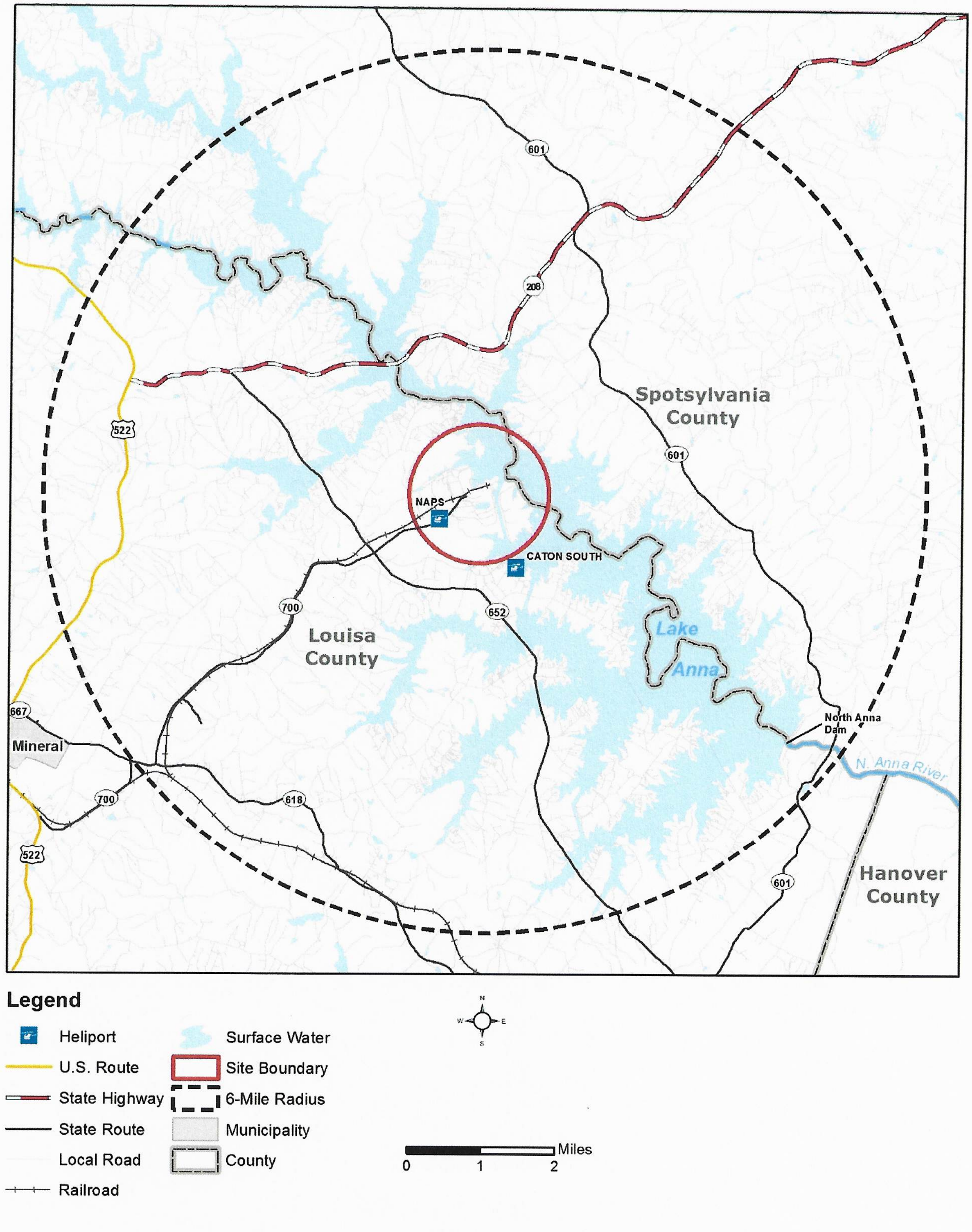
Site Boundary

County

N
W E
S

0 0.25 0.5 Miles

Figure NAPS 6-mile Vicinity



Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-FWS 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1669

July 3, 2019

Ms. Renee Hypes
Virginia Department of Conservation and Recreation
Division of Natural Heritage
217 Governor Street, 3rd Floor
Richmond, Virginia 23219

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Ms. Hypes:

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040 to midnight on August 21, 2060.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER will address the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), and important plant and animal habitats, including critical habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act.

This letter seeks input from the Virginia Department of Conservation and Recreation (VDCR) regarding such effects in the vicinity of NAPS. Also, as part of the renewal process, the NRC may request a consultation with your agency regarding the license renewal. The time frame for the NRC consultation request is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input from you regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the station's environs and any questions or additional information necessary for the consultation process. Figures depicting the station site and the vicinity within a 6-mile radius of the station and a table of listed species in the station's vicinity are enclosed, and a brief discussion of the station and its operations during the extended period of operation is provided below.

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Species potentially occurring near the NAPS site, or within Louisa and Spotsylvania Counties (counties occurring in a 6-mile radius of the site) that are currently federally or state listed (or proposed for listing) as threatened or endangered are included in the enclosed table.

During the license renewal term, Dominion proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities anticipated at the NAPS site during the subsequent license renewal period. Currently, Dominion does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion does not anticipate the continued operation of NAPS to adversely affect the environment, sensitive species, or habitats.

As stated above, this letter seeks your input on our proposed continued operation of NAPS on listed species and important habitats within the environs of the station. We appreciate your notifying us of your comments and any information or actions required of Dominion to assist in the preparation of our assessment and to facilitate NRC's consultation. Dominion plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

Sincerely,

Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

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Figure NAPS 6-mile Vicinity

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Loggerhead shrike	*Lanius ludovicianus*	--	ST
Bivalvia (mussels)			
Dwarf wedgemussel	*Alasmidonta heterodon*	FE	SE
James spinymussel	*Pleurobema collina*	FE	SE
Green floater	*Lasmigona subviridis*	UR	ST
Yellow lance	*Elliptio lanceolata*	FT	None
Heteroptera (true bugs)			
Virginia Piedmont water boatman	*Sigara depressa*	SOC	SE
Mammals			
Little brown bat	*Myotis lucifugus*	--	SE
Northern long-eared bat	*Myotis septentrionalis*	FT	ST
Tri-colored bat	*Perimyotis subflavus*	--	SE
Vascular Plants			
Small whorled pogonia	*Isotria medeoloides*	FT	SE

FE= federally endangered; FT = federally threatened; DL = delisted; UR = under review
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83 FR 14189
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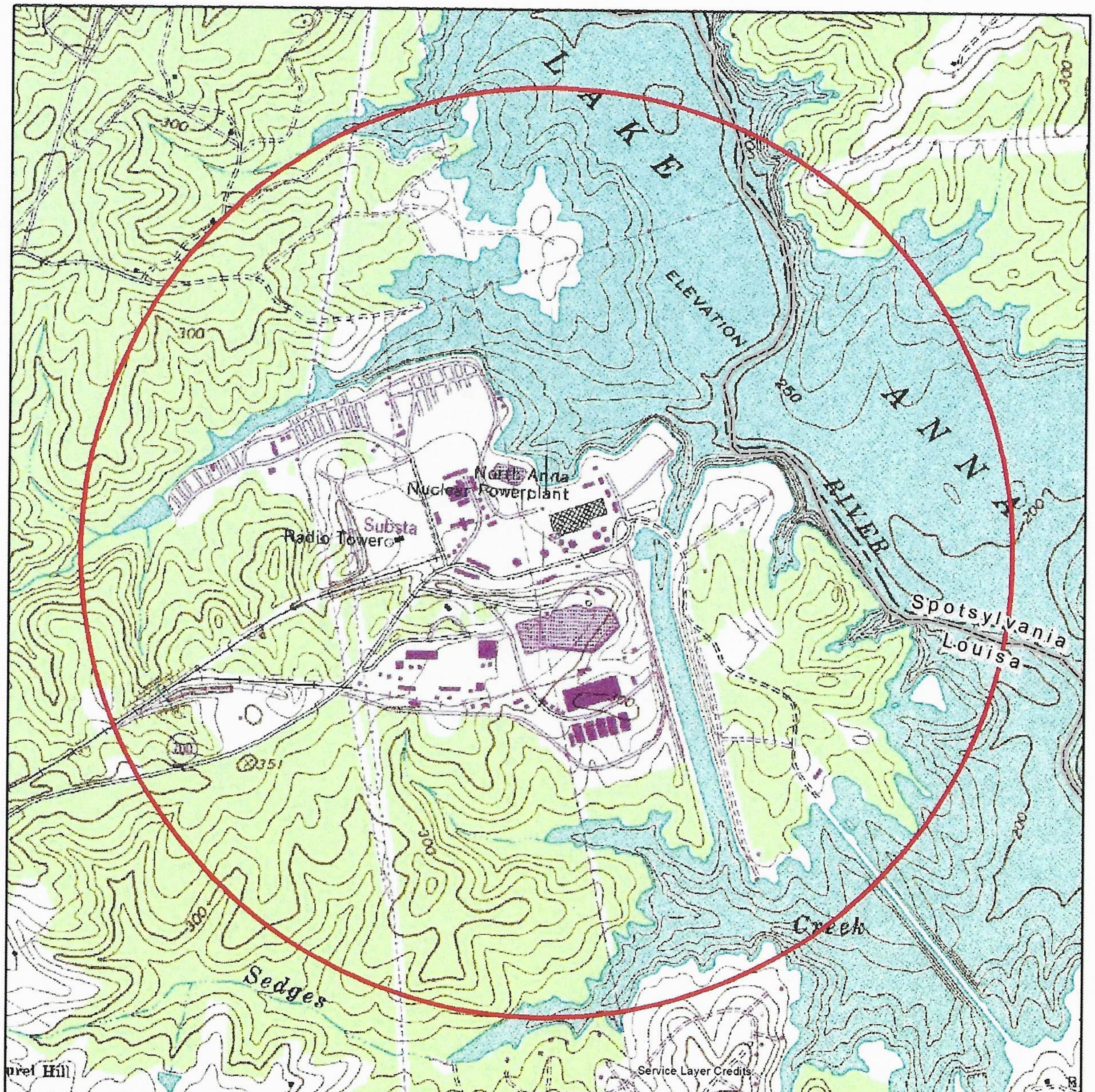
Figure NAPS Site



Legend

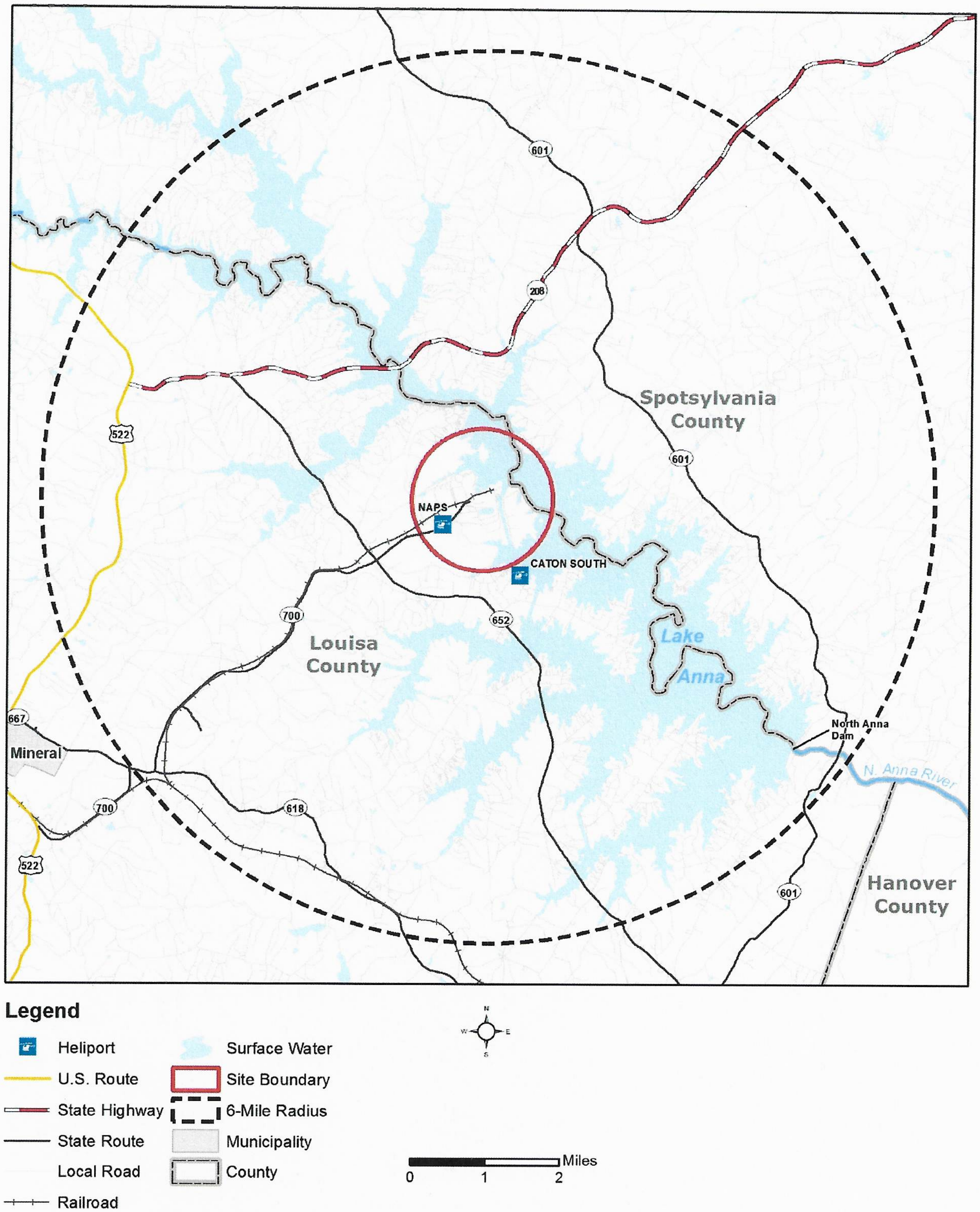
Site Boundary

County

N W E S

0 0.25 0.5 Miles

Figure NAPS 6-mile Vicinity



Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-VDCR 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1676

July 3, 2019

Ms. Amy Ewing
Virginia Department of Game and Inland Fisheries
Environmental Services Section
P.O. Box 90778
Richmond, Virginia 23228

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Ms. Ewing,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040 to midnight on August 21, 2060.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER will address the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), and important plant and animal habitats, including critical habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act.

This letter seeks input from the Virginia Department of Game and Inland Fisheries (VDGIF) regarding such effects in the vicinity of NAPS. Also, as part of the renewal process, the NRC may request a consultation with your agency regarding the license renewal. The time frame for the NRC consultation request is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input from you regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the station's environs and any questions or additional information necessary for the consultation process. Figures depicting the station site and the vicinity within a 6-mile radius of the station and a table of listed species in the station's vicinity are enclosed, and a brief discussion of the station and its operations during the extended period of operation is provided below.

NAPS is located approximately 40 miles north-northwest of Richmond, Virginia on a peninsula on the southern shore of Lake Anna in Louisa County, Virginia, and is situated approximately five miles upstream from the North Anna Dam. The NAPS site and exclusion area comprise 1803 acres, of which about 760 acres are covered by the waters of Lake Anna and the Waste Heat Treatment Facility (WHTF). In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those located within the NAPS site boundary.

Species potentially occurring near the NAPS site, or within Louisa and Spotsylvania Counties (counties occurring in a 6-mile radius of the site) that are currently federally or state listed (or proposed for listing) as threatened or endangered are included in the enclosed table.

During the license renewal term, Dominion proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities anticipated at the NAPS site during the subsequent license renewal period. Currently, Dominion does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion does not anticipate the continued operation of NAPS to adversely affect the environment, sensitive species, or habitats.

As stated above, this letter seeks your input on our proposed continued operation of NAPS on listed species and important habitats within the environs of the station. We appreciate your notifying us of your comments and any information or actions required of Dominion to assist in the preparation of our assessment and to facilitate NRC's consultation. Dominion plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

Sincerely,

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

Table of Protected Species Potentially Occurring in the NAPS Vicinity
Figure NAPS Site
Figure NAPS 6-mile Vicinity

Table of Protected Species Potentially Occurring in the NAPS Vicinity

Common Name	Scientific Name	Federal Legal Status	State Legal Status
Birds			
Bald eagle	*Haliaeetus leucocephalus*	DL	None
Loggerhead shrike	*Lanius ludovicianus*	--	ST
Bivalvia (mussels)			
Dwarf wedgemussel	*Alasmidonta heterodon*	FE	SE
James spinymussel	*Pleurobema collina*	FE	SE
Green floater	*Lasmigona subviridis*	UR	ST
Yellow lance	*Elliptio lanceolata*	FT	None
Heteroptera (true bugs)			
Virginia Piedmont water boatman	*Sigara depressa*	SOC	SE
Mammals			
Little brown bat	*Myotis lucifugus*	--	SE
Northern long-eared bat	*Myotis septentrionalis*	FT	ST
Tri-colored bat	*Perimyotis subflavus*	--	SE
Vascular Plants			
Small whorled pogonia	*Isotria medeoloides*	FT	SE

FE= federally endangered; FT = federally threatened; DL = delisted; UR = under review

SE = state endangered; ST = state threatened; SOC = species of concern

83 FR 14189

USFWS website, T&E Species by county (Louisa and Spotsylvania Counties)

VDCR website, Species by County Report (Louisa and Spotsylvania Counties)

VDGIF-Fish and Wildlife Information Service (FWIS) website, Listed Species Information Report

Figure NAPS Site

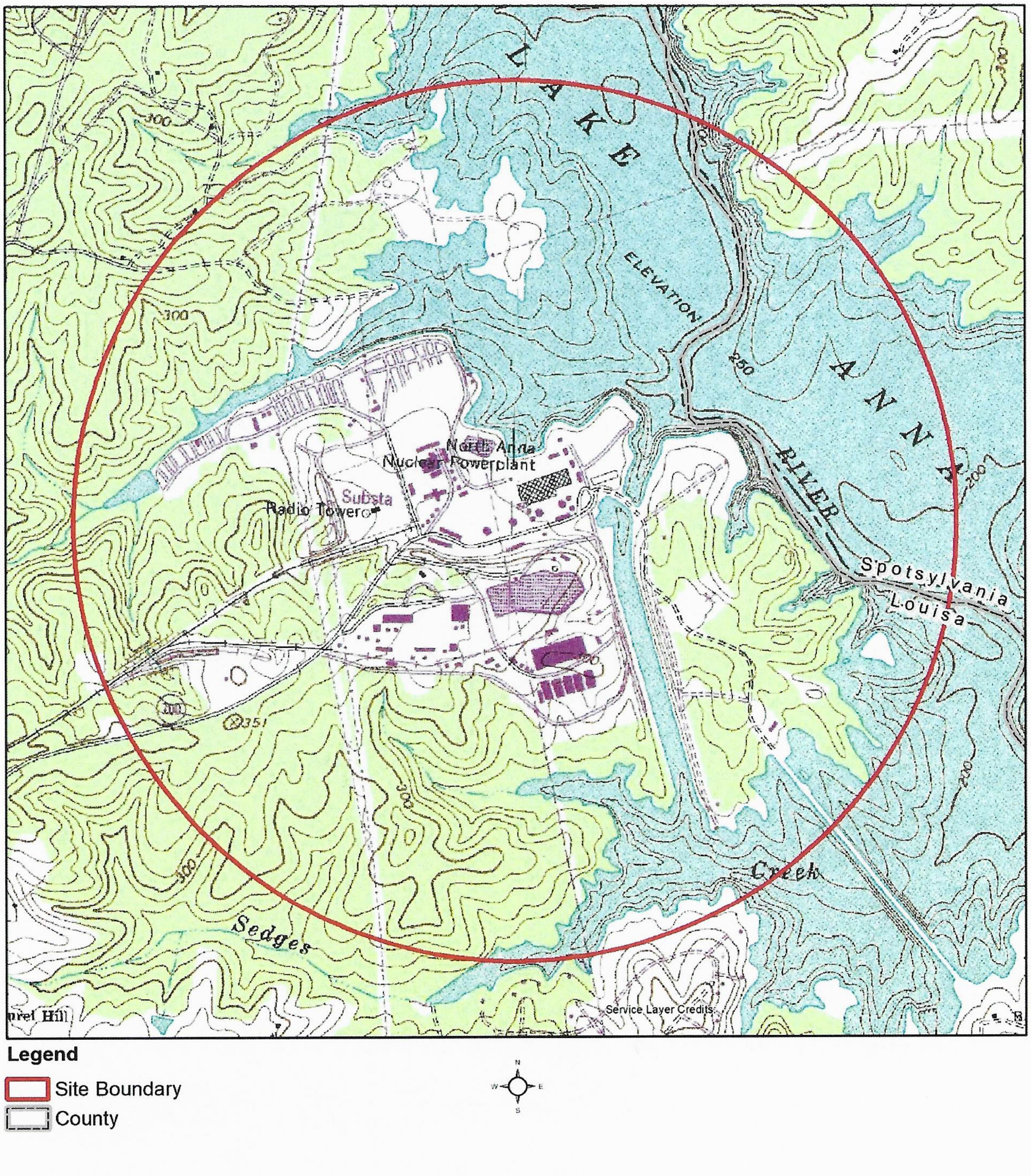
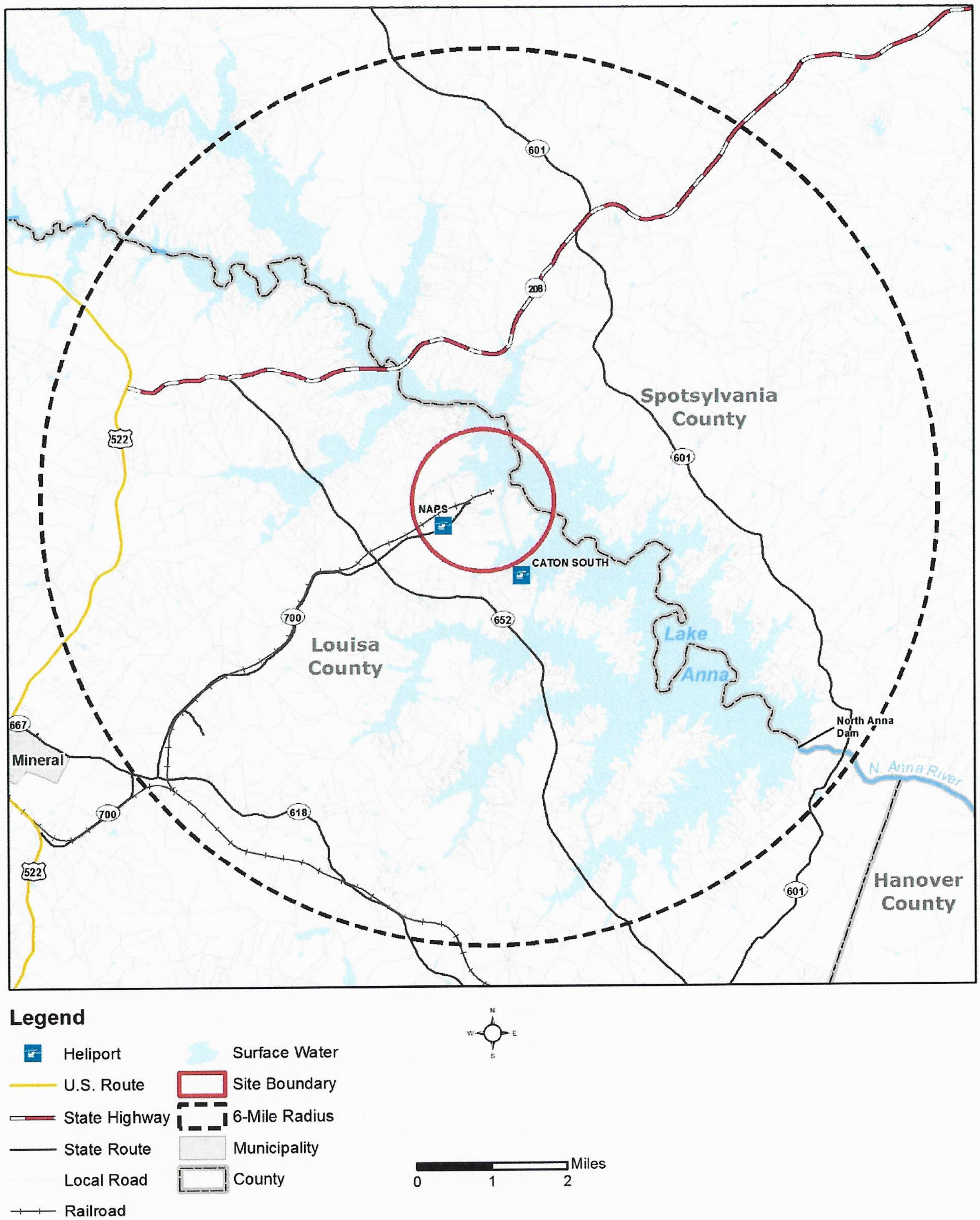


Figure NAPS 6-mile Vicinity



Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-VDGIF 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1683

July 3, 2019

Mr. Tony Watkinson
Chief of Habitat Management
Virginia Marine Resource Commission (VMRC)
2600 Washington Avenue, 3rd Floor
Newport News, Virginia 23607

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Mr. Watkinson:

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040 to midnight on August 21, 2060.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER will address the potential impact on species listed or proposed for listing as threatened or endangered in accordance with the Endangered Species Act (ESA), and important plant and animal habitats, including critical habitats as defined by the ESA and essential fish habitat as identified under the Magnuson-Stevens Fishery Conservation and Management Act.

This letter seeks input from the Virginia Marine Resource Commission (VMRC) regarding such effects in the vicinity of NAPS. Also, as part of the renewal process, the NRC may request a consultation with your agency regarding the license renewal. The time frame for the NRC consultation request is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input from you regarding the effects that license renewal activities may have on listed species (or candidates proposed for listing) and important plant and animal habitats within the station's environs and any questions or additional information necessary for the consultation process. Figures depicting the station site and the vicinity within a 6-mile radius of the station are enclosed, and a brief discussion of the station and its operations during the extended period of operation is provided below.

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During the license renewal term, Dominion proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities anticipated at the NAPS site during the subsequent license renewal period. Currently, Dominion does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion does not anticipate the continued operation of NAPS to adversely affect the environment, sensitive species, or habitats.

As stated above, this letter seeks your input on our proposed continued operation of NAPS on listed species and important habitats within the environs of the station. We appreciate your notifying us of your comments and any information or actions required of Dominion to assist in the preparation of our assessment and to facilitate NRC's consultation. Dominion plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

Sincerely,

Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

Figure NAPS Site
Figure NAPS 6-mile Vicinity

Figure NAPS Site

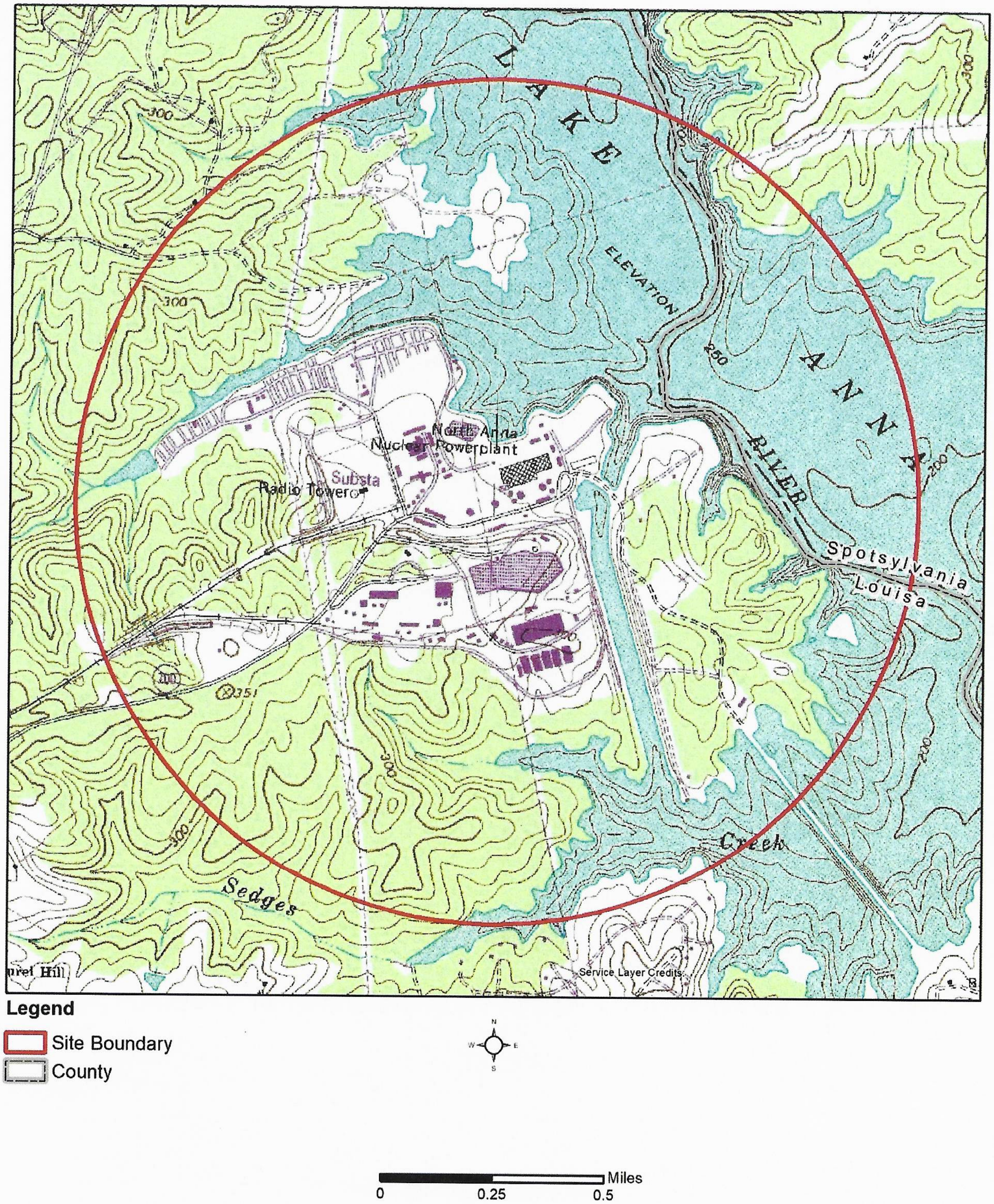
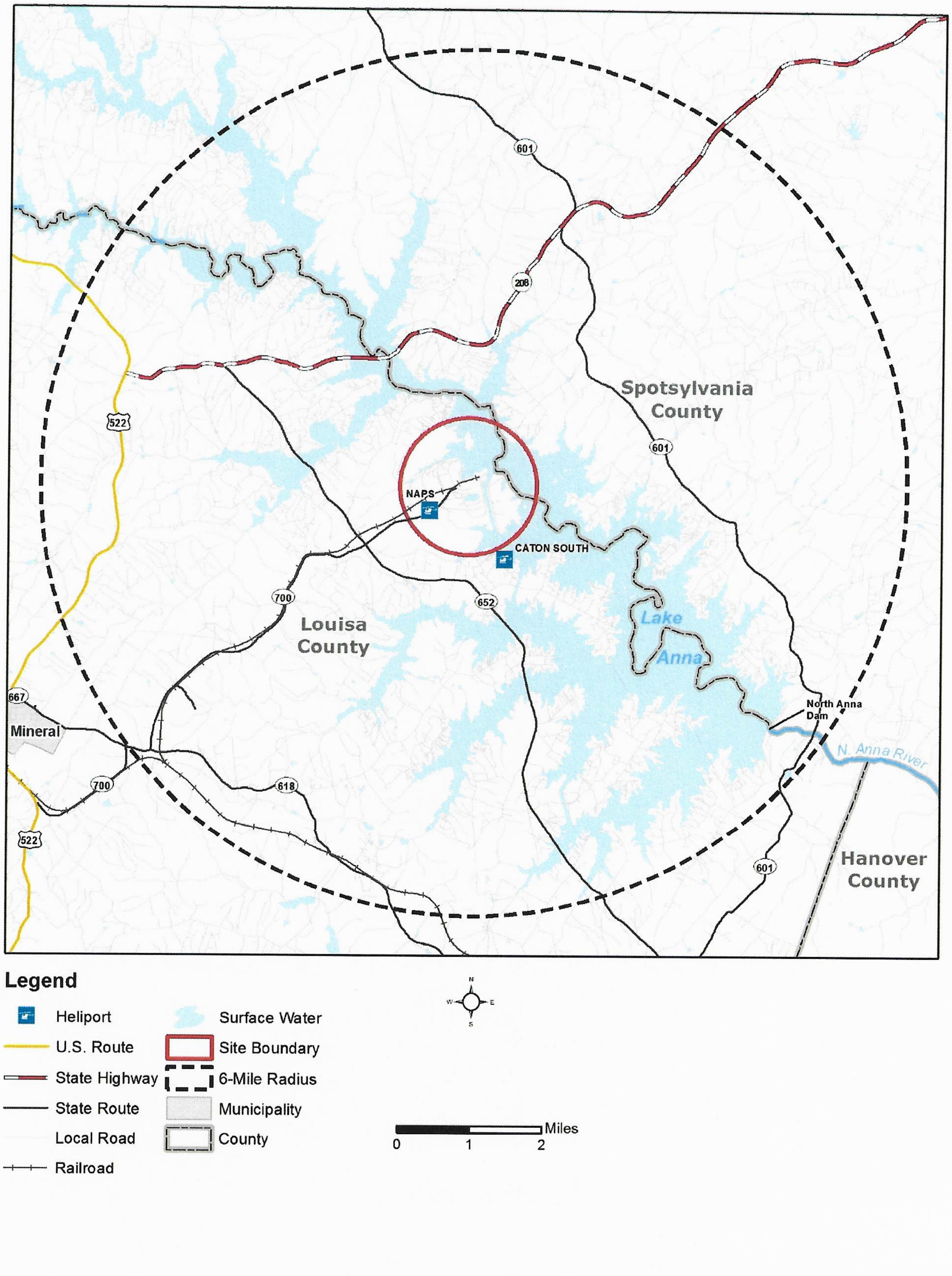


Figure NAPS 6-mile Vicinity



Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-VMRC 7-3-2019

From:	Julie Crocker - NOAA Federal
To:	Oula K Shehab-Dandan (Services - 6); Tony Banks (Generation - 6)
Subject:	[External] North Anna Relicensing
Date:	Thursday, July 18, 2019 10:36:46 AM

Ms. Shehab-Dandan and Mr. Banks,

This replies to a July 3, 2019, letter from Amanda Tornabene requesting information on species listed by NMFS under the Endangered Species Act that may occur in the area affected by continued operations of the North Anna nuclear facility. We agree with Dominion's assessment that there are no listed species under our jurisdiction in the action area. While listed Atlantic sturgeon and sea turtles occur in the Chesapeake Bay, they do not occur in Lake Anna. As such, we do not anticipate that an ESA section 7 consultation will be necessary for relicensing unless it is determined that the action area would extend into areas where ESA listed species occur.

Please let me know if you have any questions regarding this correspondence.

Julie Crocker

--
Julie Crocker
Endangered Fish Branch Chief

Greater Atlantic Regional Fisheries Office
Protected Resources Division
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, MA 01930
office: (978)282-8480
cell: (978)559-9664

Attachment D: Cultural Resource Consultation Letters

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Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1805

July 3, 2019

Chief Dean Branham
Monacan Indian Nation
PO Box 1136
Madison Heights, VA 24572

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

The Honorable Chief Branham,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040, to midnight on August 21, 2060. Dominion is contacting you for assistance in assessing the impacts from continued operation during this renewed license period.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER addresses the potential to impact historic and cultural resources including tribal cultural resources on or near the North Anna site.

While environmental impacts of an existing facility were assessed during original licensing, and license renewal is unlikely to have significant additional or different impacts, the NRC may request a consultation with the Virginia State Historic Preservation Office (SHPO) and the Monacan Indian Nation regarding license renewal. Should the NRC consultation take place, the time frame for its conduct is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input from you regarding the effects that license renewal activities may have on historic and cultural resources within the station's environs and any questions or additional information necessary for the consultation process. Figures depicting the station site and the vicinity within a 6-mile radius of the station are enclosed, and a brief discussion of the station and its operations during the extended period of operation is provided below.

NAPS is located approximately 40 miles north-northwest of Richmond, Virginia on a peninsula on the southern shore of Lake Anna in Louisa County, Virginia, and is situated approximately five miles upstream from the North Anna Dam. The NAPS site and exclusion area comprise 1803 acres, of which about 760 acres are covered by the waters of Lake Anna and the Waste Heat Treatment Facility (WHTF). In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those located within the NAPS site boundary.

During the license renewal term, Dominion proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities anticipated at the NAPS site during the subsequent license renewal period. Currently, Dominion does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion does not anticipate the continued operation of NAPS to adversely affect the environment or any cultural or historic resources.

As stated earlier, this letter seeks your input on our proposed continued operation of NAPS on historic and cultural resources, including tribal cultural resources, within the environs of the station. We appreciate your notifying us of your comments and any information you believe Dominion should consider in the preparation of the ER. Dominion plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

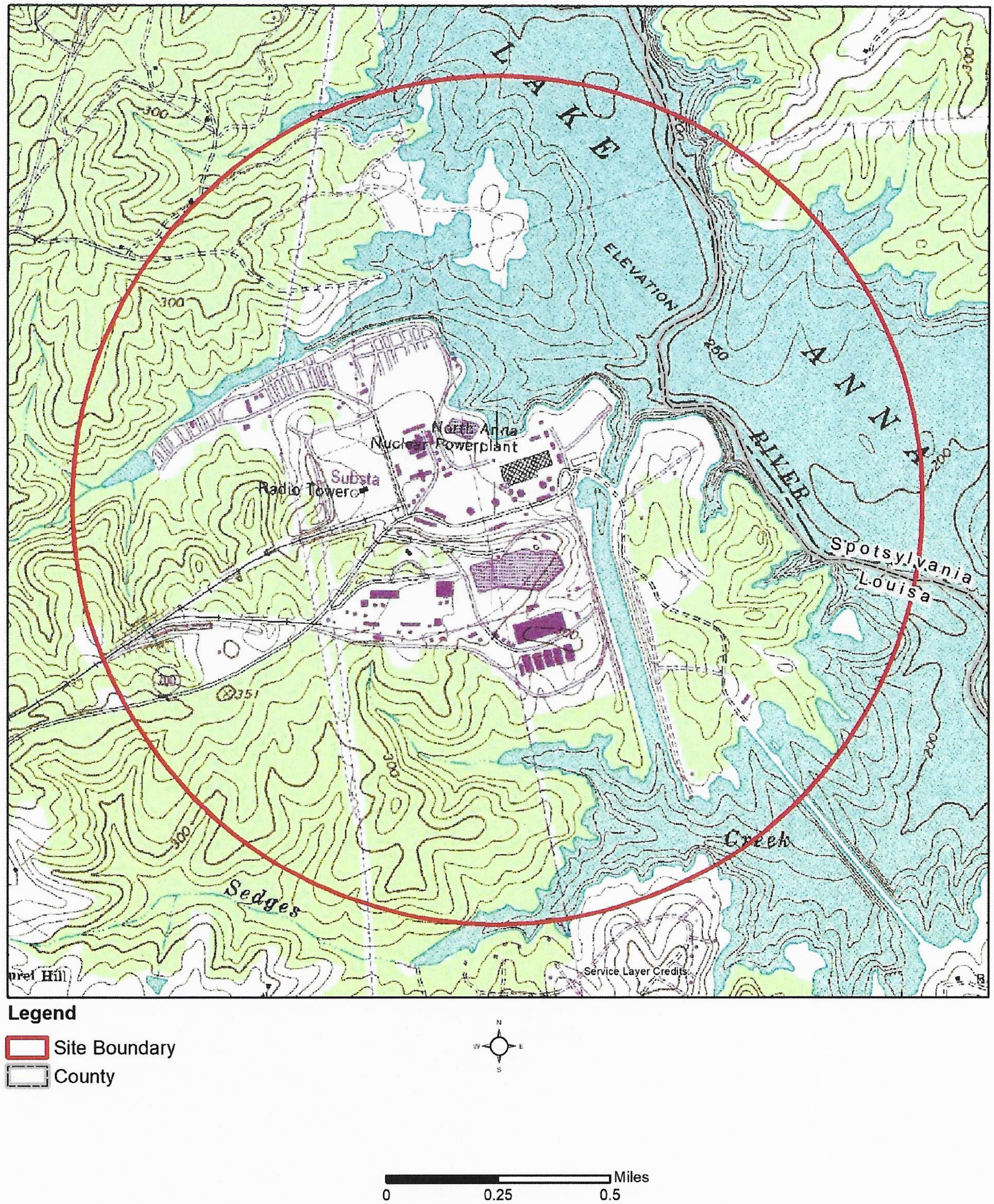
Sincerely,

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

Figure NAPS Site
Figure NAPS 6-mile Vicinity

Figure NAPS Site



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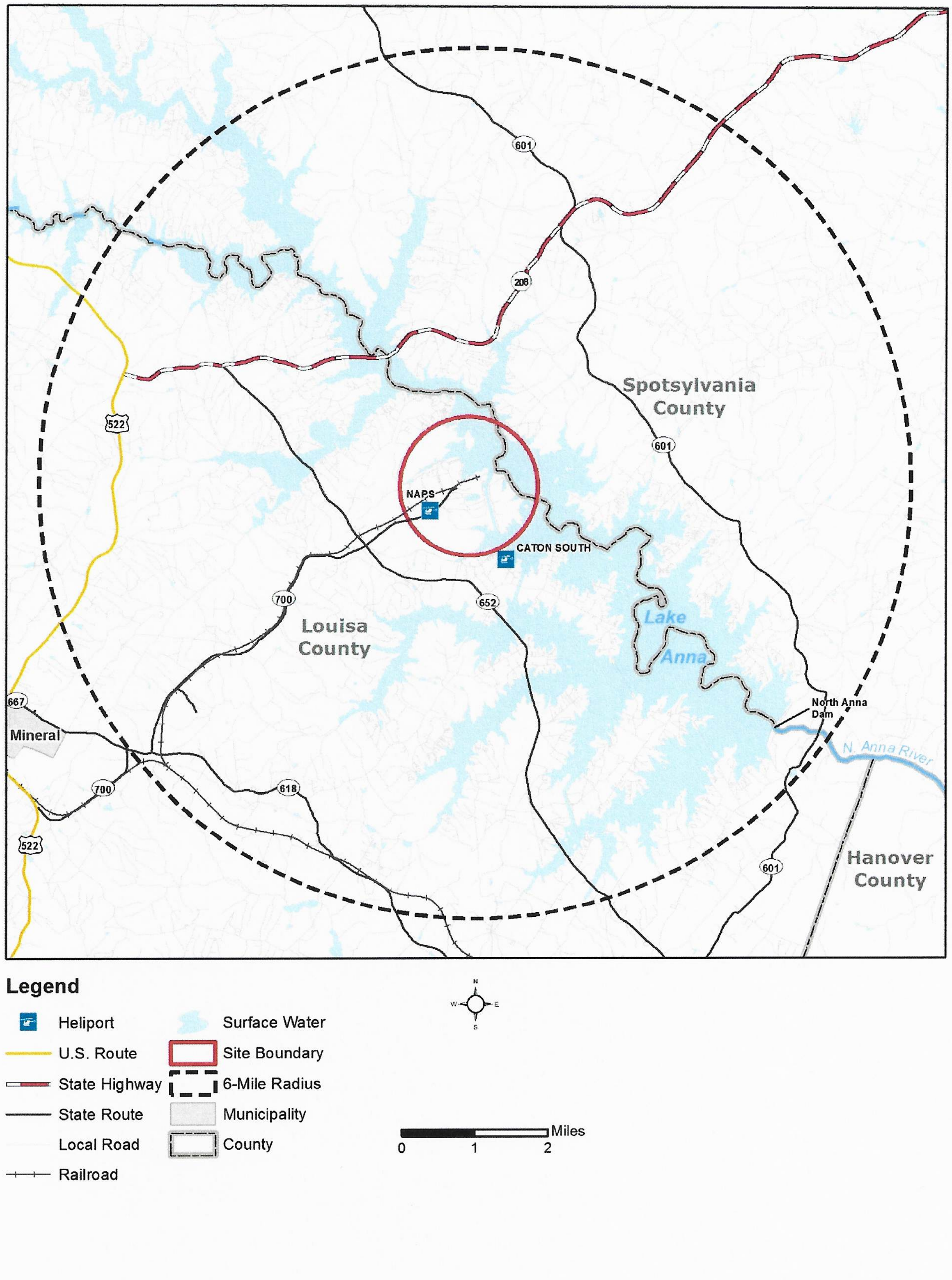

Ebc:
Amanda Tornabene
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Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal- Monacan Indian Nation 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

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RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1799

July 3, 2019

Chief G. Anne Richardson
Rappahannock Tribe
5036 Indian Neck Road
Indian Neck, VA 23148

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Chief Richardson,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040, to midnight on August 21, 2060. Dominion is contacting you for assistance in assessing the impacts from continued operation during this renewed license period.

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While environmental impacts of an existing facility were assessed during original licensing, and license renewal is unlikely to have significant additional or different impacts, the NRC may request a consultation with the Virginia State Historic Preservation Office (SHPO) and the Rappahannock Tribe regarding license renewal. Should the NRC consultation take place, the time frame for its conduct is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input from you regarding the effects that license renewal activities may have on historic and cultural resources within the station's environs and any questions or additional information necessary for the consultation process. Figures depicting the station site and the vicinity within a 6-mile radius of the station are enclosed, and a brief discussion of the station and its operations during the extended period of operation is provided below.

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Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

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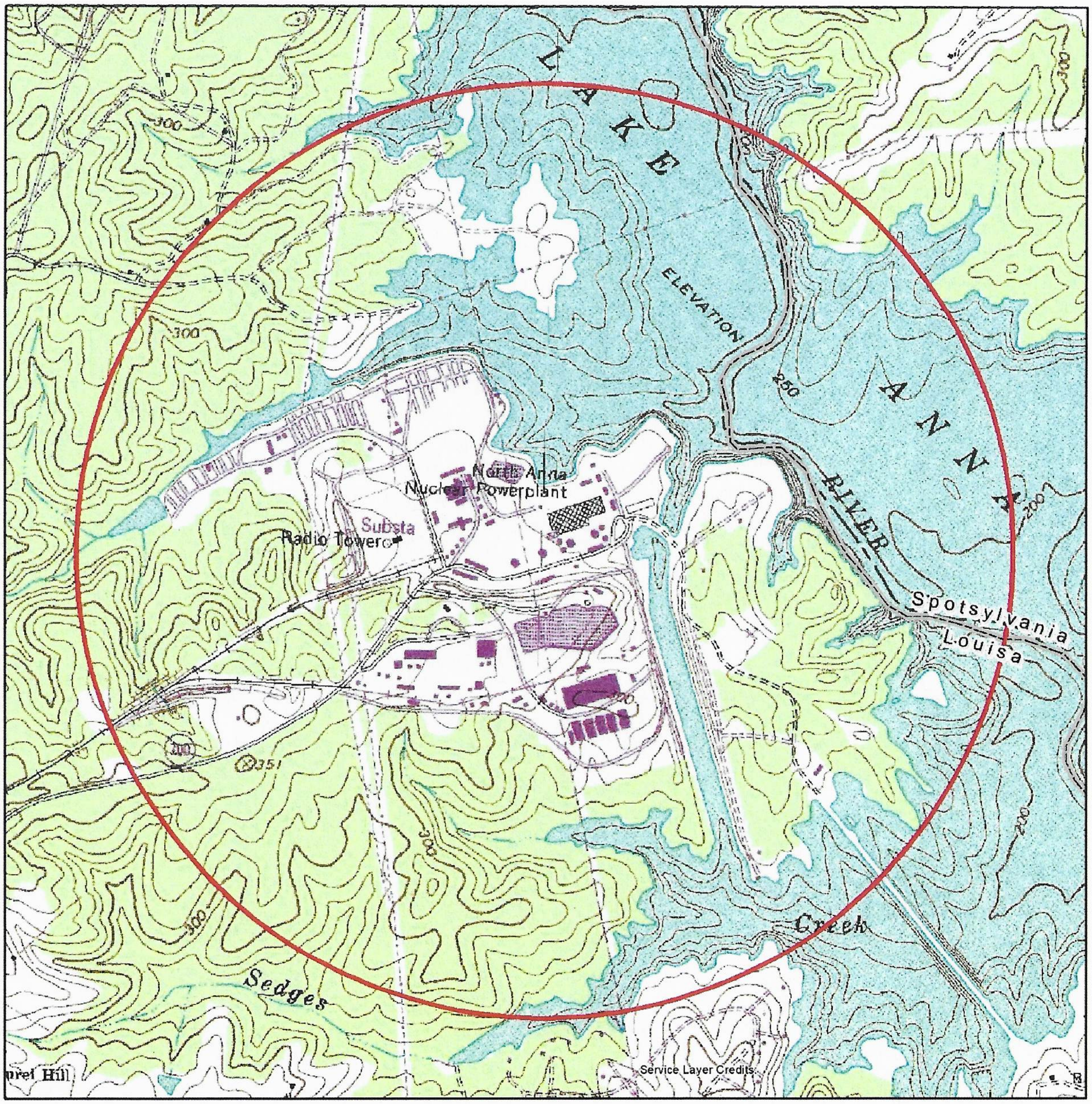
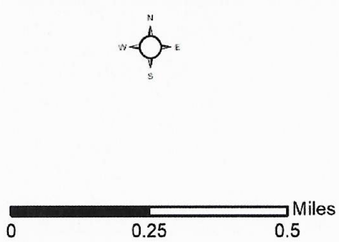


Legend

Site Boundary

County



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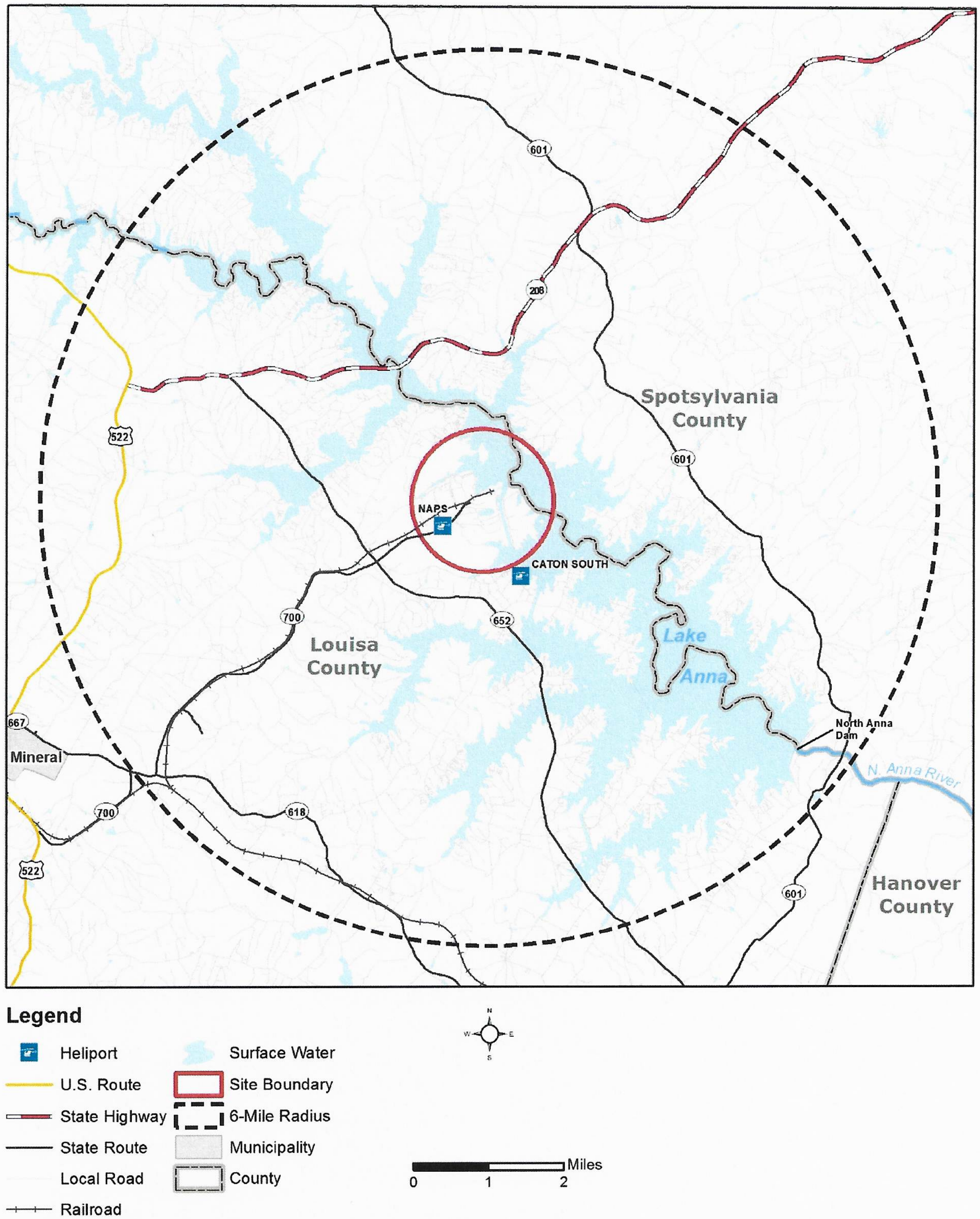

Ebc:
Amanda Tornabene
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Tony Banks
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Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal- Rappahannock Tribe 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1829

July 3, 2019

Dr. Wenonah Haire
Tribal Historic Preservation Officer
Catawba Indian Tribe
1536 Tom Steven Road
Rock Hill, SC 29730

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Dr. Haire,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040, to midnight on August 21, 2060. Dominion is contacting you for assistance in assessing the impacts from continued operation during this renewed license period.

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While environmental impacts of an existing facility were assessed during original licensing, and license renewal is unlikely to have significant additional or different impacts, the NRC may request a consultation with the Virginia State Historic Preservation Office (SHPO) and the Catawba Tribe regarding license renewal. Should the NRC consultation take place, the time frame for its conduct is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

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Vice President, Environmental Services

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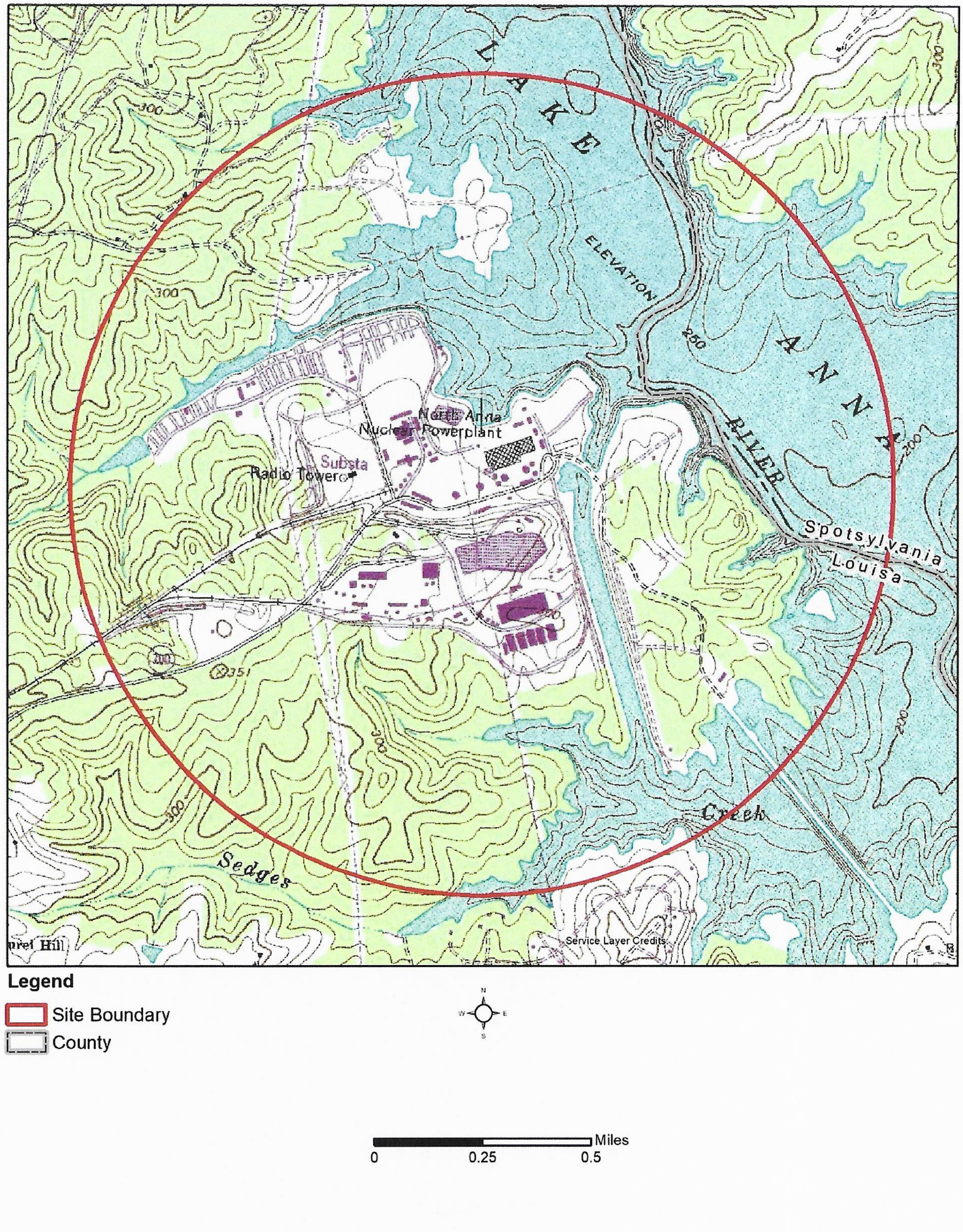

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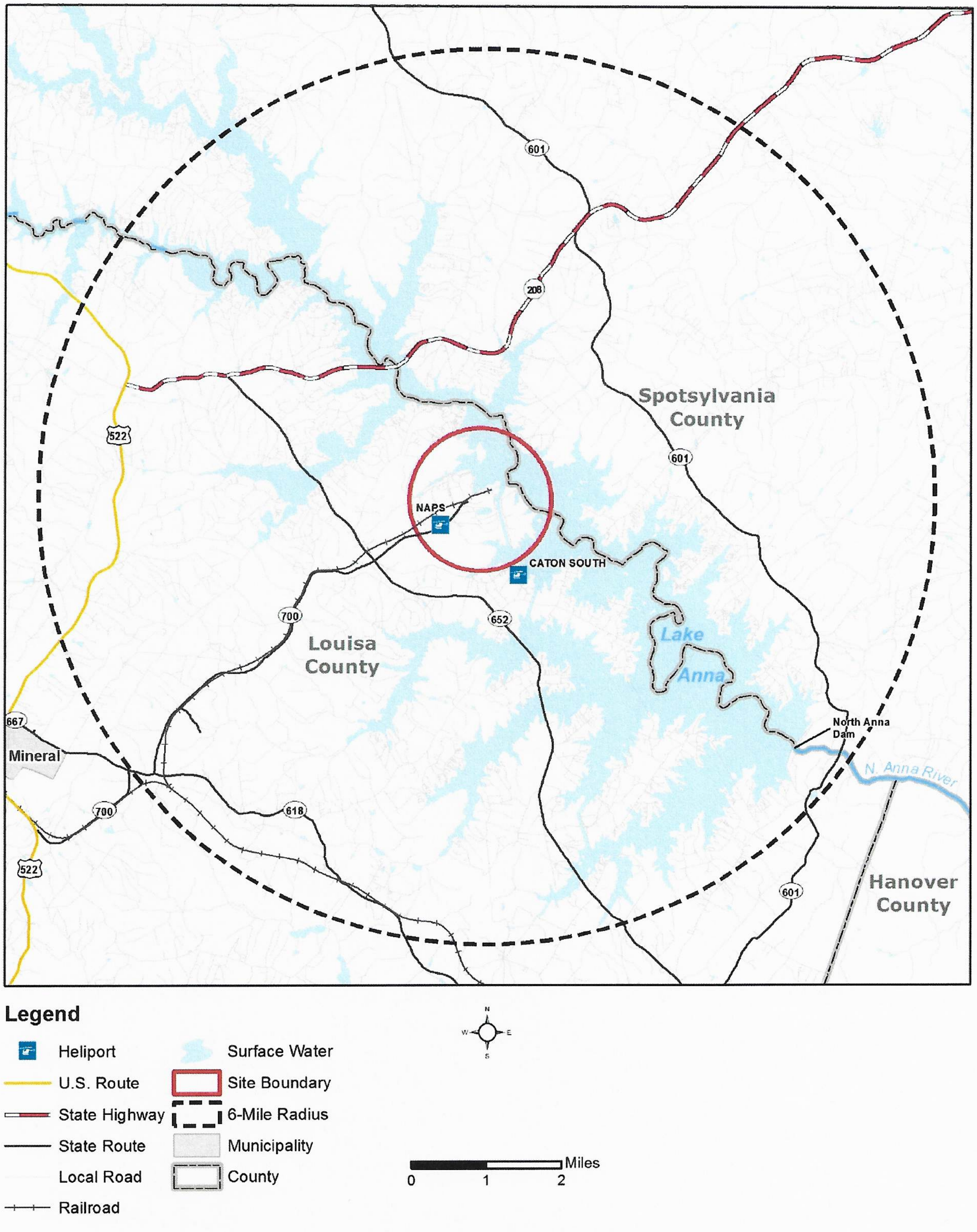

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Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Catawba Indian Tribe 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

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7018 2290 0000 9543 1713

July 3, 2019

Chief Walt "Red Hawk" Brown
Chereonhaka (Nottoway) Tribe
P.O. Box 397
27345 Aquia Path
Courtland, VA 23837

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Chief Brown,

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Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

Sincerely,

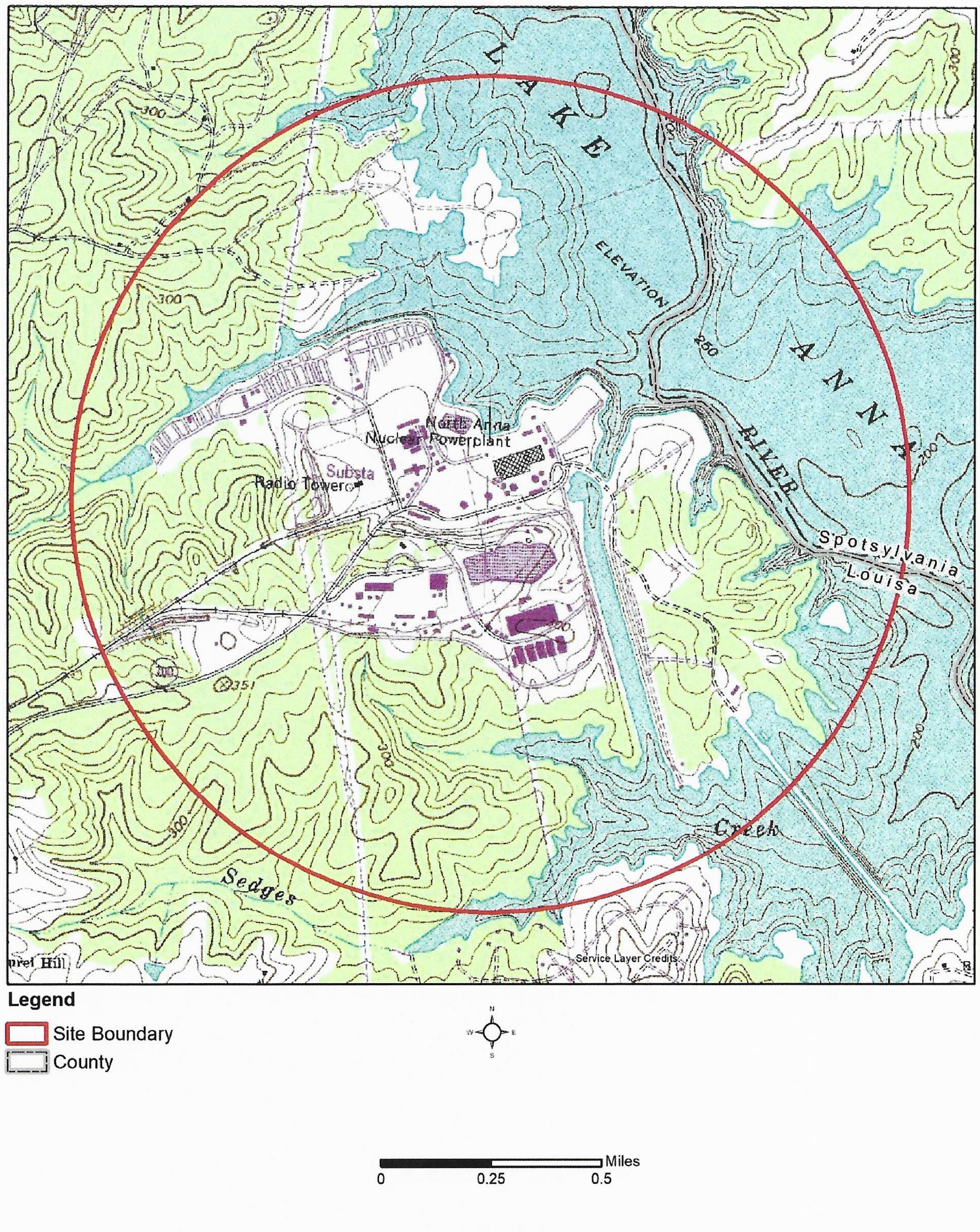
Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

Figure NAPS Site
Figure NAPS 6-mile Vicinity

Figure NAPS Site



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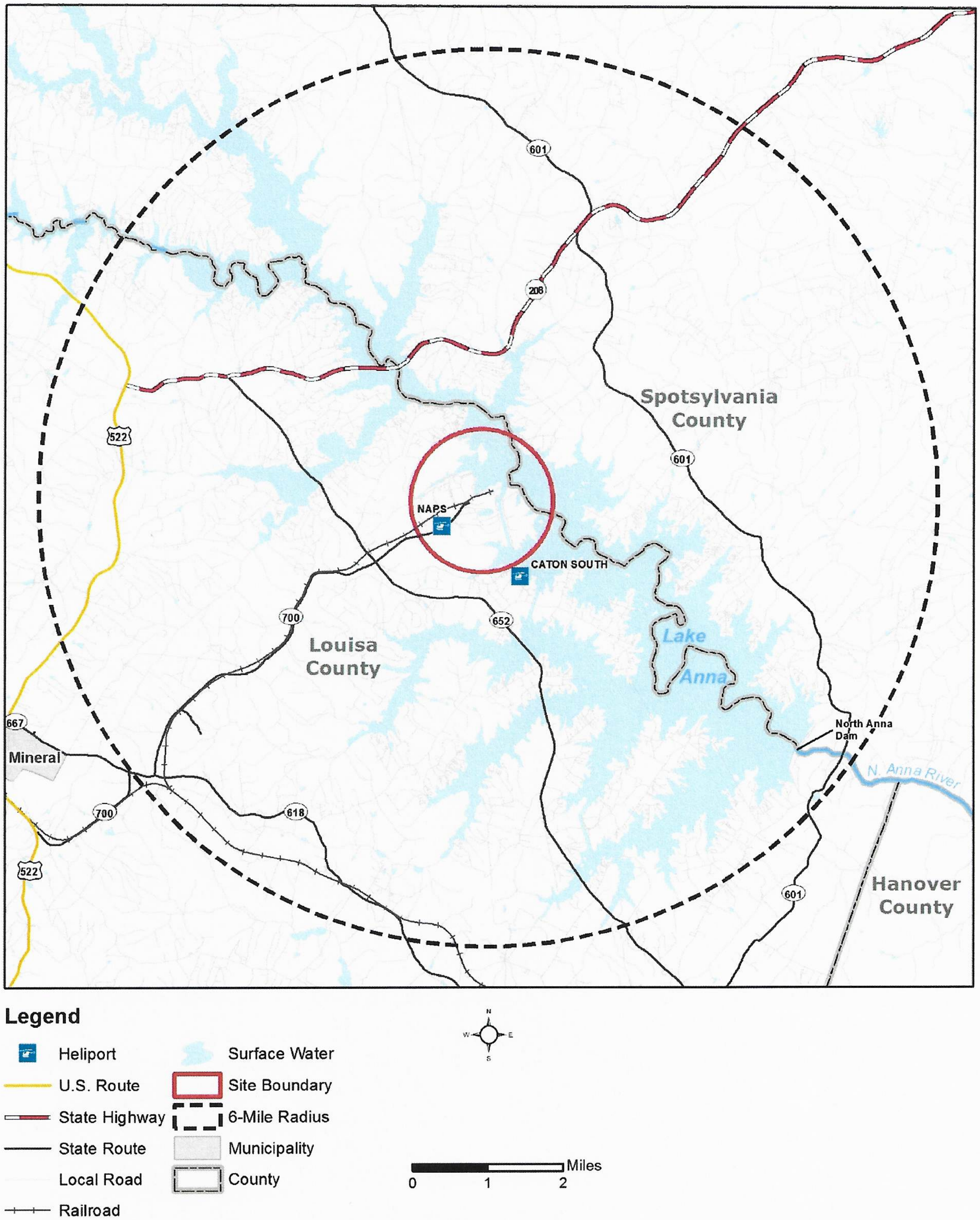

Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Chereonhaka Nottoway Tribe 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1737

July 3, 2019

Chief Gerald A. Stewart
Chickahominy Indians Eastern Division
11911 Indian Hill Lane
Providence Forge, VA 23140

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Chief Stewart,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040, to midnight on August 21, 2060. Dominion is contacting you for assistance in assessing the impacts from continued operation during this renewed license period.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER addresses the potential to impact historic and cultural resources including tribal cultural resources on or near the North Anna site.

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Sincerely,

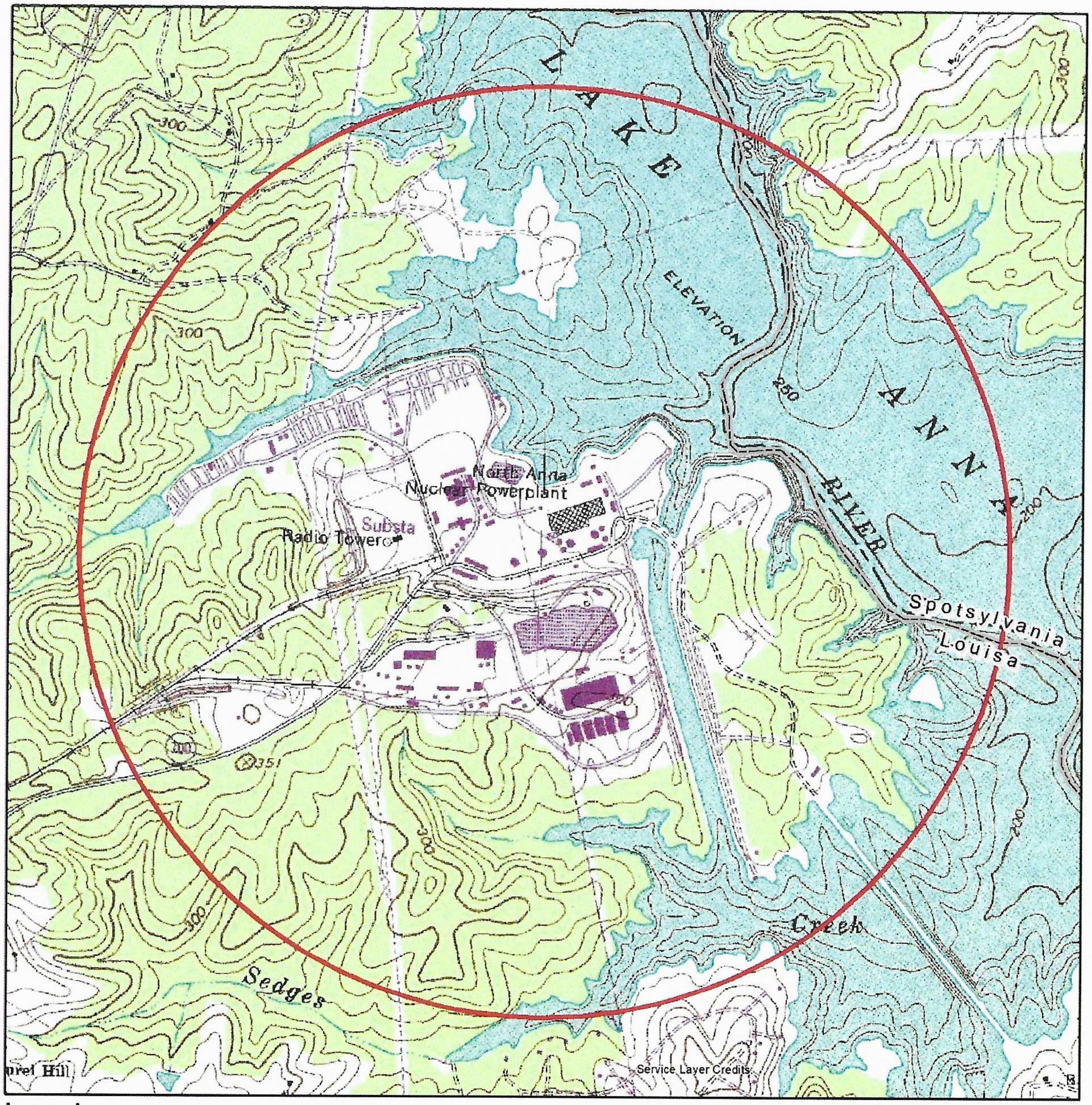
Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

Figure NAPS Site
Figure NAPS 6-mile Vicinity

Figure NAPS Site



Legend

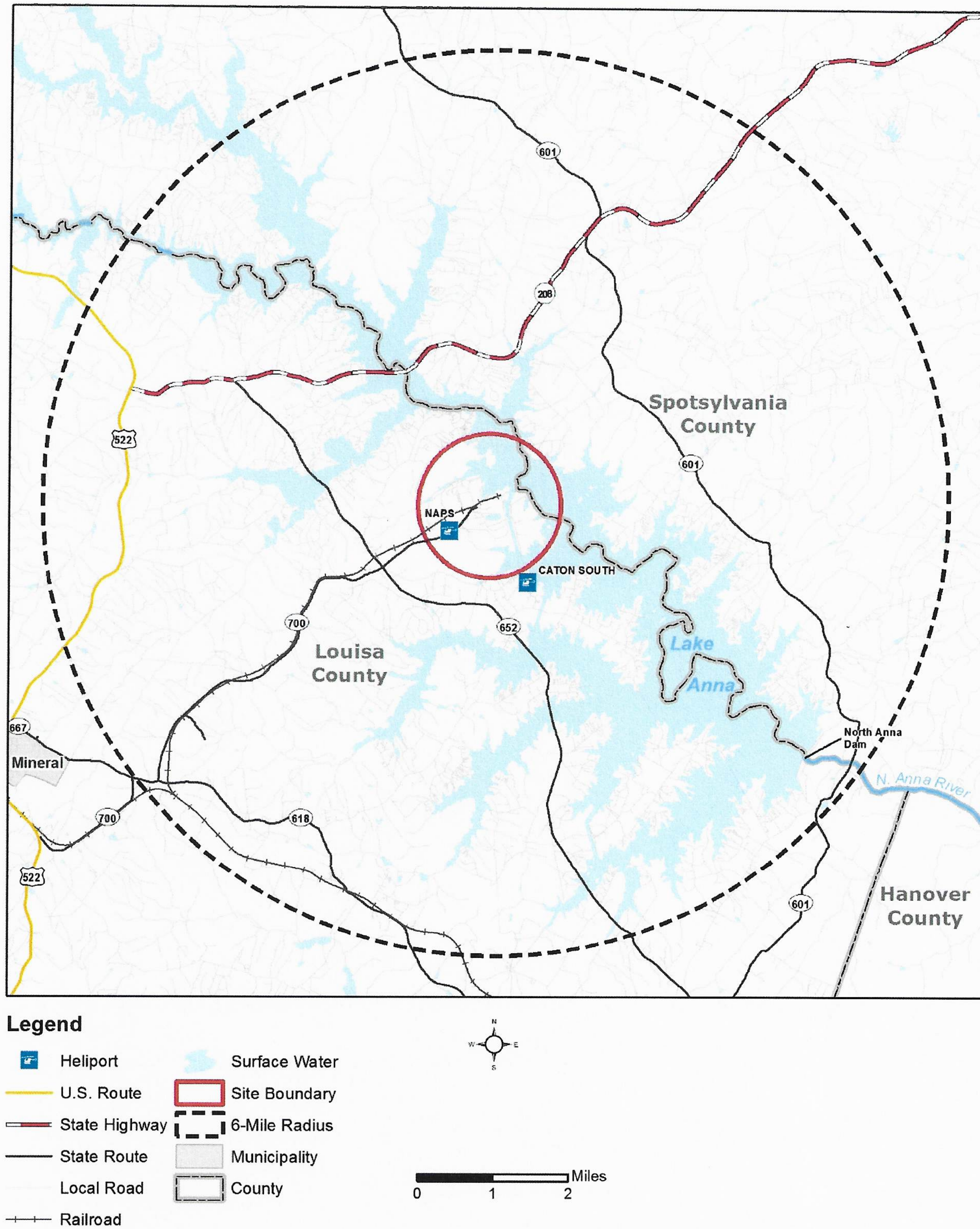
Site Boundary

County

Miles

0 0.25 0.5

Figure NAPS 6-mile Vicinity



Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Chickahominy Indians Eastern Division 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1720

July 3, 2019

Chief Stephen Adkins
Chickahominy Tribe
8200 Lott Cary Road
Providence Forge, VA 23140

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Chief Adkins,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040, to midnight on August 21, 2060. Dominion is contacting you for assistance in assessing the impacts from continued operation during this renewed license period.

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Sincerely,

Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

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Figure NAPS 6-mile Vicinity

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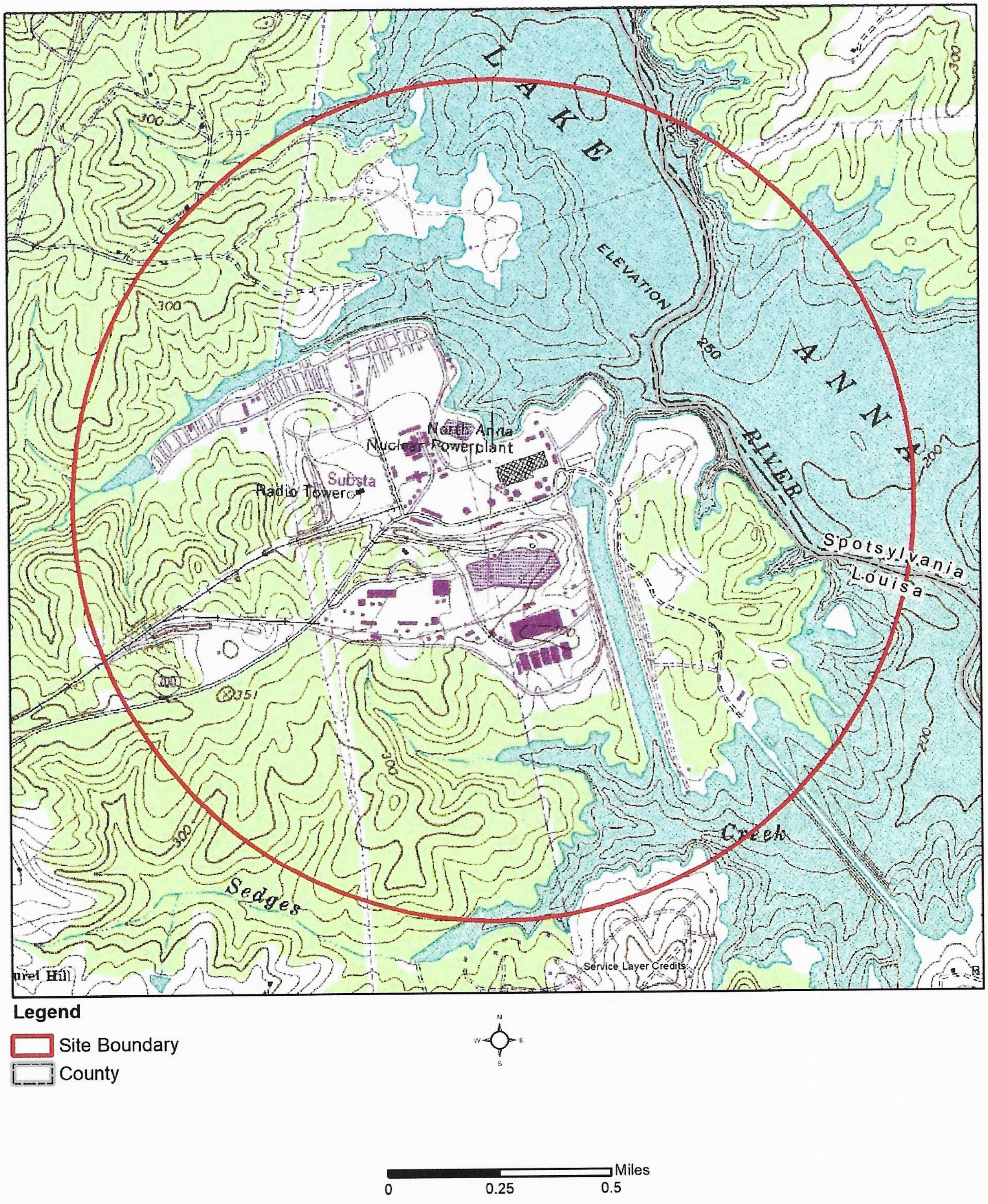

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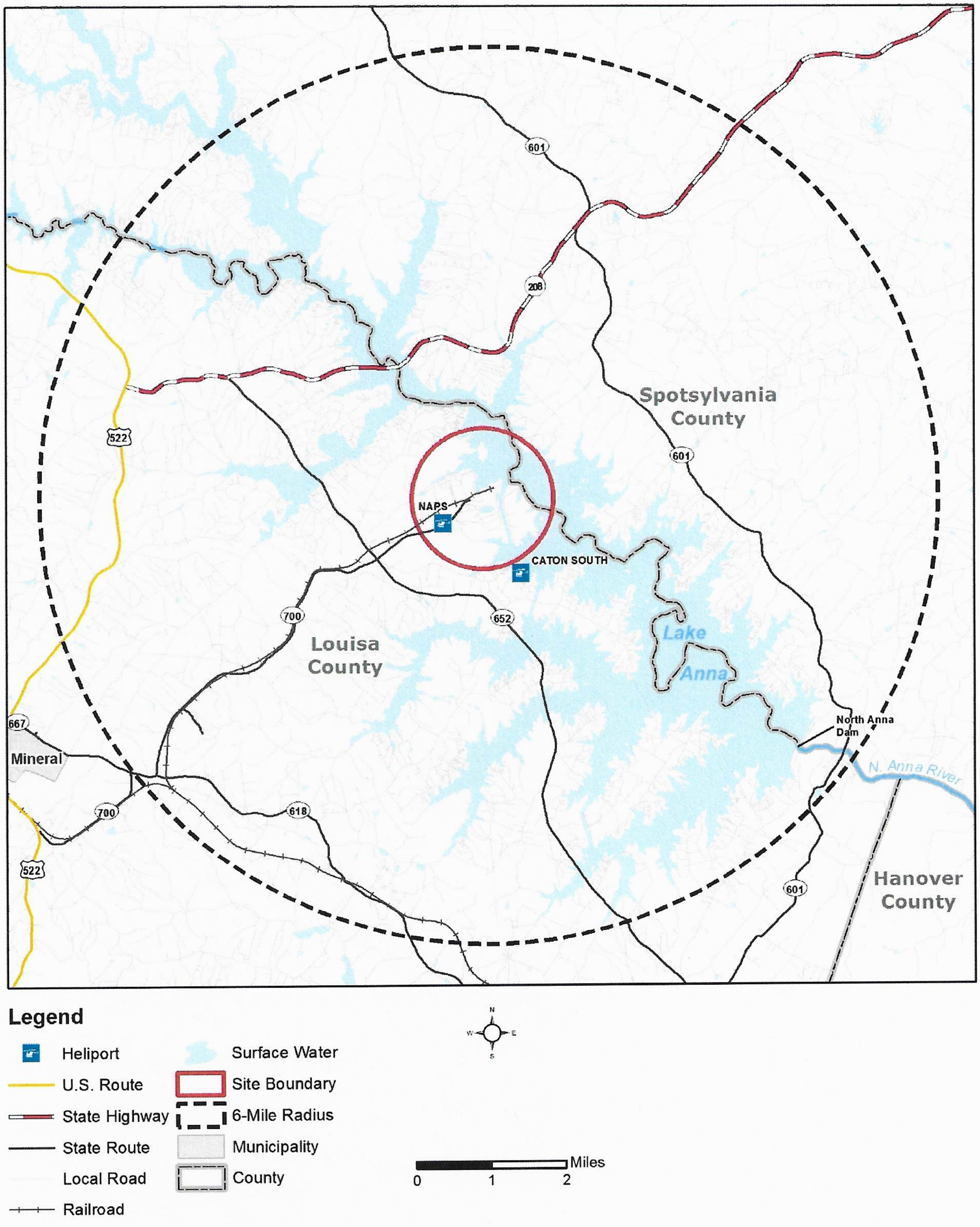

Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Chickahominy Tribe 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1706

July 3, 2019

Ms. Kimberly Penrod
The Delaware Nation
Archives, Library and Museum
31064 State Highway 281
Anadarko, OK 73005

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Ms. Penrod,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040, to midnight on August 21, 2060. Dominion is contacting you for assistance in assessing the impacts from continued operation during this renewed license period.

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Vice President, Environmental Services

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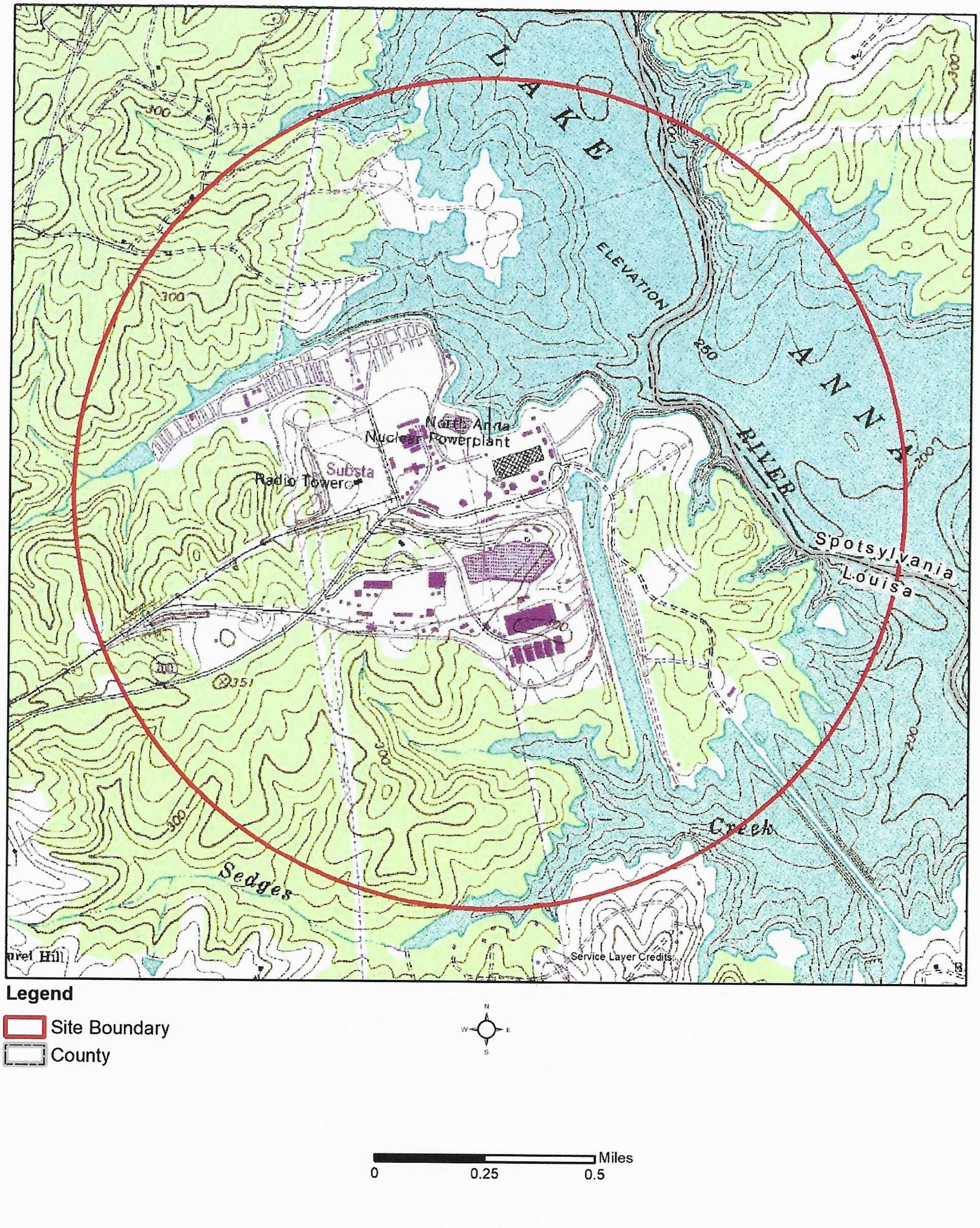

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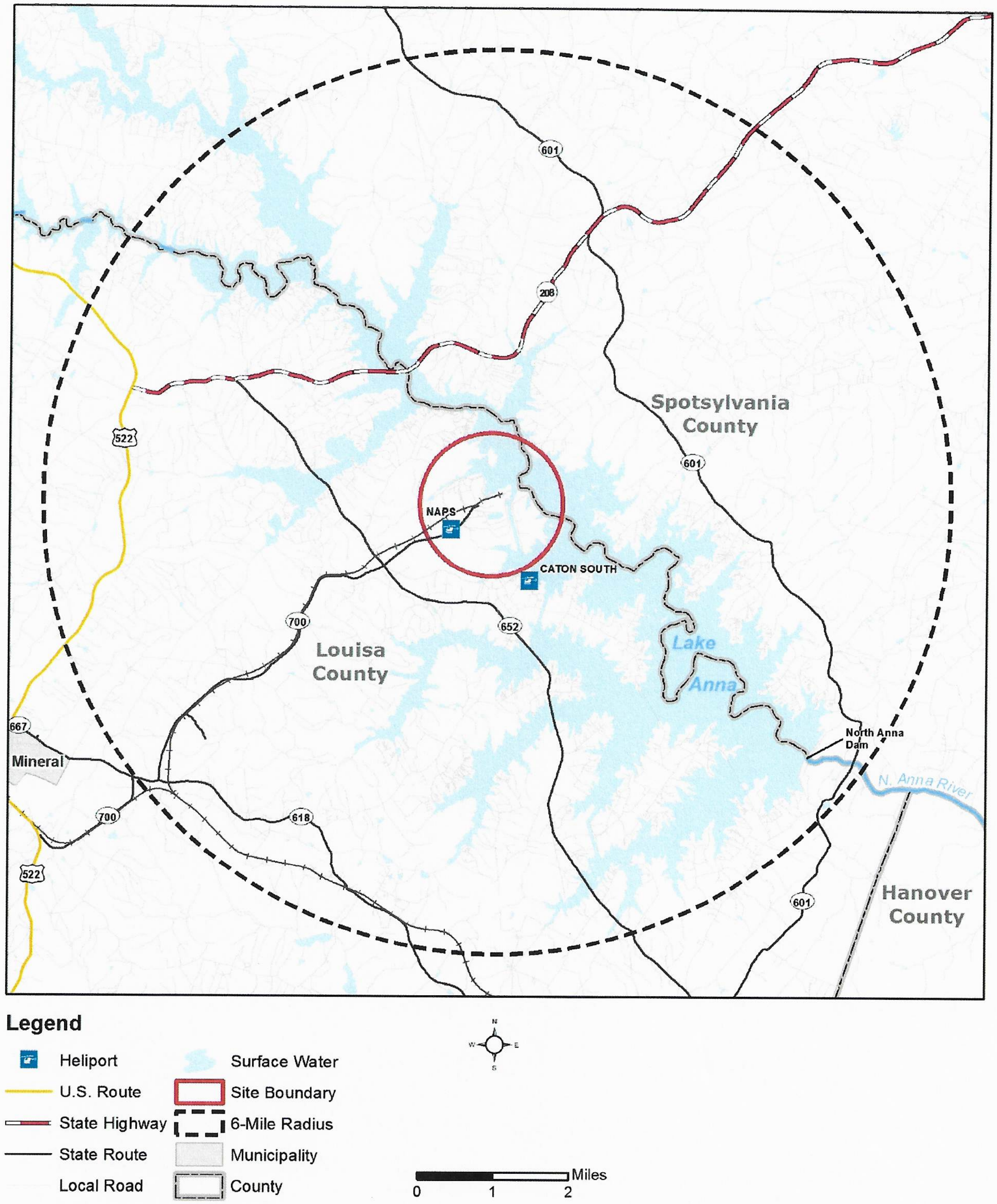

Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Delaware Nation 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1744

July 3, 2019

Chief Mark Custalow
Mattaponi Tribe
122 Nee A Ya Lane
West Point, VA 23181

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Chief Custalow,

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Vice President, Environmental Services

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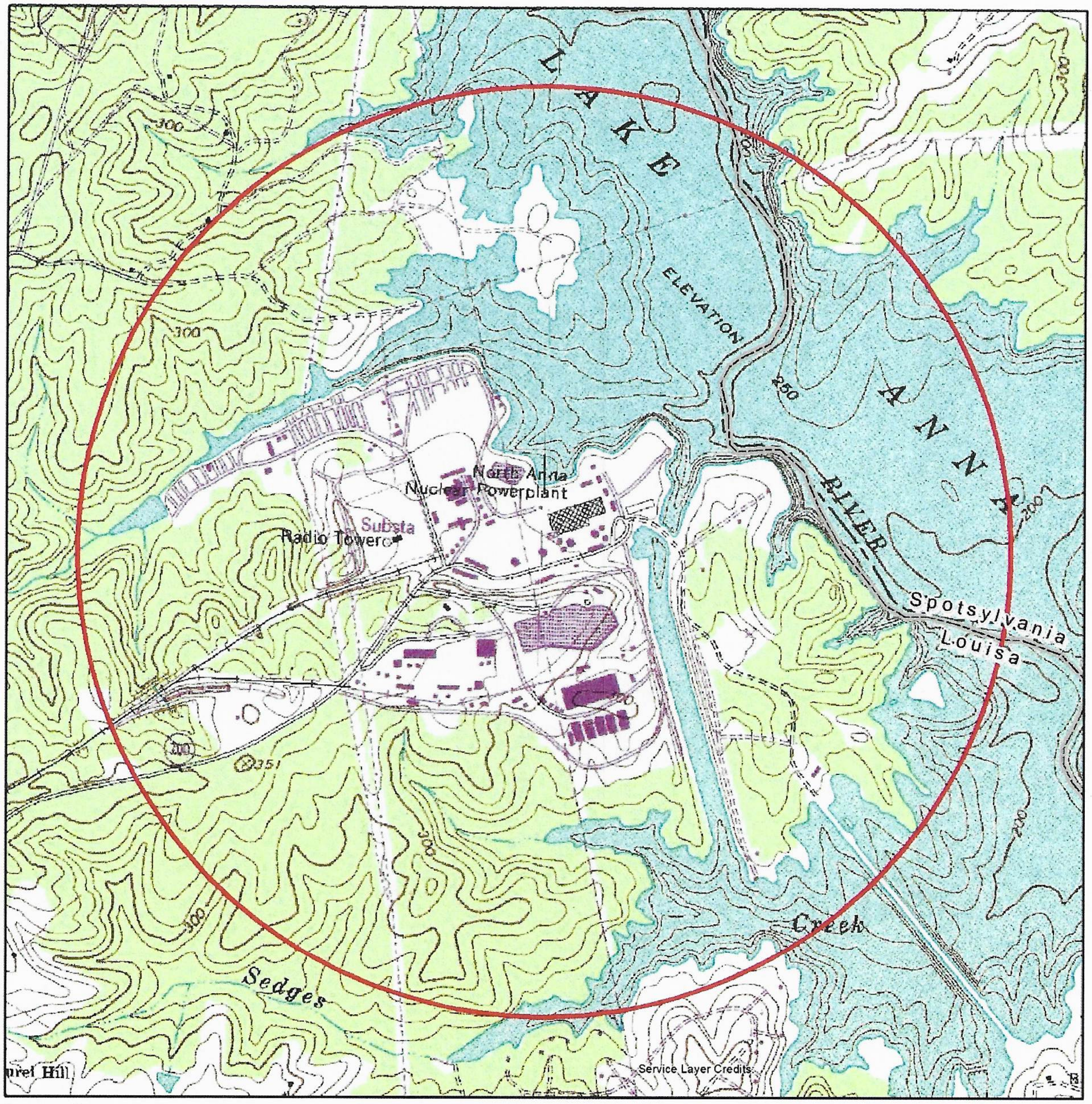
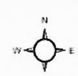


Legend

Site Boundary

County



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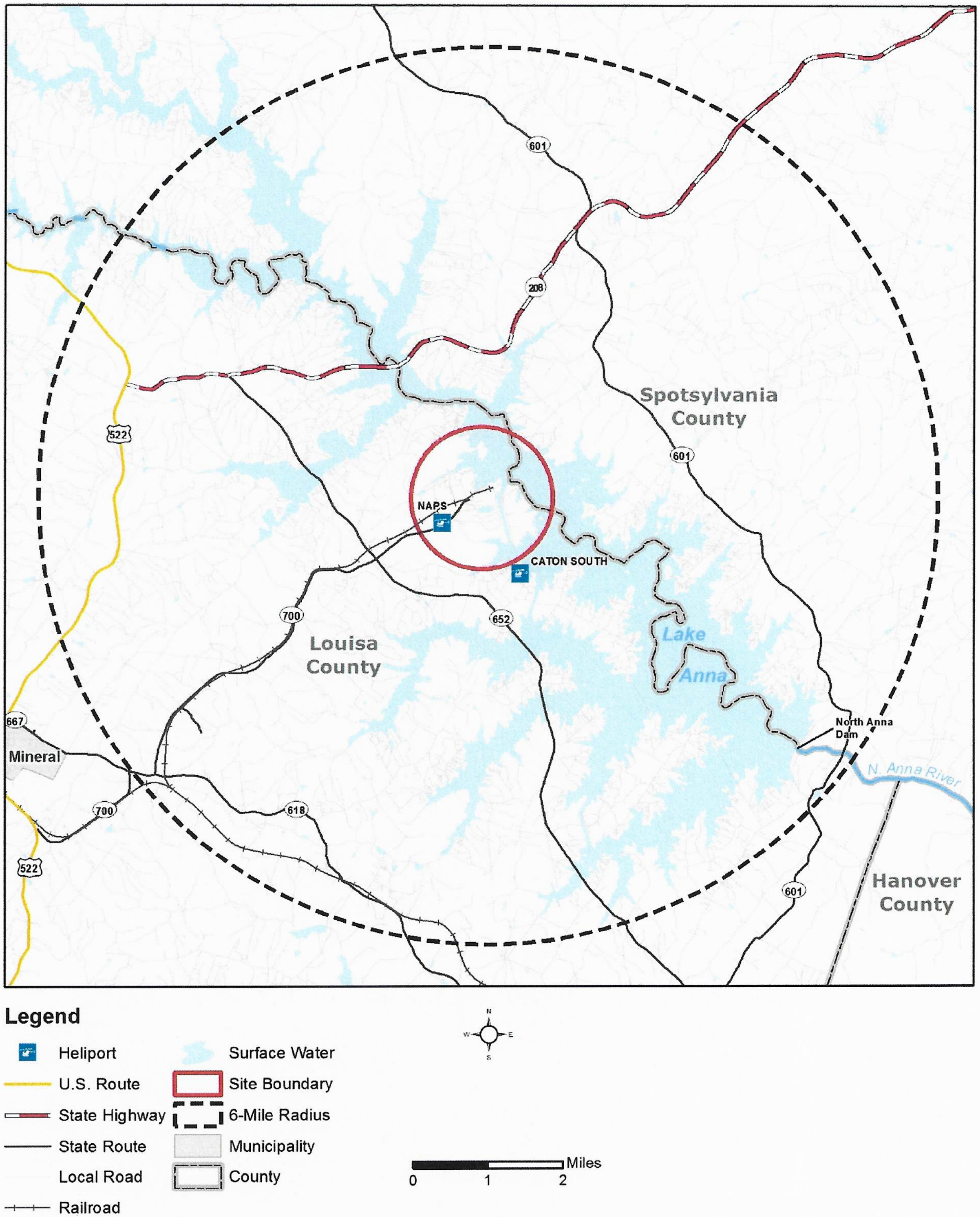

Ebc:
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Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Mattaponi Tribe 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1751

July 3, 2019

Chief Samuel Bass
Nansemond Indian Nation
1001 Pembroke Lane
Suffolk, VA 23434

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Chief Bass,

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Amanda B. Tornabene
Vice President, Environmental Services

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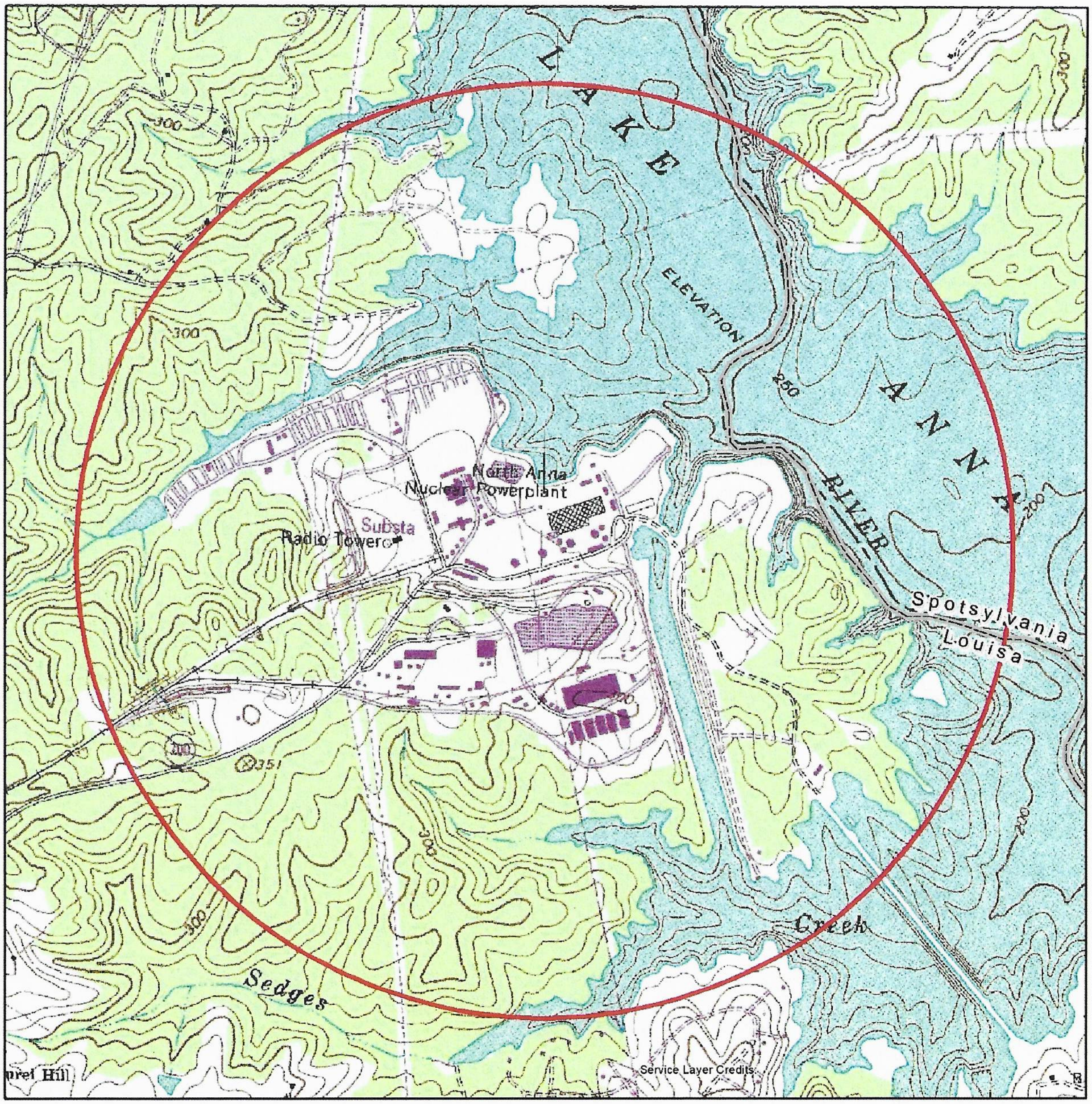

Legend

Site Boundary

County

Miles

0 0.25 0.5

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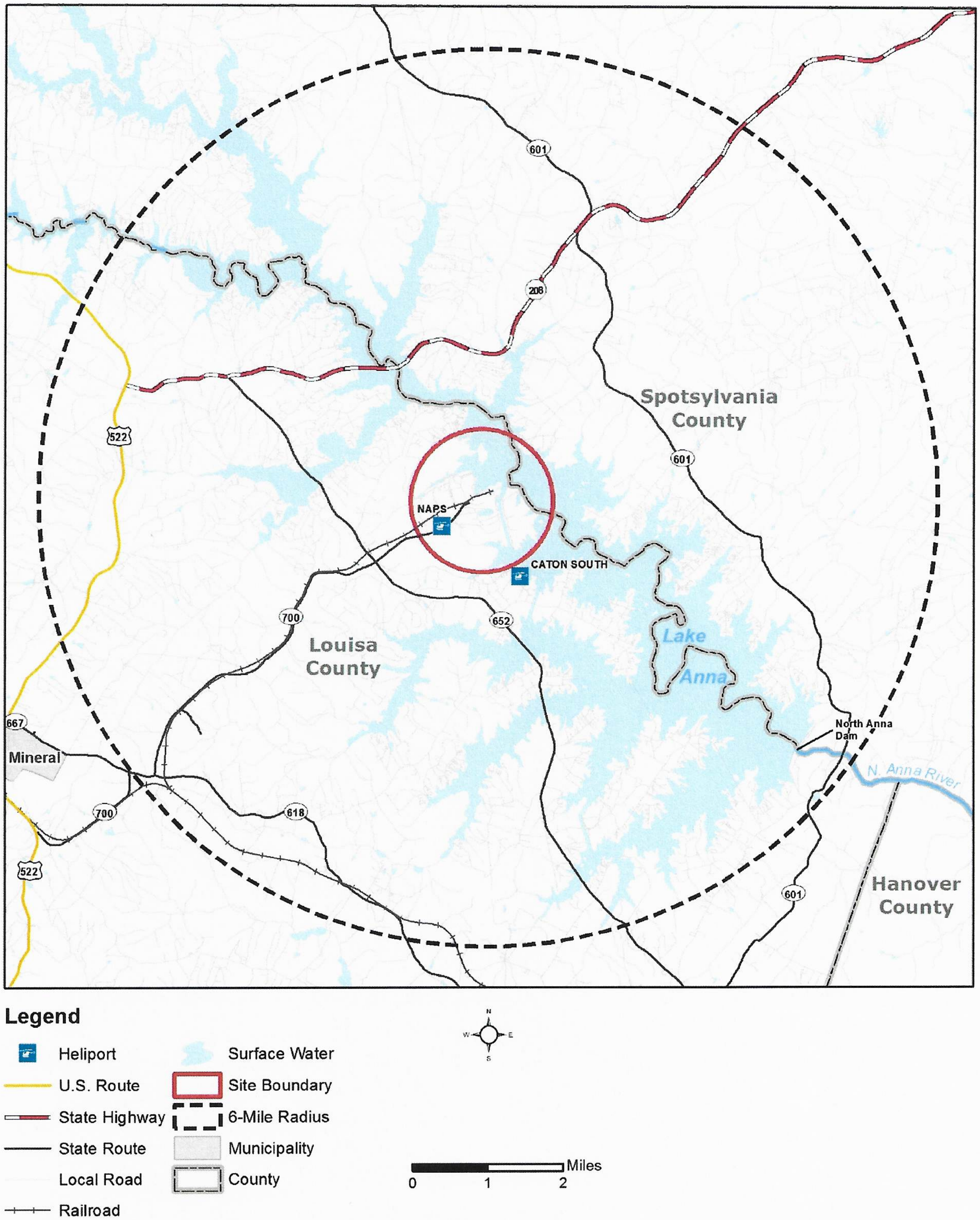

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Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Nansemond Indian Nation 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1768

July 3, 2019

Chief Lynette Allston
Nottoway Tribe
25274 Barhams Hill Road
Drewryville, VA 23844

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Chief Allston,

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During the license renewal term, Dominion proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities anticipated at the NAPS site during the subsequent license renewal period. Currently, Dominion does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion does not anticipate the continued operation of NAPS to adversely affect the environment or any cultural or historic resources.

As stated earlier, this letter seeks your input on our proposed continued operation of NAPS on historic and cultural resources, including tribal cultural resources, within the environs of the station. We appreciate your notifying us of your comments and any information you believe Dominion should consider in the preparation of the ER. Dominion plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

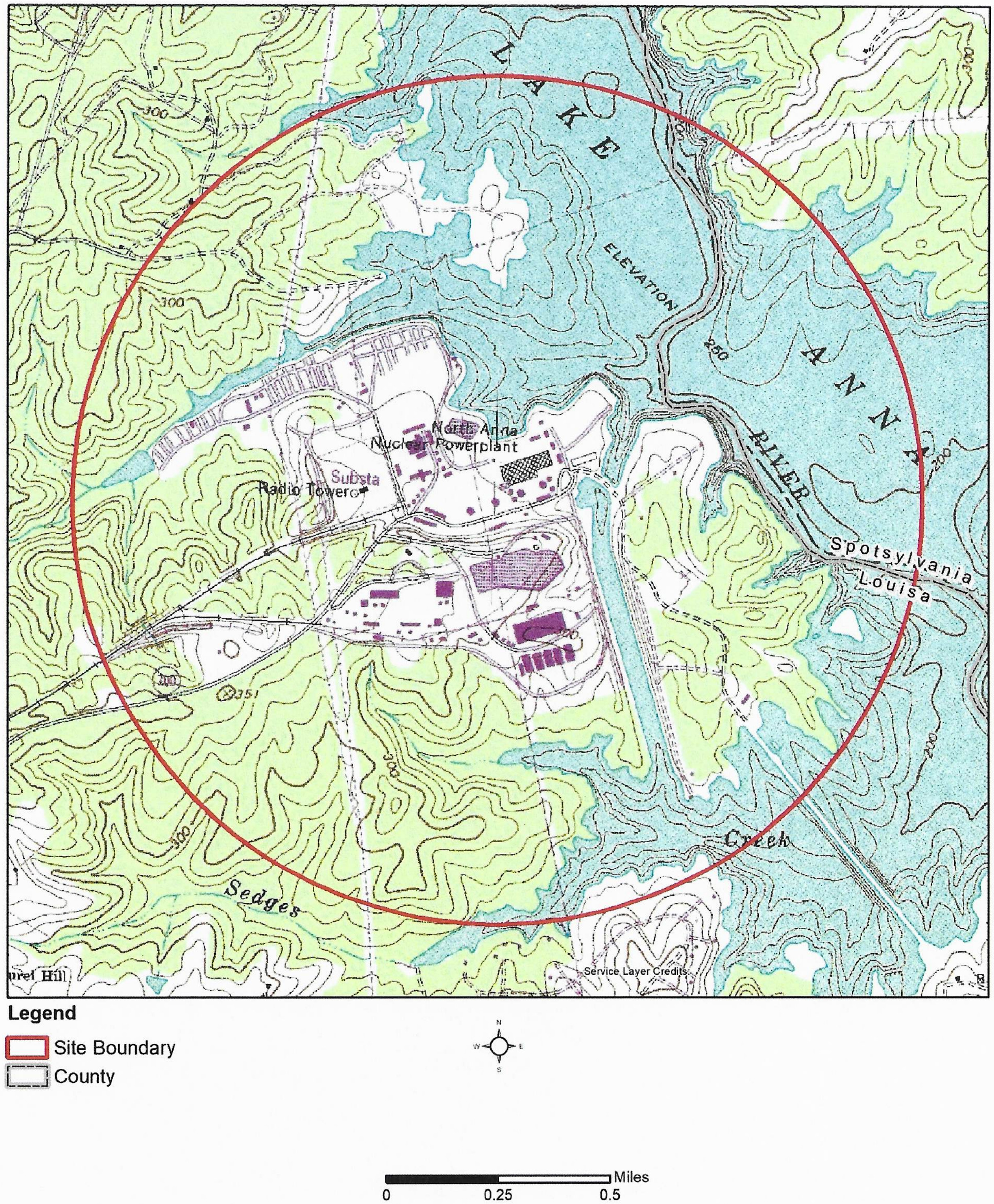
Sincerely,

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

Figure NAPS Site
Figure NAPS 6-mile Vicinity

Figure NAPS Site



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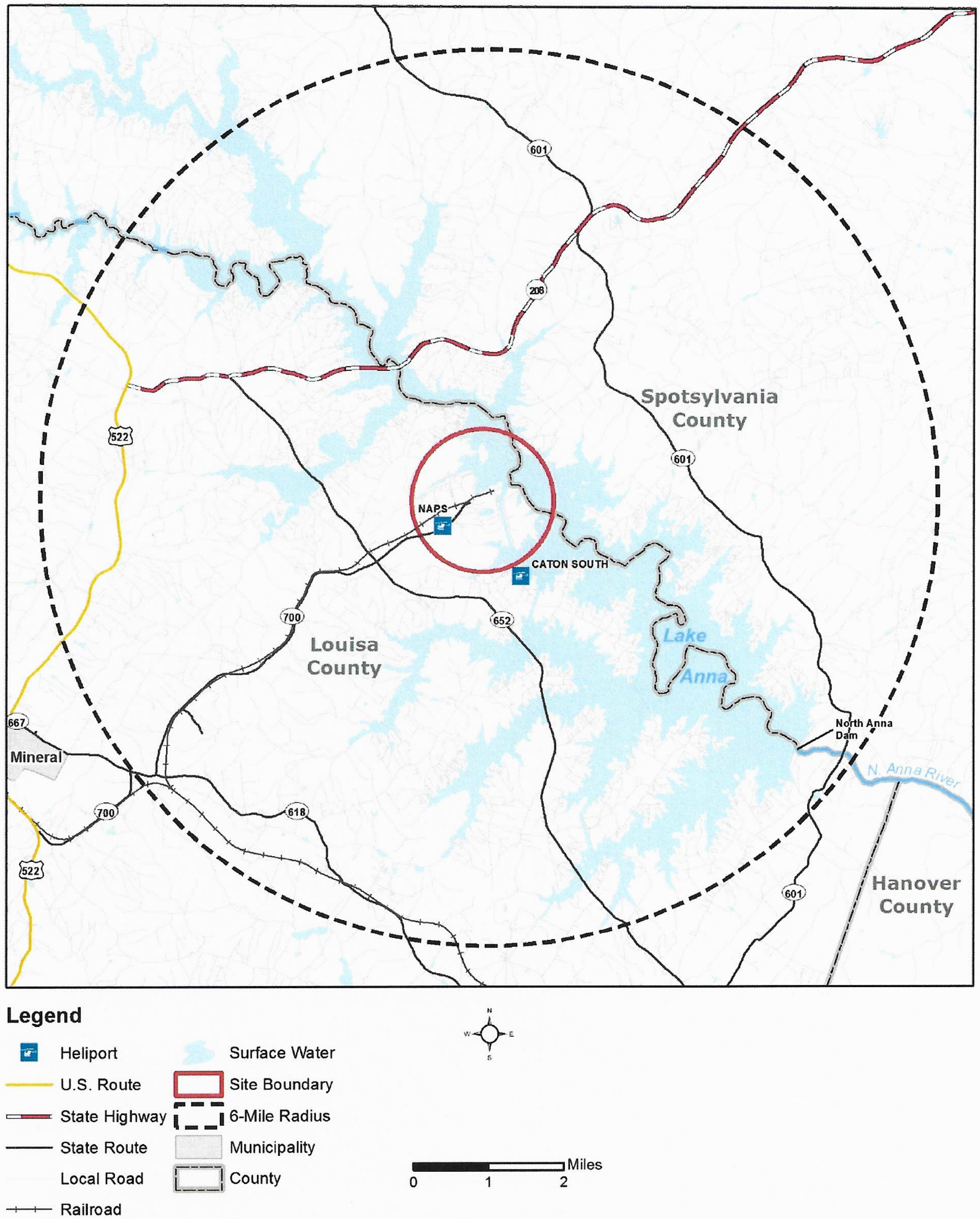


Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Nottoway Tribe 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1775

July 3, 2019

Chief Robert Gray
Pamunkey Nation
1054 Pocahontas Trail
King William, VA 23086

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Chief Gray,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040, to midnight on August 21, 2060. Dominion is contacting you for assistance in assessing the impacts from continued operation during this renewed license period.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER addresses the potential to impact historic and cultural resources including tribal cultural resources on or near the North Anna site.

While environmental impacts of an existing facility were assessed during original licensing, and license renewal is unlikely to have significant additional or different impacts, the NRC may request a consultation with the Virginia State Historic Preservation Office (SHPO) and the Pamunkey Nation regarding license renewal. Should the NRC consultation take place, the time frame for its conduct is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input from you regarding the effects that license renewal activities may have on historic and cultural resources within the station's environs and any questions or additional information necessary for the consultation process. Figures depicting the station site and the vicinity within a 6-mile radius of the station are enclosed, and a brief discussion of the station and its operations during the extended period of operation is provided below.

NAPS is located approximately 40 miles north-northwest of Richmond, Virginia on a peninsula on the southern shore of Lake Anna in Louisa County, Virginia, and is situated approximately five miles upstream from the North Anna Dam. The NAPS site and exclusion area comprise 1803 acres, of which about 760 acres are covered by the waters of Lake Anna and the Waste Heat Treatment Facility (WHTF). In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those located within the NAPS site boundary.

During the license renewal term, Dominion proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities anticipated at the NAPS site during the subsequent license renewal period. Currently, Dominion does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion does not anticipate the continued operation of NAPS to adversely affect the environment or any cultural or historic resources.

As stated earlier, this letter seeks your input on our proposed continued operation of NAPS on historic and cultural resources, including tribal cultural resources, within the environs of the station. We appreciate your notifying us of your comments and any information you believe Dominion should consider in the preparation of the ER. Dominion plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

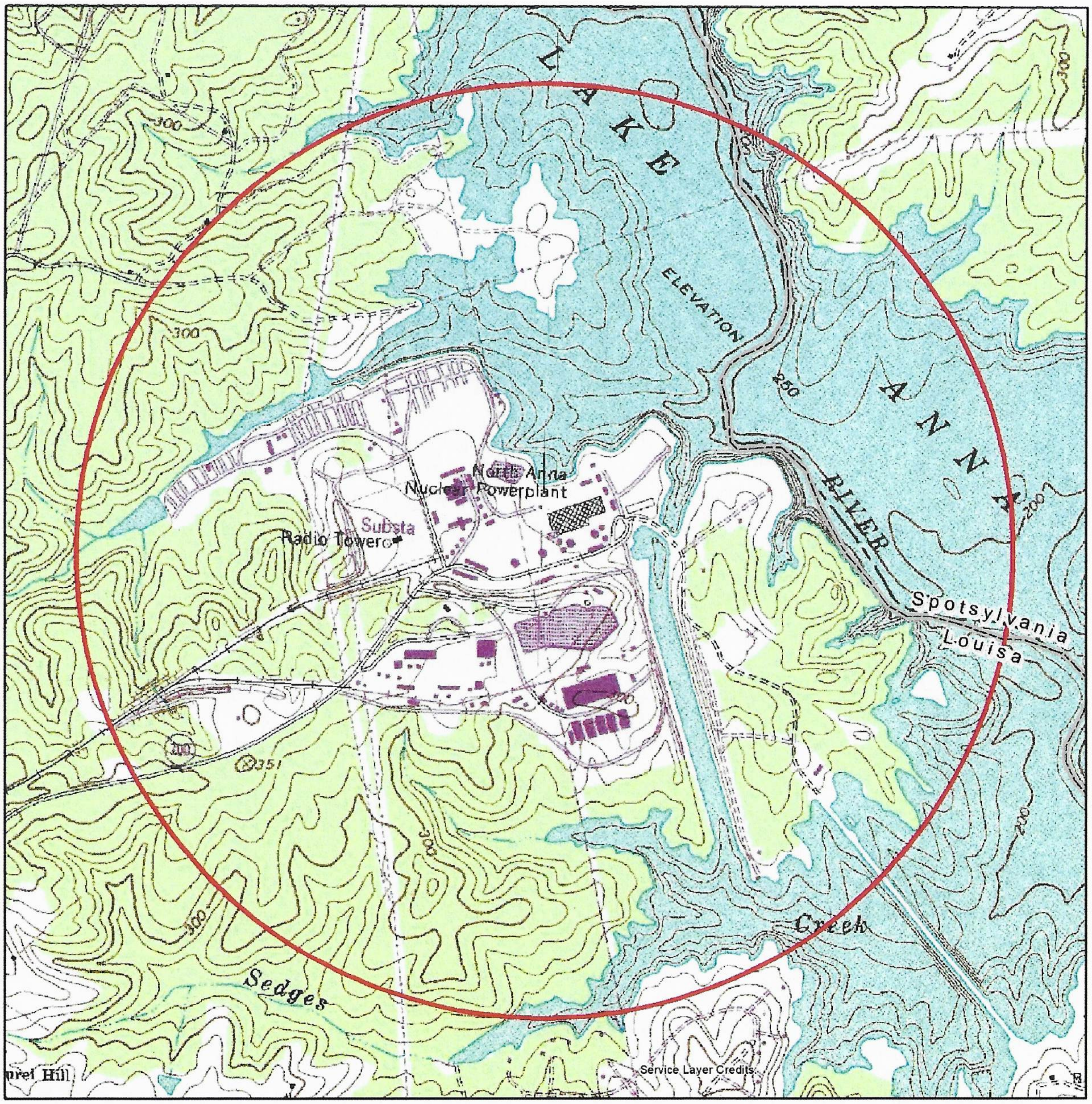
Sincerely,

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

Figure NAPS Site
Figure NAPS 6-mile Vicinity

Figure NAPS Site



Legend

Site Boundary

County

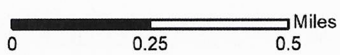
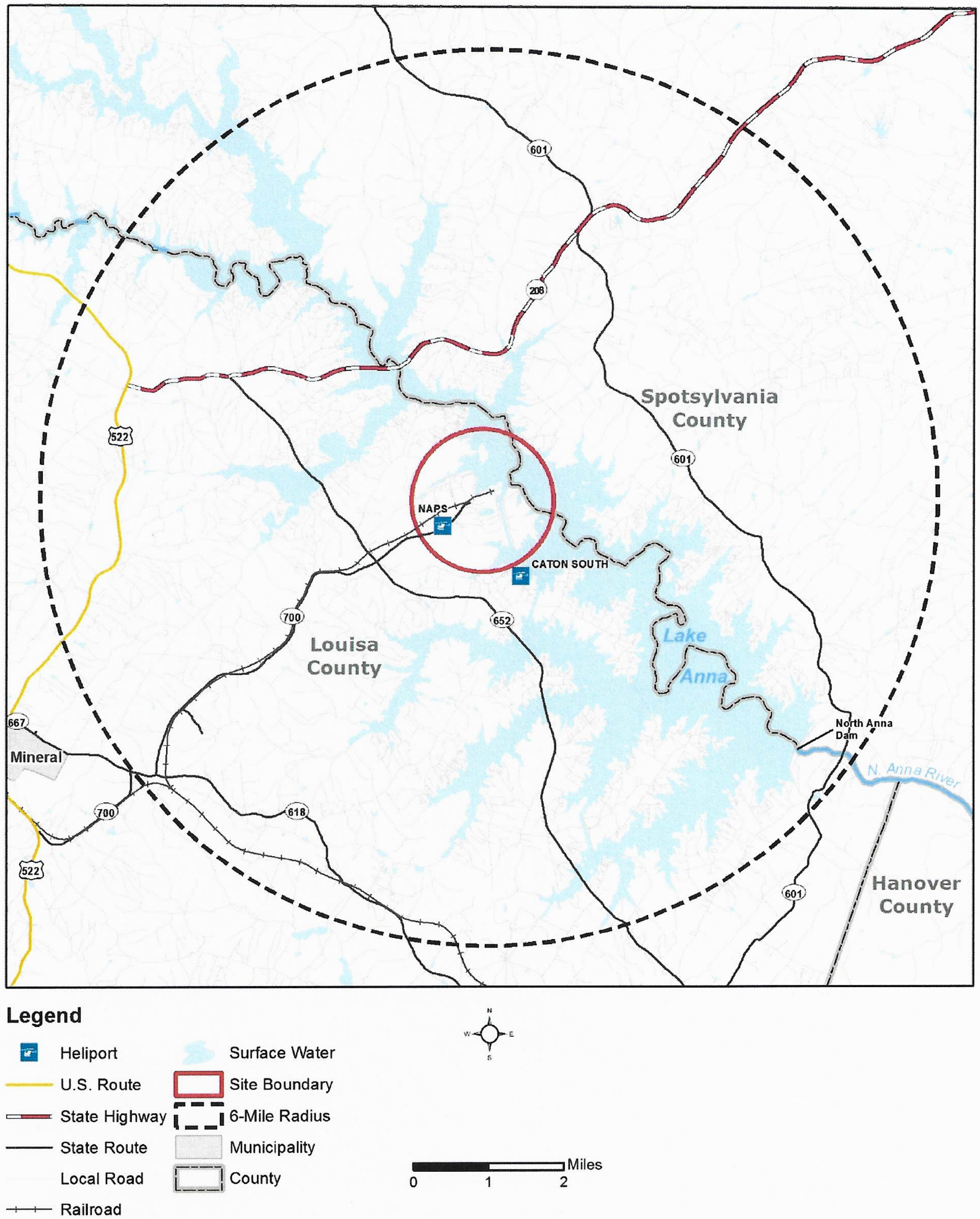


Figure NAPS 6-mile Vicinity



Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Pamunkey Nation 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1782

July 3, 2019

Chief John R. Lightner
Patawomeck Tribe
1416 Brent Street
Fredericksburg, VA 22401

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Chief Lightner,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040, to midnight on August 21, 2060. Dominion is contacting you for assistance in assessing the impacts from continued operation during this renewed license period.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER addresses the potential to impact historic and cultural resources including tribal cultural resources on or near the North Anna site.

While environmental impacts of an existing facility were assessed during original licensing, and license renewal is unlikely to have significant additional or different impacts, the NRC may request a consultation with the Virginia State Historic Preservation Office (SHPO) and the Patawomeck Tribe regarding license renewal. Should the NRC consultation take place, the time frame for its conduct is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input from you regarding the effects that license renewal activities may have on historic and cultural resources within the station's environs and any questions or additional information necessary for the consultation process. Figures depicting the station site and the vicinity within a 6-mile radius of the station are enclosed, and a brief discussion of the station and its operations during the extended period of operation is provided below.

NAPS is located approximately 40 miles north-northwest of Richmond, Virginia on a peninsula on the southern shore of Lake Anna in Louisa County, Virginia, and is situated approximately five miles upstream from the North Anna Dam. The NAPS site and exclusion area comprise 1803 acres, of which about 760 acres are covered by the waters of Lake Anna and the Waste Heat Treatment Facility (WHTF). In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those located within the NAPS site boundary.

During the license renewal term, Dominion proposes to continue operating the units as currently operated. There are currently no ground-disturbing activities anticipated at the NAPS site during the subsequent license renewal period. Currently, Dominion does not anticipate any refurbishment as a result of the technical and aging management program information that will be submitted in accordance with the NRC license renewal process.

Dominion does not anticipate the continued operation of NAPS to adversely affect the environment or any cultural or historic resources.

As stated earlier, this letter seeks your input on our proposed continued operation of NAPS on historic and cultural resources, including tribal cultural resources, within the environs of the station. We appreciate your notifying us of your comments and any information you believe Dominion should consider in the preparation of the ER. Dominion plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

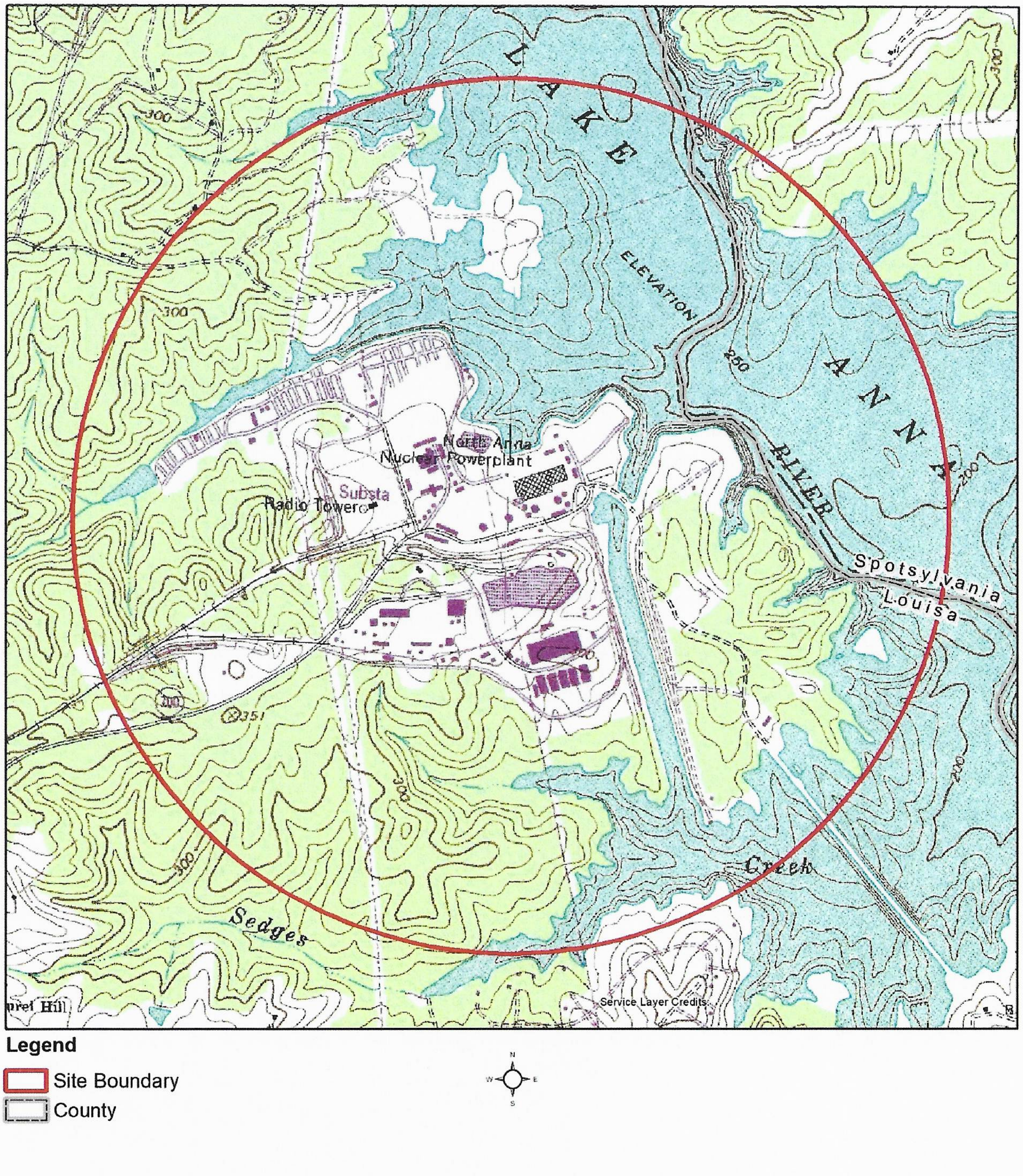
Sincerely,

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

Figure NAPS Site
Figure NAPS 6-mile Vicinity

Figure NAPS Site



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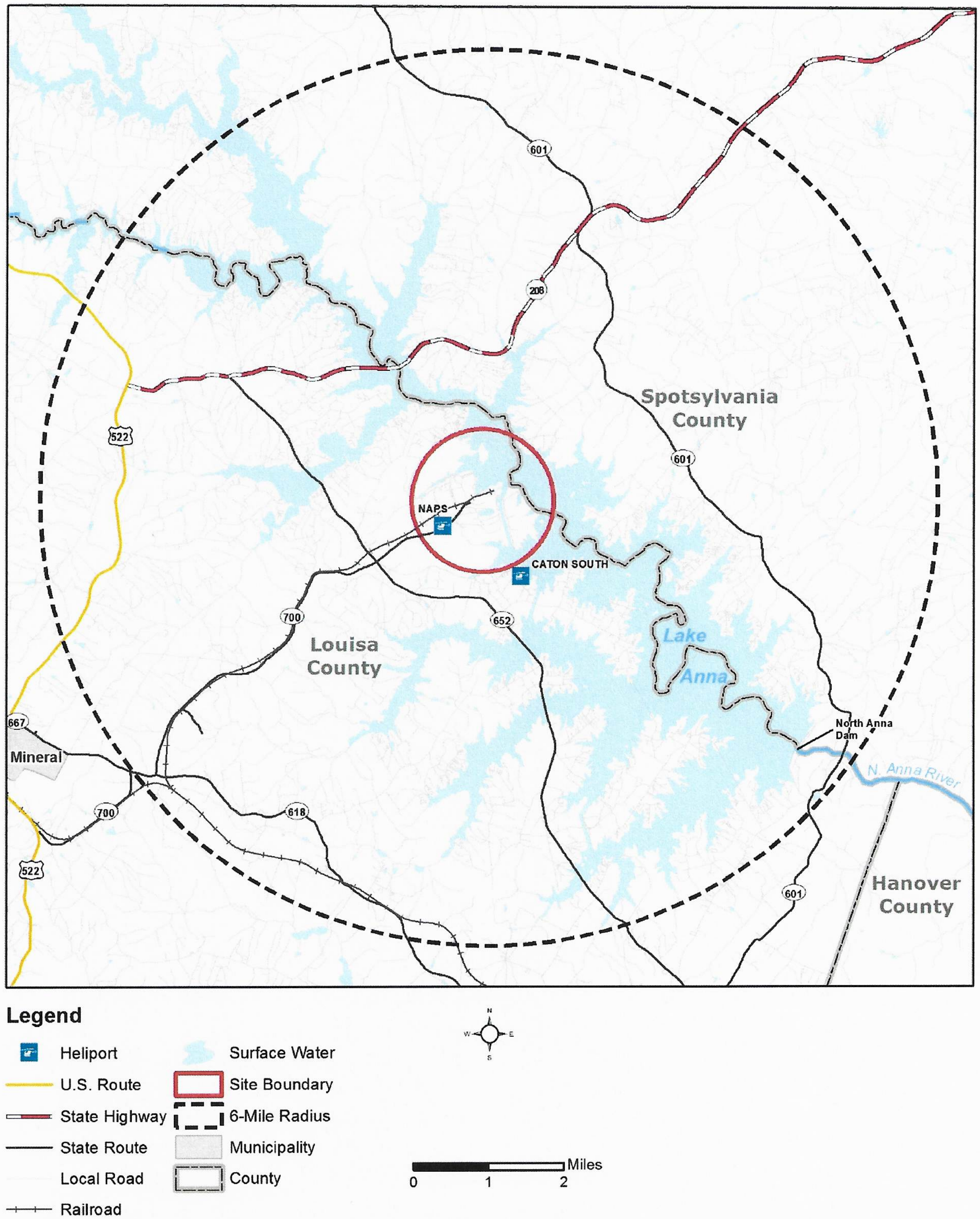

Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Patawomeck Tribe 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy®

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1812

July 3, 2019

Chief W. Frank Adams
Upper Mattaponi Tribe
5932 East River Road
King William, VA 23086

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Chief Adams,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040, to midnight on August 21, 2060. Dominion is contacting you for assistance in assessing the impacts from continued operation during this renewed license period.

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While environmental impacts of an existing facility were assessed during original licensing, and license renewal is unlikely to have significant additional or different impacts, the NRC may request a consultation with the Virginia State Historic Preservation Office (SHPO) and the Upper Mattaponi Tribe regarding license renewal. Should the NRC consultation take place, the time frame for its conduct is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

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Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

Sincerely,

Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

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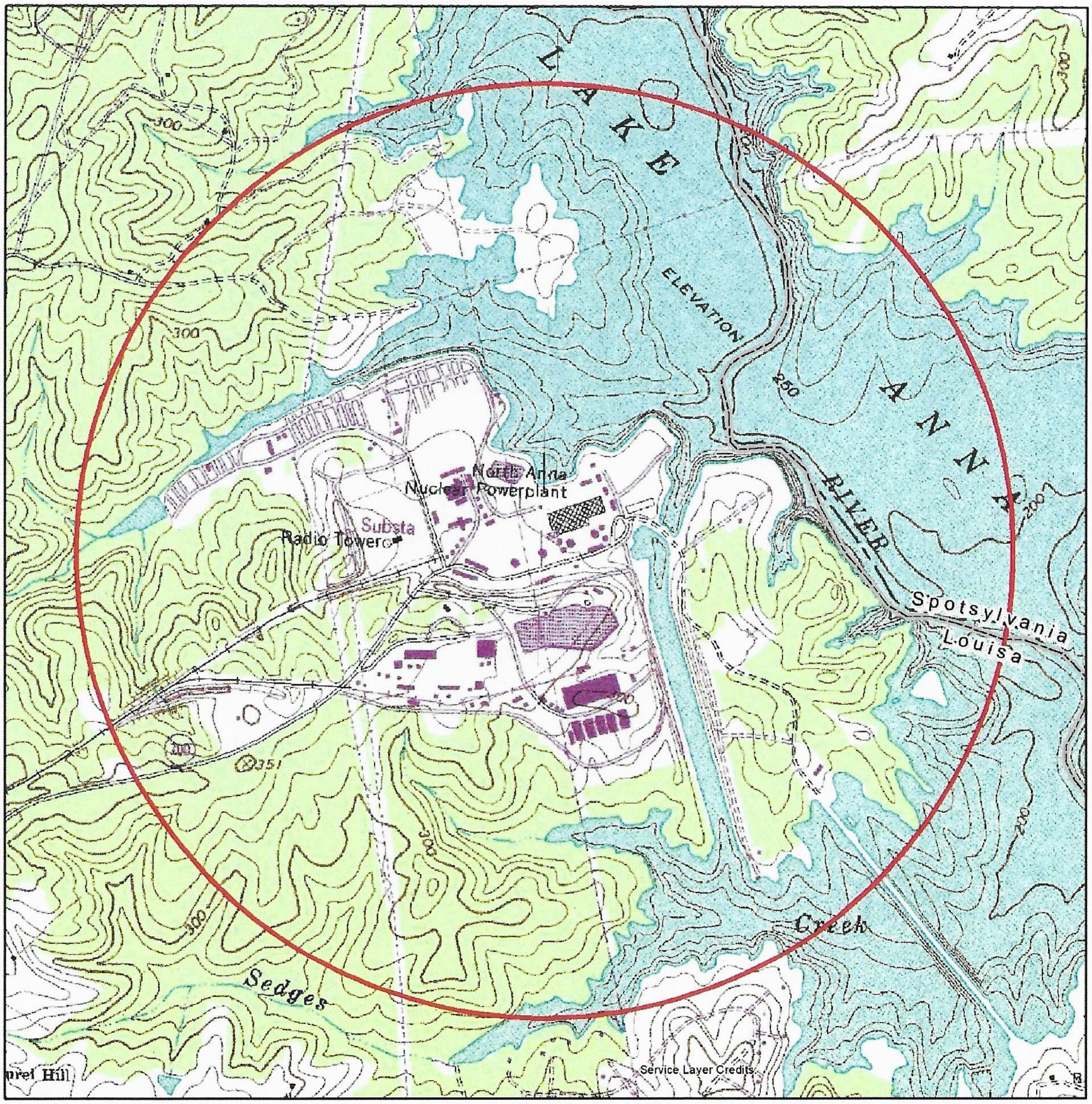


Legend

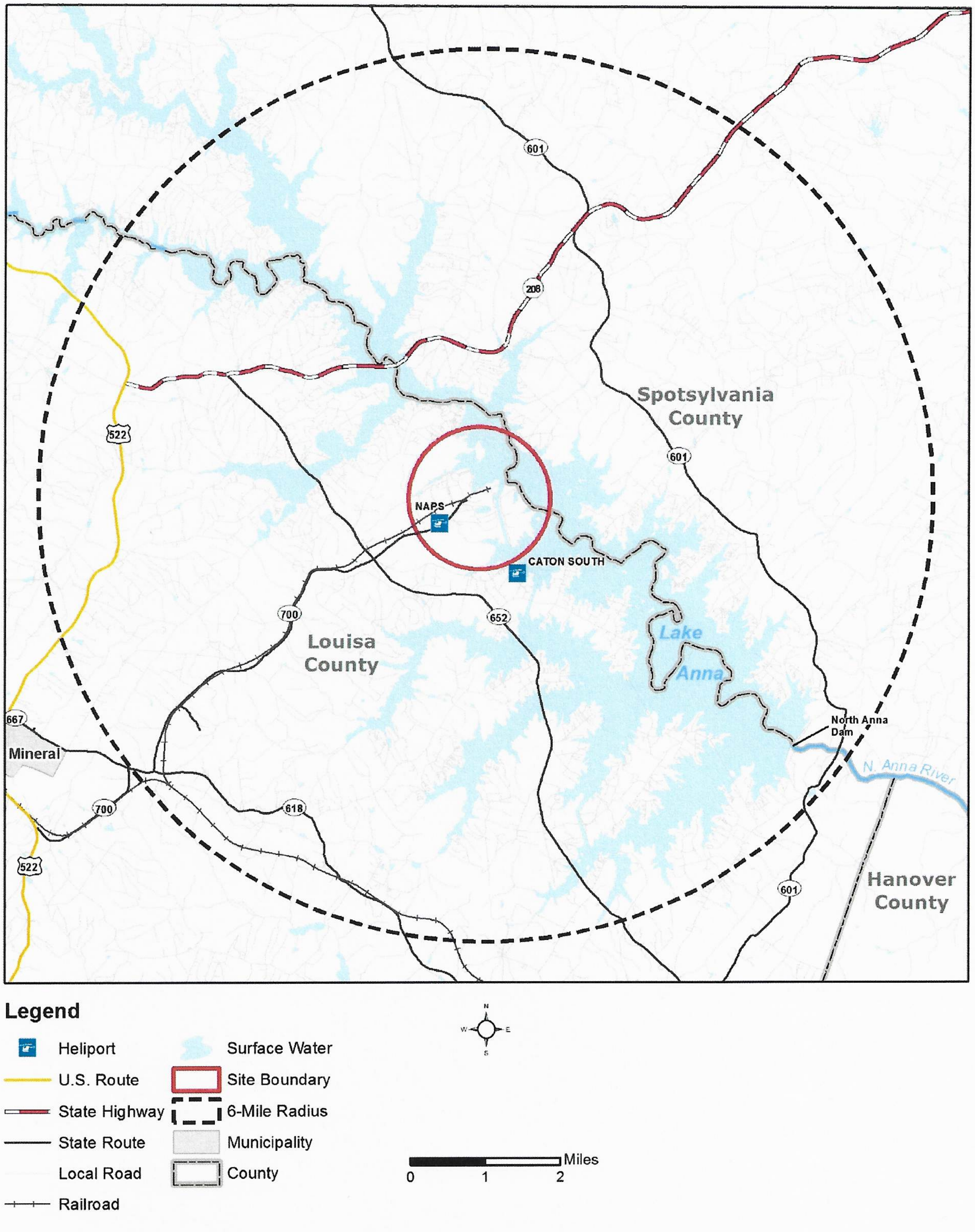
Site Boundary

County

N W E S

0 0.25 0.5 Miles

Figure NAPS 6-mile Vicinity



Ebc:
Amanda Tornabene
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Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-Upper Mattaponi Tribe 7-3-2019

Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

Dominion Energy

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9543 1690

July 3, 2019

Ms. Julie Langan, Director & State Historic Preservation Officer
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221

RE: Dominion – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Director Langan,

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application for renewing the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040 to midnight on August 21, 2060.

As part of the renewal process, the U.S. Nuclear Regulatory Commission (NRC) requires that the license renewal application include an environmental report (ER) that assesses the impacts from continued operation and any refurbishment undertaken to enable the continued operation of the units. The ER addresses the potential to impact historic and cultural resources on or near the North Anna site.

This letter seeks input from the Virginia State Historic Preservation Office (SHPO) regarding such effects in the vicinity of NAPS. Also, as part of the renewal process, the NRC may request a consultation in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470), and the federal Advisory Council on Historic Preservation regulations (36 CFR 800) with your agency regarding the license renewal. The time frame for the NRC consultation request is anticipated to be within a few months of Dominion's application submittal, currently scheduled for mid-2020.

To facilitate our assessment and a smooth consultation by the NRC, we are contacting you early in the application process seeking input from you regarding the effects that license renewal activities may have on historic and archaeological resources within the station's environs and any questions or additional information necessary for the consultation process. Figures depicting the station site and the vicinity within a 6-mile radius of the station and a table of known archaeological sites and historic properties in the station's vicinity are enclosed.

A brief discussion of the station and its operations during the extended period of operation is provided below.

NAPS is located approximately 40 miles north-northwest of Richmond, Virginia on a peninsula on the southern shore of Lake Anna in Louisa County, Virginia, and is situated approximately five miles upstream from the North Anna Dam. The NAPS site and exclusion area comprise 1803 acres, of which about 760 acres are covered by the waters of Lake Anna and the Waste Heat Treatment Facility (WHTF). In accordance with NRC regulations, the transmission lines within the scope of the license renewal are those located within the NAPS site boundary.

Cultural resource investigations from 1969 to 2006 are described in the Environmental Impact Statement (EIS) prepared for the NAPS Early Site Permit (ESP). The findings of these investigations within both the NAPS site boundary and the lake-bed area yielded few resources, and none that were discovered were recommended eligible for the National Register of Historic Places (NRHP). The 2006 investigation for the ESP site reported no cultural resources with the exception of two previously recorded historic cemeteries (44LS0221 and 44LS0222), which are potentially eligible for listing to the National Register of Historic Places (NRHP).

Further investigations in support of the North Anna Unit 3 Combined License (COL) application identified an additional historic cemetery (44LS0227) and one historic site (44LS0226) within the NAP S site boundary. The NRHP status of these resources has not been determined. Known archaeological sites and historic properties for NAP's six-mile vicinity including the NAPS site are listed in the enclosed table.

During the license renewal term, Dominion proposes to continue operating the units as currently operated. There are no ground-disturbing modifications to standing structures greater than 50 years of age anticipated at the NAPS site during the subsequent license renewal period. Currently, Dominion anticipates no license renewal-related refurbishment for NAPS.

As stated earlier, this letter seeks your input on our proposed continued operation of NAPS on historic and archaeological resources within the environs of the station. We appreciate your notifying us of your comments and any information or actions required of Dominion to assist in the preparation of our assessment and to facilitate NRC's consultation. Dominion plans to include this letter and any response you provide in the ER.

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 (oula.k.shehab-dandan@dominionenergy.com) or Mr. Tony Banks at (804) 273-2170 (tony.banks@dominionenergy.com).

Sincerely,

Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

Attachments:

Table List of Known Archaeological Sites and Historic Properties
Figure NAPS Site
Figure NAPS 6-mile Vicinity

Table List of Known Archaeological Sites and Historic Properties

Archaeological and Architectural Sites within Six-Mile Radius of NAPS				
VDHR ID#	**Resource Name/Type**	**County**	**Quadrangle**	**NRHP Status**
44LS0002	Prehistoric open air	Louisa	Lake Anna West	Not evaluated
44LS0009	Prehistoric open air	Louisa	Lake Anna West	Not evaluated
44LS0044	Prehistoric camp	Louisa	Lake Anna West	Not evaluated
44LS0102	19th century iron furnace	Louisa	Mineral	Not evaluated
44LS0108	20th century mine	Louisa	Lake Anna West	Not evaluated
44LS0109	19th century mine	Louisa	Lake Anna West	Not evaluated; submerged
44LS0110	19th century mine	Louisa	Lake Anna West	Not evaluated
44LS0111	19th century mine	Louisa	Lake Anna West	Not evaluated
44LS0112	20th century mine	Louisa	Mineral	Not evaluated
44LS0137	Prehistoric camp/19th century mine	Louisa	Mineral	Not evaluated
44LS0138	Prehistoric camp/19th century blacksmith shop	Louisa	Mineral	Not evaluated
44LS0139	Prehistoric camp/19th and 20th century mine	Louisa	Mineral	Not evaluated
44LS0140	Prehistoric camp	Louisa	Mineral	Not evaluated
44LS0141	19th century house	Louisa	Mineral	Not evaluated
44LS0142	Prehistoric camp/19th and 20th century house	Louisa	Mineral	Not evaluated
44LS0143	19th century house	Louisa	Mineral	Not evaluated
44LS0145	19th century church	Louisa	Mineral	Not evaluated
44LS0190	Victory Furnace/19th century iron furnace	Louisa	Mineral	Not evaluated
44LS0204	20th century mine	Louisa	Mineral	Not evaluated
44LS0205	19th and 20th century mine	Louisa	Mineral	Not evaluated
44LS0207	19th century mine	Louisa	Mineral	Not evaluated
44LS0208	19th and 20th century mine	Louisa	Mineral	Not evaluated
44LS0221[a]	Historic Period cemetery	Louisa	Lake Anna West	DHR: potentially eligible
44LS0222[a]	Historic Period cemetery	Louisa	Lake Anna West	DHR: potentially eligible
44LS0223	Historic Period cemetery	Louisa	Lake Anna East	Not evaluated
44LS0226[a]	19th and 20th century house	Louisa	Lake Anna West	Not evaluated

Table List of Known Archaeological Sites and Historic Properties

Archaeological and Architectural Sites within Six-Mile Radius of NAPS				
VDHR ID#	Resource Name/Type	County	Quadrangle	NRHP Status
44LS0227[(a)]	Historic Period cemetery	Louisa	Lake Anna West	Not evaluated
44LS0229	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
44LS0230	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
44LS0231	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
44LS0232	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
44LS0233	19th and 20th century house	Louisa	Lake Anna West	DHR: potentially eligible
44LS0234	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
44LS0240	19th and 20th century artifact scatter	Louisa	Lake Anna West	DHR: not eligible
44SP0043/ 088-0086	18th century Fredericksville Iron Furnace	Spotsylvania	Lake Anna West	Not evaluated; submerged
44SP0044/ 088-0086	18th to 20th century Lacy's Mill	Spotsylvania	Lake Anna West	Not evaluated
44SP0047	Prehistoric camp	Spotsylvania	Lake Anna West	Not evaluated
44SP0048	Prehistoric camp	Spotsylvania	Lake Anna West	Not evaluated
44SP0092	Historic Period mine	Spotsylvania	Lake Anna West	Not evaluated
44SP0093	19th century mine	Spotsylvania	Lake Anna West	Not evaluated
44SP0093	19th century mine	Spotsylvania	Lake Anna West	Not evaluated
44SP0094	19th century mine	Spotsylvania	Lake Anna West	Not evaluated
44SP0304	Historic Period Cemetery	Spotsylvania	Lake Anna West	Not evaluated
44SP0305	Early 20th century house	Spotsylvania	Lake Anna West	Not evaluated
44SP0306	Historic Period Cemetery	Spotsylvania	Lake Anna West	Not evaluated
44SP0307	Historic Period Farmstead	Spotsylvania	Lake Anna West	Not evaluated
44SP0452	Prehistoric camp	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0453	Prehistoric camp	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0454	Prehistoric camp	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0455	Prehistoric and 19th century prospect pit	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0456	Early 20th century house	Spotsylvania	Lake Anna West	Not evaluated
44SP0457	Railroad bed	Spotsylvania	Lake Anna West	DHR: potentially eligible
44SP0458	Prehistoric camp	Spotsylvania	Lake Anna West	DHR: potentially eligible

Table List of Known Archaeological Sites and Historic Properties

Archaeological and Architectural Sites within Six-Mile Radius of NAPS				
VDHR ID#	**Resource Name/Type**	**County**	**Quadrangle**	**NRHP Status**
44SP0459	Prehistoric camp	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0618	19th century house	Spotsylvania	Lake Anna West	DHR: not eligible
44SP0675	Early 20th century Private Hairfield Cemetery	Spotsylvania	Lake Anna West	Not evaluated
44SP0676	20th century Brooks Cemetery	Spotsylvania	Belmont	Not evaluated
054-0020	19th century Elk Creek Baptist Church	Louisa	Lake Anna West	DHR: eligible
054-0021	Historic Period house	Louisa	Lake Anna West	Not evaluated
054-0025	Fredericks Hall	Louisa	Buckner	DHR: eligible
054-0045	18th to 19th century Jerdone Castle	Louisa	Lake Anna East, Lake Anna West	NRHP listed, VLR listed
054-0058	17th to 18th century house	Louisa	Buckner	Not evaluated
054-0078	18th century Woodlawn House	Louisa	Buckner	Not evaluated
054-0080	17th to 20th century Bear Castle	Louisa	Lake Anna West	DHR: eligible
054-0120	Historic Period Boxley House	Louisa	Mineral	Not evaluated
054-0123	17th to 18th century Newman-Mitchell House	Louisa	Lake Anna West	Not evaluated
054-0126	19th century Elk Creek House	Louisa	Lake Anna West	Not evaluated
054-0127	19th to 20th century Spring Garden House	Louisa	Lake Anna West	Not evaluated
054-0128	19th century Seclusion House	Louisa	Lake Anna West	Not evaluated
054-0129	17th to 18th century Serenity House	Louisa	Lake Anna West	Not evaluated
054-0131	Historic Period house	Louisa	Mineral	Not evaluated
054-0141	Historic Period Miners Chapel	Louisa	Mineral	Not evaluated
054-0144	18th to 19th century Laurel Hill House	Louisa	Lake Anna West	Not evaluated
054-0145	Historic Period Johnson House	Louisa	Lake Anna West	Not evaluated
054-0146	Historic Period house	Louisa	Lake Anna West	Not evaluated
054-0147	Historic Period Vaughan House	Louisa	Lake Anna West	Not evaluated
054-0148	Historic Period Plum Tree Store	Louisa	Lake Anna West	Not evaluated

Table List of Known Archaeological Sites and Historic Properties

Archaeological and Architectural Sites within Six-Mile Radius of NAPS				
VDHR ID#	**Resource Name/Type**	**County**	**Quadrangle**	**NRHP Status**
054-0149	18th to 20th century Plum Tree School	Louisa	Lake Anna West	Not evaluated
054-0150	19th to 20th century Talley House	Louisa	Lake Anna West	Not evaluated
054-0151	19th to 20th century house	Louisa	Lake Anna West	Not evaluated
054-0155	18th to 19th century house	Louisa	Lake Anna West	Not evaluated
054-0182	20th century house	Louisa	Mineral	DHR: not eligible
054-0183	20th century house	Louisa	Mineral	DHR: not eligible
054-0184	19th to 20th century house	Louisa	Mineral	No longer extant
054-0185	19th century house	Louisa	Mineral	DHR: not eligible
054-0186	20th century J&R Market	Louisa	Mineral	No longer extant
054-0187	20th century House	Louisa	Mineral	No longer extant
054-0188	20th century House	Louisa	Mineral	Not evaluated
054-0189	20th century G.F. Proctor House	Louisa	Mineral	Not evaluated
054-0190	20th century House	Louisa	Mineral	Not evaluated
054-0191	20th century House	Louisa	Mineral	Not evaluated
054-0192	20th century House	Louisa	Mineral	Not evaluated
054-0193	20th century House	Louisa	Mineral	Not evaluated
054-0194	20th century House	Louisa	Mineral	Not evaluated
054-0195	19th to 20th century R. Perry Store	Louisa	Mineral	Not evaluated
054-0196	19th to 20th century O.G. Mallory House	Louisa	Mineral	Not evaluated
054-0197	20th century O.G. Mallory House	Louisa	Mineral	Not evaluated
054-0198	20th century house	Louisa	Mineral	Not evaluated
054-0199	19th to 20th century house	Louisa	Mineral	Not evaluated
054-0200	19th to 20th century house	Louisa	Mineral	Not evaluated
054-0201	20th century house	Louisa	Mineral	Not evaluated
054-0202	20th century house	Louisa	Mineral	Not evaluated
054-0203	20th century house	Louisa	Mineral	Not evaluated
054-0204	19th to 20th century house	Louisa	Mineral	Not evaluated

Table List of Known Archaeological Sites and Historic Properties

Archaeological and Architectural Sites within Six-Mile Radius of NAPS				
VDHR ID#	**Resource Name/Type**	**County**	**Quadrangle**	**NRHP Status**
054-0205	20th century house	Louisa	Mineral	Not evaluated
054-0206	20th century house	Louisa	Mineral	Not evaluated
054-0207	20th century house	Louisa	Mineral	Not evaluated
054-0208	19th to 20th century Walton Ordinary; Walton Tavern; Whitlock Store	Louisa	Mineral	DHR: not eligible
054-0209	19th to 20th century house	Louisa	Mineral	Not evaluated
054-0223	Historic Period bridge	Louisa	Mineral	No longer extant
054-0356	19th to 20th century Woodley House	Louisa	Mineral	Not evaluated
054-0375	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-0376	18th to 19th century Oak Grove Farm	Louisa	Lake Anna West	Not evaluated
054-0384	20th century house	Louisa	Buckner	Not evaluated
054-0386	19th to 20th century Hood house	Louisa	Buckner	Not evaluated
054-0387	19th to 20th century Poindexter Post Office	Louisa	Buckner	Not evaluated
054-0388	19th to 20th century Harris-Poindexter House and Store	Louisa	Buckner	NRHP listed, VLP listed
054-0390	19th to 20th century Bethpage Church	Louisa	Buckner	Not evaluated
054-0399	20th century Trainhan House	Louisa	Buckner	Not evaluated
054-0411	20th century house	Louisa	Lake Anna West	Not evaluated
054-0412	19th to 20th century Green House	Louisa	Lake Anna East	Not evaluated
054-0413	20th century school	Louisa	Lake Anna West	Not evaluated
054-5023	19th to 20th century Harris Family Cemetery	Louisa	Lake Anna East	Not evaluated
054-5024[(a)]	19th century Collins Cemetery	Louisa	Lake Anna East	Not evaluated
054-5046	19th to 20th century Trinity Baptist Church	Louisa	Mineral	DHR: not eligible
054-5047	20th century house	Louisa	Mineral	DHR: not eligible
054-5049	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5050	19th and 20th century Ware-Waller Family Cemetery	Louisa	Lake Anna West	DHR: not eligible

Table List of Known Archaeological Sites and Historic Properties

Archaeological and Architectural Sites within Six-Mile Radius of NAPS				
VDHR ID#	**Resource Name/Type**	**County**	**Quadrangle**	**NRHP Status**
054-5051	20th century Talley-Keesaer Family Cemetery	Louisa	Lake Anna West	DHR: not eligible
054-5052	19th and 20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5053	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5054	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5055	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5056	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5057	20th century house	Louisa	Lake Anna West	DHR: not eligible
054-5058	20th century house	Louisa	Lake Anna West	DHR: not eligible
088-0054	19th century Pine Forest House	Spotsylvania	Lake Anna East	Not evaluated
088-0096	19th century Good Hope Baptist Church and Cemetery	Spotsylvania	Lake Anna West	Not evaluated
088-0103	19th century Pigeon Plantation/Glenora	Spotsylvania	Lake Anna West	No longer extant
088-0114	19th century Belle Font House	Spotsylvania	Lake Anna East	Not evaluated
088-0115	Historic Period Red House	Spotsylvania	Lake Anna East	Not evaluated
088-0116	19th century William Swift House	Spotsylvania	Lake Anna East	DHR: not eligible
088-0118	20th century Brooks Store	Spotsylvania	Lake Anna West	Not evaluated
088-0120	18th century Livingston Farm	Spotsylvania	Lake Anna West	DHR: not eligible
088-0121	Historic Period Log Cabin Ruins	Spotsylvania	Lake Anna West	Not evaluated
088-0123	19th to 20th century Saint John's Church	Spotsylvania	Lake Anna East	DHR: not eligible
088-0126	19th century Llangollen House/School	Spotsylvania	Lake Anna East	DHR: potentially eligible
088-0133	18th to 20th century Bel Air House	Spotsylvania	Lake Anna West	DHR: eligible
088-0136	18th to 19th century Andrews Tavern	Spotsylvania	Lake Anna West	NRHP listed, VLR listed
088-0156	20th century house	Spotsylvania	Lake Anna East	Not evaluated
088-0157	20th century commercial building	Spotsylvania	Lake Anna West	Not evaluated
088-0158	20th century service station	Spotsylvania	Lake Anna West	Not evaluated

Table List of Known Archaeological Sites and Historic Properties

Archaeological and Architectural Sites within Six-Mile Radius of NAPS				
VDHR ID#	**Resource Name/Type**	**County**	**Quadrangle**	**NRHP Status**
088-0159	20th century school	Spotsylvania	Lake Anna West	Not evaluated
088-0160	19th to 20th century New Hope Baptist Church	Spotsylvania	Lake Anna East	Not evaluated
088-0161	19th to 20th century house	Spotsylvania	Lake Anna East	Not evaluated
088-5013	20th century Brecknock House	Spotsylvania	Lake Anna East	DHR: not eligible
088-5038	20th century house	Spotsylvania	Lake Anna East	Not evaluated
088-5041	19th century Levy House	Spotsylvania	Lake Anna East	Not evaluated
088-5042	19th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5043	19th century Ellis House	Spotsylvania	Lake Anna West	Not evaluated
088-5044	20th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5045	20th century Bethel Christian Church Cemetery	Spotsylvania	Lake Anna West	Not evaluated
088-5046	19th and 20th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5047	19th and 20th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5048	19th and 20th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5049	20th century commercial building	Spotsylvania	Lake Anna West	Not evaluated
088-5050	19th century house	Spotsylvania	Belmont	Not evaluated
088-5079	19th to 20th century house	Spotsylvania	Lake Anna East	DHR: not eligible
088-5115	19th century house	Spotsylvania	Lake Anna East	Not evaluated
088-5116	20th century house	Spotsylvania	Lake Anna East	Not evaluated
088-5117	20th century house	Spotsylvania	Lake Anna West	Not evaluated
088-5280	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5335	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5336	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5337	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5338	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5339	19th century Rockland Farm	Spotsylvania	Lake Anna West	DHR: not eligible
088-5340	20th century commercial building	Spotsylvania	Lake Anna West	DHR: not eligible
088-5341	19th to 20th century house	Spotsylvania	Lake Anna East	DHR: not eligible
088-5342	20th century house and barns	Spotsylvania	Lake Anna East	DHR: not eligible
088-5343	19th century Wildwood House	Spotsylvania	Lake Anna East	DHR: not eligible

Table List of Known Archaeological Sites and Historic Properties

Archaeological and Architectural Sites within Six-Mile Radius of NAPS				
VDHR ID#	**Resource Name/Type**	**County**	**Quadrangle**	**NRHP Status**
088-5363	20th century house	Spotsylvania	Lake Anna West	DHR: not eligible
088-5482	20th century Fairview Road Bridge	Spotsylvania	Lake Anna West	DHR: not eligible
007-5513	Chesapeake and Ohio Railroad/Louisa Railroad/Virginia Central Railroad	Albemarle, Alleghany, Augusta, Bath, Charlottesville, Covington, Hanover, Louisa, Nelson, Orange, Rockbridge, Staunton, Waynesboro	Ashland, Augusta Springs, Beaverdam, Boswells Tavern, Buckner, Charlottesville East, Charlottesville West, Churchville, Clifton Forge, Covington, Craigsville, Crozet, Elliott Knob, Gordonsville, Goshen, Green Valley, Hanover Academy, Hewlett, Keswick, Lake Anna West, Longdale Furnace, Louisa, Millboro, Mineral, Nimrod Hall, Pendleton, Staunton, Stuarts Draft, Waynesboro East, Waynesboro West	DHR: potentially eligible

a. Cultural resource sites recorded within NAPS Site Boundary.

(VDHR Virginia Cultural Resource Information System, 2019)

Figure NAPS Site

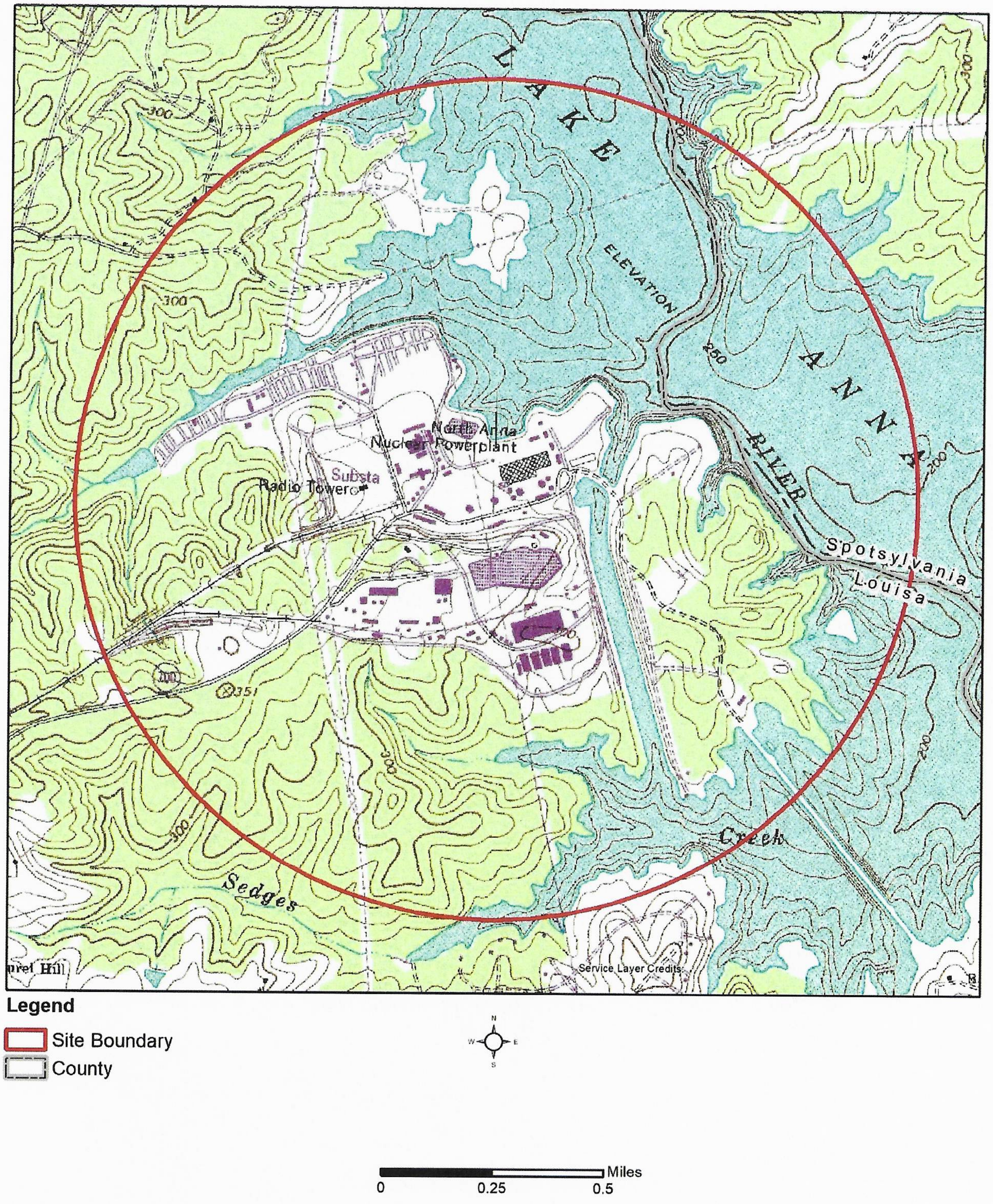
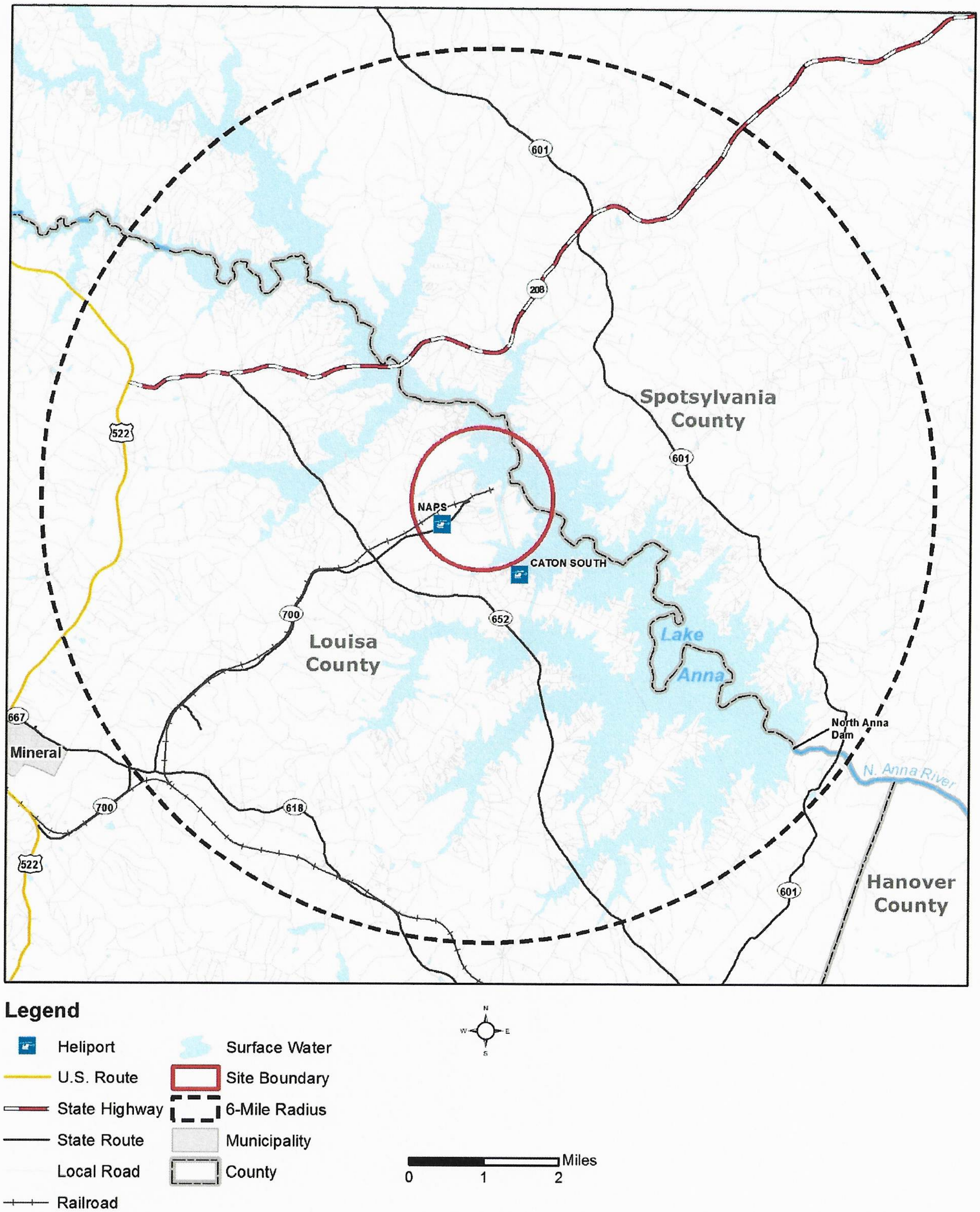


Figure NAPS 6-mile Vicinity



Ebc:
Amanda Tornabene
Thomas Effinger
Ken Roller
Randy Markey
Tony Banks
Keith Miller
Oula Shehab-Dandan

Documentum: North Anna/Permit Applications/Water-Wetlands & Waterways/
NAPS Units 1 and 2 Subsequent License Renewal-VDHR SHPO 7-3-2019

COMMONWEALTH of VIRGINIA

Matthew Strickler
Secretary of Natural Resources

Department of Historic Resources
2801 Kensington Avenue, Richmond, Virginia 23221

Julie V. Langan
Director

Tel: (804) 367-2323
Fax: (804) 367-2391
TDD: (804) 367-2386
www.dhr.virginia.gov

December 11, 2019

Amanda B. Tornabene
Dominion Energy Services, Inc.
5000 Dominion Boulevard
Glen Allen, VA 23060

Re: North Anna Power Station –Units 1 and 2 Subsequent License Renewal
Louisa County, Virginia.
DHR Project No. 2000-1210

Dear Ms. Tornabene:

The Department of Historic Resources (DHR), which serves as the Virginia State Historic Preservation Office, has received notice of Dominion Energy's intention to pursue renewal of its licenses from the Nuclear Regulatory Commission (NRC) to operate Units 1 and 2 at the North Anna Power Station (NAPS). No ground disturbing modifications to standing structures greater than 50 years of age are proposed at this time. Our comments are provided as technical assistance to Dominion Energy in assessing the potential impacts of this project on historic resources.

Our records show four (4) identified historic resources on the NAPS property. Sites 44LS0221 and 44LS0222 consist of two cemeteries that may be potentially eligible for listing in the National Register of Historic Places (NRHP). An additional cemetery (44LS0227) and one historic site (44LS0226) are located within the NAPS site boundary. The NRHP status of these resources has not been determined.

We concur that the continued operation of the facility would not adversely affect historic properties; however, we offer the following for consideration by the NRC:

- Dominion should consult with DHR on all projects at the NAPS that include ground-disturbing activities in areas not previously disturbed by similar activities; and
- Dominion should update any anticipated discoveries plans to ensure that contact information remains valid.

If you have any questions at this time, please do not hesitate to contact me at jennifer.bellville-marrion@dhr.virginia.gov.

Sincerely,

Jenny Bellville-Marrion, Project Review Archaeologist
Review and Compliance Division

COMMONWEALTH of VIRGINIA

Matthew Strickler
Secretary of Natural Resources

Department of Historic Resources
2801 Kensington Avenue, Richmond, Virginia 23221

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Director

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May 19, 2020

Oula Shehab-Dandan
Dominion Energy Services, Inc.
5000 Dominion Boulevard
Glen Allen, VA 23060

Re: North Anna Power Station –Units 1 and 2 Subsequent License Renewal
Louisa County, Virginia.
DHR Project No. 2000-1210

Dear Ms. Shehab-Dandan:

The Department of Historic Resources (DHR) has received notification that the North Anna Power Station (NAPS) has applied to the Nuclear Regulatory Commission (NRC) for an extension of its current operating license. Our comments are provided as technical assistance to Dominion Energy in assessing the potential impacts of this project on historic resources.

It is our understanding that the licensing period will extend for 60 to 80 years. Although the NAPS facility is not yet 50 years old, due to the length of the licensing renewal it will reach the 50-year mark during this relicensing cycle. The DHR requests that the NAPS complete an architectural survey of the facility and assess its eligibility to the National Register of Historic Places (NRHP) once it reaches the accepted age for such consideration. Please consult with DHR on the results of the architectural survey once complete. We are also requesting the NRC to make the survey a condition of the NAPS's license renewal.

If you have any questions at this time, please do not hesitate to contact me at jennifer.bellville-marrion@dhr.virginia.gov.

Sincerely,

Jenny Bellville-Marrion, Project Review Archaeologist
Review and Compliance Division

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Attachment E: Coastal Zone Management Act Certification

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Dominion Energy Services, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
DominionEnergy.com

BY U.S. MAIL
RETURN RECEIPT REQUESTED
7018 2290 0000 9542 6856

October 1, 2019

Ms. Laura McKay
CZM Program Manager
Virginia Department of Environmental Quality
629 East Main Street
Richmond, VA 23219

RE: Virginia Electric and Power Company – North Anna Power Station Units 1 and 2 Subsequent License Renewal

Dear Ms. McKay

The Virginia Electric and Power Company (Dominion Energy Virginia or the Company) is submitting this Coastal Zone Management Act (CZMA) Consistency Certification for the above-referenced project. The Company is preparing an application to renew the operating licenses issued by the U.S. Nuclear Regulatory Commission (NRC) for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. Dominion Energy Virginia expects to submit the renewal application in the second half of 2020. For NAPS Unit 1, this requested renewal would extend the license expiration date from April 1, 2038, to April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from August 21, 2040 to August 21, 2060.

NAPS is located in Louisa County, which is not within the Virginia coastal zone, however, Spotsylvania County, located across Lake Anna from NAPS, is within Virginia's coastal zone. Due to its proximity, Dominion Energy Virginia has developed a CZMA Consistency Certification for this project to meet the requirements of the Federal Consistency Review.

The CZMA Consistency Certification including the project description is attached. The certification demonstrates the project is consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Zone Management Program and will be conducted in a manner consistent with the Program.

We request your concurrence with the certification. Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at oula.k.shehab-dandan@dominionenergy.com (804) 273-2697 or Mr. Keith Miller at keith.j.miller@dominionenergy.com (804) 273-2569.

Sincerely,

Amanda Tornabene

Amanda B. Tornabene
Vice President, Environmental Services

Attachment

Federal Consistency Certification for Federal Permit and License Applicants

Table of Contents

COASTAL ZONE MANAGEMENT ACT CONSISTENCY CERTIFICATION

This document provides the Commonwealth of Virginia with the Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) consistency certification and necessary data and information under the Coastal Zone Management Act (CZMA) Section 307(c)(3)(A) and 15 CFR 930, subpart D, for the continued operation of the North Anna Power Station (NAPS), Units 1 and 2, of an additional 20 years under a renewed U.S. Nuclear Regulatory Commission (NRC) operating license term. NAPS, located in Louisa County, is not within the Virginia coastal zone, however, Spotsylvania County, located across Lake Anna from NAPS, is within Virginia's coastal zone, and due to its proximity, could affect it. For NAPS Unit 1, this requested subsequent license renewal (SLR) would extend the current renewed NRC operating license expiration date from April 1, 2038, to April 1, 2058. For NAPS Unit 2, this requested SLR would extend the operating license expiration date from August 21, 2040, to August 21, 2060. The proposed action for SLR is for continued operation of NAPS Units 1 and 2 until 2058 and 2060, respectively, in their current configuration and in accordance with applicable regulatory requirements of the NRC, other federal agencies, the Commonwealth of Virginia, and local government bodies with jurisdiction.

CERTIFICATION

Dominion certifies that the proposed activity complies with the enforceable policies of Virginia's Coastal Zone Management Program (VCP) and will be conducted in a manner consistent with the VCP.

NECESSARY DATA AND INFORMATION

<u>Proposed Action</u>

Dominion is applying to the NRC for renewal of the operating licenses for the two nuclear generating units of NAPS for an additional 20 years.

NAPS Units 1 and 2 were licensed originally in 1978 and 1980, respectively, for a period of 40 years, with the operating license terms expiring in 2018 and 2020. NAPS Units 1 and 2 received renewed operating licenses from the NRC on March 20, 2003, extending the license terms to 2038 and 2040, respectively (NRC 2003). For the initial license renewal, Dominion prepared a CZMA program consistency certification and received a letter of concurrence from the Virginia Department of Environmental Quality (VDEQ) on February 21, 2002, documenting that the renewal of the NAPS operating licenses was consistent with the CZMA program (NRC 2002, Table 1-1).

NAPS is located on Lake Anna in Louisa County, Virginia. Figures E-1 and E-2 show the NAPS 50-mile region and 6-mile vicinity, respectively. Figure E-3 presents the site location on a U.S. Geological Survey topographical map.

The SLR application (SLRA) being submitted to the NRC considers the impacts of continued station operation including the impacts on Lake Anna and downstream. Lake Anna was created by constructing a dam across the North Anna River as part of the overall development of the NAPS site. The North Anna Reservoir (approximately 9,600 acres) currently serves as the cooling water source for NAPS. The North Anna Dam is an earth-filled structure about 5,000 feet long and 90 feet high, with a crest elevation of 265 feet mean sea level (msl). The North Anna Dam also incorporates at its base a small two-unit hydroelectric power plant of 855-kW capacity owned and operated by Dominion. Releases from the North Anna Dam are established to maintain flows and water quality downstream. The SLRA also considers the impacts from the in-scope transmission lines shown on Figure E-4, which connect the generating units to the transmission grid and provide power to the plant during outages. These transmission lines are located wholly on the NAPS site.

Another facility co-located on the NAPS site and operated by Dominion is an independent spent fuel storage installation (ISFSI), a dry storage facility for spent fuel removed from NAPS Units 1 and 2, licensed separately by the NRC, renewed in 2018 (License No. SNM-2507). The site-specific SNM-2507 licensed facility is for storage on Pad No. 1 only. A general NRC license (Certificate of Compliance No. 1030) is used for storage on Pad No. 2 and a future Pad No. 3. The ISFSI is located within the NAPS site and consists of reinforced concrete pads with spent fuel storage canisters inside a fence. The ISFSI licenses and operations are not included as part of the SLRA proposed action.

During the proposed SLR period of extended operations, Dominion would continue to operate NAPS as currently configured, as described in the following paragraphs. In addition, Dominion would continue to maintain compliance with its federal, state, and local environmental permits and authorizations. Table E-1 provides a summary of authorizations held by NAPS for current plant operations. Authorizations in this context include any permits, licenses, approvals, or other entitlements that would continue to be in place, as appropriate, throughout the period of extended operation given their respective renewal schedules. Prior to initiating any activity associated with NAPS requiring a permit(s) and/or approval(s) applicable to the VCP's enforceable policies, Dominion will renew such permit(s) and/or approval(s) in a timely manner and will adhere to the conditions contained therein.

NAPS uses uranium dioxide fuel in two nuclear reactors to produce steam, which drives turbines that generate 1,672 (summer capacity) to 1,731 (winter capacity) megawatts of electricity for consumer use. (Dominion 2018b, IRP Figure 5.3.1, p.88)

The NAPS cooling water system is operated under Virginia Pollutant Discharge Elimination System (VPDES) Permit No. VA0052451. (VDEQ 2014a) Cooling water is withdrawn from the North Anna Reservoir, and discharged through the WHTF back to the North Anna Reservoir through VPDES Outfall 001. The VPDES permit authorizes discharges from 12 external outfalls (seven industrial process wastewater and five stormwater) and 16 internal outfalls, including effluent from the NAPS onsite sewage treatment plant (Permit No. VA0052451-01). An application for renewal of the permit was submitted on October 15, 2018 (Dominion 2018a), followed by an addendum to the application on March 12, 2019 (Dominion 2019). The permit renewal is pending.

A single 3,600-foot canal discharges into the first of three lagoons comprising the waste heat treat facility (WHTF) (approximately 3,400 acres). The discharged water flows in series through the three lagoons before the water is returned to the North Anna Reservoir [of Lake Anna, through Outfall 001]. (HDR 2018, pg. 22) The NAPS discharge permit limits waste heat rejected to the WHTF from NAPS to 13.54 x 10^9 Btu/hour (VDEQ 2014a, pg. 9). The heat rejection limit is supported by a CWA 316(a) variance based on a successful 316(a) demonstration and continuing monitoring requirements. Dominion committed to continue selected environmental studies on the North Anna Reservoir, the WHTF, and the lower North Anna River as part of a post-316(a) demonstration agreement. (VDEQ 2014b fact sheet, pgs. 61 and 63-66)

NAPS has a single cooling water intake structure with two screenwells, one for each unit. The screenwells have traveling water screens with 1/8-inch by 1/2-inch screen mesh. Fish and debris collected on the traveling screens are conveyed to a debris collection structure and disposed of offsite. (HDR 2018, pgs. 1, 2, and 22) For a renewed VPDES permit, NAPS is required by 316(b) regulations (40 CFR 122.21) to address impingement and entrainment requirements under the rule's regulations that became effective in October 2014. Regarding impingement reduction requirements of the rule, Dominion requested concurrence from the VDEQ regarding the application of the 40 CFR §125.92(c)(2) definition of closed-cycle recirculating system to NAPS. After the VDEQ's consultation with the EPA Region 3, the VDEQ agreed that Lake Anna (including the WHTF), which was created as makeup water supply and heat dissipation treatment for NAPS, met the administrative criteria of a closed-cycle recirculating system consistent with the definition in 40 CFR §125.92(c)(2). Therefore, the chosen method of compliance for NAPS to meet the impingement mortality reduction standard is through Compliance Alternative 1 (§125.94(c)(1)). For the rule's entrainment-related requirements, Dominion commissioned a two-year entrainment study and conducted technology evaluations and cost benefit analyses as required by 40 CFR §122.21(r)(9)-(12). The results of these studies, which were subjected to peer review in accordance with 40 CFR §122.21(r)(13), were included in Dominion's VPDES permit renewal application (Dominion 2018a; Dominion 2019).

Groundwater withdrawal for use by the generating units is from three water supply wells permitted for public use by the Virginia Department of Health (VDH). These three wells comprise a single water supply system at the site. A separately permitted well provides the water supply for the North Anna Nuclear Information Center (NANIC). The average groundwater withdrawal rate by NAPS in 2017 was reported as 7,399.25 gallons per day (gpd) and averaged 8,313.84 gpd between 2013 and 2017.

Dominion holds an air emission permit (Permit No. 40726) to operate two auxiliary boilers and five emergency generators in accordance with the provisions of the Commonwealth of Virginia State Air Pollution Control Board's regulations for the control and abatement of air pollution. The auxiliary boilers have been decommissioned and Dominion has applied to remove them from the permit (Dominion 2014). Although NAPS may periodically utilize a portable auxiliary boiler or generator(s) during outages, nonradioactive gaseous emissions result primarily from testing of emergency generators and diesel pumps. Because NAPS utilizes a once-through cooling system for condenser cooling purposes, there are no cooling towers and associated particulate emissions.

Dominion employs about 900 workers at NAPS. Approximately 73 percent of the permanent and temporary badged NAPS workforce reside in Hanover, Henrico, Louisa, Orange and Spotsylvania counties. During unit refueling outages, lasting about 30 days each staggered 18-month cycle, there are typically an additional 500–1,000 contractor employees onsite.

Environmental Impacts

The NRC has prepared a generic environmental impact statement (GEIS) on impacts that nuclear power plant operations can have on the environment (NRC 2013) and has codified its findings (10 CFR 51, Subpart A, Appendix B, Table B-1). NRC regulations for domestic licensing of nuclear power plants require review of environmental impacts from renewing an operating license. NRC regulation 10 CFR 51.53(c) requires an applicant for license renewal to submit with its application a separate document entitled, "Applicant's Environmental Report – Operating License Renewal Stage." Even though an environmental analysis and a supplement to the GEIS were completed for the first renewal of NAPS' operating licenses, a new analysis must be completed for SLR. The purpose of the SLRA environmental report (ER) is to evaluate the impact on human and natural environments for an additional twenty years of operation. The NRC's requirements for an SLRA ER require that the ER (1) identifies the environmental resources that may be affected; (2) assesses the potential environmental impacts of continued operations and refurbishment; and (3) identifies relevant actions to mitigate potential significant (beyond SMALL) adverse impacts and ensure federal, state, and local regulatory compliance. "SMALL" impacts are defined in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, Footnote 3 as:

> Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.

The SLR environmental evaluation focuses on 77 environmental issues which the NRC has categorized into Category 1 or Category 2. In addition to the 77 categorized issues, the GEIS and NRC regulations consider an uncategorized issue on chronic effects of electromagnetic fields that NRC has reviewed, but does not require license renewal applicants to consider in their renewal applications. Sixty (60) environmental issues are classified as Category 1 and were dispositioned generically by the NRC (10 CFR 51 Subpart A, Appendix B). Those issues do not need to be addressed individually in the ER, but the applicant is required to apply a process to look for potential new information and evaluate the significance of any new information on a plant-specific basis in the applicant's ER. The Category 1 issues applicable to NAPS are presented in Table E-2. The issues which could not be dispositioned generically are classified as Category 2 impact issues. The potential impacts of these issues must be addressed on a plant-specific basis in the ER. Category 2 issues include such items as impacts on aquatic species from entrainment, impingement, and thermal effects; endangered species; and cumulative impacts on specified environmental and socioeconomic resources that interface with NAPS. The Category 2 issues are presented in Table E-3.

NRC requirements for license renewal also include preparation of an integrated plant assessment (IPA) [10 CFR 54.21]. The IPA must identify systems, structures, and components (SSCs) subject to an aging management review. The purpose of the IPA is to demonstrate that the effects of aging will be adequately managed so that the intended functions will be maintained during the SLR term. The NAPS IPA that Dominion conducted per 10 CFR Part 54 has identified no refurbishment or replacement actions needed to maintain the functionality of SSCs during the proposed SLR term.

Regarding the applicable Category 1 issues, Dominion conducted a new and significant information review and did not identify any new and significant information. Therefore, Dominion has adopted by reference the NRC findings and GEIS analyses (NRC 2013) for all applicable Category 1 issues. The applicable Category 1 issues are presented in Table E-2 along with their NRC findings.

Regarding the applicable Category 2 issues, Table E-3 summarizes the site-specific assessment by each Category 2 issue. From the review of these individual Category 2 issues, Dominion identified the following site-specific unavoidable adverse impacts associated with the proposed SLR term:

- The majority of the land use at NAPS would continue to be designated as industrial until the plant is shut down and decommissioned (decommissioning can take up to 60 years after permanent shutdown of NAPS). Uranium mining associated with the nuclear fuel cycle also has offsite land use implications.
- Aquatic organisms would continue to be impinged and entrained at the intake structure, but these impacts were determined to be SMALL.
- Normal plant operations result in industrial wastewater discharges containing small amounts of water treatment chemical additives to Lake Anna. Station discharges are covered by the VPDES permit and compliance with the permit ensures that impacts remain SMALL.
- Operation of NAPS results in consumptive use of groundwater. However, annual average groundwater withdrawals are less than 100 gpm.
- Operation of NAPS results in consumptive use water from the North Anna Reservoir. NAPS withdraws about 2% of Lake Anna's conservation and active storage volume annually, most of which is returned to the North Anna Reservoir.

- Operation of NAPS results in the generation of spent nuclear fuel and waste material, including low-level radioactive waste (LLRW), hazardous waste, and nonhazardous waste. However, specific plant design features in conjunction with a waste minimization program; employee safety training programs and work procedures; and strict adherence to applicable regulations for storage, treatment, transportation, and ultimate disposal of this waste ensure that the impact is SMALL.
- Operation of NAPS results in an insignificant increase in radioactivity in the air. The incremental radiation dose to the local population resulting from NAPS operations is typically less than the magnitude of the fluctuations that occur in natural background radiation. Doses to the members of the public from gaseous releases from NAPS would be well within the allowable limits of 10 CFR Part 20 and 10 CFR Part 50, Appendix I. Operation of NAPS also creates a very low probability of accidental radiation exposure to inhabitants of the area.

These adverse impacts associated with the proposed NAPS SLR are mitigated to SMALL by implementation of current NAPS programs and permit compliance (i.e., VPDES permit; air permit; spill prevention, control, and countermeasure program; hazardous waste management program; cultural resources protection; and environmental review programs) and do not require the implementation of additional mitigation measures.

Findings Applicable to Enforceable Policies

Potential effects of the proposed SLR on the coastal zone are described below. Items a through i address impacts related to the VCP's enforceable policies. The policy as included in the VCP is presented in italics, and Dominion's finding of whether the policy is applicable to the proposed SLR term follows. If the policy is applicable, the finding discussion presents how Dominion complies with the policy, which in the case of most of the enforceable policies involves obtaining and complying with a federal or state permit.

a. Fisheries Management

Policy

The program stresses the conservation and enhancement of finfish and shellfish resources and the promotion of commercial and recreational fisheries to maximize food production and recreational opportunities. This program is administered by the Marine Resources Commission (MRC) (Virginia Code §28.2-200 through §28.2713) and the Department of Game and Inland Fisheries (DGIF) (Virginia Code §29.1-100 through §29.1-570).

The State Tributyltin (TBT) Regulatory Program has been added to the Fisheries Management program. The General Assembly amended the Virginia Pesticide Use and Application Act as it related to the possession, sale, or use of marine antifoulant paints containing TBT. The use of TBT in boat paint constitutes a serious threat to important marine animal species. The TBT program monitors boating activities and boat painting activities to ensure compliance with TBT regulations promulgated pursuant to the amendment. The MRC, DGIF, and Virginia Department *of Agriculture and Consumer Services share enforcement responsibilities (Virginia Code §3.1-249.59 through §3.1-249.62).*

Finding

The VDGIF manages the fisheries of the North Anna Reservoir. The VDGIF monitors the abundance of fish species through annual electrofishing and net sampling and makes fish stocking decisions accordingly (VDGIF 2016). Results indicate Lake Anna is home to many species including recreationally important species such as largemouth bass, striped bass, and black crappie and forage species. Dominion also monitors the health of the fishery through annual biological sampling required under the NAPS VPDES permit. Dominion found annual sampling results and trends demonstrate a balanced, indigenous fish community exists in Lake Anna. Trending of abundance indicates no consistent downward trends. Dominion's monitoring and trending of the North Anna River's fishery below the North Anna Dam likewise demonstrated diversity to be rich and stable and abundance fairly consistent. (Dominion 2017, pgs 3- 5 and Figure 9)

No protected species are found in the North Anna Reservoir, the WHTF, or downstream of the North Anna Dam. Suitable or optimum habitat for protected species is not found in Lake Anna. Also, no essential fish habitat (EFH) exists at Lake Anna or the North Anna River through its confluence with the South Anna River and no habitat areas of particular concern (HAPCs) or EFH areas protected from fishing are located on or adjacent to NAPS.

As noted above, NAPS operates under VPDES Permit No. VA0052451. The VPDES permit authorizes discharges from 12 external outfalls (seven industrial process wastewater and five stormwater) and 16 internal outfalls) (VDEQ 2014a). An application for renewal of the permit was submitted on October 15, 2018 (Dominion 2018a), followed by an addendum to the application on March 12, 2019 (Dominion 2019). The permit renewal is pending.

For a renewed VPDES permit, NAPS is required by 316(b) regulations (40 CFR 122.21) to address impingement and entrainment requirements under the rule's regulations that became effective in October 2014. Regarding impingement reduction requirements of the rule, Dominion requested concurrence from the VDEQ regarding the application of the 40 CFR §125.92(c)(2) definition of closed-cycle recirculating system to the NAPS. After the VDEQ's consultation with the EPA Region 3, the VDEQ agreed that Lake Anna –(including the WHTF), created as makeup water supply and heat dissipation treatment for the NAPS, met the administrative criteria of a closed-cycle recirculating system consistent with the definition in 40 CFR §125.92(c)(2). Therefore, NAPS had met the impingement mortality reduction standard through Compliance Alternative 1 (§125.94(c)(1)). For the rule's entrainment-related requirements, Dominion commissioned a two-year entrainment study and submitted the results in the permit renewal application submitted on October 15, 2018, and March 12, 2019. Dominion complies with the current NPDES permit and will comply with future permit requirements, including implementation of any best available technology conditions established by the VDEQ to minimize the impacts of entrainment.

Dominion has administrative controls in place at NAPS to ensure that operational changes or construction activities are reviewed, and the impacts to aquatic resources are minimized through implementation of BMPs, permit modifications, or acquisition of new permits as needed. In addition, regulatory programs that the site is currently subject to, such as stormwater management, spill prevention, and herbicide usage, further serve to minimize impacts.

Dominion owns boats for use at NAPS. As a matter of policy, boats are trailered and are not left water-bound, not even overnight; therefore, no antifouling coatings of any type are required.

Dominion finds that NAPS operations are in compliance with this VCP enforceable policy and will continue to have programs and permits in place to ensure compliance during the proposed SLR term.

b. Subaqueous Lands Management

Policy

The management program for subaqueous lands establishes conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects on marine and fisheries resources, wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards established by the DEQ Water Division. The program is administered by the MRC (Virginia Code §28.2-1200 through §28.2-1213).

Finding

The proposed SLR does not include impacts to subaqueous lands outside of the NAPS site. Should impacts to subaqueous lands be determined necessary, Dominion will seek and obtain all necessary permits as required to undertake the project. Moreover, Dominion finds that this VCP enforceable policy is not applicable to the NAPS site. Dominion controls all of the land within the NAPS site boundary, both above and beneath water surfaces, including those portions of the North Anna Reservoir and WHTF which lie within the site boundary. Dominion and Old Dominion Electric Cooperative (ODEC) also own all the land outside the NAPS site boundary that forms Lake Anna, up to their expected high-water marks (i.e., Elevation 255 feet above msl) (Dominion 2006, ESP ER Section 2.2.1.1, pg. 3-2-6).

Dominion finds that NAPS operations are in compliance with this VCP enforceable policy and will continue to have programs and permits in place to ensure compliance during the proposed SLR term. Furthermore, Dominion will obtain, maintain and comply with the necessary permits to protect subaqueous lands during the proposed SLR term.

c. Wetlands Management

Policy

The purpose of the wetlands management program is to preserve tidal wetlands, prevent their despoliation, and accommodate economic development in a manner consistent with wetlands preservation. (i) The tidal wetlands program is administered by the MRC (Virginia Code §28.2-1301 through §28.2-1320).

(ii) The Virginia Water Protection Permit program administered by the DEQ includes protection of wetlands --both tidal and non-tidal. This program is authorized by Virginia Code § 62.1-44.15.5 and the Water Quality Certification requirements of §401 of the Clean Water Act of 1972.

Finding

The proposed SLR does not include additional construction or land-disturbing activities involving encroachment on wetlands. Should such construction or land-disturbing activities be determined necessary, Dominion will seek and obtain all necessary permits as required to undertake the project.

The State Water Control Board issued a 401 certificate for NAPS on August 29, 1973. A copy of the certificate was provided in the VPDES permit renewal application submitted on October 15, 2018.

Dominion finds that NAPS operations are in compliance with this VCP enforceable policy and will continue to have programs and permits in place to ensure compliance during the proposed SLR term. Furthermore, Dominion will obtain, maintain and comply with the necessary permits to protect wetlands during the proposed SLR term.

d. Dunes Management

Policy

Dune protection is carried out pursuant to the Coastal Primary Sand Dune Protection Act and is intended to prevent destruction or alteration of primary dunes. This program is administered by the Marine Resources Commission (Virginia Code §28.2-1400 through §28.2-1420).

Finding

This policy covers dunes in the geographic area of the eastern shore, the Atlantic beaches south of the Chesapeake Bay entrance, and the shoreline of the Chesapeake Bay proper (VMRC 1993, page 9). The policy is not applicable to location and features of NAPS.

e. Non-point Source Pollution Control

Policy

Virginia's Erosion and Sediment Control Law requires soil-disturbing projects to be designed to reduce soil erosion and to decrease inputs of chemical nutrients and sediments to the

Chesapeake Bay, its tributaries, and other rivers and waters of the Commonwealth. This program is administered by the Department of Conservation and Recreation (DCR) (Virginia Code §10.1-560 et.seq.).

Finding

While not in scope for SLR, explicitly, Dominion holds a VDEQ construction stormwater general permit VAR10K371 for construction of the ISFSI Pad No. 3. A construction stormwater pollution prevention plan (SWPPP) was developed and is being implemented. Dominion also has a long-term maintenance agreement for onsite detention basins.

Dominion maintains and implements a SWPPP and identifies best management practices (BMPs) that are used to prevent or reduce the pollutants in stormwater discharges. The NAPS VPDES permit includes five stormwater outfalls.

For non-point source pollution control during the proposed SLR term, Dominion will obtain VDEQ construction stormwater permits and local erosion and sedimentation control permits as needed.

Dominion finds that NAPS operations are in compliance with this VCP enforceable policy and will continue to have programs and permits in place to ensure compliance during the proposed SLR term.

Coastal lands management is discussed under Item I, below.

f. Point Source Pollution Control

Policy

The point source program is administered by the State Water Control Board pursuant to Virginia Code §62.1-44.15. Point source pollution control is accomplished through the implementation of the National Pollutant Discharge Elimination System (NPDES) permit program established pursuant to §402 of the federal Clean Water Act and administered in Virginia as the VPDES permit program. The Water Quality Certification requirements of §401 of the Clean Water Act of 1972 is administered under the Virginia Water Protection Permit program.

Finding

NAPS operates under VPDES Permit No. VA0052451 (VDEQ 2014a). The current VPDES permit authorizes discharges from 12 external outfalls (seven industrial process wastewater and five stormwater) and 16 internal outfalls including effluent from the onsite sewage treatment plant (Permit No. VA0052451-01). An application for renewal of the permit was submitted on October 15, 2018 (Dominion 2018a), followed by an addendum to the application on March 12, 2019. (Dominion 2019) Compliance with current and future VPDES regulatory requirements and permit conditions and implementation of the industrial SWPPP will ensure protection of waters receiving point source discharges from NAPS operations.

Dominion intends to seek concurrence from DEQ that NAPS is not required to obtain a Virginia Water Protection Permit for continued operations pursuant to § 62.1-44.15:22.B of the Code of Virginia.

Dominion finds that NAPS operations are in compliance with this VCP enforceable policy and will continue to have programs and permits in place to ensure compliance during the proposed SLR term.

g. Shoreline Sanitation

Policy

The purpose of this program is to regulate the installation of septic tanks, set standards concerning soil types suitable for septic tanks, and specify minimum distances that tanks must be placed away from streams, rivers, and other waters of the Commonwealth. This program is administered by the Department of Health (Virginia Code §32.1-164 through §32.1-165).

Finding

NAPS utilizes an onsite wastewater treatment plant permitted by the VDEQ (VDEQ 1997). NAPS has two septic tanks, one located at the North Anna Nuclear Information Center and one located at the security training building. The septic systems were constructed and operate under permits issued by the Virginia Department of Health.

Compliance with current and future VPDES regulatory requirements and permit conditions for operation of the onsite wastewater treatment plant as well as the Virginia Department of Health permits for the septic systems will ensure shoreline sanitation.

Dominion finds that NAPS operations are in compliance with this VCP enforceable policy and will continue to have programs and permits in place to ensure compliance during the proposed SLR term.

h. Air Pollution Control

Policy

The program implements the federal Clean Air Act to provide a legally enforceable State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards. This program is administered by the State Air Pollution Control Board (Virginia Code §10.1-1300 through 10.1-1320).

Finding

Dominion holds an air emission permit (Permit No. 40726) to operate two auxiliary boilers and five emergency generators in accordance with the provisions of the Commonwealth of Virginia State Air Pollution Control Board's regulations for the control and abatement of air pollution. Air emissions supporting NAPS operations are minimal and stem from intermittent use and testing of diesel generators. Dominion will ensure compliance with permit conditions. The VDEQ is currently reviewing a permit application to remove the auxiliary boilers from the permit because they have been decommissioned.

Dominion finds that NAPS operations are in compliance with this VCP enforceable policy and will continue to have programs and permits in place to ensure compliance during the proposed SLR term.

i. Coastal Lands Management

Policy

Coastal Lands Management is a state-local cooperative program administered by the DCR's Division of Stormwater Management – Local Implementation (previously the Division of Chesapeake Bay Local Assistance) and 88 localities in Tidewater, Virginia established pursuant to the Chesapeake Bay Preservation Act; Virginia Code §§ 10.1-2100 through 10.1-2114 and Chesapeake Bay Preservation Area Designation and Management Regulations; Virginia Administrative code 9 VAC10-20-10 et seq.

Finding

The Chesapeake Bay Preservation Act and Chesapeake Bay Preservation Area designation and management regulations were designed to enhance water quality, focusing on nonpoint pollution, and still allow reasonable development to continue. The act is implemented through local governments and required Spotsylvania County and other tidewater communities to map resource protection areas (shoreline and near shoreline areas) and resource management areas (adjacent areas that if improperly used or developed have a potential for causing significant water quality degradation or for diminishing the functional value of the resource protection area). (VDEQ 2019)

Spotsylvania County implemented the regulations related to the Chesapeake Bay Preservation Act through its code of ordinances which designated the entire county as part of the Chesapeake Bay Preservation Area and defined Resource Protection Areas (Spotsylvania County 2019).

The proposed SLR does not include additional construction outside of the NAPS site, which is located in Louisa County. NAPS, however, may require additional space for spent fuel storage during the proposed SLR term. For the potential construction of an additional concrete pad at the existing ISFSI, Dominion would seek and obtain all required state and local permit(s) including for construction stormwater and erosion and sediment control. For any other land disturbing activities during the proposed SLR term, Dominion would obtain the appropriate permits and authorizations prior to conducting the activity, and operate in compliance with such permits and authorizations.

Dominion finds that NAPS operations are in compliance with this VCP enforceable policy and will continue to have programs and permits in place to ensure compliance during the proposed SLR term.

CONSIDERATION OF ADVISORY POLICIES

Potential effects of the proposed SLR on advisory policies are described below. Advisory policies are VCP recommendations and compliance with them is not required for the purposes of consistency but should be considered. The advisory policies as included in the VCP are presented in italics, and Dominion's finding of whether the advisory policy is applicable to the proposed SLR term follows. If the policy is applicable, the finding discussion presents how Dominion complies with the policy.

a. Geographic Areas of Particular Concern

i. Coastal Natural Resource Areas

Policy

These areas are vital to estuarine and marine ecosystems and/or are of great importance to areas immediately inland of the shoreline. Such areas receive special attention from the Commonwealth because of their conservation, recreational, ecological, and aesthetic values. These areas are worthy of special consideration in any planning or resources management process and include the following resources:

- Wetlands
- Aquatic Spawning, Nursery, and Feeding Grounds
- Coastal Primary Sand Dunes
- Barrier Islands
- Significant Wildlife Habitat Areas
- Public Recreation Areas
- Sand and Gravel Resources
- Underwater Historic Sites

Findings

The resources applicable to geographic location are addressed below. The other resources (i.e., coastal primary sand dunes, barrier islands, sand and gravel resources, and underwater historic sites) are not applicable to the geographic location and/or features of NAPS.

Wetlands

See the wetlands management discussion, Item c, above.

Aquatic Spawning, Nursery, and Feeding Grounds

See the fisheries management discussion, Item a, above.

Significant Wildlife Habitat Areas

Two natural community types identified within the Virginia Department of Conservation and Recreation (VDCR) Rare and Natural Communities database (VDCR 2018) are within the six-mile vicinity of NAPS. The communities are Piedmont Central Appalachian mixed oak/hardwood forest and Coastal Plain/Outer Piedmont acidic seepage swamp. The Piedmont Central Appalachian mixed oak/hardwood forest natural community was identified as occurring with the York River Basin subunits YO18 and YO20. Subunits YO18 and YO2O are found on the Louisa County and Spotsylvania County sides of Lake Anna and encompass Lake Anna State Park. This group of oak-dominated forests is prevalent on xeric, infertile upland sites. Habitats are variable, ranging from sterile, low-elevation "flatwoods" to steep, rocky mountainsides. The Coastal Plain/Outer Piedmont acidic seepage swamp was identified as occurring with the York River basin subunit YO20. This group contains forested vegetation of braided headwaters stream bottoms and seeping toe-slopes saturated by abundant groundwater discharge. These identified areas will not be disturbed with any future planned activities.

Adherence to the NAPS VPDES, compliance with current and future VDPES regulatory requirements and permit conditions, and implementation of the SWPPP and BMPs, will mitigate impacts from NAPS on Lake Anna and adjacent terrestrial natural communities.

Public Recreation Areas

Lake Anna is one of Virginia's most popular lakes. Dominion controls all the land of Lake Anna up to the expected high-water marks (i.e., Elevation 255 feet above msl) (Dominion 2006, ESP ER Section 2.2.1.1, pg. 3-2-6). Development on or attached to Dominion property is allowed by a permit issued from Dominion, e.g., fixed or floating docks, piers, boardwalks, slips, accessory buildings.

Lake Anna State Park was developed in 1983 on the Spotsylvania County side of Lake Anna northwest of NAPS. The park currently includes a total of 3,127 acres with 10 miles of shoreline. (VDCR 2019a LASP Master Plan) As of 2016, the VDCR reported that Lake Anna State Park's visitor attendance had increased to over 400,000 persons annually, including overnight and day use visitation. (VDCR 2019b LASP annual attendance)

Six commercial marinas also provide recreational users with amenities and services such as food, fuel, and bait; year-round boat rental and storage facilities; and camping facilities, playgrounds, picnic areas, and beach areas. (LAVC 2019) In 2006, it was estimated that over 600,000 people access Lake Anna annually. (Dominion 2006, Table 2.1-2)

Future development along the Spotsylvania County's Lake Anna shorefront is subject to Spotsylvania's code of ordinances which includes zoning designations and restrictions and has also designated the entire county as part of the Chesapeake Bay Preservation Area (Spotsylvania County 2019). Spotsylvania County also has a comprehensive plan that guides and recommends future land uses within the county (Spotsylvania County 2018).

ii. Coastal Natural Hazard Areas

Policy

This policy covers areas vulnerable to continuing and severe erosion and areas susceptible to potential damage from wind, tidal, and storm related events including flooding. New buildings and other structures should be designed and sited to minimize the potential for property damage due to storms or shoreline erosion. The areas of concern are as follows:

- Highly Erodible Areas
- Coastal High Hazard Areas, including floodplains

Finding

NAPS is not located in a highly erodible area or a coastal high hazard area.

iii. Waterfront Development Areas

Policy

These areas are vital to the Commonwealth because of the limited number of areas suitable for waterfront activities. The areas of concern are as follows:

- Commercial Ports
- Commercial Fishing Piers
- Community Waterfronts

Although the management of such areas is the responsibility of local government and some regional authorities, designation of these areas as waterfront development areas of particular concern (APC) under the VCP is encouraged. Designation will allow the use of federal CZMA funds to be used to assist in planning for such areas and in the implementation of such plans. The VCP recognizes two broad classes of priority uses for waterfront development APC:

- Water access-dependent activities
- Activities significantly enhanced by the waterfront location and complementary to other existing and/or planned activities in a given waterfront area

Finding

Dominion controls all the land of Lake Anna up to the expected high-water marks (i.e., Elevation 255 feet above msl). (Dominion 2006, ESP ER Section 2.2.1.1, pg. 3-2-6) Development on or attached to Dominion property is allowed by permit issued by Dominion. There are currently six commercial marinas on Lake Anna. (LAVC 2019)

b. Advisory Policies for Shorefront Access Planning and Protection

Policies

VCP has advisory policies for shorefront access planning and protection listing the following categories:

i. *Public beaches*

ii. *Recreational opportunities and shoreline access*

iii. *Parks, natural areas, and wildlife management areas*

iv. *Waterfront recreational land acquisition*

v. *Waterfront recreational facilities.*

vi. *Waterfront Historic Properties*

Finding

Dominion controls all of the land within the NAPS site boundary, both above and beneath water surfaces, including those portions of the North Anna Reservoir and WHTF which lie within the site boundary (see Figure E-3). Dominion and ODEC also own all the land outside the NAPS site boundary that forms Lake Anna, up to the expected high water mark, i.e., elevation 255 feet above msl. (Dominion 2006, ESP ER Section 2.2.1.1, pg. 3-2-6) Lakeshore property owners can request a permit from Dominion for development (e.g., fixed or floating docks, piers, boardwalks, slips, accessory buildings) on, or attached to, Dominion's property. The permits are revocable; however, none have been revoked.

Lake Anna is one of Virginia's most popular lakes. As noted above, Lake Anna State Park was developed on the Spotsylvania County side of Lake Anna northwest of NAPS in 1983. The park currently includes a total of 3,127 acres with 10 miles of shoreline. (VDCR 2019a LASP Master Plan) As of 2016, the VDCR reported that Lake Anna State Park's visitor attendance had increased to over 400,000 persons annually, including overnight and day use visitation (VDCR 2019b LASP annual attendance).

Six commercial marinas also provide recreational users with amenities and services such as food, fuel, and bait; year-round boat rental and storage facilities; and camping facilities, playgrounds, picnic areas, and beach areas. (LAVC 2019) In 2006, it was estimated that over 600,000 people access Lake Anna annually. (Dominion 2006 ESP, Table 2.1-2)

Future development on the Spotsylvania County shorefront is subject to Spotsylvania's code of ordinances which includes zoning designations and restrictions and has also designated the entire county as part of the Chesapeake Bay Preservation Area (Spotsylvania County 2019).

Spotsylvania County also has a comprehensive plan that guide and recommends future land uses within the county (Spotsylvania County 2018).

Cultural resources on the NAPS site are protected by Dominion’s historic resources consultation guidance (Dominion 2009) and Dominion’s cultural resources description process (CRDP). The guidance document and the CRDP ensure that cultural resources are protected from unauthorized removal and that, in the event ground disturbance is required in these areas, coordination with the Virginia Department of Historic Resources (VDHR) (serving as Virginia’s state historic preservation office) is conducted. The guidance protects known cultural resources, as well as unknown cultural resources, by establishing a process for all activities that require a federal permit, use federal funding, or have the potential to impact historic resources.

State Notification

By this certification that the continued operation of NAPS Units 1 and 2 during the proposed SLR term is consistent with the VCP, Virginia is notified that it has six months from the receipt of this letter and accompanying information in which to concur with or object to Dominion’s certification. Pursuant to 15 CFR Section 930.62(b), if Virginia has not issued a decision within three months following commencement of state agency review, it shall notify Dominion and the federal agency (NRC) of the status of the matter and the basis for further delay. The state’s concurrence, objection, or notification of review status shall be sent to:

Chief of Environmental Section
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
One White Flint
11555 Rockville Pike
Rockville, MD 20555-2738

Amanda B. Tornabene
Vice President Environmental Services
Dominion Energy Services, Inc.
5000 Dominion Boulevard
Glen Allen, VA 23060

Should you or your staff have any questions or comments, please contact Ms. Oula Shehab-Dandan at (804) 273-2697 or oula.k.shehab-dandan@dominionenergy.com, or Mr. Keith Miller at (804) 273-2569 or keith.j.miller@dominionenergy.com.

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Table E-1 Permits and Authorizations for Current NAPS Operations

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
SECC	Omnibus Low-Level Radioactive Waste Interstate Compact Consent Act (1980 and amended in 1985)	Authorization to export waste	None	Updated annually	Export of LLRW outside the region
NRC	Atomic Energy Act, 10 CFR 49	NAPS license to operate Unit 1	NPF-4	4/1/2038	Operation of NAPS Unit 1
NRC	Atomic Energy Act, 10 CFR 50	NAPS license to operate Unit 2	NPF-7	8/21/2040	Operation of NAPS Unit 2
NRC	10 CFR 51; 10 CFR 72	ISFSI	SNM-2507	6/30/2058	Operation of a dry storage ISFSI
USFWS	MBTA 50 CFR 13 50 CFR 21.41	Depredation permit	MB705136-0	3/31/2019	Authorization for selective take of migratory birds
VDEQ	Coastal Zone Management Act Section 307(c)(3)(A)	Consistency determination with the Virginia Coastal Management Program	Concurrence letter, E. Irons, VDEQ to J. W. White, Dominion Virginia Power, 2/21/02 (NRC 2002, p. E-9)	NA	Certification that NAPS complies with the Virginia Coastal Management Program
VDEQ	CAA, 9 VAC 5-80-50 through 9 VAC 5-80-300 and 9 VAC 5-140-10 through 9 VAC 5-140-900	Stationary source permit to operate	Registration number: 40726	Operating under a permit shield	Operation of emergency diesel and auxiliary boilers
VDEQ	40 CFR 280; 9VAC25-580-10	Underground storage tanks registration for VA regulated tanks	Registration numbers: PNA-7, -8, -9, -10, -11	Various	Operation of underground storage tanks
VDEQ	9VAC25-91-10	Aboveground tanks > 660 gallons registration	Facility ID-301265, Owner ID -31021,	10/2022	Operation of aboveground storage tanks

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
			ODCP No. FC-06-7030		
VDEQ	CWA, Section 402; 9VAC25-790	VPDES permit	VA0052451	Administratively continued	Authorization for wastewater discharges
VDEQ	9VAC25-880-60.A.1	Long-term maintenance agreement of permanent stormwater management facilities	NA	NA	Maintenance of detention basins #1, #2, #3, #4A, and #4B
VDEQ	Virginia Stormwater Management Act, 9VAC25-870	General VPDES permit for construction activities	VAR10K371	6/30/2019	Construction stormwater permit for ISFSI Pad 3
VDEQ	18VAC160-20	Authorization to operate a wastewater treatment plant	VA0052451-01	NA	Wastewater treatment plant operating permit
VDH	12 VAC 5-590-260 Waterworks Regulations of the Virginia Department of Health	Waterworks operation permit (NANIC Well)	2109610	NA	Authorization of operate a Class V non-transient non-community waterworks
VDH	12 VAC 5-590-260 Waterworks Regulations of the Virginia Department of Health	Waterworks operation permit	2109600	NA	Authorization of operate a Class V non-transient non-community waterworks
VDHR	National Historic Preservation Act Section 106	Consultation with State or Tribal Historic Preservation Office	NA	Active	Consideration, assessment, and protection of cultural resources, as necessary

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
USDOT	49 CFR 107 Subpart G	Registration	4929 (issued to Virginia Electric and Power Company)	None	Hazardous materials shipments
USEPA		Small quantity hazardous waste generator	VAD065376279	NA	Hazardous waste generator registration

Table E-2 Category 1 Issues Applicable to NAPS

Issue	NRC Finding from 10CFR51, Subpart A, Appendix B, Table B-1
Onsite land uses	SMALL. Changes in onsite land use from continued operations and refurbishment associated with license renewal would be a small fraction of the nuclear power plant site and would involve only land that is controlled by the licensee.
Offsite land uses	SMALL. Offsite land use would not be affected by continued operations and refurbishment associated with license renewal.
Aesthetic impacts	SMALL. No important changes to the visual appearance of plant structures or transmission lines are expected from continued operations and refurbishment associated with license renewal.
Air quality impacts (all plants)	SMALL. Air quality impacts from continued operations and refurbishment associated with license renewal are expected to be small at all plants. Emissions resulting from refurbishment activities at locations in or near air quality nonattainment or maintenance areas would be short-lived and would cease after these refurbishment activities are completed. Operating experience has shown that the scale of refurbishment activities has not resulted in exceedance of the *de minimis* thresholds for criteria pollutants, and best management practices including fugitive dust controls and the imposition of permit conditions in state and local air emissions permits would ensure conformance with applicable state or tribal implementation plans. Emissions from emergency diesel generators and fire pumps and routine operations of boilers used for space heating would not be a concern, even for plants located in or adjacent to nonattainment areas. Impacts from cooling tower particulate emissions even under the worst-case situations have been small.
Air quality effects of transmission lines	SMALL. Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.
Noise impacts	SMALL. Noise levels would remain below regulatory guidelines for offsite receptors during continued operations and refurbishment associated with license renewal.
Geology and soils	SMALL. The effect of geologic and soil conditions on plant operations and the impact of continued operations and refurbishment activities on geology and soils would be small for all nuclear power plants and would not change appreciably during the license renewal term.
Surface water use and quality (non-cooling system impacts)	SMALL. Impacts are expected to be small if best management practices are employed to control soil erosion and spills. Surface water use associated with continued operations and refurbishment associated with license renewal would not increase significantly or would be reduced if refurbishment occurs during a plant outage.
Altered current patterns at intake and discharge structures	SMALL. Altered current patterns would be limited to the area in the vicinity of the intake and discharge structures. These impacts have been small at operating nuclear power plants.
Altered thermal stratification of lakes	SMALL. Effects on thermal stratification would be limited to the area in the vicinity of the intake and discharge structures. These impacts have been small at operating nuclear power plants.

Issue	NRC Finding from 10CFR51, Subpart A, Appendix B, Table B-1
Scouring caused by discharged cooling water	SMALL. Scouring effects would be limited to the area in the vicinity of the intake and discharge structures. These impacts have been small at operating nuclear power plants.
Discharge of metals in cooling system effluent	SMALL. Discharges of metals have not been found to be a problem at operating nuclear power plants with cooling-tower-based heat dissipation systems and have been satisfactorily mitigated at other plants. Discharges are monitored and controlled as part of the National Pollutant Discharge Elimination System (NPDES) permit process.
Discharge of biocides, sanitary wastes, and minor chemical spills	SMALL. The effects of these discharges are regulated by Federal and State environmental agencies. Discharges are monitored and controlled as part of the NPDES permit process. These impacts have been small at operating nuclear power plants.
Surface water use conflicts (plants with once-through cooling systems)	SMALL. These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems.
Effects of dredging on surface water quality	SMALL. Dredging to remove accumulated sediments in the vicinity of intake and discharge structures and to maintain barge shipping has not been found to be a problem for surface water quality. Dredging is performed under permit from the U.S. Army Corps of Engineers, and possibly, from other State or local agencies.
Temperature effects on sediment transport capacity	SMALL. These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem.
Groundwater contamination and use (non-cooling system impacts)	SMALL. Extensive dewatering is not anticipated from continued operations and refurbishment associated with license renewal. Industrial practices involving the use of solvents, hydrocarbons, heavy metals, or other chemicals, and/or the use of wastewater ponds or lagoons have the potential to contaminate site groundwater, soil, and subsoil. Contamination is subject to State or Environmental Protection Agency regulated cleanup and monitoring programs. The application of best management practices for handling any materials produced or used during these activities would reduce impacts.
Groundwater use conflicts (plants that withdraw less than 100 gallons per minute)	Plants that withdraw less than 100 gpm are not expected to cause any groundwater use conflicts.
Groundwater quality degradation resulting from water withdrawals	SMALL. Groundwater withdrawals at operating nuclear power plants would not contribute significantly to groundwater quality degradation.
Exposure of terrestrial organisms to radionuclides	SMALL. Doses to terrestrial organisms from continued operations and refurbishment associated with license renewal are expected to be well below exposure guidelines developed to protect these organisms.

Issue	NRC Finding from 10CFR51, Subpart A, Appendix B, Table B-1
Cooling system impacts on terrestrial resources (plants with once-through cooling systems or cooling ponds)	SMALL. No adverse effects to terrestrial plants or animals have been reported as a result of increased water temperatures, fogging, humidity, or reduced habitat quality. Due to the low concentrations of contaminants in cooling system effluents, uptake and accumulation of contaminants in the tissues of wildlife exposed to the contaminated water or aquatic food sources are not expected to be significant issues.
Bird collisions with plant structures and transmission lines	SMALL. Bird collisions with cooling towers and other plant structures and transmission lines occur at rates that are unlikely to affect local or migratory populations and the rates are not expected to change.
Transmission line right-of-way (ROW) management impacts on terrestrial resources	SMALL. Continued ROW management during the license renewal term is expected to keep terrestrial communities in their current condition. Application of best management practices would reduce the potential for impacts.
Electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	SMALL. No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.
Entrainment of phytoplankton and zooplankton (all plants)	SMALL. Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.
Infrequently reported thermal impacts (all plants)	SMALL. Continued operations during the license renewal term are expected to have small thermal impacts with respect to the following: Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem. Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem. Thermal discharge may have localized effects but is not expected to affect the larger geographical distribution of aquatic organisms. Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem. Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem.
Effects of cooling water discharge on dissolved oxygen, gas supersaturation, and eutrophication	SMALL. Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been mitigated. Low dissolved oxygen was a concern at one nuclear power plant with a once-through cooling system but has been mitigated. Eutrophication (nutrient loading) and resulting effects on chemical and biological oxygen

Issue	NRC Finding from 10CFR51, Subpart A, Appendix B, Table B-1
	demands have not been found to be a problem at operating nuclear power plants.
Effects of non-radiological contaminants on aquatic organisms	SMALL. Best management practices and discharge limitations of NPDES permits are expected to minimize the potential for impacts to aquatic resources during continued operations and refurbishment associated with license renewal. Accumulation of metal contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal.
Exposure of aquatic organisms to radionuclides	SMALL. Doses to aquatic organisms are expected to be well below exposure guidelines developed to protect these aquatic organisms.
Effects of dredging on aquatic organisms	SMALL. Dredging at nuclear power plants is expected to occur infrequently, would be of relatively short duration, and would affect relatively small areas. Dredging is performed under permit from the U.S. Army Corps of Engineers, and possibly, from other State or local agencies.
Effects on aquatic resources (non-cooling system impacts)	SMALL. Licensee application of appropriate mitigation measures is expected to result in no more than small changes to aquatic communities from their current condition.
Impacts of transmission line right-of-way (ROW) management on aquatic resources	SMALL. Licensee application of best management practices to ROW maintenance is expected to result in no more than small impacts to aquatic resources.
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	SMALL. These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.
Employment and income, recreation and tourism	SMALL. Although most nuclear plants have large numbers of employees with higher than average wages and salaries, employment, income, recreation, and tourism impacts from continued operations and refurbishment associated with license renewal are expected to be small.
Tax revenues	SMALL. Nuclear plants provide tax revenue to local jurisdictions in the form of property tax payments, payments in lieu of tax (PILOT), or tax payments on energy production. The amount of tax revenue paid during the license renewal term as a result of continued operations and refurbishment associated with license renewal is not expected to change.
Community services and education	SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to local community and educational services would be small. With little or no change in employment at the licensee's plant, value of the power plant, payments on energy production, and PILOT payments expected during the license renewal term, community and educational services would not be affected by continued power plant operations.

Issue	NRC Finding from 10CFR51, Subpart A, Appendix B, Table B-1
Population and housing	SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to regional population and housing availability and value would be small. With little or no change in employment at the licensee's plant expected during the license renewal term, population and housing availability and values would not be affected by continued power plant operations.
Transportation	SMALL. Changes resulting from continued operations and refurbishment associated with license renewal to traffic volumes would be small.
Radiation exposures to the public	SMALL. Radiation doses to the public from continued operations and refurbishment associated with license renewal are expected to continue at current levels, and would be well below regulatory limits.
Radiation exposures to plant workers	SMALL. Occupational doses from continued operations and refurbishment associated with license renewal are expected to be within the range of doses experienced during the current license term, and would continue to be well below regulatory limits.
Human health impact from chemicals	SMALL. Chemical hazards to plant workers resulting from continued operations and refurbishment associated with license renewal are expected to be minimized by the licensee implementing good industrial hygiene practices as required by permits and Federal and State regulations. Chemical releases to the environment and the potential for impacts to the public are expected to be minimized by adherence to discharge limitations of NPDES and other permits.
Microbiological hazards to plant workers	SMALL. Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures as required by permits and Federal and State regulations.
Physical occupational hazards	SMALL. Occupational safety and health hazards are generic to all types of electrical generating stations, including nuclear power plants, and are of small significance if the workers adhere to safety standards and use protective equipment as required by Federal and State regulations.
Design-basis accidents	SMALL. The NRC staff has concluded that the environmental impacts of design-basis accidents are of small significance for all plants.
Low-level waste storage and disposal	SMALL. The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment would remain small during the license renewal term.
Onsite storage of spent nuclear fuel	During the license renewal term, SMALL. The expected increase in the volume of spent nuclear fuel from an additional 20 years of operation can be safely accommodated onsite during the license renewal term with small environmental impacts through dry or pool storage at all plants. For the period after the licensed life for reactor operations, the impacts of onsite storage of spent nuclear fuel during the continued storage period are discussed in NUREG–2157 and as stated in § 51.23(b), shall be deemed incorporated into this issue.
Offsite radiological impacts of spent	For the high-level waste and spent-fuel disposal component of the fuel cycle, the EPA established a dose limit of 0.15 mSv (15 millirem) per year for the first 10,000 years and 1.0 mSv (100 millirem) per year between 10,000 years and

Issue	NRC Finding from 10CFR51, Subpart A, Appendix B, Table B-1
nuclear fuel and high-level waste disposal	1 million years for offsite releases of radionuclides at the proposed repository at Yucca Mountain, Nevada. The Commission concludes that the impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high-level waste disposal, this issue is considered Category 1.
Mixed-waste storage and disposal	SMALL. The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal would not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small.
Nonradioactive waste storage and disposal	SMALL. No changes to systems that generate nonradioactive waste are anticipated during the license renewal term. Facilities and procedures are in place to ensure continued proper handling, storage, and disposal, as well as negligible exposure to toxic materials for the public and the environment at all plants.
Offsite radiological impacts—individual impacts from other than the disposal of spent fuel and high-level waste	SMALL. The impacts to the public from radiological exposures have been considered by the Commission in Table S–3 of this part. Based on information in the GEIS, impacts to individuals from radioactive gaseous and liquid releases, including radon-222 and technetium-99, would remain at or below the NRC's regulatory limits.
Offsite radiological impacts—collective impacts from other than the disposal of spent fuel and high-level waste	There are no regulatory limits applicable to collective doses to the general public from fuel-cycle facilities. The practice of estimating health effects on the basis of collective doses may not be meaningful. All fuel-cycle facilities are designed and operated to meet the applicable regulatory limits and standards. The Commission concludes that the collective impacts are acceptable. The Commission concludes that the impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective impacts of the uranium fuel cycle, this issue is considered Category 1.
Non-radiological impacts of the uranium fuel cycle	SMALL. The non-radiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant would be small.
Transportation	SMALL. The impacts of transporting materials to and from uranium-fuel-cycle facilities on workers, the public, and the environment are expected to be small.
Termination of plant operations and decommissioning	SMALL. License renewal is expected to have a negligible effect on the impacts of terminating operations and decommissioning on all resources.

Table E-3 Impacts of Proposed NAPS Subsequent License Renewal by Category 2 Environmental Issue

Resource Issue	ER Section	Environmental Impact
Surface Water Resources		
Surface water use conflicts (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	E4.5.1	No impact. Issue is not applicable because NAPS utilizes a once-through cooling system[(a)] and does not utilize cooling ponds or cooling towers for condenser cooling purposes.
Groundwater Resources		
Groundwater use conflicts (plants that withdraw more than 100 gallons per minute [gpm]) [10 CFR 51.53(c)(3)(ii)(C)]	E4.5.3	No impact. Issue is not applicable because NAPS does not withdraw more than 100 gallons per minute.
Groundwater use conflicts (plants with closed-cycle cooling systems that withdraw makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	E4.5.2	No impact. Issue is not applicable because NAPS utilizes a once-through cooling system[(a)] with cooling water supplied from Lake Anna.
Groundwater quality degradation (plants with cooling ponds at inland sites) [10 CFR 51.53(c)(3)(ii)(D)]	E4.5.4	No impact. Issue is not applicable because NAPS uses a once through cooling system[(a)] and does not utilize cooling ponds.
Radionuclides released to groundwater [10 CFR 51.53(c)(3)(ii)(P)]	E4.5.5	SMALL impact. No unplanned radioactive liquid releases were reported between 2012 and 2017.
Terrestrial Resources		
Effects on terrestrial resources (non-cooling system impacts) [10 CFR 51.53(c)(3)(ii)(E)]	E4.6.5	SMALL impact. No refurbishment or other license renewal-related construction activities have been identified; adequate management programs and regulatory controls in place to prevent impacts outside of previously disturbed areas.
Water use conflicts with terrestrial resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	E4.6.4	No impact. Issue is not applicable because NAPS utilizes a once-through cooling system[(a)] and does not utilize cooling ponds or cooling towers for condenser cooling purposes.
Aquatic Resources		
Impingement and entrainment of aquatic organisms (plants with once-through cooling systems or cooling ponds) [10 CFR 51.53(c)(3)(ii)(B)]	E4.6.1	SMALL impact. Current impingement configuration and entrainment studies indicate that there is a small impact to the Lake Anna fishery due to the existing cooling water intake structure. The VDEQ will make another best technology available determination during the upcoming permit reissuance. The results of that determination will be incorporated into the permit.

Resource Issue	ER Section	Environmental Impact
		Dominion will continue to comply with the current and future VPDES permit.
Thermal impacts on aquatic organisms (plants with once-through cooling systems or cooling ponds) [10 CFR 51.53(c)(3)(ii)(B)]	E4.6.2	SMALL impact. The NAPS discharge permit limits waste heat rejected to the WHTF from NAPS to 13.54 x 10^9 Btu/hour (VDEQ 2014a, pg. 9). The heat rejection limit is supported by a CWA 316(a) variance based on a successful 316(a) demonstration, and this demonstration continues to be supported by annual biological studies and temperature readings and trending. Issuance of the NAPS VPDES permit denotes the VDEQ's conclusion that NAPS, in operating in conformance with the permit, would be in compliance with the CWA requirements.
Water use conflicts with aquatic resources (plants with cooling ponds or cooling towers using makeup water from a river) [10 CFR 51.53(c)(3)(ii)(A)]	E4.6.3	No impact. Issue is not applicable because NAPS utilizes a once-through cooling system[a] and does not utilize cooling ponds or cooling towers for condenser cooling purposes.
Special Status Species and Habitats		
Threatened, endangered, and protected species and essential fish habitat [10 CFR 51.53(c)(3)(ii)(E)]	E4.6.6	No effect. No refurbishment or other license-renewal related construction activities have been identified. The continued operation of the site would have no adverse effects on any federally or state-listed species. SLR would have no effect on threatened, endangered, and protected species in the vicinity of NAPS.
Historic and Cultural Resources		
Historic and cultural resources [10 CFR 51.53(c)(3)(ii)(K)]	E4.7	No adverse effects on historic properties. No refurbishment or other license renewal-related construction activities have been identified; administrative procedure ensures protection of these types of resources in the event of excavation activities.
Human Health		
Microbiological hazards to the public (plants that use cooling ponds, lake, or canals or that discharge to a river) [10 CFR 51.53(c)(3)(ii)(G)]	E4.9.1	SMALL impact. Conditions necessary for optimal growth of pathogens are limited by water temperatures in the WHTF and the North Anna Reservoir and wastewater disinfection practices. Field sampling has detected *N. fowleri* in low concentrations in some, but not all samples collected from the North Anna Reservoir and the WHTF, and no cases of PAM have been reported for Lake Anna. Annual sampling for *E. coli* in Lake Anna during warm weather months further reduce the risk to the public

Resource Issue	ER Section	Environmental Impact
Electric shock hazards [10 CFR 51.53(c)(3)(ii)(H)]	E4.9.2	SMALL impact. The NRC determined electric shock potential for the evaluated lines was small and did not warrant mitigation measures.
Postulated Accidents		
Severe accidents [10 CFR 51.53(c)(3)(ii)(L)] (SAMA = severe accident mitigation alternatives)	E4.15.1	SMALL impact. Potentially cost-effective SAMAs are not related to adequately managing the effects of aging during the period of extended operation.
Environmental Justice		
Minority and low-income populations [10 CFR 51.53(c)(3)(ii)(N)]	E4.10.1	No disproportionately high and adverse impacts or effects on minority and low-income populations identified.
Cumulative Impacts		
Cumulative Impacts [10 CFR 51.53(c)(3)(ii)(O)]	E4.12	MODERATE ADVERSE to LARGE BENEFICIAL impacts. SMALL for land use and visual resources, air quality and noise, geology and soils, ecological resources, human health, and waste management; SMALL to MODERATE for water resources; MODERATE ADVERSE to LARGE BENEFICIAL for Socioeconomics and no effect on historic and cultural resources.

a. The VDEQ has determined that the North Anna Reservoir and the WHTF collectively meet the administrative criteria of a closed-cycle recirculating system consistent with the definition in 40 CFR §125.92(c)(2).

Figure E-1 NAPS 50-Mile Region

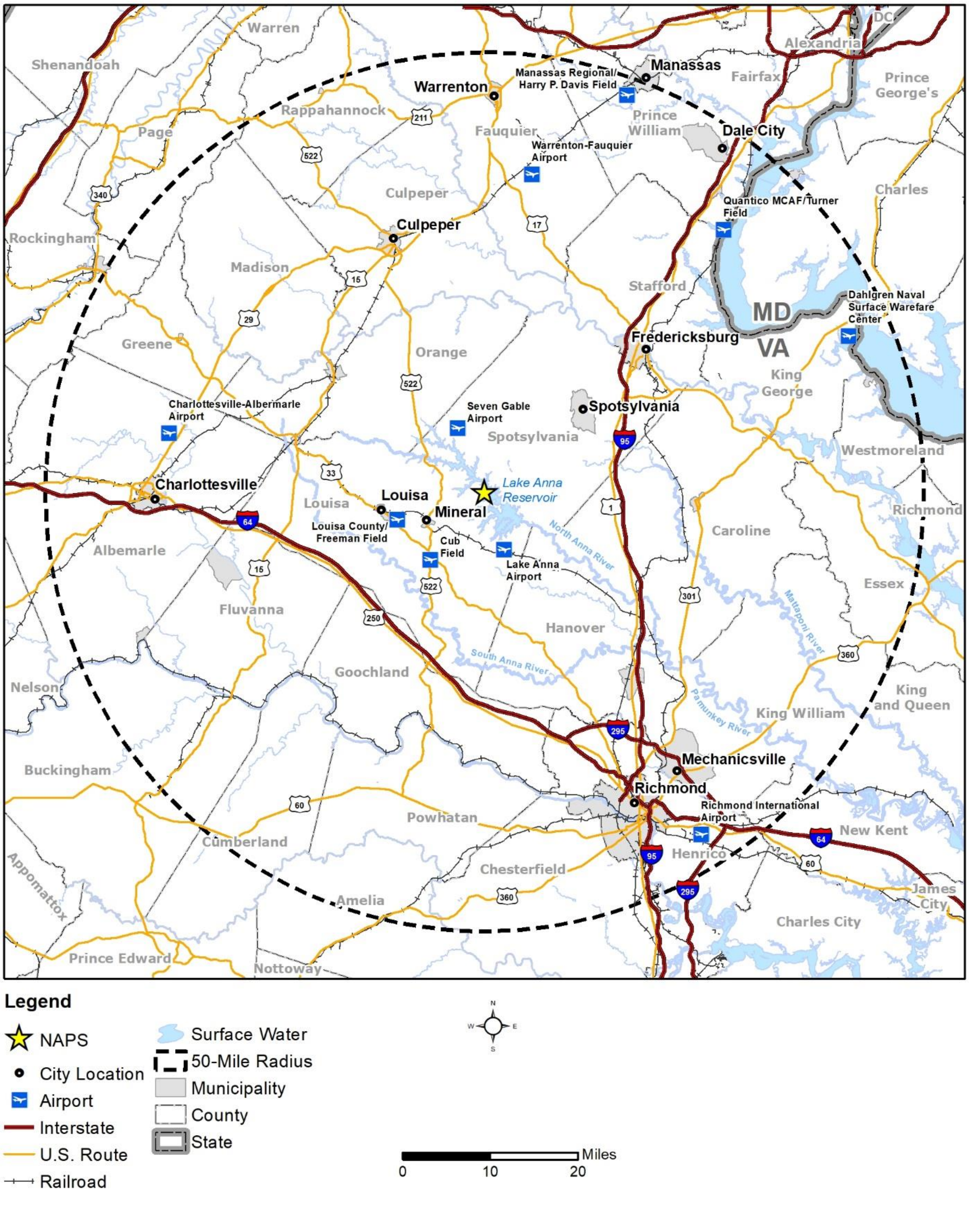


Figure E-2 NAPS 6-Mile Vicinity

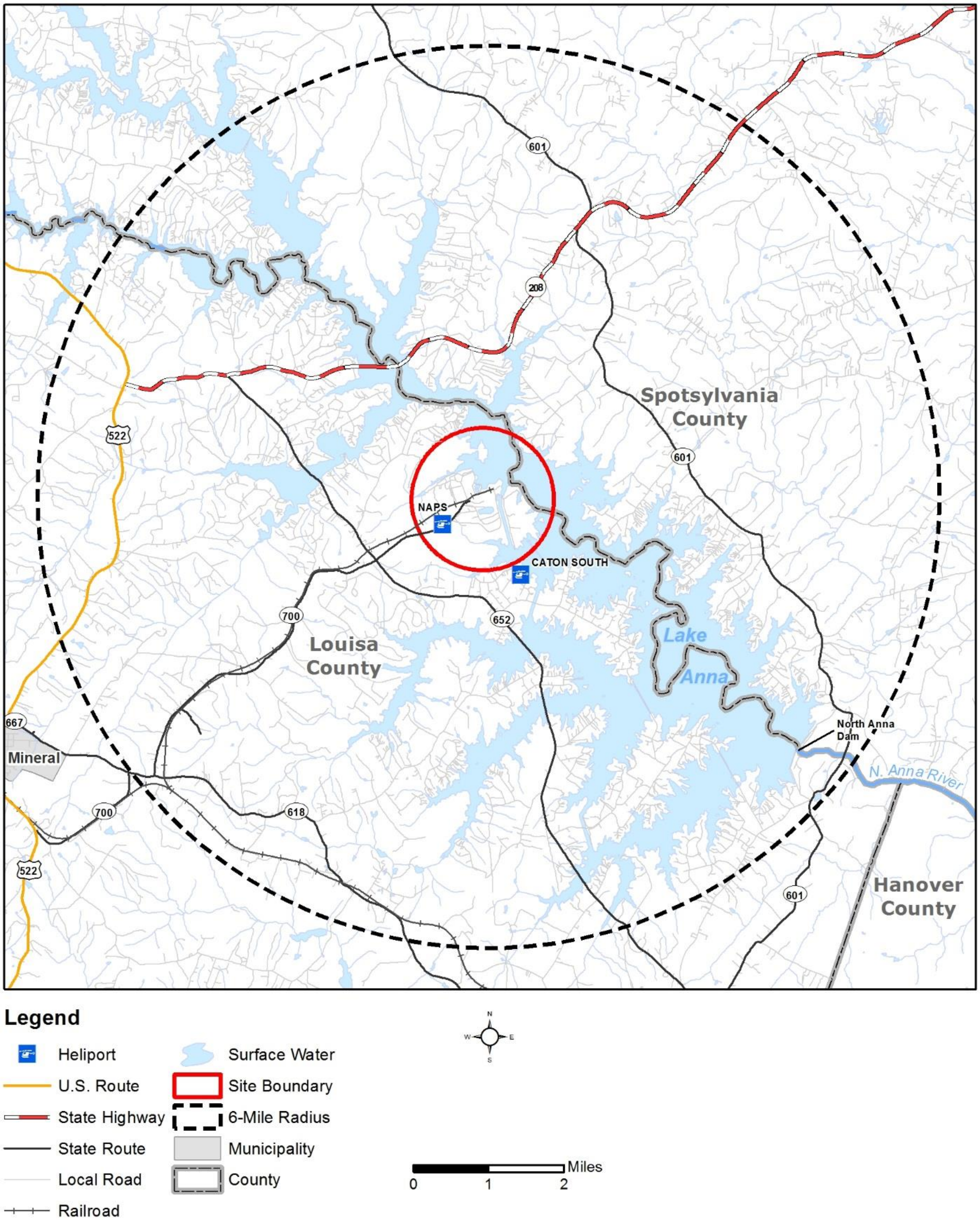


Figure E-3 NAPS Site Topography

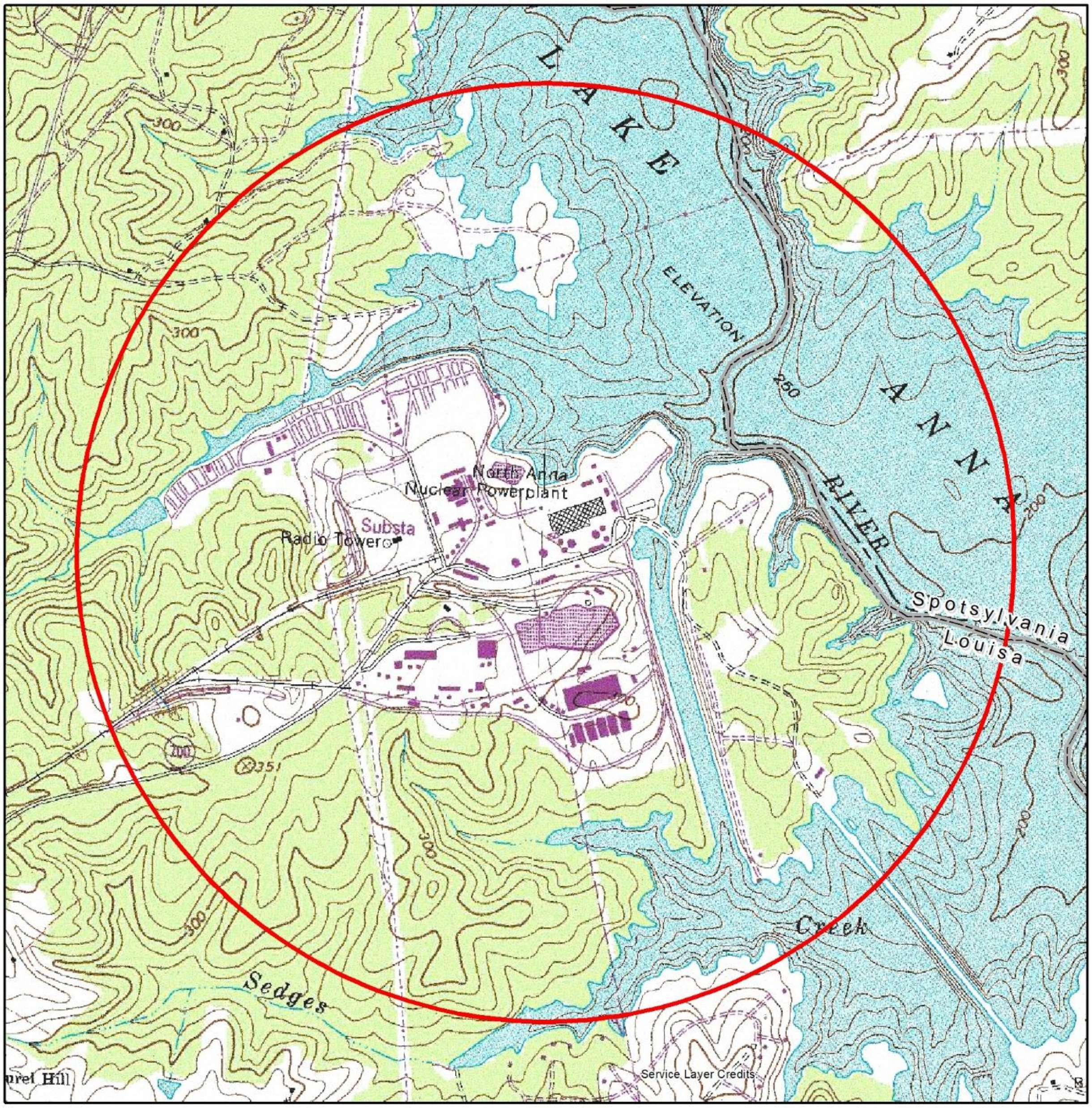
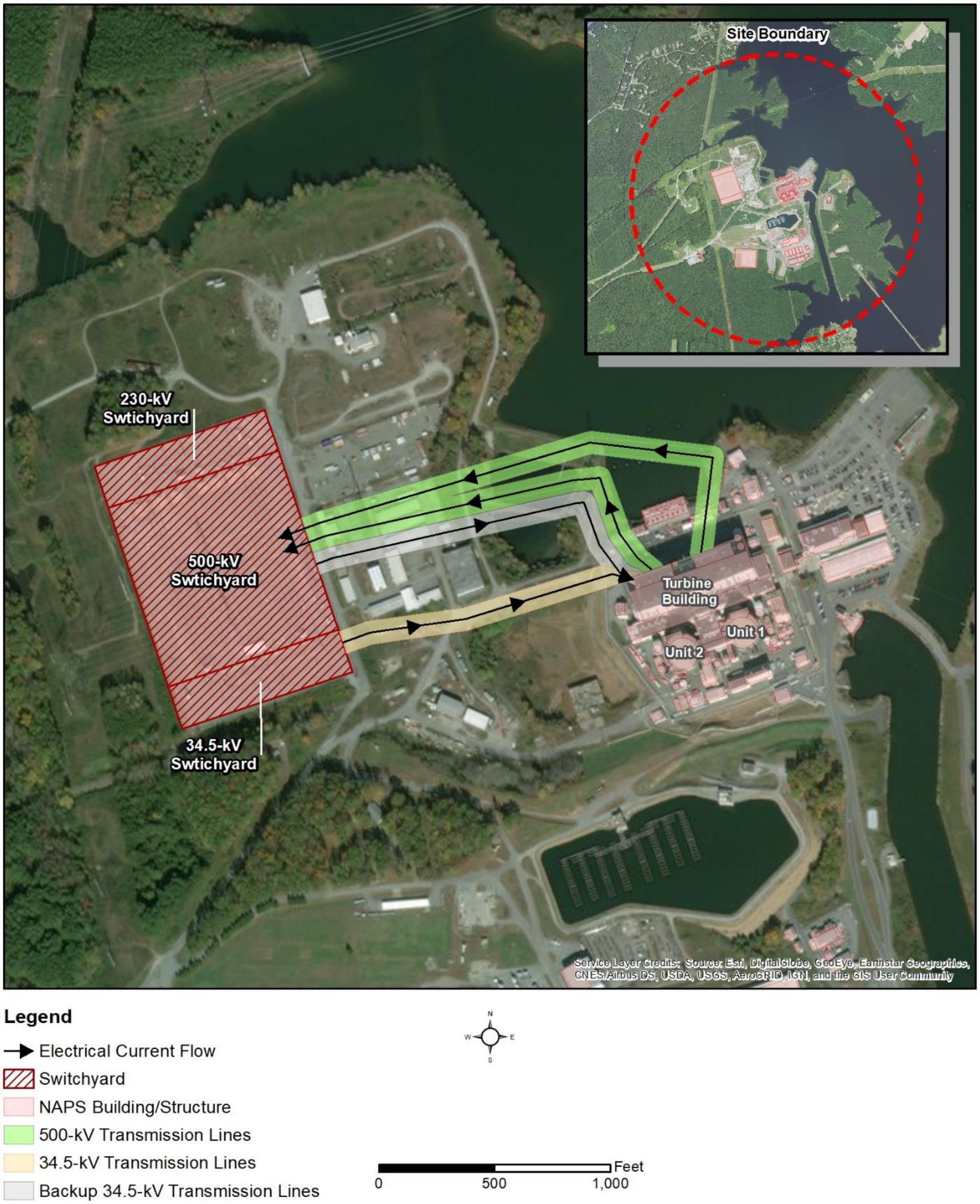


Figure E-4 NAPS Site Layout and In-Scope Transmission Lines



COMMONWEALTH of VIRGINIA

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December 23, 2019

Ms. Amanda B. Tornabene
Dominion Energy Services, Inc.
5000 Dominion Boulevard
Glen Allen, Virginia 23060
Via email: amanda.b.tornabene@dominionenergy.com

RE: Federal Consistency Certification, North Anna Power Station Units 1 and 2 Subsequent License Renewal, Dominion Energy Virginia, Louisa and Spotsylvania Counties, DEQ 19-124F.

Dear Ms. Tornabene:

The Commonwealth of Virginia has completed its review of the Federal Consistency Certification (FCC) provided for the above-referenced action. The Department of Environmental Quality (DEQ) is responsible for coordinating Virginia's review of federal consistency documents and responding to appropriate officials on behalf of the Commonwealth. This letter is in response to the FCC dated and received on October 1, 2019, submitted by Dominion Energy Services, Inc. The following agencies participated in this review:

Department of Environmental Quality
Department of Game and Inland Fisheries
Department of Conservation and Recreation
Virginia Marine Resources Commission
Department of Health

In addition, the Department of Agriculture and Consumer Services, Department of Historic Resources, Louisa and Spotsylvania Counties, Thomas Jefferson Planning District Commission, and the George Washington Regional Commission were invited to comment on the proposal.

PROJECT DESCRIPTION

The Virginia Electric and Power Company (Dominion or Company) proposes to renew the operating licenses issued by the U.S. Nuclear Regulatory Commission (NRC) for North Anna Power Station Units 1 and 2 (NAPS) in Louis County for an additional 20 years. Dominion Energy Virginia expects to submit the renewal application in the second half of 2020. For NAPS Unit 1, this requested subsequent license renewal (SLR) would extend the license expiration date from April 1, 2038, to April 1, 2058. For NAPS Unit 2, this SLR would extend the license expiration date from August 21, 2040 to August 21, 2060. The proposed action for SLR is for continued operation of NAPS Units 1 and 2 until 2058 and 2060, respectively, in their current configuration and in accordance with applicable regulatory requirements of the NRC, other federal agencies, the Commonwealth of Virginia, and local government bodies with jurisdiction.

PUBLIC PARTICIPATION

In accordance with Title 15, Code of Federal Regulations (CFR), §930.2, the public was invited to participate in the review of the FCC. Public notice of this proposed action was published in OEIR's Program Newsletter and on the DEQ website from October 11, 2019 through November 8, 2019. No public comments were received in response to the notice.

FEDERAL CONSISTENCY UNDER THE COASTAL ZONE MANAGEMENT ACT

Pursuant to the Coastal Zone Management Act of 1972 (CZMA), as amended, and the federal consistency regulations implementing the CZMA (15 CFR, Part 930, Subpart D, Section 930.50 *et seq*.), projects receiving federal permits, licenses, or approvals which can affect Virginia's coastal uses or resources, must be constructed and operated in a manner which is consistent with the Virginia Coastal Zone Management (CZM) Program. The Virginia CZM Program is comprised of a network of programs administered by several agencies. In order to be consistent with the Virginia CZM Program, all the applicable permits and approvals listed under the enforceable policies of the Virginia CZM Program must be obtained prior to commencing the project.

FEDERAL CONSISTENCY CONCURRENCE

Based on our review of the consistency certification and the comments submitted by agencies administering the enforceable policies of the Virginia CZM Program, DEQ concurs that the proposal is consistent with the Program provided all applicable permits and approvals are obtained as described below. If, prior to construction, the project should change significantly and any of the enforceable policies of the Virginia CZM Program would be affected, pursuant to 15 CFR 930.66, the applicant must submit supplemental information to DEQ for review and approval. However, other state approvals which may apply to this project are not included in this consistency concurrence. Therefore, the applicant must ensure that this project is constructed and operated in accordance with all applicable federal, state and local laws and regulations.

FEDERAL CONSISTENCY ANALYSIS

According to the FCC, the proposed activity complies with the enforceable policies of the Virginia CZM Program and will be conducted in a manner consistent with the Program. The resource agencies that are responsible for the administration of the enforceable policies of the Virginia CZM Program generally agree with findings of the FCC. The applicant must ensure that the proposed action is consistent with the aforementioned policies. In accordance with 15 CFR Part 930, subpart D, 930.58(a)(3), Dominion has consider potential project impacts on the advisory policies of the Virginia CZM Program and finds the proposed action consistent with those policies. The analysis which follows responds to the discussion of the enforceable policies of the Virginia CZM Program that apply to this project.

1. Fisheries Management. According to the FCC (page 7), Lake Anna is home to many species including recreationally important species such as largemouth bass, striped bass, and black crappie and forage species. Dominion monitors the health of the fishery through annual biological sampling required under the NAPS Virginia Pollutant Discharge Elimination System (VPDES) permit. Dominion found annual sampling results and trends demonstrate a balanced, indigenous fish community exists in Lake Anna. Trending of abundance indicates no consistent downward trends. Dominion's monitoring and trending of the North Anna River's fishery below the North Anna Dam likewise demonstrated diversity to be rich and stable and abundance fairly consistent. Dominion finds that NAPS operations are in compliance with this enforceable policy and will continue to have programs and permits in place to ensure compliance during the proposed SLR term.

1(a) Agency Jurisdiction. The Department of Game and Inland Fisheries (Virginia Code 29.1-100 to 29.1-570) and Virginia Marine Resources Commission (Virginia Code 28.2-200 to 28.2-713) have management authority for the conservation and enhancement of finfish and shellfish resources in the Commonwealth. In addition, the Virginia Department of Health (VDH) Division of Shellfish Sanitation (DSS) is responsible for protecting the health of the consumers of molluscan shellfish and crustacea by ensuring that shellfish growing waters are properly classified for harvesting, and that molluscan shellfish and crustacea processing facilities meet sanitation standards.

1(b) Agency Findings.

(i) Department of Environmental Quality

The VPDES program at DEQ-NRO finds that Dominion's chosen method to meet the impingement mortality reduction standard is through Compliance Alternative 1. However, DEQ-NRO has not completed its evaluation of Dominion's 316(b) submittal to determine if this alternative results in the minimization of adverse environmental impacts.

(ii) Department of Game and Inland Fisheries

The Department of Game and Inland Fisheries (DGIF) has no significant concerns with the current operation of the station with these two units and as such, no concerns about relicensing them.

(iii) Virginia Marine Resources Commission

The Virginia Marine Resources Commission (VMRC) finds that the SLR has no foreseeable impacts on the fisheries management enforceable policy under its jurisdiction. As proposed, VMRC has no objection to Dominion's consistency finding.

(iv) Department of Health

VDH-DSS has no comments on the proposal.

1(c) Recommendations. DGIF recommends that Dominion continue to coordinate with agency staff regarding management of the lake and associated ecosystems. DGIF recommends the use of the Best Available Technology to minimize impingement and entrainment of aquatic species, fish eggs and larvae at the water intakes.

1(d) Conclusion. The proposed action is consistent with the fisheries management enforceable policy of the Virginia CZM Program, assuming there are no significant modifications of current operations.

For additional information or questions, contact DEQ-NRO, Bryant Thomas at (703) 583-3843 or bryant.thomas@deq.virginia.gov, DGIF, Amy Ewing at (804) 367-2211 or amy.ewing@dgif.virginia.gov, VMRC, Randy Owen at (757) 247-2251 or randy.owen@mrc.virginia.gov, and/or VDH-DSS, Keith Skiles at (804) 864-7487 or keith.skiles@vdh.virginia.gov.

2. Subaqueous Lands Management. According to the FCC (page 8), Dominion controls all of the land within the NAPS site boundary, both above and beneath water surfaces, including those portions of the North Anna Reservoir and waste heat treatment facility (WHTF) which lie within the site boundary. Dominion and Old Dominion Electric Cooperative (ODEC) also own all the land outside the NAPS site boundary that forms Lake Anna, up to their expected high-water marks (i.e., Elevation 255 feet above mean sea level). Accordingly, Dominion finds that this enforceable policy is not applicable to the NAPS site.

2(a) Agency Jurisdiction. The management program for subaqueous lands establishes conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects on marine and fisheries resources, tidal wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards established by DEQ. The program is administered by VMRC (Virginia Code §28.2-1200 to §28.2-1213).

2(b) Agency Findings. VMRC has no objections to the renewal of the North Anna Power Station operating licenses since there is no new work proposed over state-owned submerged land.

2(c) Conclusion. The proposed action is consistent with the subaqueous lands management enforceable policy of the Virginia CZM Program.

Contact VMRC, Randy Owen at (757) 247-2251 or randy.owen@mrc.virginia.gov.

3. Wetlands Management. According to the FCC (page 9), the proposed SLR does not include additional construction or land-disturbing activities involving encroachment on wetlands. Should such construction or land-disturbing activities be determined necessary, Dominion will seek and obtain all necessary permits as required to undertake the project.

3(a) Agency Jurisdiction. The wetlands management enforceable policy is administered by the Virginia Marine Resources Commission for tidal wetlands (Virginia Code 28.2-1301 through 28.2-1320) and the Department of Environmental Quality through the Virginia Water Protection Permit program for tidal and non-tidal wetlands (Virginia Code §62.1-44.15:20 and Water Quality Certification pursuant to Section 401 of the Clean Water Act).

3(b) Agency Findings.

(i) Department of Environmental Quality

The Virginia Water Protection (VWP) Permit program at the DEQ Central Office (CO) has no comments.

(ii) Virginia Marine Resources Commission

VMRC finds there are no tidal wetlands under its jurisdiction in close proximity to the project area.

3(c) Conclusion. The proposed SLR is consistent with the wetlands management enforceable policy of the Virginia CZM Program.

For additional information, contact DEQ-CO, Michelle Henicheck at (804) 698-4007 or michelle.henicheck@deq.virginia.gov or VMRC, Randy Owen at (757) 247-2251 or randy.owen@mrc.virginia.gov.

4. Nonpoint Source Pollution Control. According to the FCC (page 10), Dominion will obtain DEQ construction stormwater permits and local erosion and sedimentation control permits as needed for non-point source pollution control during the proposed SLR term. Dominion finds that NAPS operations are in compliance with the enforceable policy and will continue to have programs and permits in place to ensure compliance during the proposed SLR term.

4(a) Agency Jurisdiction. The DEQ Office of Stormwater Management (OSWM) administers the nonpoint source pollution control enforceable policy of the Virginia CZM Program through *Virginia Erosion and Sediment Control Law and Regulations* (*VESCL&R*) and *Virginia Stormwater Management Law and Regulations* (*VSWML&R*). In addition, DEQ is responsible for the issuance, denial, revocation, termination and enforcement of the Virginia Stormwater Management Program (VSMP) General Permit for Stormwater Discharges from Construction Activities related to municipal separate storm sewer systems (MS4s) and construction activities for the control of stormwater discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Program.

4(b) Requirements.

(i) Erosion and Sediment Control Plan

Dominion is responsible for submitting a project-specific erosion and sediment control (ESC) plan to the appropriate locality for review and approval pursuant to the ESC requirements, for any land-disturbing activity equal to or greater than 10,000 square feet (2,500 square feet in a Chesapeake Bay Preservation Area). Depending on local requirements the area of land disturbance requiring an ESC plan may be less. The ESC plan must be approved prior to any land-disturbing activity. All regulated land-disturbing activities associated with the project, including on and off site access roads, staging areas, borrow areas, stockpiles, and soil intentionally transported from the project must be covered by the project specific ESC plan. ESC program requirements must be requested through the locality. [Reference: Virginia Erosion and Sediment Control Law §62.1-44.15 *et seq*.; *Virginia Erosion and Sediment Control Regulations* 9 VAC 25-840-10 *et seq*.].

(ii) Stormwater Management Plan

A Stormwater Management (SWM) plan may be required depending on local requirements. SWM program requirements must be requested through the locality. [Reference: Virginia Stormwater Management Act §62.1-44.15 *et seq*.; *Virginia Stormwater Management* (*VSMP*) *Permit Regulations* 9 VAC 25-870-10 *et seq*.].

(iii) Virginia Stormwater Management Program General Permit for Stormwater Discharges from Construction Activities

The operator or owner of a construction project involving land-disturbing activities equal to one acre is required to register for coverage under the General Permit for Discharges of Stormwater from Construction Activities and develop a project-specific stormwater pollution prevention plan (SWPPP). The SWPPP must be prepared prior to submission of the registration statement for coverage under the general permit and the SWPPP must address water quality and quantity in accordance with the *VSMP Permit Regulations*. General information and registration forms for the General Permit are available on DEQ's website at http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx. [Reference: Virginia Stormwater Management *Act* 62.1-44.15 *et seq*.] *VSMP Permit Regulations* 9 VAC 25-880 *et seq*.].

4(c) Conclusion. The proposed action is consistent with the nonpoint source pollution control enforceable policy of the Virginia CZM Program.

For additional information, contact DEQ-OSWM, Larry Gavan at (804) 698-4040 or larry.gavan@deq.virginia.gov.

5. Point Source Pollution Control. According to the FCC (page 10), NAPS operates under VPDES Permit No. VA0052451. The current VPDES permit authorizes discharges from 12 external outfalls (seven industrial process wastewater and five stormwater) and 16 internal outfalls including effluent from the onsite sewage treatment plant (Permit No. VA0052451-01). An application for renewal of the permit was submitted on October 15, 2018, followed by an addendum to the application on March 12, 2019. Compliance with current and future VPDES regulatory requirements and permit conditions and implementation of the industrial SWPPP will ensure protection of waters receiving point source discharges from NAPS operations.

5(a) Agency Jurisdiction. The point source program is administered by the State Water Control Board (DEQ) pursuant to Virginia Code §62.1-44.15. Point source pollution control is accomplished through the implementation of: (1) The National Pollutant Discharge Elimination System (NPDES) permit program established pursuant to Section 402 of the federal Clean Water Act and administered in Virginia as the Virginia Pollutant Discharge Elimination System (VPDES) permit program; and (2) the Virginia Water Protection Permit (VWPP) program administered by DEQ (Virginia Code §62.1-44.15:20 *et seq*.) and Water Quality Certification pursuant to Section 401 of the Clean Water Act.

5(b) Agency Findings. The VPDES program at DEQ-NRO notes that Dominion's permit and fact sheet identifies ten external outfalls with seven of them being industrial process water and three stormwater. In addition, the permit and fact sheet identifies eighteen internal outfalls which includes two stormwater outfalls that discharge to the Waste Heat Treatment Facility.

5(c) Conclusion. The proposed action is consistent with the point source pollution control enforceable policy of the Virginia CZM Program.

For additional information or questions, contact DEQ-NRO, Bryant Thomas at (703) 583-3843 or bryant.thomas@deq.virginia.gov.

6. Air Pollution Control. According to the FCC (pages 11 and 12), Dominion holds an air emission permit (Permit No. 40726) to operate two auxiliary boilers and five emergency generators in accordance with the provisions of the Commonwealth of Virginia State Air Pollution Control Board's regulations for the control and abatement of air pollution. Air emissions supporting NAPS operations are minimal and stem from intermittent use and testing of diesel generators. Dominion will ensure compliance with permit conditions. DEQ is currently reviewing a permit application to remove the auxiliary boilers from the permit because they have been decommissioned.

6(a) Agency Jurisdiction. DEQ's Air Division implements the federal Clean Air Act to provide a legally enforceable State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards. This program is administered by the State Air Pollution Control Board (DEQ) (Virginia Code §10-1.1300 through §10.1-1320).

6(b) Agency Findings. The DEQ Air Division finds that the facility is located in a designated ozone attainment and emission control area for ozone (O_3) and oxides of nitrogen (NO_x). Precursors to O_3 pollution include volatile organic compounds (VOCs) and NO_x. In addition, DEQ finds that a new Article 5 State Operating Permit was issued on June 13, 2019. Dominion removed the boilers from the permit and now the permit only contains the requirements for the 4 emergency generator sets and one blackout generator.

6(c) Recommendation. Dominion should continue to take all reasonable precautions to limit emissions of VOCs and NO_x, principally by controlling or limiting the burning of fossil fuels.

6(d) Requirements. In general, future activities under the SLRs must continue to mitigate for air emissions.

(i) Fugitive Dust

During construction, fugitive dust must be kept to a minimum by using control methods outlined in 9 VAC 5-50-60 *et seq.* of the *Regulations for the Control and Abatement of Air Pollution*. These precautions include, but are not limited to, the following:

- Use, where possible, of water or chemicals for dust control;
- Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;
- Covering of open equipment for conveying materials; and
- Prompt removal of spilled or tracked dirt or other materials from paved streets and removal of dried sediments resulting from soil erosion.

(ii) Open Burning

If project activities include the open burning or use of special incineration devices for the disposal of debris either on or off site, this activity must meet the requirements of 9 VAC 5-130-10 through 9 VAC 5-130-60 and 9 VAC 5-130-100 of the *Regulations* for open burning, and it may require a permit. The *Regulations* provide for, but do not require, the local adoption of a model ordinance concerning open burning. The applicant should contact local fire officials to determine what local requirements, if any, exist.

6(e) Conclusion. The proposed SLR is consistent with the air pollution control enforceable policy of the Virginia CZM Program.

Questions and additional information on the State Operating Permit may be directed to DEQ, Tamera Thompson at (804) 698-4502 or tamera.thompson@deq.virginia.gov.

7. Coastal Lands Management. The FCC (page 12) states that the proposed SLR does not include additional construction outside of the NAPS site, which is located in Louisa County. NAPS, however, may require additional space for spent fuel storage during the proposed SLR term. For the potential construction of an additional concrete pad at the existing ISFSI, Dominion would seek and obtain all required state and local permit(s) including for construction stormwater and erosion and sediment control. For any other land disturbing activities during the proposed SLR term, Dominion would obtain the appropriate permits and authorizations prior to conducting the activity, and operate in compliance with such permits and authorizations.

7(a) Agency Jurisdiction. The DEQ Local Government Assistance Programs (LGAP) administers the coastal lands management enforceable policy through the Chesapeake Bay Preservation Act (Bay Act) (Virginia Code §62.1-44.15 *et seq*.) and *Chesapeake Bay Preservation Area Designation and Management Regulations* (*Regulations*) (9 VAC 25-830-10 *et seq*.).

7(b) Chesapeake Bay Preservation Areas. In Spotsylvania County, the areas protected by the Chesapeake Bay Preservation Act, as locally implemented, require conformance with performance criteria. These areas include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) as designated by the county. RPAs include:

- tidal wetlands,
- certain non-tidal wetlands,
- tidal shores, and
- a 100-foot vegetated buffer area located adjacent to and landward of these features and along both sides of any water body with perennial flow.

All areas of the county not included in the RPA are designated as RMA.

7(c) Agency Findings. DEQ-LGAP finds that the NAPS is located on the south side of Lake Anna in Louisa County, between Hackney Creek to the north and Sedges Creek to the south. As Louisa County is not subject to the Bay Act, DEQ-LGAP has no comments regarding the proposed license renewal.

7(d) Conclusion. The proposed action is consistent with the coastal lands management enforceable policy of the Virginia CZM Program.

For additional information regarding these comments, contact DEQ-LGAP, Daniel Moore at (804) 698-4520 or daniel.moore@deq.virginia.gov.

ADDITIONAL ENVIRONMENTAL CONSIDERATIONS

In addition to the enforceable policies of the Virginia CZM Program, comments were also provided with respect to other applicable requirements and recommendations. The applicant must ensure that future development is constructed and operated in accordance with all applicable federal, state, and local laws and regulations.

1. Solid and Hazardous Waste Management.

1(a) Agency Jurisdiction. On behalf of the Virginia Waste Management Board, the DEQ Division of Land Protection and Revitalization (DEQ-DLPR) is responsible for carrying out the mandates of the Virginia Waste Management Act (Virginia Code §10.1-1400 *et seq*.), as well as meeting Virginia's federal obligations under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response Compensation Liability Act (CERCLA), commonly known as Superfund.

Virginia:

- Virginia Waste Management Act, Virginia Code § 10.1-1400 *et seq.*
- *Virginia Solid Waste Management Regulations*, 9 VAC 20-81
- (9 VAC 20-81-620 applies to asbestos-containing materials)
- *Virginia Hazardous Waste Management Regulations*, 9 VAC 20-60
- (9 VAC 20-60-261 applies to lead-based paints)
- *Virginia Regulations for the Transportation of Hazardous Materials*, 9 VAC 20-110.

Federal:

- Resource Conservation and Recovery Act, 42 U.S. Code sections 6901 *et seq.*
- U.S. Department of Transportation *Rules for Transportation of Hazardous Materials*, 49 *Code of Federal Regulations*, Part 107
- Applicable rules contained in Title 40, *Code of Federal Regulations*.

DEQ-DLPR also administers laws and regulations on behalf of the State Water Control Board governing Petroleum Storage Tanks (Virginia Code §62.1-44.34:8 *et seq*.), including Aboveground Storage Tanks (9 VAC 25-91 *et seq*.) and Underground Storage Tanks (9 VAC 25-580 *et seq*. and 9 VAC 25-580-370 *et seq*.), also known as 'Virginia Tank Regulations', and § 62.1-44.34:14 *et seq*. which covers oil spills

1(b) Agency Findings. DLPR staff conducted a search of solid and hazardous waste databases (including petroleum releases) to identify waste sites in close proximity. The search did not identify any waste sites within the area which might impact the license renewal.

1(c) Requirements. The following requirements would generally apply to future development of the facility.

(i) Waste Management

Any soil, sediment or groundwater that is suspected of contamination or wastes that are generated must be tested and disposed of in accordance with applicable federal, state, and local laws and regulations. All construction waste must be characterized in accordance with the *Virginia Hazardous Waste Management Regulations* prior to management at an appropriate facility.

(ii) Petroleum Contamination

If evidence of a petroleum release must be reported to DEQ-NRO in accordance with Virginia Code § 62.1-44.34.8 through 9 and 9 VAC 25-580-10 *et seq*. The disposal of contaminated soils and groundwater must be done in accordance with DEQ regulatory guidelines.

(iii) Petroleum Storage Tanks

The installation and use of above-ground storage tanks (ASTs) with a capacity of greater than 660 gallons for temporary fuel storage (>120 days) during construction must follow the requirements in 9 VAC 25-91-10 *et seq*.

(iv) Asbestos-containing Material and Lead-based Paint

Structures should be checked for asbestos-containing materials (ACM) and lead-based paint (LBP) prior to disturbance. If ACM or LBP are found, in addition to the federal waste-related regulations mentioned above, state regulations 9 VAC 20-80-640 for ACM and 9 VAC 20-60-261 for LBP must be followed.

1(d) Recommendations. The following recommendations would generally apply to future development of the facility.

(i) Database Searches

Prior to any future development, DLPR staff recommends a search of project areas using the following solid and hazardous waste databases to identify waste sites (including petroleum releases) in close proximity to project areas:

- Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Database: Superfund Information Systems Information on hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation, including sites that are on the National Priorities List (NPL) or being considered for the NPL:

  www.epa.gov/superfund/sites/cursites/index.htm

- DEQ Online Database: Virginia Environmental Geographic Information Systems Information on Permitted Solid Waste Management Facilities, Impaired Waters, Petroleum Releases, Registered Petroleum Facilities, Permitted Discharge (Virginia Pollution Discharge Elimination System Permits) Facilities, Resource Conservation and Recovery Act (RCRA) Sites, Water Monitoring Stations, National Wetlands Inventory:

  www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx

(ii) Pollution Prevention

DEQ encourages all construction projects and facilities to implement pollution prevention principles, including the reduction, reuse, and recycling of all solid wastes generated. All generation of hazardous wastes should be minimized and handled appropriately.

For additional questions or further information regarding waste comments, contact DEQ-DLPR, Carlos Martinez at (804) 698-4575 or carlos.martinez@deq.virginia.gov.

2. Natural Heritage Resources.

2(a) Agency Jurisdiction.

(i) The Virginia Department of Conservation and Recreation (DCR) Division of Natural Heritage (DNH)

DNH's mission is conserving Virginia's biodiversity through inventory, protection and stewardship. The Virginia Natural Area Preserves Act (Virginia Code §10.1-209 through 217) authorizes DCR to maintain a statewide database for conservation planning and project review, protect land for the conservation of biodiversity, and protect and ecologically manage the natural heritage resources of Virginia (the habitats of rare, threatened and endangered species, significant natural communities, geologic sites, and other natural features).

(ii) Virginia Department of Agriculture and Consumer Services (VDACS)

The Endangered Plant and Insect Species Act of 1979 (Virginia Code Chapter 39 §3.1-1020 through 1030) authorizes VDACS to conserve, protect and manage endangered and threatened species of plants and insects. Under a Memorandum of Agreement established between VDACS and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species.

2(b) Agency Findings.

(i) Natural Heritage Resources

DCR-DNH searched its Biotics Data System (Biotics) for occurrences of natural heritage resources from the area. According to the information currently in Biotics, natural heritage resources have not been documented within the project boundary including a 100 foot buffer. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources. In addition, the project boundary does not intersect any of the predictive models identifying potential habitat for natural heritage resources.

(ii) State-listed Threatened and Endangered Plant and Insect Species

DCR finds that the current activity will not affect any documented state-listed plants or insects.

(iii) State Natural Area Preserves

DCR files do not indicate the presence of any State Natural Area Preserves under the agency's jurisdiction in the project vicinity.

2(c) Recommendation. New and updated information is continually added to Biotics. Dominion should coordinate with DCR-DNH, Rene Hypes at (804) 371-2708 or rene.hypes@dcr.virginia.gov, for an update on natural heritage information prior to any construction.

3. Wildlife Resources and Protected Species.

3(a) Agency Jurisdiction. The Virginia Department of Game and Inland Fisheries (DGIF), as the Commonwealth's wildlife and freshwater fish management agency, exercises enforcement and regulatory jurisdiction over wildlife and freshwater fish, including state- or federally-listed endangered or threatened species, but excluding listed insects (Virginia Code, Title 29.1). DGIF is a consulting agency under the U.S.

Fish and Wildlife Coordination Act (16 U.S. Code §661 *et seq*.) and provides environmental analysis of projects or permit applications coordinated through DEQ and several other state and federal agencies. DGIF determines likely impacts upon fish and wildlife resources and habitat, and recommends appropriate measures to avoid, reduce or compensate for those impacts. For more information, see the DGIF website at *www.dgif.virginia.gov*.

3(b) Agency Findings. DGIF has no significant concerns with the current operation of NAPS and as such, no concerns about the relicensing.

3(c) Recommendation. DGIF recommends Dominion continue to coordinate with staff regarding the management of the lake and associated ecosystems.

Contact DGIF, Amy Ewing at (804) 367-2211 or amy.ewing@dgif.virginia.gov for additional information.

4. Floodplain Management.

4(a) Agency Jurisdiction. The DCR Division of Dam Safety and Floodplain Management (DSFM) is the lead coordinating agency for the Commonwealth's floodplain management program and the National Flood Insurance Program (Executive Memorandum 2-97). Pursuant to §10.1-603 of the Virginia Code and in accordance with 44 CFR section 60.12 of the National Flood Insurance Program Regulations for Floodplain Management and Flood Hazard Identification, all construction or land-disturbing activities initiated by an agency of the Commonwealth, or by its contractor, in floodplains shall be submitted to the locality and comply with the locally adopted floodplain management ordinance.

4(b) National Flood Insurance Program. According to the DCR Floodplain Management Program staff, the National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA), and communities who elect to participate in this voluntary program manage and enforce the program on the local level through that community's local floodplain ordinance. Each local floodplain ordinance must comply with the minimum standards of the NFIP, outlined in 44 CFR 60.3; however, local communities may adopt more restrictive requirements in their local floodplain ordinance, such as regulating the 0.2% annual chance flood zone (shaded Zone X).

All development within a Special Flood Hazard Area (SFHA) or floodplain, as shown on the locality's Flood Insurance Rate Map (FIRM), must be permitted and comply with the requirements of the local floodplain ordinance. Projects conducted by federal agencies within the SFHA must comply with Executive Order 11988: Floodplain Management.

The NFIP defines development as "*any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging,* *filling, grading, paving, excavation or drilling operations or storage of equipment or materials.*" (44 CFR 59.1).

The NFIP defines Special Flood Hazard Area (SFHA) as "the *land in the flood plain within a community subject to a 1 percent or greater chance of flooding in any given year. The area may be designated as Zone A on the FHBM. After detailed ratemaking has been completed in preparation for publication of the flood insurance rate map, Zone A usually is refined into Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, or V1-30, VE, or V.*" (44 CFR 59.1).

4(c) Requirements. The DCR Floodplain Management Program does not have regulatory authority for projects in the SFHA. The applicant must coordinate with the local floodplain administrator for an official floodplain determination. If the project is located in the SFHA, the project must comply with the locality's floodplain ordinance and obtain a local permit. Failure to comply with the local floodplain ordinance could result in enforcement action from the locality.

4(d) Recommendations. Use the Virginia Flood Risk Information System (VFRIS) to find flood zone information at www.dcr.virginia.gov/vfris. Local floodplain administrator contact information may be found on DCR's Local Floodplain Management Directory at www.dcr.virginia.gov/dam-safety-and-floodplains/floodplain-directory.

5. Public Water Supply.

5(a) Agency Jurisdiction. Virginia Department of Health (VDH) Office of Drinking Water (ODW) reviews projects for the potential to impact public drinking water sources (groundwater wells, springs and surface water intakes). VDH administers both federal and state laws governing waterworks operation.

5(b) Agency Findings. The following public groundwater wells appear to be located within a 1 mile radius of the project site (wells within a 1,000-foot radius are formatted in **bold):**

PWS ID Number	City/County	System Name	Facility Name
2109600	**LOUISA**	**NORTH ANNA POWER STATION**	**WELL 6**
6177235	SPOTSYLVANIA	LAKE ANNA MARINA	WELL
6177245	SPOTSYLVANIA	ANNA CABANA_ THE	DRILLED WELL
2109600	LOUISA	NORTH ANNA POWER STATION	WELL 8
2109610	LOUISA	NORTH ANNA NUCLEAR INFORMATION CENTER	WELL
2109600	LOUISA	NORTH ANNA POWER STATION	WELL 7
6177417	SPOTSYLVANIA	STURGEON CREEK MARINA	WELL 1

There are no surface water intakes located within a 5-mile radius of the project site. The project is within the watershed of the following public surface water sources:

PWS ID Number	System Name	Facility Name
4085398	HANOVER SUBURBAN WATER SYSTEM	NORTH ANNA RWI

5(c) Recommendations. Best Management Practices should be employed on site, including erosion and sediment control and spill prevention controls and countermeasures (SPCCs). Wells within a 1,000-foot radius of a project should be field marked and protected from accidental damage during construction.

For additional information, contact VDH-ODW, Arlene Fields Warren at (804) 864-7781 or arlene.warren@vdh.virginia.gov.

Thank you for the opportunity to comment on the FCC submitted for the North Anna Power Station Units 1 and 2 Subsequent License Renewal in Louisa and Spotsylvania Counties. The detailed comments of reviewing agencies are attached for your review. Please contact me at (804) 698-4204 or John Fisher at (804) 698-4339 for clarification of these comments.

Sincerely,

Bettina Rayfield, Program Manager
Environmental Impact Review and Long-Range Priorities

Enclosures

Ec: Amy Ewing, DGIF
Robbie Rhur, DCR
Arlene Fields Warren, VDH
Tony Watkinson, VMRC
Kristen Bachand, VMRC
Roger Kirchen, DHR
Keith Tignor, VDACS
Christian Goodwin, Louisa County
Ed Petrovitch, Spotsylvania County
Chip Boyles, TJPDC
Linda Millsap, GWRC
Oula Shehab-Dandan, Dominion Energy
Keith Miller, Dominion Energy

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Re: FW: FW: NEW PROJECT NRC North Anna Power Station Units 1 & 2 License Renewal, DEQ #19-124F

1 message

Thompson, Tamera <tamera.thompson@deq.virginia.gov> Thu, Oct 31, 2019 at 9:17 AM
To: "Fisher, John" <john.fisher@deq.virginia.gov>
Cc: Ballou Thomas kbi57177 <thomas.ballou@deq.virginia.gov>, Kotur Narasimhan <kotur.narasimhan@deq.virginia.gov>

The information for air is out of date.

A new Article 5 State Operating Permit was issued on 6/13/2019. Dominion removed the boilers from the permit and now the permit only contains the requirements for the 4 emergency generator sets and one blackout generator.

Table E1 should be updated:

VDEQ CAA, 9 VAC 5-80-800 through 9 VAC 5-80-1040

Stationary source permit to operate Registration number: 40726

Operating under State Operating Permit

Operation of 4 emergency diesel generator sets and a blackout generator

Tamera Thompson
Manager, Office of Air Permit Programs
VA DEQ
1111 E. Main Street
Richmond, VA 23219
(804) 698-4502
tamera.thompson@deq.virginia.gov

On Thu, Oct 10, 2019 at 3:23 PM Fisher, John <john.fisher@deq.virginia.gov> wrote:

> Tom:
>
> See attached.
>
> John
>
> John E. Fisher
> Virginia Department of Environmental Quality
> Division of Environmental Enhancement
> Office of Environmental Impact Review
> 1111 East Main Street, Suite 1400
> Richmond, Virginia 23219
> (804) 698-4339
> john.fisher@deq.virginia.gov
>
> For program updates and public notices please subscribe to Constant Contact
>
> On Thu, Oct 10, 2019 at 3:02 PM Ballou, Thomas <thomas.ballou@deq.virginia.gov> wrote:
>
>> John - can you send us the documents that were sent to DEQ for review. Thanks.

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR PROGRAM COORDINATION

ENVIRONMENTAL REVIEW COMMENTS APPLICABLE TO AIR QUALITY

TO: John Fisher

We thank **OEIR** for providing DEQ-AIR an opportunity to review the following project:

Document Type: Federal Consistency Certification
Project Sponsor: Nuclear Regulatory Commission
Project Title: North Anna Power Station Units 1 & 2 Subsequent License Renewal
Location: Louisa County, Spotsylvania County
Project Number: DEQ #19-124F

Accordingly, I am providing following comments for consideration.

PROJECT LOCATION: **X OZONE ATTAINMENT AREA FOR NOX & VOC**

REGULATORY REQUIREMENTSMAY BE APPLICABLE TO:
☐ CONSTRUCTION
X License Renewal

STATE AIR POLLUTION CONTROL BOARD REGULATIONS THAT MAY APPLY:

1. ☐ 9 VAC 5-40-5200 C & 9 VAC 5-40-5220 E – STAGE I
2. ☐ 9 VAC 5-45-760 et seq. – Asphalt Paving operations
3. ☐ **9 VAC 5-130 et seq. – Open Burning**
4. ☐ **9 VAC 5-50-60 et seq. Fugitive Dust Emissions**
5. ☐ 9 VAC 5-50-130 et seq. - Odorous Emissions; Applicable to__________________
6. ☐ 9 VAC 5-60-300 et seq. – Standards of Performance for Toxic Pollutants
7. ☐ 9 VAC 5-50-400 Subpart_____, Standards of Performance for New Stationary Sources, designates standards of performance for the___________________________
8. ☐ 9 VAC 5-80-1100 et seq. of the regulations – Permits for Stationary Sources
9. ☐ 9 VAC 5-80-1605 et seq. Of the regulations – Major or Modified Sources located in PSD areas. This rule may be applicable to the ___________________________
10. ☐ 9 VAC 5-80-2000 et seq. of the regulations – New and modified sources located in non-attainment areas
11. ☐ 9 VAC 5-80-800 et seq. Of the regulations – State Operating Permits. This rule may be applicable to ____

COMMENTS SPECIFIC TO THE PROJECT:

(Kotur S. Narasimhan)
Office of Air Data Analysis

DATE: October 9, 2019

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

MEMORANDUM

TO: John Fisher, DEQ/EIR Environmental Program Planner

FROM: Carlos A. Martinez, Division of Land Protection & Revitalization Review Coordinator

DATE: November 6, 2019

COPIES: Sanjay Thirunagari, Division of Land Protection & Revitalization Review Manager; file

SUBJECT: Environmental Impact Review: 19-124F North Anna Power Station Units 1 & 2 Subsequent License Renewal in Mineral, Virginia.

The Division of Land Protection & Revitalization (DLPR) has completed its review of the Nuclear Regulatory Commission's October 9, 2019 EIR for North Anna Power Station Units 1 & 2 Subsequent License Renewal in Mineral, Virginia.

Solid and hazardous waste issues were not addressed in the submittal. The submittal did not indicate that a search of Federal or State environmental databases was conducted. DLPR staff conducted a search of the project area of solid and hazardous waste databases (including petroleum releases) to identify waste sites in close proximity. DLPR search did not identify any waste sites which might impact license renewal.

Prior to any future development, DLPR staff recommends a search of project areas using the following solid and hazardous waste databases to identify waste sites (including petroleum releases) in close proximity to project areas:

- Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Database: Superfund Information Systems Information on hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation, including sites that are on the National Priorities List (NPL) or being considered for the NPL:
    - www.epa.gov/superfund/sites/cursites/index.htm
- DEQ Online Database: Virginia Environmental Geographic Information Systems

Information on Permitted Solid Waste Management Facilities, Impaired Waters, Petroleum Releases, Registered Petroleum Facilities, Permitted Discharge (Virginia Pollution Discharge Elimination System Permits) Facilities, Resource Conservation and Recovery Act (RCRA) Sites, Water Monitoring Stations, National Wetlands Inventory:

- www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx

GENERAL COMMENTS

Soil, Sediment, Groundwater, and Waste Management

Any soil, sediment or groundwater that is suspected of contamination or wastes that are generated must be tested and disposed of in accordance with applicable Federal, State, and local laws and regulations. Some of the applicable state laws and regulations are: Virginia Waste Management Act, Code of Virginia Section 10.1-1400 *et seq.*; Virginia Hazardous Waste Management Regulations (VHWMR) (9VAC 20-60); Virginia Solid Waste Management Regulations (VSWMR) (9VAC 20-81); Virginia Regulations for the Transportation of Hazardous Materials (9VAC 20-110). Some of the applicable Federal laws and regulations are: the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Section 6901 *et seq.*, and the applicable regulations contained in Title 40 of the Code of Federal Regulations; and the U.S. Department of Transportation Rules for Transportation of Hazardous Materials, 49 CFR Part 107.

Asbestos and/or Lead-based Paint

All structures being demolished/renovated/removed should be checked for asbestos-containing materials (ACM) and lead-based paint (LBP) prior to demolition. If ACM or LBP are found, in addition to the federal waste-related regulations mentioned above, State regulations 9VAC 20-81-620 for ACM and 9VAC 20-60-261 for LBP must be followed. Questions may be directed to Graham Simmerman at the DEQ's Valley Regional Office at (540) 574-7800.

Pollution Prevention – Reuse - Recycling

Please note that DEQ encourages all construction projects and facilities to implement pollution prevention principles, including the reduction, reuse, and recycling of all solid wastes generated. All generation of hazardous wastes should be minimized and handled appropriately.

If you have any questions or need further information, please contact Carlos A. Martinez by phone at (804) 698-4575 or email carlos.martinez@deq.virginia.gov.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

MEMORANDUM

TO: John Fisher, DEQ Environmental Impact Review Coordinator

FROM: Daniel Moore, DEQ Principal Environmental Planner

DATE: October 10, 2019

SUBJECT: DEQ #19-124F: NRC – North Anna Power Station Units 1 &2 Subsequent License Renewal: Louisa and Spotsylvania Counties, Virginia

We have reviewed the Federal Consistency Determination for the above-referenced project and offer the following comments regarding consistency with the provisions of the *Chesapeake Bay Preservation Area Designation and Management Regulations* (Regulations):

In Spotsylvania County, the areas protected by the Chesapeake Bay Preservation Act, as locally implemented, require conformance with performance criteria. These areas include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) as designated by the County. RPAs include tidal wetlands, certain non-tidal wetlands and tidal shores. RPAs also include a 100-foot vegetated buffer area located adjacent to and landward of these features and along both sides of any water body with perennial flow. All areas of the County not included in the RPA are designated as RMAs.

The North Anna Power Station (NAPS) is located on the south side of Lake Anna in Louisa County, between Hackney Creek to the north and Sedges Creek to the south. Based on review of the documents submitted, including Figure E-3 (NAPS Site Topography – p. 34) and Figure E-4 (NAPS Site Layout and In-Scope Transmission Lines – p. 35), the NAPS is located entirely in Louisa County. As Louisa County is not subject to the Chesapeake Bay Preservation Act, the DEQ Office of Local Government Assistance Programs has no comments regarding the proposed license renewal.

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Re: NEW PROJECT NRC North Anna Power Station Units 1 & 2 License Renewal, DEQ #19-124F

1 message

Holland, Benjamin <benjamin.holland@deq.virginia.gov> Thu, Oct 17, 2019 at 12:12 PM
To: "Fisher, John" <john.fisher@deq.virginia.gov>

John,

Apologies, but I've got some late additional comments from our VPDES permitting folks for this proposal:

Virginia Pollution Discharge Elimination System (VPDES) comments:

Page 2 Proposed Action (last paragraph) - Dominion indicates that there are twelve external outfalls (seven industrial process water and five stormwater). The permit and fact sheet actually identify ten external outfalls with seven of them being industrial process water and three stormwater).
Page 2 Proposed Action (last paragraph) - Dominion indicates that there are sixteen internal outfalls. The permit and fact sheet actually identify eighteen internal outfalls which includes two stormwater outfalls that discharge to the Waste Heat Treatment Facility.
Page 2 Proposed Action (last paragraph) - Dominion provides a permit number of VA0052451-01. This is not the correct VPDES permit number for the facility. The correct VPDES permit number is VA0052451.
Page 3 Proposed Action (first paragraph) - Dominion defines WHTF as waste heat treat facility. All VPDES documentation (application for reissuance, permit, fact sheet) refers to this as the waste heat treatment facility.
Page 3 Proposed Action (second paragraph) - Dominion states that their chosen method of compliance for NAPS to meet the impingement mortality reduction standard is through Compliance Alternative 1. This is a factual statement. However, it should be noted that DEQ has not yet completed its evaluation of Dominion's 316(b) submittal to determine if this alternative results in the minimization of adverse environmental impacts.
Page 7 Fisheries Management - Finding (paragraph 3) - Dominion again sites the external / internal outfall statistics from page two.
Page 7 Fisheries Management - Finding (paragraph 4). - Dominion states that NAPS has met the impingement mortality reduction standard through Compliance Alternative 1. It should again be noted that DEQ has not yet completed its evaluation of Dominion's 316(b) submittal to determine if Compliance Alternative 1 results in the minimization of adverse environmental impacts.
Page 10 Point Source Pollution Control (paragraph 2) - Dominion again sites the external / internal outfall statistics from page two.

On Wed, Oct 16, 2019 at 9:40 AM Fisher, John <john.fisher@deq.virginia.gov> wrote:

> Okay. We should attempt to provide project-specific comments on this one.
>
> John E. Fisher
> Virginia Department of Environmental Quality
> Division of Environmental Enhancement
> Office of Environmental Impact Review
> 1111 East Main Street, Suite 1400
> Richmond, Virginia 23219
> (804) 698-4339
> john.fisher@deq.virginia.gov
>
> For program updates and public notices please subscribe to Constant Contact
>
> On Wed, Oct 16, 2019 at 8:29 AM Holland, Benjamin <benjamin.holland@deq.virginia.gov> wrote:
>
> > Follow-up late comments may be incoming from VPDES - I'll let you know.
> >
> > On Thu, Oct 10, 2019 at 3:07 PM Holland, Benjamin <benjamin.holland@deq.virginia.gov> wrote:
> >
> > > John - I've been told by our VWPP staff that that portion of the review process for this project should be handled out of Central Office. Otherwise, no comment from our programs beyond the boilerplate response.

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Re: NEW PROJECT NRC North Anna Power Station Units 1 & 2 License Renewal, DEQ #19-124F

1 message

Holland, Benjamin <benjamin.holland@deq.virginia.gov> Thu, Oct 10, 2019 at 3:07 PM
To: John Fisher <John.Fisher@deq.virginia.gov>

John - I've been told by our VWPP staff that that portion of the review process for this project should be handled out of Central Office. Otherwise, no comment from our programs beyond the boilerplate response.

Northern Regional Office comments regarding the EIR for *North Anna Power Station Units 1 & 2 Subsequent License Renewal, DEQ #19-124F*, are as follows:

Land Protection Division – The project manager is reminded that if any solid or hazardous waste is generated/encountered during construction, the project manager would follow applicable federal, state, and local regulations for their disposal.

Air Compliance/Permitting - The project manager is reminded that during the construction phases that occur with this project; the project is subject to the Fugitive Dust/Fugitive Emissions Rule 9 VAC 5-50-60 through 9 VAC 5-50-120. In addition, should any open burning or use of special incineration devices be employed in the disposal of land clearing debris during demolition and construction, the operation would be subject to the Open Burning Regulation 9 VAC 5-130-10 through 9 VAC 5-130-60 and 9 VAC 5-130-100.

Virginia Water Protection Permit (VWPP) Program – The project manager is reminded that a VWP permit from DEQ may be required should impacts to surface waters be necessary. DEQ VWP staff recommends that the avoidance and minimization of surface water impacts to the maximum extent practicable as well as coordination with the US Army Corps of Engineers. Upon receipt of a Joint Permit Application for the proposed surface water impacts, DEQ VWP Permit staff will review the proposed project in accordance with the VWP permit program regulations and current VWP permit program guidance. VWPP staff reserve the right to provide comment upon receipt of a permit application requesting authorization to impact state surface waters, and at such time that a wetland delineation has been conducted and associated jurisdiction determination made by the U.S. Army Corps of Engineers.

Erosion and Sediment Control and Storm Water Management: DEQ has regulatory authority for the Virginia Pollutant Discharge Elimination System (VPDES) programs related to municipal separate storm sewer systems (MS4s) and construction activities. Erosion and sediment control measures are addressed in local ordinances and State regulations. Additional information is available at http://www.deq.virginia.gov/Programs/Water/StormwaterManagement.aspx. Non-point source pollution resulting from this project should be minimized by using effective erosion and sediment control practices and structures. Consideration should also be given to using permeable paving for parking areas and walkways where appropriate, and denuded areas should be promptly revegetated following construction work. If the total land disturbance exceeds 10,000 square feet, an erosion and sediment control plan will be required. Some localities also require an E&S plan for disturbances less than 10,000 square feet. A stormwater management plan may also be required. For any land disturbing activities equal to one acre or more, you are required to apply for coverage under the VPDES General Permit for Discharges of Storm Water from Construction Activities. The Virginia Stormwater Management Permit Authority may be DEQ or the locality.

On Wed, Oct 9, 2019 at 11:19 AM Fulcher, Valerie <valerie.fulcher@deq.virginia.gov> wrote:

> **Good morning - this is a new OEIR review request/project:**

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Re: NEW PROJECT NRC North Anna Power Station Units 1 & 2 License Renewal, DEQ #19-124F

1 message

Gavan, Lawrence <larry.gavan@deq.virginia.gov> Wed, Oct 9, 2019 at 1:42 PM
To: "Fisher, John" <john.fisher@deq.virginia.gov>

(a) Agency Jurisdiction. The DEQ administers the nonpoint source pollution control enforceable policy of the VCP through the *Virginia Erosion and Sediment Control Law and Regulations* (*VESCL&R*) and *Virginia Stormwater Management Law and Regulations* (*VSWML&R*).

(b) Erosion and Sediment Control Plan. The Applicant is responsible for submitting a project-specific erosion and sediment control (ESC) plan to the locality in which the project is located for review and approval pursuant to the local ESC requirements, if the project involves a land-disturbing activity of 10,000 square feet or more (2,500 square feet or more in a Chesapeake Bay Preservation Area). Depending on local requirements the area of land disturbance requiring an ESC plan may be less. The ESC plan must be approved by the locality prior to any land-disturbing activity at the project site. All regulated land-disturbing activities associated with the project, including on and off site access roads, staging areas, borrow areas, stockpiles, and soil intentionally transported from the project must be covered by the project specific ESC plan. Local ESC program requirements must be requested through the locality. [Reference: *Virginia Erosion and Sediment Control Law* §62.1-44.15 et seq.; *Virginia Erosion and Sediment Control Regulations 9*VAC25-840-10 et seq.]

(c) Stormwater Management Plan. Depending on local requirements, a Stormwater Management (SWM) plan may be required. Local SWM program requirements must be requested through the locality. [Reference: *Virginia Stormwater Management Act* §62.1-44.15 et seq.; *Virginia Stormwater Management* (*VSMP*) *Permit Regulations 9*VAC25-870-10 et seq.]

(d) General Permit for Stormwater Discharges from Construction Activities (VAR10). DEQ is responsible for the issuance, denial, revocation, termination and enforcement of the Virginia Stormwater Management Program (VSMP) General Permit for Stormwater Discharges from Construction Activities related to municipal separate storm sewer systems (MS4s) and construction activities for the control of stormwater discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Program.

The operator or owner of a construction project involving land-disturbing activities equal to or greater than 1 acre is required to register for coverage under the General Permit for Discharges of Stormwater from Construction Activities and develop a project-specific stormwater pollution prevention plan (SWPPP). The SWPPP must be prepared prior to submission of the registration statement for coverage under the General Permit and the SWPPP must address water quality and quantity in accordance with the *VSMP Permit Regulations*. General information and registration forms for the General Permit are available at http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx
(Reference: VSWML 62.1-44.15 et seq.; VSMP Permit Regulations 9VAC 25-880 et seq.)

On Wed, Oct 9, 2019 at 11:19 AM Fulcher, Valerie <valerie.fulcher@deq.virginia.gov> wrote:

> **Good morning - this is a new OEIR review request/project:**

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Re: NEW PROJECT NRC North Anna Power Station Units 1 & 2 License Renewal, DEQ #19-124F

1 message

Henicheck, Michelle <michelle.henicheck@deq.virginia.gov> Tue, Oct 15, 2019 at 11:59 AM
To: "Fisher, John" <john.fisher@deq.virginia.gov>

Hey John,

I don't have any comments for this project however, I have forwarded the information to the other water programs and Scott Kudlas's group will have comments. I have told the water programs to send their comments to you directly.

Michelle Henicheck, PWS
Senior Wetland Ecologist
Virginia Department of Environmental Quality

Phone: 804.698.4007
Email: michelle.henicheck@deq.virginia.gov

New Location:
1111 East Main Street, Suite 1400
Richmond, Virginia 23219

On Thu, Oct 10, 2019 at 3:34 PM Fisher, John <john.fisher@deq.virginia.gov> wrote:

> Michelle:
>
> The DEQ Northern Regional Office staff tells me that the North Anna Power Station is under the Central Office's jurisdiction with respect to VWPP. See the request for comments below on the license renewals for Units 1 and 2 at NAPS.
>
> John
>
> John E. Fisher
> Virginia Department of Environmental Quality
> Division of Environmental Enhancement
> Office of Environmental Impact Review
> 1111 East Main Street, Suite 1400
> Richmond, Virginia 23219
> (804) 698-4339
> john.fisher@deq.virginia.gov
>
> For program updates and public notices please subscribe to Constant Contact
>
> ---------- Forwarded message ---------
> From: **Fulcher, Valerie** <valerie.fulcher@deq.virginia.gov>
> Date: Wed, Oct 9, 2019 at 11:19 AM
> Subject: NEW PROJECT NRC North Anna Power Station Units 1 & 2 License Renewal, DEQ #19-124F
> To: rr dgif-ESS Projects <essprojects@dgif.virginia.gov>, Keith Tignor <keith.tignor@vdacs.virginia.gov>, Roberta Rhur <robbie.rhur@dcr.virginia.gov>, odwreview (VDH) <odwreview@vdh.virginia.gov>, Carlos Martinez <carlos.martinez@deq.virginia.gov>, Kotur Narasimhan <kotur.narasimhan@deq.virginia.gov>, Michelle Henicheck <michelle.henicheck@deq.virginia.gov>, Lawrence Gavan <larry.gavan@deq.virginia.gov>, Daniel Moore <daniel.moore@deq.virginia.gov>, Benjamin Holland <benjamin.holland@deq.virginia.gov>, Roger Kirchen <roger.kirchen@dhr.virginia.gov>, Anthony Watkinson <tony.watkinson@mrc.virginia.gov>, <cboyles@tjpdc.org>,

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

ESSLog# 39998_19-124F_NAPSrelicensing1&2_DGIF_AME20191120

1 message

Ewing, Amy <amy.ewing@dgif.virginia.gov>
To: John Fisher <john.fisher@deq.virginia.gov>

Wed, Nov 20, 2019 at 5:08 PM

John,

I know these comments are very late, but I did want to get something to you about the relicensing of Units 1 and 2 and North Anna Power Station. We have no significant concerns with the current operation of the station with these two units and as such no concerns about relicensing them. We recommend continued coordination with us regarding management of the lake and associated ecosystems. We recommend use of the Best Technology Available to minimize impingement and entrainment of aquatic species at their water intakes.

Assuming no significant modification of current operations, we find this reissuance consistent with the Fisheries Enforceable Policies of the CZMA.

Thanks, Amy

Amy Ewing
Environmental Services Biologist
Manager, Fish and Wildlife Information Services
P 804.367.2211
Virginia Department of Game & Inland Fisheries
CONSERVE. CONNECT. PROTECT.
A 7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228
www.dgif.virginia.gov

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Re: NEW PROJECT NRC North Anna Power Station Units 1 & 2 License Renewal, DEQ #19-124F

1 message

Warren, Arlene <arlene.warren@vdh.virginia.gov> Mon, Nov 4, 2019 at 12:26 PM
To: John Fisher <john.fisher@deq.virginia.gov>

Project Name: North Anna Power Sta on Units 1 & 2 Subsequent License Renewal
Project #: 19-124 F
UPC #: N/A
Loca on: **Louisa County, Spotsylvania County**

VDH – Office of Drinking Water has reviewed the above project. Below are our comments as they relate to proximity to **public drinking water sources** (groundwater wells, springs and surface water intakes). Poten al impacts to public water distribu on systems or sanitary sewage collec on systems **must be verified by the local u lity.**

The following public groundwater wells appear to be located within a 1 mile radius of the project site (wells within a 1,000-foot radius are forma ed in **bold):**

PWS ID Number	City/County	System Name	Facility Name
2109600	**LOUISA**	**NORTH ANNA POWER STATION**	**WELL 6**
6177235	SPOTSYLVANIA	LAKE ANNA MARINA	WELL
6177245	SPOTSYLVANIA	ANNA CABANA_ THE	DRILLED WELL
2109600	LOUISA	NORTH ANNA POWER STATION	WELL 8
2109610	LOUISA	NORTH ANNA NUCLEAR INFORMATION CENTER	WELL
2109600	LOUISA	NORTH ANNA POWER STATION	WELL 7
6177417	SPOTSYLVANIA	STURGEON CREEK MARINA	WELL 1

There are no surface water intakes located within a 5-mile radius of the project site.

The project is within the watershed of the following public surface water sources:

PWS ID Number	System Name	Facility Name
4085398	HANOVER SUBURBAN WATER SYSTEM	NORTH ANNA RWI

- ***Comments from Radiological Health, Mr. Steven Harrison, Director*** were “The Office of Radiological Health does not have any comments or ques ons on the proposed North Anna Power Sta on Units 1 & 2 Subsequent License Renewal as it relates to the Coastal Zone Management Act Consistency Cer fica on that was submi ed for the project. “

- ***No comments were received from our Culpeper Field Director, Mark Perry.***

- ***No comments were received from OEHS. Lance Gregory.***

Best Management Prac ces should be employed, including Erosion & Sedimenta on Controls and Spill Preven on Controls & Countermeasures on the project site.

Well(s) within a 1,000-foot radius from the project site should be field marked and protected from accidental damage during construc on.

The Virginia Department of Health – Office of Drinking Water appreciates the opportunity to provide comments. If you have any ques ons, please let me know.

Best Regards,

Arlene Fields Warren

GIS Program Support Technician

Office of Drinking Water

Virginia Department of Health

109 Governor Street

Richmond, VA 23219

(804) 864-7781

On Wed, Oct 9, 2019 at 11:19 AM Fulcher, Valerie <valerie.fulcher@deq.virginia.gov> wrote:

Good morning - this is a new OEIR review request/project:

Document Type: **Federal Consistency Cerfic aon**
Project Sponsor: **Nuclear Regulatory Commission**
Project Title: **North Anna Power Staon Units 1 & 2 Sub sequent License Renewal**
Locaon: **Louisa County, Spotsylvania County**
Project Number: **DEQ #19-124F**

The document is a ached.

The due date for comments is NOVEMBER 4, 2019. You can send your comments either directly to JOHN FISHER by email (John.Fisher@deq.virginia.gov), or you can send your comments by regular interagency/U.S. mail to the Department of Environmental Quality, Office of Environmental Impact Review, 1111 East Main St., Richmond, VA 23219.

If you cannot meet the deadline, please nof y the project coordinator prior to the comment due date. Arrangements may be made to extend the deadline for comments if possible. An agency will be considered to have no concerns if comments are not received (or contact is made) within the review period. However, it is important that agencies consistently parcipa te in accordance with Virginia Code Secon 10.1-1192.

REVIEW INSTRUCTIONS:

A. Please review the document carefully. If the proposal has been previously reviewed (e.g. as a draft EIS or a Part 1 EIR), please consider whether your earlier comments have been adequately addressed.

COMMONWEALTH of VIRGINIA

Marine Resources Commission
380 Fenwick Road
Bldg 96
Fort Monroe, VA 23651-1064

Matthew J. Strickler
Secretary of Natural Resources

Steven G. Bowman
Commissioner

November 5, 2019

Department of Environmental Quality
Attn: John Fisher
Office of Environmental Impact Review
1111 East Main St.
Richmond, VA 23219

Re: Federal Consistency Certification
North Anna Power Station Units 1 & 2 Subsequent License Renewal
DEQ #19-124F

Dear Mr. Fisher:

This will respond to the request for comments regarding the Federal Consistency Certification for the North Anna Power Station Units 1 & 2 Subsequent License Renewal project (DEQ #19-124F), prepared by U.S. Nuclear Regulatory Commission, on behalf of North Anna Power Station. Specifically, the North Anna Power Station has proposed to renew its operating licenses for its two nuclear generating units for an additional 20 years. The project is located in Louisa and Spotsylvania Counties, Virginia.

Since there is no new work proposed over State-owned submerged land, the Virginia Marine Resources Commission (VMRC) has no objections to the renewal of the North Anna Power Station operating licenses.

Please be advised that the VMRC pursuant to Chapter 12, 13, & 14 of Title 28.2 of the Code of Virginia administers permits required for submerged lands, tidal wetlands, and beaches and dunes. The VMRC administers the enforceable policies of fisheries management, subaqueous lands, tidal wetlands, and coastal primary sand dunes and beaches which comprise some of Virginia's Coastal Zone Management Program. VMRC staff has reviewed the submittal and offers the following comments:

Fisheries and Shellfish: Recommend the implementation of any best available technology conditions, established by DEQ, be followed to minimize the impacts of impingement and entrainment of fish eggs and larvae.

State-owned Submerged Lands: No impacts anticipated.

Tidal Wetlands: None in close proximity to the project area.

Beaches and Coastal Primary Sand Dunes: None in close proximity to the project area.

As such, this project has no foreseeable impacts on the VMRC's enforceable policies. As proposed, we have no objection to the consistency findings provided by the applicant. Should the proposed project change, a new review by this agency may be required relative to these jurisdictional areas.

If you have any questions please contact me at (757) 247-2251 or by email at randy.owen@mrc.virginia.gov. Thank you for the opportunity to comment.

Sincerely,

Randy Owen
Deputy Chief, Habitat Management Division

RDO/keb
HM

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

Russell W. Baxter
Deputy Director of Dam Safety & Floodplain Management and Soil & Water Conservation

Thomas L. Smith
Deputy Director of Operations

MEMORANDUM

DATE: November 4, 2019

TO: John Fisher, DEQ

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: DEQ 19-124F, North Anna Power Station Units 1 & 2 Subsequent License Renewal

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in Biotics, natural heritage resources have not been documented within the submitted project boundary including a 100 foot buffer. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources. In addition, the project boundary does not intersect any of the predictive models identifying potential habitat for natural heritage resources.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The Virginia Department of Game and Inland Fisheries (VDGIF) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov.

Division of Dam Safety and Floodplain Management

Floodplain Management Program:
The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA), and communities who elect to participate in this voluntary program manage and enforce the program on the local level through that community's local floodplain ordinance. Each local floodplain ordinance must comply with the minimum standards of the NFIP, outlined in 44 CFR 60.3; however, local communities may adopt more restrictive requirements in their local floodplain ordinance, such as regulating the 0.2% annual chance flood zone (shaded X Zone).

All development within a Special Flood Hazard Area (SFHA) or floodplain, as shown on the locality's Flood Insurance Rate Map (FIRM), must be permitted and comply with the requirements of the local floodplain ordinance. As per Executive Memorandum 2-97, development in a floodplain by an agency of the Commonwealth, or by its contractor, shall comply with the locally adopted floodplain management ordinance. Additionally, new state-owned buildings shall not be constructed in the SFHA unless a variance is granted by the Department of General Services. Projects conducted by federal agencies within the SFHA must comply with Executive Order 11988: Floodplain Management.

The NFIP defines development as "*any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.*" (44 CFR 59.1)

The NFIP defines Special Flood Hazard Area (SFHA) as "*the land in the flood plain within a community subject to a 1 percent or greater chance of flooding in any given year. The area may be designated as Zone A on the FHBM. After detailed ratemaking has been completed in preparation for publication of the flood insurance rate map, Zone A usually is refined into Zones A, AO, AH, A1-30, AE, A99, AR, AR/A1-30, AR/AE, AR/AO, AR/AH, AR/A, VO, or V1-30, VE, or V.*" (44 CFR 59.1)

DCR's Floodplain Management Program does not have regulatory authority for projects in the SFHA. The applicant/developer must contact the local floodplain administrator for an official floodplain determination, and if the project is located in the SFHA, this project must comply with the community's local floodplain ordinance, including receiving a local permit. Failure to comply with the local floodplain ordinance could result in enforcement action from the locality. For state projects, DCR recommends that compliance documentation be provided prior to the project being funded. For federal projects, the applicant/developer is encouraged reach out to the local floodplain administrator and comply with the community's local floodplain ordinance.

To find flood zone information, use the Virginia Flood Risk Information System (VFRIS):
www.dcr.virginia.gov/vfris

To find local floodplain administrator contact information, use DCR's Local Floodplain Management Directory:
www.dcr.virginia.gov/dam-safety-and-floodplains/floodplain-directory

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

Attachment F: Other Consultations

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Keith J Miller (Services - 6)

From: Kenneth Roller (Services - 6)
Sent: Wednesday, April 29, 2020 9:21 AM
To: Oula K Shehab-Dandan (Services - 6); Keith J Miller (Services - 6); Paul Vidonic (Services - 6); Cameron D Bryant (Services - 6)
Cc: THOMAS EFFINGER (Services - 6); Rick R Linker (Services - 6)
Subject: FW: [EXTERNAL] Re: Dominion Energy North Anna Power Station: Request for VDH Response

FYI. Thank you all for your work to prepare this response to VDH.

From: Kenneth Roller (Services - 6)
Sent: Wednesday, April 29, 2020 9:17 AM
To: 'Warren, Arlene' <arlene.warren@vdh.virginia.gov>
Cc: Robert Edelman <robert.edelman@vdh.virginia.gov>; Ragnauth Bennett jiv51864 <bennett.ragnauth@vdh.virginia.gov>; Dwayne Roadcap <dwayne.roadcap@vdh.virginia.gov>; Singh, Tony <tony.singh@vdh.virginia.gov>; Marcia Degen <Marcia.Degen@vdh.virginia.gov>; Moses, Aaron <aaron.moses@vdh.virginia.gov>; James Gregory <lance.gregory@vdh.virginia.gov>; Dwight Flammia <dwight.flammia@vdh.virginia.gov>; Wood, Adam <adam.wood@vdh.virginia.gov>; Smigo, Margaret <margaret.smigo@vdh.virginia.gov>; Joseph Hilbert <joe.hilbert@vdh.virginia.gov>; Steven Harrison <steve.harrison@vdh.virginia.gov>
Subject: RE: [EXTERNAL] Re: Dominion Energy North Anna Power Station: Request for VDH Response

Ms. Warren,

Thank you for providing comments regarding the relicensing of the North Anna Power Station in your email dated February 21, 2020. The following information is provided in response to two statements made in your email to better inform VDH of the impacts of station operations on Lake Anna and the North Anna River. This information was discussed with Mr. Robert Edelman, VDH Office of Drinking Water, during a March 25, 2020 conference call with Dominion Energy.

In the email, the following statement is made:
"it is our understanding that the thermally enriched cooling water discharge from NAPS is allowed to dissipate its heat by means of a series of lagoons before the discharge finally traverses into the North Anna River. However, the water is still thermally enriched but at a reduced level."

Response:

- The thermally enriched cooling water released from NAPS dissipates its heat as it traverses through a series of 3 lagoons collectively known as the Waste Heat Treatment Facility (WHTF).
- Water exiting the WHTF is not discharged directly to the North Anna River, but instead is discharged into Lake Anna.
- The discharge from the WHTF into Lake Anna is designated as Outfall 001, which is located in the dike of the 3rd lagoon at the Moody Town Rd. Bridge. This outfall is designed to promote mixing of the WHTF water with the lake water. Historically, during warmer months (when harmful algae blooms are more likely to occur), the difference in temperature between lake water just outside of Outfall 001 and uplake of the Route 208 bridge (see bullet 4 in points of clarification below) has been approximately 1°C.
- Outfall 001 is located approximately 1 mile from the North Anna dam.
- Water is released from the dam to the North Anna river at a minimum release rate of 40 cfs. The releases from the dam are significantly smaller than the water that is discharged through outfall 001, which results in a

substantial retention time of the water in the lake following discharge from Outfall 001. This retention time promotes further cooling and mixing.

- The station's cooling water intake is located approximately 6 miles up-lake from the dam which creates some reverse flow of lake water away from the dam back towards the intake.

The following statements are also made in the correspondence:

" *We do not know the impact of the thermally enriched cooling water discharge from the NAPS on algae blooms or HABs at Lake Anna. The risk of a HAB in Lake Anna is unknown but is a concern since the toxins associated with a HAB are difficult to remove using conventional surface water treatment."*

Response:

- Dominion Energy has been operating the power station for decades and has not observed harmful algae blooms (HABs) until the past few years. Importantly, no significant changes to the operation of the station cooling water system and WHTF have been made since the station began operation. This indicates that any factors facilitating the blooms are not due to station operation, including the cooling water discharge.
- The organisms that cause HABs are naturally occurring in freshwater and they only become a problem when their densities grow to very large, unsafe levels. The limiting factors that prevent the proliferation of these organisms are typically water temperature and/or available nutrients.
- The HABs recorded by VDH have been located in the upper arms of Lake Anna, many miles from Outfall 001, and outside the reaches of the thermal plume.
- Thermal monitoring data that Dominion Energy has collected over the life of the station, which is required by the station's discharge permit and is reported to DEQ annually, demonstrate that the influence of the thermal plume ends near the Route 208 bridge, which is approximately 2 miles up-lake from the power station. Anecdotal evidence also supports this, as the lake has been known to freeze above the Route 208 bridge during very cold winters. The closest recorded HAB was located another 2 miles up-lake from the Route 208 bridge.
- Thermal monitoring data also demonstrate that the upper arms of Lake Anna often have the warmest summertime temperatures recorded in Lake Anna. The thermal discharge from the station does not reach that area.
- Water quality data collected by the Lake Anna Civic Association indicates that the upper lake is nutrient enriched and the lower lake is nutrient poor with respect to total phosphorous which is suspected to be driving the algae blooms. http://www.lakeannavirginia.org/MAP_RESULTS_2019Oct_TPOS.jpg
- Through conversations with Margaret Smigo (VDH), we have learned that HABs are likely starting in the upper arms of Lake Anna and are pushed down through the lake system towards the power station by increased flow and nutrient loading following rain events.
- Algae blooms in the WHTF have been observed in the creeks that feed the WHTF and have not appeared in the main channel of the WHTF.
- Cyanotoxin results from water samples monitoring algae blooms in the WHTF measured levels below advisory thresholds or was not detected.
- There have been no confirmed HABs in the 3rd lagoon of the WHTF.
- We have not received any reports of HABs in the North Anna River.

Thank you again for your comments concerning the relicensing of the North Anna Power Station. Please let me know if you have any questions concerning the information presented in this email.

Ken Roller
Manager, Environmental
Dominion Energy Environmental Services
120 Tredegar Street, Richmond, VA 23219
(804) 592-7825 (Cell)

Dominion Energy

Actions Speak Louder

From: Warren, Arlene <arlene.warren@vdh.virginia.gov>
Sent: Friday, February 21, 2020 9:49 AM
To: Kenneth Roller (Services - 6) <kenneth.roller@dominionenergy.com>
Cc: Robert Edelman <robert.edelman@vdh.virginia.gov>; Ragnauth Bennett jiv51864 <bennett.ragnauth@vdh.virginia.gov>; Dwayne Roadcap <dwayne.roadcap@vdh.virginia.gov>; Singh, Tony <tony.singh@vdh.virginia.gov>; Marcia Degen <Marcia.Degen@vdh.virginia.gov>; Moses, Aaron <aaron.moses@vdh.virginia.gov>; James Gregory <lance.gregory@vdh.virginia.gov>; Dwight Flammia <dwight.flammia@vdh.virginia.gov>; Wood, Adam <adam.wood@vdh.virginia.gov>; Smigo, Margaret <margaret.smigo@vdh.virginia.gov>; Joseph Hilbert <joe.hilbert@vdh.virginia.gov>; Steven Harrison <steve.harrison@vdh.virginia.gov>
Subject: [EXTERNAL] Re: Dominion Energy North Anna Power Station: Request for VDH Response

Project Name: Request for Comments - Dominion Energy North Anna Power Station
Location: Louisa - Hanover Counties

Mr. Roller:

VDH, Office of Drinking Water (ODW), on August 14, 2019, received the above-named project requesting input concerning the potential existence and perceived health risks associated with thermophilic organisms that may be present in the portion of Lake Anna that receives the cooling water discharge from its North Anna Power Station Units 1 and 2 (NAPS). This request is based on Dominion Energy preparing an application to renew the operating licenses for the NAPS.

In a letter-report to you dated October 31, 2013 from VDH, Office of Epidemiology, it is our understanding that the thermally enriched cooling water discharge from NAPS is allowed to dissipate its heat by means of a series of lagoons before the discharge finally traverses into the North Anna River. However, the water is still thermally enriched but at a reduced level.

The North Anna River is used by Hanover County's Suburban Waterworks (PWSID: VA4085398) as a drinking water source for its Doswell Surface Water Treatment Plant. This is the only surface water intake downstream of Lake Anna. During 2019, VDH received numerous reports of algae blooms in Lake Anna through our Harmful Algae Bloom Online reporting system. Algae blooms may indicate a water quality or other problem. VDH ODW is concerned about the recurring algae blooms in Lake Anna, with the possibility that an algae bloom may become a harmful algae bloom (HAB), possibly impacting the water quality at the downstream drinking water intake. We do not know the impact of the thermally enriched cooling water discharge from the NAPS on algae blooms or HABs at Lake Anna. The risk of a HAB in Lake Anna is unknown but is a concern since the toxins associated with a HAB are difficult to remove using conventional surface water treatment.

The following table summarizes the other responses to your request:

Name of Responder	Date	Comment
VDH, Office of Environmental Health Services (OEHS), Division	10/31/2019	None

of Onsite Sewage and Water Services		
VDH, Office of Epidemiology	10/31/2019	None
VDH, Office of Radiological Health	10/30/2019	None
VDH, Division of Shellfish Safety	11/12/2019	See note (*) below.

* *On May 6, 2019, the OEHS provided comments on the NAPS as being similar to that for the Surry Power Station Units 1 and 2, as follows:*

"Currently any risk is perceived (not known) and not likely given the long-term existence of this discharge and lack of any known issues resulting in exposure for that area. While VDH does not suspect the waste heat discharge exacerbates waterborne pathogen growth and public health risk is likely very low as a result, the agency opts to withhold a formal statement in this regard until additional modeling is conducted during the upcoming VPDES permit re-issuance. It will coordinate with the company and DEQ to ensure the modeling scenarios incorporate the critical conditions when public risk and temperatures are highest."

Potential impacts on public water distribution systems or sanitary sewage collection systems must be verified by the local utility.

The VDH, ODW appreciates the opportunity to coordinate the collection and provision of these comments. If you have any questions, please let me know.

Best Regards,

Arlene Fields Warren
GIS Program Support Technician
Office of Drinking Water
Virginia Department of Health
109 Governor Street
Richmond, VA 23219
(804) – 864-7781

On Wed, Aug 14, 2019 at 11:32 AM Kenneth Roller <kenneth.roller@dominionenergy.com> wrote:

> Dear Ms. Warren:
>
> Dominion Energy is seeking a response from VDH concerning the potential existence and perceived health risks associated with thermophilic organisms that may be present in the portion of Lake Anna that receives the cooling water discharge from our North Anna Power Station (NAPS). We recently worked through Dr. Marcia Degen to obtain similar VDH input related to our Surry Power Station. Dr. Degen indicated that you would be coordinating the VDH response to this request.

Information concerning the reason for this request and specific microorganisms of concern is presented below. Additional supporting information is included in the attachments to this email.

Reason for this Request and Microorganisms of Concern

Virginia Electric and Power Company d/b/a Dominion Energy Virginia (Dominion) is preparing an application with the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses for North Anna Power Station Units 1 and 2 (NAPS) for an additional 20 years. For NAPS Unit 1, this requested renewal would extend the license expiration date from midnight on April 1, 2038, to midnight on April 1, 2058. For NAPS Unit 2, this requested renewal would extend the license expiration date from midnight on August 21, 2040, to midnight on August 21, 2060.

The license renewal process requires that Dominion develop an environmental report (ER) that assesses the potential for environmental impacts from continued operation of the facility for an additional 20 years. One area of potential environmental impact concerns microorganisms that might be associated with the NAPS once-through cooling water discharge (see below). NRC has provided guidance (Reference) that Dominion should consult with VDH concerning potential health concerns associated with the following microorganisms in the portion of Lake Anna that receives the station's cooling water discharge:

- The enteric pathogens *Salmonella* spp. and *Shigella* spp., as well as *Pseudomonas aeruginosa* and thermophilic fungi.
- The bacteria *Legionella* spp., which causes Legionnaires' disease, and
- Free-living amoebae of the genera *Naegleria* (*Naegleria fowleri*) and *Acanthamoeba*

Dominion Conclusions

Given that field measurements show water temperatures in the WHTF and North Anna Reservoir are below the optimum for growth of thermophilic microorganisms, NAPS does not provide a seed source or inoculant that would stimulate population growth, and no case of Lake Anna related PAM has been reported, Dominion does not anticipate the continued operation of NAPS to adversely affect the environment or public health as a result of microbiological hazards.

We are seeking VDH concurrence with Dominion's conclusion that the continued operation of NAPS for the extended license term (subsequent license renewal) would not be expected to adversely affect the environment or public health from exposure to thermophilic pathogens in Lake Anna. We appreciate your consideration of this request and look forward to a response preferably within a couple weeks, if possible. Please contact me or Tony Banks (see contact information below) should you have any questions concerning this transmittal.

Sincerely,

Ken Roller

Manager, Environmental

Kenneth.roller@dominionenergy.com

804-273-3494

804-592-7825

Tony Banks, MPH

Generation Project Manager, Nuclear

Tony.banks@dominionenergy.com

804-273-2170

804-201-3965

Reference: NRC Regulatory Guide 4.2, Supplement 1, Revision 1, 2013