SUPPLEMENTAL ENVIRONMENTAL RESOURCE REPORT

CALVERT CLIFFS NUCLEAR POWER PLANT UNIT 3

CALVERT COUNTY, MARYLAND

Prepared for:

CALVERT CLIFFS 3 NUCLEAR PROJECT, LLC

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May 16, 2008

Project 8093-07-6565

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LIST OF ABBREVIATIONS AND ACRONYMS

ALTA-ACSM	American Land Title Association – American Congress of Surveying and Mapping
ALARA	As Low as Reasonably Achievable
APC	Area of Potential Construction
APE	Area of Potential Effect
B-IBI	Benthic Index of Biological Integrity
Bechtel	Bechtel Power Group
BEHI	Bank Erosion Hazard Index
BGE	Baltimore Gas and Electric
CCSWCD	Calvert County Soil and Water Conservation District
CBCA	Chesapeake Bay Critical Area
CBP	Chesapeake Bay Program
CAC	Chesapeake Bay Critical Area Commission
CC3	Calvert Cliffs 3 Nuclear Project, LLC
CCNPP	Calvert Cliffs Nuclear Power Plant
CEG	Constellation Energy Group, Inc.
CENG	Constellation Energy Nuclear Group, LLC
CFR	Code of Federal Regulations
COA	COA, Inc.
COLA	Construction and Operating License Application
CWA	Clean Water Act
CWIS	Cooling Water Intake Structure
CWS	Cooling Water Supply System
DC	District of Columbia
DOE	United States Department of Energy
DOE	Determination of Eligibility
DNR	Maryland Department of Natural Resources
EDF	Electricité de France
EDGs	Emergency Diesel Generators
EFH	Essential Fish Habitat
EHV	Extra High Voltage

ESA	Endangered Species Act
ESWS	Essential Service Water System
˚F	Degree Fahrenheit
FEMA	Federal Emergency Management Agency
FIDS	Forest Interior Dwelling Species
fps	feet per second
ft	foot
GAI	GAI Consultants, Inc.
gpm	gallons per minute
HEC-HMS	Hydrologic Engineering Center-Hydrologic Modeling System
JAH	John A. Hofman, P.C.
kV	Kilovolt
LNG	Liquefied Natural Gas
MACTEC	MACTEC Engineering and Consulting, Inc.
MD	Maryland
MD 2/4	Maryland State Highway 2/4
MDE	Maryland Department of the Environment
MDEWMA	Maryland Department of the Environment, Water Management Administration
MHT	Maryland Historic Trust
mi	Mile
MOA	Memorandum of Agreement
msl	Mean Sea Level
MVA	Megavolt Ampere
MW	Megawatt
MWe	Megawatt Electrical
NATC	Naval Air Test Center
NBS	Near Bank Shear Stress
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1966 as amended
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Association
NPDES	National Pollutant Discharge Elimination System

NRC	Nuclear Regulatory Commission
NRCS	Natural Resource Conservation Service
NWI	National Wetlands Inventory
ORAM	Ohio Rapid Assessment Method
Panamerican	Panamerican Consultants, Inc.
Phragmites	*Phragmites australis*
PJM	PJM Interconnection, LLC
PPRP	Maryland Power Plant Research Program
ppt	Parts per Thousand
psi	Pounds per square inch
PWR	Pressurized Water Reactors
RECP	Rolled Erosion Control Product
RFMC	Regional Fishery Management Council
RGL	Regulatory Guidance Letter
SAV	Submerged Aquatic Vegetation
SCS	Soil Conservation Service
SFA	Sustainable Fisheries Act
SL	Standard Length
Tetra Tech NUS	Tetra Tech Nuclear Utility Services
TMDL	Total Maximum Daily Load
TSA	Temperature Storage Area
UHS	Ultimate Heat Sink
UNE	UniStar Nuclear Energy, LLC
UNO	UniStar Nuclear Operating Services, LLC
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
U.S. EPR	United States Evolutionary Power Reactor
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VIMS	Virginia Institute of Marine Sciences

EXECUTIVE SUMMARY

Calvert Cliffs 3 Nuclear Project, LLC (CC3) (Co-Applicant) is proposing to construct and UniStar Nuclear Operating Services, LLC (UNO) (Co-Applicant) is proposing to operate a new nuclear power unit (CCNPP Unit 3) on the existing Calvert Cliffs Nuclear Power Plant (CCNPP) site.

The CCNPP site consists of 2,070 acres near Lusby, Calvert County, Maryland. The site is located on the west shore of the Chesapeake Bay, approximately halfway between the mouth of the bay and its headwaters at the Susquehanna River. The site is bound to the north and south by wooded land, to the east by the Chesapeake Bay, and to the west by Solomons Island Road (Maryland State Highway 2/4 [MD 2/4]). The site is approximately 40 miles southeast of Washington, D.C. and 7.5 miles north of Solomons Island, Maryland. The two existing CCNPP units (Units 1 and 2) are located in the east-central part of the CCNPP site. Under current plans, the new generating unit and associated facilities would be located within an area of the CCNPP site south and west of the existing CCNPP Units 1 and 2. CCNPP Unit 3 will be constructed primarily on the South Parcel. The construction of Unit 3 will require the use of approximately 420 acres of the 2,070 acre CCNPP site, of which 281 acres will be permanently used by Unit 3 and its supporting facilities.

The CCNPP Unit 3 site consists primarily of forested areas south and southwest of the existing reactors. The site topography is generally rolling and is dissected by a dendritic pattern of stream valleys with narrow floodplains, adjoined by steep side slopes. The Chesapeake Bay shore consists of a narrow sandy beach abutted by sheer sandy cliffs that exceed 100 ft in height at some locations. Streams located within the CCNPP Unit 3 site are non-tidal, as shoreline cliffs prevent tidal influence from extending west of the beach bordering the Chesapeake Bay. Tidal waters on the CCNPP Unit 3 site are limited to the Chesapeake Bay shoreline. The majority of the site is situated outside the Federal Emergency Management Agency (FEMA) 500-year and 100-year flood zones.

Potentially jurisdictional wetlands and surface waters (ponds and stream features) within the CCNPP Unit 3 site were delineated from May to September 2006. Field verification of the potentially jurisdictional wetlands and surface waters was conducted by the USACE (Baltimore District) during January and February 2008. The CCNPP Unit 3 site was divided into nine Assessment Areas to facilitate the delineation of wetlands and surface waters on site.

- Assessment Areas I, II, and III correspond to small unnamed watersheds that drain directly to the Chesapeake Bay.

- Assessment Areas IV, V, and VI form the Johns Creek watershed (upstream of Goldstein Branch).

- Assessment Area IV constitutes the up-gradient headwaters to Johns Creek and their adjoining wetlands, while Assessment Area V constitutes the main channel and adjoining wetlands.

- Assessment Area VI comprises a sequence of man-made basins carrying stormwater runoff from the Lake Davies dredged material disposal area to Johns Creek.

- Assessment Area VII constitutes the headwaters, main channel, and associated wetlands of Goldstein Branch.

- Assessment Area VIII consists of a small cluster of seepages and headwaters that flow north past the northern perimeter of the CCNPP Unit 3 site and ultimately contribute to Woodland Branch and St. Leonard Creek.

- Assessment Area IX comprises a series of seepages and headwaters that drain into a storm drain system under the existing developed portion of the CCNPP site.

The construction footprint for the proposed CCNPP Unit 3 facilities has been designed to minimize encroachment into areas delineated as wetlands or surface waters. However, construction of the proposed facilities would not be possible without permanently impacting approximately 8,350 linear feet (lf) of intermittent and upper perennial, jurisdictional stream channels and approximately 11.71 acres of jurisdictional (USACE and/or MDE) wetland areas. The project would also disturb approximately 30.85 acres of land defined as non-tidal wetland buffer (50-ft width) by Calvert County under the Maryland Non-tidal Wetlands Protection Act.

The proposed impacts to the jurisdictional wetlands and streams will require compensatory mitigation by the USACE and the MDE. The USACE and the USEPA have issued regulations governing compensatory mitigation for activities authorized by permits issued by the USACE. The compensatory mitigation plan for the CCNPP Unit 3 site was prepared pursuant to these regulations. The mitigation for impacts to approximately 11.71 acres of jurisdictional forested wetlands, emergent (herbaceous) wetlands, and surface waters will include:

(1) the enhancement of one manmade, abandoned, sediment basin within the Lake Davies Disposal Area;
(2) the enhancement of a portion of Johns Creek;
(3) the creation of forested and herbaceous wetland habitat within the largest manmade, abandoned, sediment basin of the Lake Davies Disposal Area; and
(4) the creation of forested wetland habitat within the Camp Conoy area which lies within the CBCA.

The primary goal of the mitigation plan is to establish viable bottomland hardwood forest habitat and emergent wetland habitat within a historically-altered upland area (Lake Davies Disposal Area), along with enhancement of existing poorly drained bottomland hardwood forest habitat within Johns Creek and the creation of forested wetland habitat within the Camp Conoy area. Compensatory mitigation for impacts to jurisdictional streams on the CCNPP Unit 3 site will include stream restoration and stream enhancement. Stream restoration intended to establish physical, biological and riparian function where once existed but has since been lost will include the adjustment of horizontal/vertical channel alignment and channel cross section performed on approximately 6,283 lf of stream channel. Proposed stream restoration treatments include: 1) instream habitat structures (cover logs, lateral/longitudinal diversity, root wads), bank stabilization (vegetative and bioengineering treatments) and riparian wetland enhancements (hydraulic and vegetative). Stream enhancement activities, intended to increase existing functions include less intense grading operations and minor adjustments such as horizontal alignment and channel cross section. Proposed stream enhancements include: improvements to aquatic habitat, bank stabilization and native riparian planting. Enhancement activities will be performed on approximately 4,146 lf of stream channel.

Floral and faunal surveys were conducted on the CCNPP Unit 3 project site from May 2006 through April 2007 to document quality and extent of habitat for animal and plant species, including protected (listed) species. Additional site reconnaissance of representative wetland and upland habitats was conducted from November 2007 through February 2008. No federally-listed species were observed during the surveys. The following state-listed species were observed: Shumard's oak (*Quercus shumardii*), showy goldenrod (*Solidago speciosa*), and the bald eagle (*Haliaeetus leucocephalus*). Discussions have been initiated among the Co-Applicants, the USFWS, and the DNR regarding the potential affect the development of the CCNPP Unit 3 site will have on the bald eagle, as successful nesting has occurred on site. The known location of Shumard's oak is outside the development footprint. Mitigation for impact on the observed population of showy goldenrod will be to transplant individuals likely to be impacted to suitable habitat elsewhere on the CCNPP property.

Cultural resources, as well as the aquatic resources of Chesapeake Bay, were also investigated for the CCNPP Unit 3 site. Potential impacts to the Chesapeake Bay waters were addressed pursuant to Section 10 of the Rivers and Harbors Act of 1899. The Section 10 investigation included descriptions of the planned shore-front structures, proposed construction methods, estimated quantities for dredging and excavation, and measures to mitigate the impact of construction activities. Finally, engineering plans have been prepared for the CCNPP Unit 3 site which will address control of storm water (prevention of erosion and control of sedimentation) which may occur during construction and operation phases in connection with site development. In developing the stormwater plan, applicable regulations and design criteria established by the State of Maryland, Calvert County, and the NRCS were utilized.

1.0 INTRODUCTION

Calvert Cliffs 3 Nuclear Project, LLC (CC3) (Co-Applicant) is proposing to construct and UniStar Nuclear Operating Services, LLC (UNO) (Co-Applicant) is proposing to operate a new nuclear power unit on the existing Calvert Cliffs Nuclear Power Plant (CCNPP) site. The new unit will be designated as CCNPP Unit 3. The purpose of the proposed new nuclear power unit is to generate electricity for sale at wholesale.

CC3 is a wholly-owned subsidiary of UniStar Nuclear Energy, LLC (UNE), a joint venture between Constellation Energy Group, Inc.'s (CEG) nuclear subsidiary, Constellation Energy Nuclear Group, LLC (CENG) and Electricité de France (EDF). CEG is a Fortune 125 competitive energy company based in Baltimore, Maryland and is one of the nation's largest energy companies, with total assets of over $21 billion. EDF is the largest nuclear plant owner and most experienced nuclear operator in the world. EDF is also the largest utility in France, where nuclear power provides approximately 80 percent of the electricity.

UniStar Nuclear Operating Services, LLC (UNO) is a Delaware limited liability company with its principal place of business in Baltimore, Maryland. UNO is currently a wholly-owned subsidiary of UNE, formed for the purpose of being a licensee and operator of nuclear power plants. UNO will be the operator and co-licensee of CCNPP Unit 3.

Development of CCNPP Unit 3 requires approval of a combined license application (COLA) by the U.S. Nuclear Regulatory Commission (NRC). In preparation for the COLA, a Site Layout Team/Cooling Water Systems Working Group, a multi-disciplinary team of industry experts, was selected to evaluate a suitable layout location for the proposed power unit. The criteria and considerations used to evaluate suitable layout locations were grouped in the following eight categories:

1. Environmental
2. Land Use and Zoning (State and Local)
3. Construction Considerations
4. Construction Facilities
5. Switchyard/Transmission Lines
6. Security
7. Permanent Facility Considerations
8. Impact to Existing Facilities or Structure

The team recommended that the South Parcel of the existing CCNPP site would be a suitable base location for the site layout of CCNPP Unit 3.

The application process for obtaining a combined license from the NRC for CCNPP Unit 3 commenced with the filing of an Environmental Report and related documents on July 13, 2007. Development for the proposed facility will include clearing, grading, filling, and soil preparation in portions of the site. CC3 desires to acquire the necessary permits to begin site preparation for the initiation of construction by December 2008.

The proposed activity complies with the enforceable policies of the State of Maryland's approved coastal zone management program and will be conducted in a manner consistent with such program.

1.1 BACKGROUND

The CCNPP site, currently owned by Calvert Cliffs Nuclear Power Plant, Inc., consists of 2,070 acres near Lusby, Calvert County, Maryland (Figure 1.1-1). The site is located on the west shore of the Chesapeake Bay, approximately halfway between the mouth of the bay and its headwaters at the Susquehanna River. The site is bound to the north and south by wooded land, to the east by the Chesapeake Bay, and to the west by Solomons Island Road (Maryland State Highway 2/4 [MD 2/4]). The site is approximately 40 miles southeast of Washington, D.C. and 7.5 miles north of Solomons Island, Maryland. The two existing CCNPP units (Units 1 and 2) are located in the east-central part of the CCNPP site.

Under current plans, the new generating unit and associated facilities would be located within an area of the CCNPP site south and west of the existing CCNPP Units 1 and 2. CCNPP Unit 3 will be constructed primarily on the South Parcel. CC3, a wholly owned subsidiary of UNE, will own approximately726 acres of the South Parcel (the Unit 3 Parcel). The remainder of the South Parcel (the Reserved Parcel) will be owned by another subsidiary of UNE. Unit 3 will be constructed primarily on the Unit 3 Parcel, but it will also impact the 963 acre North Parcel and the Reserved Parcel. CC3 will obtain the easements necessary for the work performed on the adjacent parcels. UNO will be the operator and co-licensee of Unit 3. Construction of Unit 3 will require the use of approximately 420 acres of the 2,070 acre CCNPP site, of which 281 acres will be permanently used by Unit 3 and its supporting facilities. Most of the construction and permanent use areas will be located on the South Parcel, but some of the construction and permanent use areas will be located on the North Parcel.

The CCNPP site consists primarily of forested areas south and southwest of the existing reactors. The site topography is generally rolling and is dissected by a dendritic pattern of stream valleys with narrow floodplains, adjoined by steep side slopes (grade exceeds 25 percent in places) (Figure 1.1-2). Elevations on the CCNPP site range from sea level on the bay shore to nearly 150 ft above mean sea level in more northern portions of the site. The bay shore consists of a narrow sandy beach abutted by sheer sandy cliffs that exceed 100 ft in height at some locations.

Large areas in the north-central part of the site have been graded to accommodate existing facilities and a dredge material disposal area (Lake Davies disposal area). The eastern part of the CCNPP site, including most lands east of Camp Conoy Road, drains directly into the Chesapeake Bay. Runoff enters a series of unnamed intermittent and first-order perennial streams that flow generally eastward. Most lands west of Camp Conoy Road drain into a system of headwaters that coalesce to form the west-flowing Johns Creek. After exiting the western perimeter of the site, Johns Creek flows west to St. Leonard Creek, a tidal tributary of the Patuxent River. Lands in the northern part of the site drain to Goldstein Branch, a tributary of Johns Creek. Surface water impoundments within the site include the Camp Conoy fishing pond and Lake Davies area, a disposal area for dredge materials. Streams located within the CCNPP campus are non-tidal, as shoreline cliffs prevent tidal influence from extending west of the beach bordering the Chesapeake Bay. Tidal waters on the CCNPP campus are limited to the Chesapeake Bay shoreline. The majority of the site is situated outside the Federal Emergency Management Agency (FEMA) 500-year and 100-year flood zones. However, small narrow portions of the site along the Chesapeake Bay shoreline and another small portion adjacent to the western portion of the property boundary along Johns Creek are depicted as lying within the FEMA 100-year flood zone (Figure 1.1-3).

1.2 PURPOSE AND OBJECTIVES

The purpose of this report is to document the current ecological and physical condition of jurisdictional waters and other resources that occur on the CCNPP campus. This document also describes mitigation activities proposed to offset potential impacts to jurisdictional waters. The specific objective of this study is to provide the USACE, the Maryland Department of the Environment (MDE), the U.S. Fish and Wildlife Service (USFWS), and other regulatory reviewing agencies with a basis to evaluate and issue an Individual Section 404/10 Permit, a Maryland NonTidal Wetlands Permit and associated certifications for the proposed land use and development. This report documents the approach to wetland mitigation outlined in the 404 (b)(1) guidelines and followed by the State of Maryland, including avoidance, minimization, and compensation for impacts to waters of the U.S. The goal of the State of Maryland is to "attain no net overall loss in nontidal wetland acreage and function, and to strive for a net resource gain in nontidal wetlands." COMAR 26.23.04.03A.

1.3 AGENCY COORDINATION

Several meetings were held to discuss the proposed project with various State and federal regulatory and resource agencies. MACTEC Engineering and Consulting, Inc. (MACTEC) met on-site with a representative of USACE for field verification of the potentially jurisdictional wetlands and surface waters on January 14 and 15 and February 5, 2008. Final USACE verification of the Jurisdictional Determination is forthcoming. In addition, Co-Applicants and MACTEC have met with representatives of the Maryland Power Plant Research Program (PPRP), to discuss the proposed project. The Chesapeake Bay Critical Area Commission (CAC) has also been informed of the proposed project. On May 5, 2008 the Co-Applicants met with certain interested federal and state agencies to make a presentation about the project's scope.

1.4 PROJECT MILESTONES

The following list presents future project milestones and implementation dates:

- Maryland Public Service Commission expected to issue CPCN – December 2008
- Site preparation begins – December 2008
- Non-safety related construction begins – May 2009
- NRC issues Design Certification for U.S. EPR – October 2010
- NRC issues COL – March 2011
- Full plant construction begins – April 2011
- Plant construction complete – July 2015
- Plant startup testing begins – July 2015
- Commercial operation begins – December 2015

2.0 PROJECT NEED AND PURPOSE

2.1 PROJECT NEED

The Maryland Public Service Commission (PSC) has found that there is a demonstrated future need for additional base-load electric capacity in the region that includes the State of Maryland. According to the PSC, conservation, energy efficiency, and demand response are all important ways to reduce the region's growing electricity demand, but may be insufficient to off-set the need for new base-load generation. A mixture of short-term and long-term generation, transmission, and demand reduction solutions and a diverse mix of generating fuel sources may be utilized to meet this need. The development of nuclear power can be one part of an overall strategy to address the region's energy needs by creating a diverse energy portfolio that will protect both the stability and reliability of the bulk power system and support a robust and competitive wholesale market for electric power.

Reliability load forecasts prepared by the PSC, the Power Plant Resource Program of the Maryland Department of Natural Resources (PPRP), and PJM Interconnection, LLC (PJM) indicate that the reserve margin between available electrical supply and demand is tightening. The construction and operation of the CCNPP Unit 3 will provide a significant new supply source of electrical power near rapidly growing demand in the Baltimore-Washington metropolitan areas. The addition of an electrical power supply source nearby to load centers is expected to reduce the peak period congestion on transmission lines within the State of Maryland, as well as to free capacity on lines that are importing power from adjacent states.

2.2 PROJECT PURPOSE

The purpose of the proposed CCNPP Unit 3 is to generate electricity for sale at wholesale. The new nuclear power unit will be a U.S. EPR designed to produce approximately 1,710 MWe of gross generation capacity, or approximately 1,600 MWe of net output for sale after on-site consumption. The construction of the CCNPP Unit 3 will meet the primary goal of adding baseload electrical supply to the rapidly growing demand in the Baltimore-Washington metropolitan area. Construction and operation of the Unit 3 facility is expected to meet several additional goals and provide the important benefits listed below:

- **Site design employs several environmentally-sustainable and "green" technology principles**. Nuclear power is a source of "carbon-free" electricity. An innovative cooling system will reduce the volume of water extracted from the Chesapeake Bay by one-tenth that of Units 1 and 2 combined. Construction will take place on an existing nuclear facility so that the creation of a new utility infrastructure will be significantly minimized.

- **Results in measureable economic benefits to Calvert County and the State of Maryland**. The new unit is estimated to generate approximately $20 million in additional annual tax revenue, is expected to provide approximately 4,000 temporary construction jobs, and is expected to create approximately 360 full-time jobs during operation.

- **Implementation of safe and secure technology**. The U.S. EPR design incorporates four redundant, independent safety systems and a double-walled containment structure that houses the nuclear reactor.

3.0 PROPOSED PROJECT DEVELOPMENT

3.1 LOCATION AND LAYOUT OF THE GENERATING STATION

Existing plant structures occupy approximately 220 acres, with most of the power block structures located near the eastern edge of the site, about at the center of the 10,000-ft long CCNPP site shoreline. The remainder of the property is mostly densely wooded areas. Access to the existing plant is via an onsite road that intersects MD 2/4 west of the site or via the Chesapeake Bay by barge.

The proposed CCNPP Unit 3 will be located at the existing CCNPP site. The CCNPP site consists of 2,070 acres in Calvert County, Maryland, on the west bank of the Chesapeake Bay, about 40 miles southeast of Washington, D.C. New plant structures for proposed Unit 3 will occupy approximately 281 acres of the CCNPP site.

Figure 3.1-1 shows the proposed site layout for the CCNPP site including Unit 3. The CCNPP property contains two existing pressurized water reactors (PWR) designated as CCNPP Units 1 and 2. The proposed CCNPP Unit 3 will be located just south of the existing nuclear power plant within the CCNPP site. CCNPP Unit 3 will be separated from CCNPP Units 1 and 2 by a distance of approximately 2,500 ft. The CCNPP Unit 3 Reactor and Turbine Buildings will be located farther inland than Units 1 and 2 and at least 1,000 ft from the shoreline. Due to its distance from and location relative to CCNPP Units 1 and 2, Unit 3 will have a separate protected area and construction access road. The separate, construction access road is necessary to facilitate security measures, including the ability to more efficiently separate (screen) operating employees from construction workers, with as many as 4,000 construction workers entering the site each day. The Unit 3 access road will connect to MD 2/4 to the west and will be built south of the existing CCNPP Units 1 and 2 access road. The existing barge slip/heavy haul road will be re-established and extended to accommodate construction of CCNPP Unit 3.

The CCNPP Unit 3 Reactor Building and Turbine Building will be side by side, with the Reactor Building oriented toward the east. The Reactor Building will be surrounded by the Fuel Pool Building, four Safeguard Buildings, two Emergency Diesel Generator (EDG) Buildings, the Reactor Auxiliary Building, the Radioactive Waste Processing Building, and the Access Building (collectively, the Power Block; Figure 3.1-1).

The CCNPP Unit 3 Reactor Building will be an upright cylindrical concrete structure, capped with a spherical dome. The Reactor Building is 186 ft in diameter with an overall height of 244 ft. The plant grade for CCNPP Unit 3 will be at an elevation of approximately 85 ft. With the bottom of the Reactor Building foundation 40 ft below grade, the new Reactor Building will rise 204 ft above grade. The top of the Reactor Building will be at an elevation of approximately 289 ft.

In contrast to CCNPP Units 1 and 2, which use a once-through cooling system, CCNPP Unit 3 will have a closed-loop cooling system. The CCNPP Unit 3 Circulating Water Supply System (CWS) Cooling Tower will be a round concrete structure with an overall diameter of 528 ft and approximate height of 164 ft. Similar to CCNPP Units 1 and 2, other CCNPP Unit 3 buildings will be concrete or steel with metal siding.

The CCNPP Unit 3 Ultimate Heat Sink (UHS) function will be provided by four mechanical forced draft Essential Service Water System (ESWS) cooling towers situated above storage basin pools. Each of the four pools will be approximately 0.19 acre in size and will not occupy significant land area beyond the tower footprint. The pools will normally be supplied with makeup water from the nonsafety-related CCNPP Unit 3 Desalination Plant.

Due to forested onsite areas, visual screening from outside the facility is provided by trees so that only the tops of the taller structures may be visible from adjacent properties at ground level. Because of the hybrid design of the CWS cooling tower, minimal water vapor plume will be visible. Many of the CCNPP Unit 3 buildings themselves will not be visible because the taller structures will mask the lower rise structures. Due to onsite elevation changes, topographical features will also help to screen and seclude plant structures from surrounding properties even when foliage is seasonally absent. In addition, since CCNPP Unit 3 will be located approximately 3,000 to 4,000 ft from the nearest residential properties, distance will help shield the plant from view.

From the east, considering that the approximate 2-mile long shoreline bordering the CCNPP property comprises steep cliffs with little beach area, views of the new plant should be limited due to elevation differences, forested borders, and the approximately 1,000-ft setback. Construction of the heavy haul road, related heavy equipment staging area and new water intake structure will require removal of a portion of a forested hill slope between the Units 1 and 2 intake forebay and the barge slip. The Intake Structure and Pump House and associated discharge piping at the shoreline for CCNPP Unit 3 should have minimal visual impact considering their proposed locations between the CCNPP Units 1 and 2 intake structure and the barge slip facility. No other structures will be visible from nearby ground-level vantage points.

Aesthetic principles and concepts used in the design and layout of CCNPP Unit 3 include the following:

- Woodlands onsite have been avoided as much as possible.
- Selecting the southern portion of the CCNPP property, where natural valleys exist, for the location of the new power block structures. This area will provide a low profile for the new plant and should require less excavation for site preparation and clearing due to preexisting, cleared areas around Camp Conoy.
- Utilizing a hybrid cooling tower with a plume abatement system to minimize visible vapor plume.
- Locating most of the plant structures beyond the 1,000 ft CBCA, although security perimeter fencing, gravel path, water intake and discharge structures, and heavy haul road and construction staging area will be constructed in the CBCA.
- Placing the Intake Structure and Pump House and associated discharge piping in the existing, developed section of shoreline.
- Constructing buildings similar in shape, size and material to existing buildings.
- Utilizing cooling systems that minimize environmental impacts.
- Minimizing tree removal by locating the construction lay-down areas, parking areas and construction offices and warehouses in pre-existing dredge material areas, cleared fields or lightly forested areas where practical.

In addition to the above, exterior finishes for plant buildings will be similar in color and texture to those of the CCNPP Units 1 and 2 buildings. This provides for a consistent appearance by architecturally integrating the buildings on the CCNPP site. Areas that are cleared to support construction activities and that will not be required to support Unit 3 operation will be either maintained by reseeding or restored by replanting with native trees and vegetation, so that the CCNPP Unit 3 landscape blends with the CCNPP Units 1 and 2 landscape and the remaining undisturbed areas on the CCNPP site.

3.2 CONSTRUCTION ACTIVITIES AND IMPACTS

This section describes the activities associated with the construction of the facility that have the potential of impacting the environment. The following is a list of activities that will affect the environment during this construction phase:

- Clearing, Grubbing, and Grading – Spoils, backfill borrow, and topsoil storage areas will be established on parts of the CCNPP property. Clearing and grubbing of the site begins with harvesting trees, vegetation removal, and disposal of tree stumps. Topsoil will be moved to a storage area for later use in preparation for excavation. The general plant area, including the switchyard and CWS cooling tower area, will be brought to plant grade in preparation for foundation excavation and installation. Approximately 420 acres of land will be cleared for road, facility construction, laydown, concrete batch plant and other construction-related uses.

- Road Construction – A new and upgraded intersection at Nursery Road on MD 2/4, south of the existing Calvert Cliffs Parkway to CCNPP Units 1 and 2, will be built and utilized as a construction access route into the CCNPP Unit 3 construction area. Approximately 2 mile of road will be upgraded and built to accommodate traffic into the construction area. The existing barge slip heavy haul road will also be upgraded and extended to the Unit 3 site area and construction laydown areas. The maximum slope for the existing and extended haul road is 4 percent grade. A CCNPP Unit 3 site perimeter road system will be installed including an access road from the cooling tower area to the power block area.

- Temporary Utilities – Temporary utilities including above-ground and underground infrastructure for power, communications, potable water, wastewater and waste treatment facilities, fire protection, and construction gas and air systems must be constructed and installed.

- Temporary Construction Facilities – Temporary construction facilities including offices, warehouses, sanitary toilets, a changing area, a training area, and personnel access facilities must be built. The site of the concrete batch plant includes the cement storage silos, the batch plant, and areas for aggregate unloading and storage. From lessons learned at other EPR construction sites, the Co-Applicants anticipate that the batch plant will be located as close as practicable to the site of construction of safety-related structures, thus ensuring quality control (safety-grade) concrete.

- Parking, Laydown, Fabrication, and Shop Preparation Areas – The parking, laydown, fabrication and shop areas will require preparation of the parking and laydown areas by grading and stabilizing the surface with gravel. The shop and fabrication areas include the concrete slabs for formwork, laydown, module assembly, equipment parking and maintenance, and fuel and lubricant storage. Concrete pads for cranes and crane assembly will be installed.

- Underground Installations – Concurrent with the power block earthworks, the initial nonsafety-related underground fire protection, water supply, sanitary and hydrogen gas piping, and electrical power and lighting duct banks will be installed and backfilled. These installations will continue as construction progresses.

- Unloading Facilities Installation – The existing barge slip will be upgraded. New sheet pile will be installed, and the existing crane foundations will be removed from the water. The slip will be re-established by dredging to receive large barge shipments that have roll-on, roll-off capability. Concurrently, crane foundations will be placed to erect a new heavy lift crane.

- Intake/Pumphouse Cofferdams – A sheet pile cofferdam and dewatering system will be installed on the south side of the CCNPP Units 1 and 2 intake structure to facilitate the construction of the CCNPP Unit 3 makeup water intake structures and pump houses. Pilings may also be driven to facilitate construction of the new discharge system piping.

  Excavation and dredging of the intake structures, erection of pump houses, and installation of mechanical, piping, and electrical systems follow the piling operations and continue through site preparation into plant construction. Excavated and dredged material will be transported to an onsite spoils area located outside the boundaries of designated wetlands.

- Power Block Earthwork (Excavation) – The deepest excavations in the power block area are for the CCNPP Unit 3 reactor and auxiliary building foundations that extend to approximately 40 ft below plant grade. The next deepest excavations are for the turbine building foundation area which will be excavated approximately 21 ft below plant grade with the circulating water piping excavation areas extending down to 33 ft below plant grade.

  The excavations will take place concurrent with the installation of any required dewatering systems, slope protection, and retaining wall systems. At a minimum, drainage sumps will be installed at the bottom of the excavations from which surface drainage and groundwater infiltration will be pumped to a stormwater discharge point. Monitoring of construction effluents and stormwater runoff will be performed as required in the stormwater pollution prevention plan, the National Pollution Discharge Elimination System (NPDES) permit, and other applicable permits obtained for construction. Excavated material will be transferred to the spoils and backfill borrow storage areas. Acceptable material from the excavations will be stored and reused as structural backfill.

- Power Block Earthwork (Backfill) – The installation of suitable backfill to support structures or systems occurs as part of the site preparation activities. Backfill material will come from the concrete batch plant, onsite borrow pit and storage areas, or offsite sources. Excavated areas will be backfilled to reach the initial level of the building foundation grade. Backfill will continue to be placed around the foundation as the building rises from the excavation until final plant grade is reached.

- Nuclear Island Base Mat Foundations – The deepest foundations in the power block are installed early in the construction sequence. Detailed steps include: installation of the grounding grid, mud-mat concrete work surface, reinforcing steel and civil, electrical, mechanical/piping embedded items, forming, and concrete placement and curing.

- Transmission Corridors – A new transmission substation/switchyard will be installed adjacent to the power block area for CCNPP Unit 3. A new onsite transmission corridor will be installed from the CCNPP Unit 3 switchyard to the existing CCNPP Units 1 and 2 switchyard. Tower foundations will be installed as well as an access road running along the corridor.

- Offsite Areas – No offsite areas will be impacted by the construction activities for CCNPP Unit 3. The existing offsite transmission corridor and towers will be utilized for the high voltage lines for CCNPP Unit 3.

- Concrete Batch Plant – The project will include two (2) temporary concrete batch plants, each with a peak production of 200 cubic yards per hour. The total cement production is estimated to be 500,000 cubic yards over the four-year construction period of the facility. This is approximately 125,000 cubic yards per year. The batch plant will use a baghouse to abate air emissions.

3.3 OPERATIONAL FEATURES

Linear facilities that will be required for CCNPP Unit 3 will include the following systems:

- water supply system,

- water treatment system,

- cooling system,

- radioactive waste systems,

- non-radioactive waste systems, and

- radioactive materials transportation systems.

3.3.1 Water Supply System

CCNPP Unit 3 requires water for cooling and operational uses. Water use by non-plant facilities includes potable and sanitary needs for administrative buildings and warehouses, and water required for landscaping maintenance. Primary water consumption is for turbine condenser cooling. Cooling water for the turbine condenser and closed cooling heat exchanger for normal plant operating conditions is provided by the CWS, which is a non-safety-related interface system. Circulating water for condenser heat dissipation is taken from the Chesapeake Bay and will normally be withdrawn at an average rate of 34,748 gallons per minute (gpm). A small fraction of the intake water will be used to clean debris from the traveling water screens. The CWS is a closed-cycle, wet cooling system. The heated cooling water from the main condenser is sent to the spray headers of the cooling tower, where heat content of the cooling water is transferred to the ambient air via evaporative cooling and conduction. After passing through the cooling tower, the cooled water is recirculated back to the main condenser for reuse, completing the closed cycle cooling water loop. Makeup water from the Chesapeake Bay is required to replace evaporative water losses, drift losses, and blowdown discharge from the CWS cooling tower. The average monthly consumptive use of Chesapeake Bay water during normal operating conditions will be approximately 750 million gallons per month. During normal shutdown/cooldown conditions, the maximum flow of water required by the CWS will be 40,440 gpm.

Four additional mechanical draft cooling towers with water storage basins (i.e., one basin for each of the four trains) comprise the UHS, which functions to dissipate heat rejected from the ESWS. During normal plant shutdown/cooldown, when all four trains of the ESWS are operating and assuming a maximum makeup flow rate of 941 gpm for each ESWS cooling tower, the peak water demand will be 3,764 gpm. The maximum water flow will be provided by the Desalination Plant and from water stored in the ESWS cooling tower storage basins. Peak water demand for normal plant shutdown/cooldown will only be for a short period of time. Any supply shortfall resulting from peak demand can be made up by stored water from several on-site storage tanks.

Sustained desalinated water demand for power plant makeup is 103 gpm and includes water supplies for the Demineralized Water Distribution System, the Potable and Sanitary Water Distribution System and the Fire Water Distribution System. The Demineralized Water Distribution System produces and delivers demineralized water to the power plant for systems that need high quality, non-safety makeup water. Except for containment isolation, the Demineralized Water Distribution System interfaces are non-safety-related. Under normal system operation, water consumption by the Demineralized Water Distribution System is 80 gpm. During normal shutdown/cooldown conditions, water consumption is also anticipated to be approximately 80 gpm. During normal plant operation, the Potable and Sanitary Water Distribution System supplies consumers with pre-treated water (i.e., Drinking Water Supply) at an average rate of 20 gpm. Due to potential surges in water demand, water consumption for the Potable and Sanitary Water Distribution System during normal shutdown/cooldown conditions is anticipated to be 36 gpm.

3.3.2 Water Treatment Systems

Water treatment will be required for both influent and effluent water streams. Because the cooling water source for CCNPP Unit 3 is the same as that for CCNPP Units 1 and 2, cooling water treatment methodologies for CCNPP Unit 3 will be similar. However, because desalinated water will provide water for CCNPP Unit 3 operations, in lieu of groundwater used by CCNPP Units 1 and 2, fresh water treatment methodologies will differ between the two plants. As previously noted, the source of fresh water for CCNPP Unit 3 will be desalinated bay water.

3.3.3 Cooling Systems

CCNPP Unit 3 cooling system design, operational modes, and component design parameters are determined from the U.S. EPR design documents, site characteristics, and engineering evaluations. These characteristics and parameters are used to assess and evaluate the impacts on the environment. Environmental impacts occur at the intake and discharge structures and the cooling towers. There are two cooling systems that have intakes and cooling towers. These systems are the CWS and the ESWS.

3.3.4 Radioactive Waste Systems

The design and operational objectives of the CCNPP Unit 3 radioactive waste treatment systems are to maintain, during normal operation, the radioactivity content of liquid and gaseous effluents from the site such that the dose guidelines expressed in Appendix I to 10 Code of Federal Regulations (CFR) Part 50 (10 CFR 50.34a), 40 CFR 190, and 10 CFR 20.1301(d) are met. The radioactive waste treatment systems are designed to keep doses to the public as low as reasonably achievable (ALARA). The dose to the public from radwaste systems during plant operation will meet the dose limits for individual members of the public as specified in 10 CFR 20.1301.

3.3.5 Non-Radioactive Waste Systems

The non-radioactive waste streams include: (1) effluents containing chemicals or biocides; (2) sanitary system effluents; and (3) other effluents (non-radioactive gaseous wastes, liquid wastes, hazardous wastes, mixed wastes, and solid effluents).

Chemicals are typically used to control water quality, scale, corrosion and biological fouling. Sources of non-radioactive effluents include plant blowdown, sanitary wastes, floor and equipment drains, and storm water runoff. Naturally occurring substances (e.g., marine growth) will not be changed in form or concentration by plant operations. Those naturally occurring substances that are not sloughed off will be removed to a landfill.

Sanitary waste systems installed during pre-construction and construction activities will likely include portable toilets supplied and serviced by a licensed sanitary waste treatment contractor. Sanitary waste will be removed offsite during pre-construction and construction activities and will not add to the existing onsite discharge effluents. During the operations phase for CCNPP Unit 3, a Waste Water Treatment Plant will collect sanitary wastes. If any plant-related radionuclides are identified, the sludge will be disposed of as low level radioactive waste.

Effluent discharges are regulated under the provisions of the Federal Water Pollution Control Act, and the conditions of discharge will be specified in the NPDES permit. It is expected that effluent limits for the CCNPP Unit 3 sanitary system will be similar to those already in effect for the CCNPP Units 1 and 2 sanitary systems.

Non-radioactive gaseous emissions result from testing and operating the diesel generators and from their related fuel storage tanks. All air emissions will comply with federal, state, and local emissions standards and requirements.

Non-radioactive liquid effluents that could potentially drain to the Chesapeake Bay are limited under the NPDES permit. There are three anticipated outfalls for release of non-radioactive liquid effluents from CCNPP Unit 3: (1) one for plant effluents (e.g., effluent from sewage treatment, the Desalination Plant, cooling tower blowdown, etc.) via the offshore, submerged diffuser; (2) one for stormwater via various surface outlets throughout the CCNPP Unit 3 site area; and (3) one for intake screen backwash. These outfalls will be controlled under the CCNPP Unit 3 NPDES permit. Treatment of non-radioactive liquid waste effluents is similar to the treatment employed for CCNPP Units 1 and 2.

A Hazardous Waste Minimization Plan will be developed and maintained that documents the current and planned efforts to reduce the amount or toxicity of the hazardous waste to be generated at CCNPP Unit 3. Hazardous wastes will be collected and stored in a controlled access temporary storage area (TSA). A Hazardous Material and Oil Spill Response guideline will be maintained that defines HAZMAT team positions and duties. Procedures will be put in place to minimize the impact of any hazardous waste spills in the unlikely event of occurrence. Containers of known hazardous waste received at a TSA will be transported offsite within 90 days of the container's accumulation date according to the applicable section/unit procedures.

Mixed waste includes hazardous waste that is intermixed with low-level radioactive material, special nuclear material, or by-product material. Federal regulations governing generation, management, handling, storage, treatment, disposal, and protection requirements associated with these wastes are contained in 10 CFR (NRC regulations) and 40 CFR (Environmental Protection Agency regulations). Mixed waste is generated during routine maintenance activities, refueling outages, radiation and health protection activities, and radiochemical laboratory practices. The quantity of mixed waste generated at CCNPP Unit 3 is expected to be small, as it is at other nuclear power plants. The management of mixed waste for CCNPP Unit 3 will comply with the requirements of U.S. Environmental Protection Agency's (USEPA) Mixed Waste Enforcement Policy and the Memorandum of Understanding with the State of Maryland until an approved USEPA permitted disposal facility becomes available. CCNPP Units 1 and 2 currently ship some mixed waste offsite to permitted facilities. This occurs infrequently and is dependent on the wastes actually generated. It is expected that CCNPP Unit 3 will also infrequently ship some mixed waste to permitted facilities.

Operation of an industrial waste facility for private use at the CCNPP site does not require a permit but must comply with the regulations imposed by the State of Maryland for construction, installation and operation of solid waste facilities. Acceptable wastes for a landfill containing land clearing debris include earthen material such as clays, sands, gravels and silts; topsoil; tree stumps; root mats; brush and limbs; logs; vegetation; and rock. Other waste materials such as office paper and aluminum cans will be recycled locally. Putrescible wastes will be disposed in a permitted offsite disposal facility. The types of solid waste that are expected to be generated by CCNPP Unit 3 include: hazardous waste; mixed waste; and cooling water intake debris, trash, and solid waste. Based on the operating experience at CCNPP Units 1 and 2, it is expected that CCNPP Unit 3 will recycle, recover, or send offsite for disposal virtually all solid waste.

3.3.6 Radioactive Waste

Unirradiated fuel will be shipped to CCNPP Unit 3 by truck. The procedures will be similar to those established for CCNPP Units 1 and 2.

The U.S. Department of Energy (DOE) is responsible for irradiated fuel shipments from CCNPP Unit 3 to a permitted repository. The DOE will make the decision regarding the mode of transport. It is anticipated that irradiated fuel will be shipped by truck, rail, or barge. Radioactive waste from CCNPP Unit 3 will be shipped by truck or rail.

CCNPP Unit 3 will operate in accordance with carrier procedures and policies that comply with the requirements of 10 CFR 51.52(a)(4), 10 CFR 71, 49 CFR 173, and 49 CFR 178.

The temporary storage and disposal of high level nuclear waste, including spent fuel, is subject to the exclusive regulatory jurisdiction of the DOE.

3.4 WATER INTAKE AND DISCHARGE SYSTEM

A new water intake structure will be built between the intake structure for Units 1 and 2 and the barge slip. The new intake structure will support both CWS and ESWS water needs.

A new discharge structure will be built to the north of the existing barge slip. This discharge facility will meet the Maryland water quality standards for discharge into the Chesapeake Bay.

3.4.1 Water Intake System

The Chesapeake Bay water intake system design would consist of a wedge-shaped expansion of the CCNPP Units 1 and 2 intake channel forebay, the CCNPP Unit 3 forebay and related piping; the CCNPP Unit 3 non-safety-related CWS makeup water intake structure and associated equipment, including the non-safety-related CWS makeup pump; the safety-related UHS makeup water intake structure and associated equipment, including the safety-related UHS makeup water pumps; and the makeup water chemical treatment system.

The Unit 3 intake water forebay will be 100 feet by 120 feet by 30 feet deep and will be located between the Units 1 and 2 intake and the barge slip. It will draw water from the extended Units 1 and 2 intake forebay through new intake water piping.

The CCNPP Unit 3 CWS makeup water intake structure will be an approximately 78 ft long, 55 ft wide and 30 ft deep concrete structure with individual pump bays. The UHS makeup water intake structure will be an approximately 75 ft long, 60 ft wide and 30 ft deep concrete structure with individual pump bays. Flow velocities at the intake channel will depend on the Chesapeake Bay water level. Even at the minimum recorded Chesapeake Bay water level of - 4.0 ft below msl, the flow velocity along the new intake channel will be less than 0.5 feet per second (fps), based on the maximum makeup demand of 43,480 gpm.

One makeup pump is located in each pump bay and one dedicated traveling band screen and trash rack is located in the CWS and UHS makeup intake structures. Debris collected by the trash racks and the traveling water screens will be collected in a debris basin for cleanout and disposal as solid waste.

3.4.2 Plant Discharge System

The proposed discharge structure will be designed to meet applicable navigation and maintenance criteria and to provide an acceptable mixing zone for the thermal plume per Maryland regulations for thermal discharges. The proposed discharge point will be near the southwest bank of the Chesapeake Bay, approximately 1,200 ft south of the intake structure for CCNPP Unit 3 and extending approximately 550 ft into the Chesapeake Bay.

The preliminary centerline elevation of the discharge pipe will be 3 ft above the bottom of the Chesapeake Bay. Riprap will be used as an erosion control measure at the discharge point.

The NPDES permit is expected to specify threshold concentrations of “free available chlorine” (when chlorine is used) and “free available oxidants” (when bromine or a combination of bromine and chlorine is used) in cooling tower blowdown. The CCNPP Unit 3 NPDES permit will contain discharge limits for discharges from the cooling towers for two priority pollutants, chromium and zinc, which are widely used in the U.S. as corrosion inhibitors in cooling towers.

3.5 LOCATION AND DESIGN FEATURES OF ELECTRIC SYSTEM UPGRADES

Because the CCNPP Unit 3 will be constructed adjacent to 500 kV transmission lines with adequate capacity to carry its output, along with that of CCNPP Units 1 and 2, there will not be the need to add any additional offsite transmission lines to support this project. The findings of the PJM feasibility and impact studies support this conclusion.

CCNPP Unit 3 will be connected to the grid through a new 500 kV, sixteen breaker, breaker and a half substation constructed at the CCNPP Unit 3 site. The existing 500 kV transmission lines (Calvert Cliffs to Waugh Chapel and Calvert Cliffs to Chalk Point) extending from the existing 500 kV substation for CCNPP Units 1 and 2 will be used for CCNPP Unit 3. Two new approximately one-mile long 500 kV transmission lines will be installed to connect the existing CCNPP Units 1 and 2 substation to the new CCNPP Unit 3 substation and to the grid. Additionally, two existing 500kV, 3,500 MVA circuits that are currently connected to the existing Units 1 and 2 substation will be disconnected from that substation and extended one mile to the Unit 3 substation (i.e., switch yard).

3.6 TRANSMISSION CORRIDORS AND OFFSITE AREAS

The additional electricity generated from CCNPP Unit 3 will not require the addition of new offsite right-of-way for any transmission lines. However, the proposed CCNPP Unit 3 construction activities on the CCNPP site will require the following transmission system changes:

- One new 500 kV substation to transmit power from CCNPP Unit 3,
- Two new 500 kV, 3,500 MVA circuits connecting the new CCNPP Unit 3 substation to the existing CCNPP Units 1 and 2 substation and indirectly to the grid, and
- Two existing 500 kV, 3,500 MVA circuits that are currently connected to the existing CCNPP Units 1 and 2 substation will be disconnected from that substation and extended 1.0 mile to the CCNPP Unit 3 substation.

Numerous breaker upgrades and associated modifications will also be required at Waugh Chapel substation, Chalk Point Generating Station, and other existing substations. The North and South Circuits of the CCNPP power transmission system are located in corridors totaling approximately 65 miles of 350 to 400 ft wide rights of way owned by BGE. The lines cross mostly secondary-growth hardwood and pine forests, pasture, and farmland, as well as CCNPP Units 1 and 2 infrastructure. CCNPP Units 1 and 2 are also connected to the Southern Maryland Electric Cooperative's Bertha substation via a 69 kV underground transmission line.

The on-site transmission line work to support this project will require new towers and transmission lines to connect the CCNPP Unit 3 switchyard to the existing switchyard for CCNPP Units 1 and 2 and the grid. Line routing will be conducted to avoid or minimize impact on the existing Independent Spent Fuel Storage Installation, wetlands, and threatened and endangered species identified in the local area. No new offsite corridors or widening of existing corridors are required.

3.7 INTAKE FOREBAY AND STRUCTURES

3.7.1 Description

As depicted in Figure 3.7-1, the following will be constructed between the existing CCNPP Units 1 and 2 Intake Forebay and the Barge Unloading Facility:

1. Unit 3 Intake Pipes
2. Unit 3 Intake Forebay
3. Unit 3 Circulating Water Makeup Intake Structure
4. Unit 3 UHS Makeup Water Intake Structure
5. Unit 3 UHS Electrical Building

The new intake piping will draw water from the existing (and extended) Units 1 and 2 Intake Forebay and distribute it into the new Unit 3 Intake Forebay.

Located at the periphery of the new Unit 3 Intake Forebay are the non-safety related Unit 3 Circulating Water Makeup Intake Structure, safety related Unit 3 UHS Makeup Water Intake Structure, and non-safety related Unit 3 Fish Return Facility. Located behind the UHS Makeup Water Intake Structure is the Unit 3 UHS Electrical Building.

3.7.2 Construction Approach

The construction involves three primary areas, which are described sequentially below. Overlap of the three segments will occur, as dictated by the required construction schedule.

3.7.2.1 New Unit 3 Intake Forebay and Adjacent Structures except the new Fish Return Facility

1. Install silt fencing
2. Install sheet pile around the new structures (Items 2 through 5 above)
3. Install a dewatering system
4. Dewater and excavate the area
5. Place structural backfill
6. Construct structures
7. Remove sheet pile and dewatering equipment
8. Remove silt fencing upon completion of construction

3.7.2.2 Expansion of the Units 1 and 2 Intake Forebay

1. Install floating silt curtains
2. As depicted in Figure 3.7-2, dredge out the wedge defined by the Units 1 and 2 Intake Forebay, an extension of the Units 1 and 2 Forebay, and shoreline down below the pipe inverts
3. Install a new sheet pile wall across the wedge, consistent with the existing braced sheet pile walls
4. Place new armor rock at the base of the new length of the Intake Forebay
5. Open up the existing sheet pile wall to allow water to flow into the newly created wedge-shaped area
6. Remove floating silt curtain

3.7.2.3 New Buried Intake Piping

1. Install sheet pile along the intake pipe routing
2. Install a dewatering system
3. Dewater the affected area and excavate inside the sheet pile walls

4. Place bedding material and install the intake pipes, including tie-ins

5. Backfill around the pipes and, subsequently, remove sheet piling and silt curtains

3.7.3 Mitigation Techniques

The major mitigation technique is to perform the majority of the construction within the new extension of the Units 1 and 2 braced sheet piling. Floating silt curtains will be used to contain suspended sediments within a controlled area.

3.8 DISCHARGE SEAL WELL STRUCTURE, PIPING, AND OUTFALL STRUCTURE

3.8.1 Description

Treated wastewater from the Unit 3 Cooling Tower Blow Down Basin will be conveyed for disposal in the Chesapeake Bay through the outfall/discharge pipe. Prior to entering the discharge pipe, the wastewater will enter a seal well (Figure 3.8-1) where the velocity of the water is significantly reduced. The size of the seal well is approximately 60 ft long by 25 ft wide by approximately 30 ft high. The seal well will be located approximately 50 ft from the shoreline. The discharge pipe will be 30 inch diameter HDPE pipe with 3 single port diffusers at its outfall. Offshore, the centerline of the discharge pipe will be approximately 6 ft below existing grade.

A plan view of the Discharge Seal Well, Piping, and Outfall Structure is provided as Figure 3.8-2, with cross sections of the pipe excavation and dredged area provided as Figure 3.8-3.

3.8.2 Construction Approach

Construction of the seal well structure will include the use of sheet pile walls by either vibratory hammer or impact hammer, or open excavation, reinforced concrete construction and placement of compacted granular backfill.

The anticipated construction sequencing for the discharge pipe and outfall consists of the following activities:

- Survey and layout the outfall
- Install floating silt curtains around the perimeter of the work area
- Dredge a trench for the outfall pipe and diffuser
- Launch (pulled into the prepared trench) the outfall pipe and diffuser
- Cover the pipe with stone and/or riprap
- Place riprap around the diffuser for protection
- Remove the floating silt curtains after sediments have settled

Clamshell dredging will be used for all dredging operations, including when such work is performed via a barge. The anticipated slope for this dredged area is 4:1. Material dredged by barge will be stored on barge, until offloaded to trucks at the Barge Unloading Facility. Material dredged from the shoreline will be directly offloaded to truck. Dredged material will ultimately be disposed at the Lake Davies area located approximately 3,500 ft west of the existing Units 1 and 2 Intake. The typical physical properties of the sediment in the Chesapeake Bay have been determined to be 96% sand, 2.3% clay, 1.5% gravel, and 0.2% silt. The sediment material has a specific gravity of 2.679 and is 73.4% solids.

3.8.3 Mitigation Techniques

Potential turbidity from clamshell dredging will be mitigated via lowering and raising the clamshell bucket slowly and/or using a closed bucket. Floating silt curtains will be used at the edges of dredged areas to contain the suspended sediments. On-land construction areas will utilize silt fencing at their periphery.

3.9 BARGE UPLOADING FACILITY

3.9.1 Description

The Barge Unloading Facility consists of a man-made jetty which extends into the Chesapeake Bay, as illustrated in Figures 3.9-1A and B. The Barge Unloading Facility was originally constructed to support the construction of CCNPP Units 1 and 2. The original Barge Unloading Facility included a gantry crane, supported by the barge slip and two pile caps and a mooring bollard, as can be seen in Figure 3.9-2. A bulkhead was installed to facilitate the roll-off of materials. To achieve the required draft, a channel was dredged on the south side of the slip. Since the completion of Units 1 and 2, sediment in the channel has accumulated, the gantry crane has been dismantled, and the existing bulkhead has degraded.

To the south of the Barge Unloading Facility is a discharge pipe for an existing stream. Soils have since accumulated in front of the bulkhead causing the stream to meander through the soils until it reaches the Chesapeake Bay.

The following activities are planned for the restoration of the existing Barge Unloading Facility:

- Channel dimensions will be restored (Figures 3.9-1A and B)
- Existing bulkhead will be replaced (Figure 3.9-3)
- A reinforced concrete apron behind the bulkhead will be constructed (Figure 3.9-4)
- The stream discharge directly to the Chesapeake Bay will be restored (Figure 3.9-5)
- The existing capped piles intended to support the original gantry crane and mooring bollard are expected to be removed (Figures 3.9-1A and B)

3.9.2 Construction Approach

3.9.2.1 Channel Restoration

Channel restoration will be accomplished by clamshell dredging. Figures 3.9-1A and B illustrate the dredge lines for the restored channel. It is anticipated that approximately 60,000 cubic yards of material will be dredged in order to restore the channel dimensions. Material dredged by barge will be stored on barge, until offloaded to trucks at the Barge Unloading Facility. Material dredged from the shoreline will be directly offloaded to truck. Dredged material will ultimately be disposed at the Lake Davies area located approximately 3,500 ft west of the existing Units 1 and 2 Intake. The typical physical properties of the sediment in the Chesapeake Bay have been determined to be 96% sand, 2.3% clay, 1.5% gravel, and 0.2% silt. The sediment material has a specific gravity of 2.679 and is 73.4% solids.

3.9.2.2 Bulkhead and Apron Installation

The existing bulkhead will be demolished and removed from the site. The new sheet pile bulkhead will be installed by either vibratory hammer or impact hammer method.

3.9.2.3 Stream Discharge Restoration

The discharge for the stream will be restored through the addition of a riprap apron adjacent to the new bulkhead.

3.9.3 Impacts

3.9.3.1 Channel Restoration

The dredged material will be characterized prior to disposal. Dredged material other than clean sands will be disposed in the Lake Davies area on the CCNPP site. Clean sands may be re-used as bedding material. Suspended sediments resulting from the dredging are anticipated to be contained by the floating silt curtain.

3.9.3.2 Bulkhead and Apron Installation

Spoils resulting from the installation of the apron will be disposed of on site at a predetermined location. Suspended sediments resulting from the bulkhead installation are anticipated to be contained by the floating silt curtain.

3.9.4 Mitigation Techniques

3.9.4.1 Channel Restoration

To mitigate the impact of the dredging activities, floating silt curtains will be utilized for the duration of the restoration activities in order to contain the suspended sediments to a controlled area. Furthermore, controlling the bucket speed and the use of a closed bucket will help mitigate the amount of suspended sediments.

3.9.4.2 Bulkhead and Apron Installation

To mitigate the impact of construction activities, silt fencing and floating silt curtains will be utilized.

3.10 FISH RETURN FACILITY

3.10.1 Description

The existing Units 1 and 2 Fish Return Facility is located to the southeast side of the Units 1 and 2 Intake Forebay. Currently water from Units 1 and 2 flows through the existing Fish Return Facility where environmental aquatic studies can be performed. Traveling screen wash water leaving the facility then enters the Chesapeake Bay directly through a buried conduit to the shoreline outfall. The Fish Return Facility contains a holding pit, two isolation gates and flow trough. The main isolation gate is normally open, allowing discharging of screen wash water (containing fish) to the Chesapeake Bay. If needed, the main gate would close, and the side isolation gate opens up allowing diversion of screen wash water to the holding pit to allow environmental studies. Water overflowing the holding pit would lead to the buried conduit and exit to the bay.

A new fish collection/holding facility, similar to that of Units 1 and 2, will be constructed for the new Unit 3 Intake Structure. It will be located on the east side (bay side) of the Unit 3 Intake Forebay. Screen wash water and fish collected from the traveling screens of the Unit 3 Circulating Water Makeup Intake Structure will be diverted to the new Fish Return Facility and will be released to the Chesapeake Bay via a buried pipe to a new shoreline outfall. The outfall will be submerged below low tide level to minimize any drop at the exit to facilitate the returning of the fish to the Chesapeake Bay water. No modification to the existing fish return and holding facility for Units 1 and 2 is necessary.

3.10.2 Construction Approach

The construction activities will include:

- Install sheet piling around the new Fish Return Facility
- Install a dewatering system
- Install silt curtain for outfall
- Dewater and excavate approximately 3,000 cubic yards of soil
- Construct the new Fish Return Facility
- Install outfall into the Chesapeake Bay (below low tide line)
- Place backfill
- Tie into the Unit 3 intake structures prior to operation

4.0 ALTERNATIVE ANALYSIS

4.1 ANALYSIS OF ALTERNATIVE SITES AND ALTERNATIVE AREAS WITHIN EXISTING SITE

During the initial planning stage, the Co-Applicants performed a comprehensive evaluation of both the potential to build the Project at other potential sites and the areas of the existing site that would be most suitable for construction given the project's purpose. The Co-Applicants consider the "initial planning stage" for this project to be the time when the feasibility and environmental studies were conducted in support of the Co-Applicants' application for a combined Construction and Operating License (COLA) at the U.S. Nuclear Regulatory Commission. COMAR 26.23.02.05.

The basic project purpose is to build a nuclear power plant that will provide 1600 net MW of power. The construction of the CCNPP Unit 3 will meet the primary goal of adding baseload electrical supply to the rapidly growing demand in the Baltimore-Washington metropolitan area. Electric supply in Maryland is further hampered by transmission congestion. As the Maryland Power Plant Research Group wrote in the Maryland Cumulative Environmental Impact Report (14th ed., 2007):

> Eliminating key constraints can alleviate congestion. This may be achieved through the construction of new transmission lines, by building new generation within a load pocket, or with demand side management.

4.2 ALTERNATIVE SITES

Siting of a nuclear power plant has very specific technical requirements that only a limited number of locations can provide. To be considered as candidate sites, a location must meet the following criteria as outlined in NUREG-1555, (NRC, 1999), Section 9.3 (W)(4c):

- Consumptive use of water should not cause significant adverse effects on other users.
- There should not be any further endangerment of Federal, State, regional, local, and affected Native American tribal listed threatened, endangered, or candidate species.
- There should not be any potential significant impacts to spawning grounds or nursery areas of populations of important aquatic species on Federal, State, regional, local, and affected Native American tribal lists.
- Discharges of effluents into waterways should be in accordance with Federal, State, regional, local, and affected Native American tribal regulations and would not adversely impact efforts to meet water-quality objectives.
- There would be no preemption of or adverse impacts on land specially designated for environmental, recreational, or other special purposes.
- There would not be any potential significant impact on terrestrial and aquatic ecosystems, including wetlands, which are unique to the resource area.
- Population density and numbers conform to 10 CFR 100.
- There are no other significant issues that affect costs by more than 5% or that preclude the use of the site.

In addition to meeting all applicable regulations and guidelines, the following factors influenced the decision to review sites.

- The site would be suitable for the design parameters contemplated for the new plant design.

- The location would be compatible with an applicant's current system and transmission capabilities.

4.2.1 Greenfield Site (OFFSITE NEW)

A greenfield site is a hypothetical location that has not previously been developed for any use. The NRC has noted that the general environmental impact of new nuclear construction on a greenfield site is generally severe (NRC, 1996), and greater than the impacts associated with construction and operation of a facility at an existing nuclear plant site. However, for the purposes of this site analysis, the possible general impacts of a greenfield site were reviewed.

It was assumed that the greenfield site would be located in an area that met the siting criteria of 10 CFR 100. As a result, the site would likely be rural, or at least in an area with low population in Maryland. The site would have to be near a possible supply of cooling water such as Chesapeake Bay. The site would require at least 500 to 1000 acres (200 to 400 hectares) to accommodate construction and operation needs (for comparison, the CCNPP Unit 3 project area requires about 420 acres (170 hectares) due to its co-location with existing Units 1 and 2. Additionally, it was assumed that the general environmental considerations associated with construction and operation at a greenfield site would be similar to those discussed in NUREG-1555 (NRC, 1999). The greenfield site was not the environmentally preferable location for several reasons:

- Terrestrial and aquatic resources: Impacts to the terrestrial and aquatic resources at a greenfield site would be greater than the impact at the other candidate sites. It was assumed that that the impacts during construction would temporarily disturb most aquatic habitats, while permanently disturbing some forest and open areas.

- Aesthetic impact would be greater. While the environmental impacts of construction and operation would be similar, much of the existing infrastructure at the CCNPP site would have to be developed to access the new site. Additionally, large areas of land would be cleared, graded and modified to accommodate construction and operation. The infrastructure advantages of the existing CCNPP site would likely not be available at most of the potential greenfield sites in Maryland.

- Socioeconomic impacts at the postulated greenfield site would generally be equal to or greater than those at the other candidate sites. Agricultural lands and historically important sites may also be adversely affected as the property and necessary cooling water facilities are built. Noise levels are likely to increase during construction and operation. Education, recreation, and other public facilities would likely be adversely affected by the increase in worker population for construction and operation. Air quality will be temporarily affected by construction dust and diesel fuel emissions.

- The land, or access to it (including any easements), would have to be obtained from one or more third parties. An undeveloped site would require 500 to 1,000 acres (200 to 400 hectares), including an exclusion area. In addition, it is likely that new transmission lines and corridors would be necessary to connect the new reactor to the existing transmission system. As such, impacts would not be limited to the immediate vicinity of the new reactor.

4.2.2 Co-Locating at Existing Nuclear Plant.

The only existing nuclear power plant in Maryland is CCNPP. The NRC recognizes the advantages presented by locating a new nuclear power plant unit at an existing nuclear facility. In the case of an existing nuclear power facility, the NRC has previously found the site to be acceptable on the basis of a NEPA review and/or determined it to be environmentally satisfactory on the basis of operating experience. There is also existing infrastructure that can be utilized for the proposed nuclear power plant. As the NRC wrote in its review of the Dominion Nuclear North Anna, LLC site selection:

> The North Anna site's transmission capacity was originally designed for additional nuclear units. Further, non-nuclear units are not subject to the same stringent siting requirements as nuclear power plants, and consequently can be located closer to urban areas than can nuclear power reactors. Also, as Dominion points out, nuclear sites have two other advantages over non-nuclear sites: a greater knowledge of environmental conditions at the site and an existing nuclear infrastructure at the site.

Dominion Nuclear North Anna (Early Site Permit for North Anna ESP Site) CLI-07-27, ___ NRC ___ (Slip Op. 16-19)(2007).

For this project, collocating the new reactor is preferable to the greenfield alternative. Collocation reduces the costs when compared to greenfield development because the new reactor will be able to take advantage of the infrastructure that serves the existing reactor(s). In addition to reducing costs, collocation negates the need for many of the preliminary analyses because these analyses have already been performed for the existing site license.

Preliminary analyses of site suitability, appropriate seismicity and geological setting, federal, state, and local regulatory restrictions, and many other significant issues have already been conducted for the existing unit(s).

4.2.3 Advantages of CCNPP Site

The CCNPP Site is ideally suited to the project. It is located in Maryland and is consistent with the project's basic purpose because it would provide 1600 net MW of electric supply in a location with no significant transmission issues. The existing transmission and other infrastructure that could be utilized by CCNPP3 are major advantages. Specific impacts associated with the existing site are described below.

4.2.3.1 Land Use and Wetlands Impact

The CCNPP site is located in Maryland on the Chesapeake Bay. Land use in the area surrounding the CCNPP site is predominantly rural. Hunting is common in the region surrounding the plant because large areas are rural and forested. Less than 5% of the county land uses are classified as commercial or industrial. Calvert County has open space and land preservation plans in place that direct commercial development toward town centers in order to preserve the rural character. Because the property is already used for nuclear powered electric generation, there would be minimal impact on land use. The wetlands impacts of the project are relatively small in comparison to the magnitude of the project.

4.2.3.2 Water

The CCNPP site is located on the western shore of the Chesapeake Bay, which is an estuary approximately 200 mi (320 km) long and up to 35 mi (56 km) wide. Makeup water for the plant would be drawn from Chesapeake Bay. Groundwater at the site occurs at depths near 30 ft (9 m) and flows toward the Chesapeake Bay. The artesian aquifer from which water is drawn during conduction is approximately 550 ft (167 m) below ground surface and approximately 100 ft (30 m) thick. This aquifer underlies much of Maryland. Current groundwater use at the site for existing operational and domestic use does not noticeably alter offsite groundwater characteristics. Operational fresh water needs will be provided by desalination of Chesapeake Bay water, so there will be no impacts on groundwater.

Additional groundwater withdrawals required for constructing the new reactor are not expected to destabilize offsite groundwater resources. Due to the large size of both the surface water and groundwater resources and the current rural nature of the area and resultant low usage of these resources, impacts to water resources at the site from construction and operation of the new reactor unit are anticipated to be small.

4.2.3.3 Terrestrial Ecology and Sensitive Species

The CCNPP site is largely forested and situated among other large forested tracts. Together these tracts form one contiguous and predominantly undeveloped forested area. The State of Maryland prepared a Wildlife Management Plan for the CCNPP site in 1987, and Baltimore Gas and Electric updated the plan in 1993 to include several habitat enhancement projects. The Wildlife Habitat Council has certified and registered the CCNPP site as a valuable corporate wildlife habitat.

The federally listed threatened puritan tiger beetle (*Cicindela puritans*) and the northeastern beach tiger beetle (*Cicindela dorsaliscan*) can be found at the base of the cliffs on the CCNPP site along the beach south of the barge dock, but will be not be impacted by the project. The bald eagle, which is on the state threatened list, has active nests on the CCNPP site. One of those is expected to require removal or movement of the nest, but the others will not be disturbed. The Maryland Natural Heritage Program lists species that are rare to uncommon, and lists two terrestrial species as present at the site. Special procedures have been proposed to minimize impact to the showy goldenrod (*Solidago speciosa*). The Shumard's Oak (*Quercus shumardii*) species will not be impacted by the project.

4.2.3.4 Aquatic Ecology and Sensitive Species

The area of the Chesapeake Bay where the CCNPP site is located is in the mesohaline zone, which is characterized by moderate salinity. Recreationally and commercially important shellfish and finfish found in large numbers in the vicinity of the plant during pre-operational surveys included the eastern oyster (*Crassostrea virginic*a), blue crab (*Callinectes sapidus*), striped bass (*Morone saxatilis*), and weakfish (*Cynoscion regalis*). One aquatic state-listed endangered species, the shortnose sturgeon (*Acipenser brevirostrum*), is known to inhabit the Chesapeake Bay. However, impingement studies conducted at the CCNPP site area over the past 30 years have never collected a shortnose sturgeon.

Construction impacts would be primarily due to runoff and siltation and will be controlled by best management practices and compliance with permit requirements. Because no sensitive species are known to occur in the vicinity and the new reactor is expected to have a similar impact to the existing reactor, construction and operation of the new reactor at this site would have minimal impact on the aquatic ecology in the Chesapeake Bay.

4.2.3.5 Historic, Cultural, and Archeological Resources

There are eight historic sites within a 5 mi (8.0 km) radius of CCNPP site listed on the National Register of Historic Places. Two historic dwellings are located on the original Calvert Cliffs site, which were evaluated by the Maryland Historical Trust and found to be ineligible to be nominated for inclusion on the National Register (BGE, 1998). However, photographs and some architectural elements of the structures were salvaged and are displayed in the Visitors Center (a remodeled old tobacco barn) onsite.

During 1992 and 1993, archeological surveys were conducted along a proposed South Circuit transmission line and right-of-way. As a result, two archeological sites were examined extensively during a testing phase. One prehistoric site was found to retain sufficient subsurface integrity to be considered eligible for inclusion on the National Register of Historic Places. The impact areas of the site were evaluated extensively, and towers were located in areas that would not affect any intact subsurface deposits (BGE, 1998).

From the air, the principal visual features of the CCNPP site region are the Chesapeake Bay, the Patuxent River, and countryside that is generally wooded. The distance across the Chesapeake Bay in the vicinity of CCNPP site is approximately 6 mi (10 km) and, from the shore, the far shore is a dark line on the horizon; the view up-Bay or down-Bay is water to the horizon. From the Chesapeake Bay, the shoreline is wooded with widely spaced small housing developments and marinas. The CCNPP site has a 1,500 ft (457 m) wide developed area approximately in the middle of 6 mi (9.7 km) of undeveloped, wooded shoreline featuring 100 ft (30 m) cliffs. These scenic resources have remained unchanged since the construction of CCNPP Units 1 and 2.

Scenic resources inland have changed since the construction of CCNPP Units 1 and 2 due to area population growth. This growth has resulted in housing, commercial, and road development supplanting agricultural and wooded areas. However, Maryland State Highway 2/4, which transects the area, is a scenic highway, affording views of gently rolling, wooded countryside with interspersed development and occasional agricultural areas.

4.2.3.6 Transmission Corridors

The existing CCNPP transmission facilities consist of three separate three-phase, 500 kV transmission lines. Two circuits deliver power to the Waugh Chapel substation and a third line connects to the Chalk Point generating station.

No additional offsite transmission corridors or other offsite land use will be required to connect the new reactor unit to the grid. An onsite 500 kV transmission line of approximately 1.0 mile (1.6 km) in length will have to be constructed to connect the CCNPP Unit 3 substation to the existing Units 1 and 2 substation and to the grid. Additionally, two existing 500 kV circuits that are currently connected to the existing Units 1 and 2 substation will be disconnected from that substation and extended 1.0 mile (1.6 km) to the Unit 3 substation.

4.3 FACILITY LAYOUT ALTERNATIVES

Because the existing CCNPP site is in Maryland, has previously been determined to meet NRC requirements for a nuclear plant and because the proposed CCNPP 3 project could be constructed in close proximity to the existing units with relatively small adverse impact on wetlands, the CCNPP 3 site meets the basic purpose of the project, while minimizing wetlands impacts. The Co-Applicants took the further step of studying alternative locations within the property to determine the location that would meet all of the NRC requirements but minimize impact on wetlands.

A multi-disciplinary team of industry experts evaluated locations for the proposed power unit at the CCNPP site. Specifically, they evaluated potential locations for two 1600 MWe U.S. EPR units and the corresponding type of circulating water system for use with the new plant (Bechtel, 2006). Subsequently, the Co-Applicants determined to seek regulatory approval for one unit.

The onsite facility configuration (site layout) was assessed for potential environmental impacts to the CCNPP site. This analysis focused on several environmental categories that are protected under special-purpose environmental laws and that contain specific provisions for the avoidance and minimization of impacts. These categories include wetlands, floodplains, CBCA, historic and archaeological resources, and protected species.

For the layout evaluation, the team determined to avoid impacts by establishing that neither the power block nor the cooling towers would be located within the following excluded areas (Bechtel, 2006):

- Lake Davies Disposal Area – Lake Davies is located west of the existing Units 1 and 2 and served as the landfill for the dredge materials from the original intake/discharge canal construction. An estimated 3 million cubic yards of material were disposed of in this area. This area represents unknown subsurface conditions and would require excavation and backfill with suitable fill material. Further evaluation is deemed a high risk due to inadequate soil conditions. It is unknown whether sufficient quality backfill is available. This area would also require significant piping lengths to and from the bay for the closed cooling water makeup and discharge.

- 1500-ft radius from known bald eagle nests (*Haliaeetus leucocephalus*) – This area is reserved as an exclusion zone for construction activity and location of the nuclear plant facilities.

- Cemetery located near the southern property boundary – A small cemetery of 3 graves was found at the end of Road M-1 in the southern portion of the property.

- Reserved transmission corridors and within 300 ft of existing transmission lines – The CCNPP site has 500 kV transmission lines traversing the property to the north from the existing switchyard. The setback was established to eliminate the effects of vapor drift on the transmission lines.

- Nearby offsite and onsite pipelines or other hazards – Bechtel determined that there are no nearby offsite or onsite hazardous pipelines that impact layout selection for this study. A modified American Land Title Association – American Congress of Surveying and Mapping (ALTA-ACSM) survey has been performed to verify the absence of onsite hazardous pipelines.

Complete avoidance of some impacts to environmental categories, such as wetlands or streams, associated with the CCNPP Unit 3 may not be feasible due to the large area of land disturbance required. Efforts were made to avoid impacts to wetlands and streams through consideration of several different project alternatives, including the No-Action Alternative (see Section 4.4).

Efforts to minimize impacts in the alternatives development process included:

- Avoiding and minimizing impacts to the most valuable/functional wetlands and stream systems

- Moving the core development project component (power block) to the largest contiguous upland area

In addition, the following considerations are generic in nature and each was reviewed for applicability to the CCNPP site. Each siting decision generally has both positive and negative effects on multiple issues and was considered in the total context of plant siting. Evaluation criteria were developed based on the following eight categories:

- Environmental

- Land Use and Zoning (State, Local)

- Construction Considerations

- Construction Facilities

- Switchyard/Transmission Lines

- Security

- Permanent Facility Considerations

- Impact to Existing Facilities or Structures

These minimization techniques resulted in the reduction of impacts on-site for the Preferred Alternative layout.

Efforts were made to avoid, to the extent possible, the long-term and short-term adverse impacts associated with the destruction or modification of wetlands and streams and to avoid direct or indirect support of new construction in wetlands and streams wherever there is a practicable alternative. Impacts were only considered when there was no practicable alternative, and Unit 3 includes all practicable measures to reduce impacts to jurisdictional wetlands, streams, and other surface waters. In keeping with the direction provided in the Clean Water Act (CWA), Section 404 (b)(1) Guidelines, the Co-Applicants evaluated each of the onsite alternative layouts based on the approximate acreage, type, and value of wetlands and streams that would be impacted. Alternatives that would result in no impacts or minimal impacts to wetlands and streams were preferred over alternatives that would result in a greater amount of impacts.

Efforts also were made to minimize the potential risks to human safety and property damage and the potential adverse impacts on natural and beneficial floodplain values. The Co-Applicants evaluated each alternative layout based on the approximate acreage of floodplains that would be impacted. Alternatives that would result in no impacts or minimal impacts to floodplains were preferred over alternatives that would result in a greater amount of impacts.

In addition, the Co-Applicants evaluated each of the alternative layouts with respect to the CBCA, an area that includes the Chesapeake Bay, its tributaries to the head of tide, tidal wetlands, and all land and water areas within 1,000 ft beyond the landward boundary of these waters and wetlands. The CBCA was established to help improve water quality and productivity in the Chesapeake Bay and to foster more environmentally sensitive development in areas near the shoreline. Alternatives that would result in no impacts or minimal impacts to the CBCA were preferred over alternatives that would result in a greater amount of impacts.

The Co-Applicants also evaluated each of the alternative layouts based on the potential to result in direct or indirect impacts to known historic and archaeological resources. Alternative layouts that were retained through the evaluation process were considered to be the most feasible, possible, prudent, and reasonable alternatives and were retained for further consideration. Alternatives that would result in no impacts or minimal impacts to these resources were preferred over alternatives that would result in a greater amount of impacts with respect to historic and archaeological resources.

4.3.1 Alternative A

Originally, the Co-Applicants were studying the possible siting of two nuclear generating units, Units 3 and Unit 4. At this time, the Co-Applicants are not seeking to permit or construct Unit 4. Nevertheless, the study analyzed both Units 3 and 4.

Alternative A consists of locating Unit 3 on the north side of the existing units. Originally with this alternative, the reactor buildings and turbine buildings of Units 3 and 4 would be side by side, east to west, along with the switchyard to the south and the cooling towers to the north. This arrangement of reactor buildings and turbine buildings of Units 3 and 4 in an east-to-west configuration presented significant construction challenges. With this arrangement, the eastern-most unit would be constructed first with an approximate 1-year lag for the next unit. This arrangement would cause all construction to pass over the western-most unit to get to the eastern unit on the bay side. This arrangement would result in a more complex circulating water piping or box culvert layout with routing between the unit and the bay, between the units, and west of Unit 4. Connection with the existing protected area would create a very large protected area that would contain the switchyard for the new units.

A significant amount of grubbing, clearing, and cut and fill would be required for this alternative. Most of the property north of the main access road is heavily forested outside of the cleared land around the visitors' center and security access point. A significant amount of cut and fill would be required to create a plant grade at approximate elevation 75 ft (considered to approximate the existing switchyard grade) and fill in the ravines and valleys on each side of fire road A-2 and the large valley at the north end of the property in the Fowler Tract. A large wetland is identified in the northern section of the property and is also detrimental to this alternative.

Construction on the north would require separating the construction activities and site from the operating plant, which would require relocation of the main access road and security access point. The following facilities would also require demolition and/or relocation:

- Security access facility
- Cell phone tower
- Visitor center
- Educational center
- Chimneys

- Transformers
- PUP facility
- Dog training facility
- Historical tobacco barns

This alternative would require extending the existing switchyard south and reconfiguring the transmission lines south to the new bay to allow for space on the north end to connect with the new switchyard.

Because of the construction difficulties associated with this alternative, Alternative A was eliminated from further evaluation and is not discussed further in this alternatives analysis.

4.3.2 Alternative B

Alternative B is a similar configuration as Alternative A except that the reactor buildings are located south and the switchyard is located on the north side of the turbine buildings resulting in a longer transition to the existing switchyard. The constructability issues are the same as described for Alternative A above due to the reactor buildings and turbine buildings of the two units being located side by side, east to west. This configuration would facilitate a better transition to the existing protected area due to the reactor buildings and safeguards buildings being located south next to the existing protected area.

Because of the construction difficulties associated with this alternative, Alternative B was eliminated from further evaluation and is not discussed further in this alternatives analysis.

4.3.3 Alternative C

Alternative C originally consisted of locating the two units on the north side of the existing units. The reactor buildings and turbine buildings of the two units were oriented side by side, south to north, reactor building towards the east, switchyard west, and cooling towers north. The power blocks are entirely within the I-1 zoning district. Depending on the cooling tower layout, a portion of the cooling towers and circulating water system would extend over the Farm and Forestry District into the Fowler tract.

With the arrangement of reactor buildings and turbine buildings of Units 3 and 4 south to north, better construction access, circulating water system layout, and security separation between the units is provided. With this arrangement, construction materials and activities can flow from the west for both units without crossing over each other. Routing of the circulating water system piping or box culverts between the switchyard and the turbine buildings provides a simpler layout for construction.

Alternative C would require extending the existing switchyard south and reconfiguring the transmission lines south to the new bay to allow for space on the north end to connect with the new switchyard. Even though the cooling towers are located greater than 300 ft from the transmission lines under this option, there is the potential for plume and drift effects on the main transmission lines running north from Units 1 and 2.

Due to Alternative C being adjacent to the existing protected area, special compensatory actions may be necessary during construction. Also, since the height of the site for the new plant is greater than the existing plant, the possibility exists that a blast wall may be necessary along the construction road as it passes the diesel generator buildings. These considerations may also cause the power blocks to be located further north, thus creating more separation between the existing protected area and the construction zone.

A significant amount of grubbing, clearing, and cut and fill is anticipated for this option. Most of the property north of the main access road is heavily forested outside of the cleared land around the visitor center and security access point. A significant amount of cut and fill would be required to create a plant grade at approximate elevation 75 ft and fill in the ravines and valleys on each side of fire road A-2 and the large valley at the north end of the property in the Fowler Tract. A large wetland is identified in the northern section of the property.

Construction on the north would require separating the construction activities and site from the operating plant. This would require demolition and/or relocation of the main access road and security access point. The following facilities would also require demolition and/or relocation:

- Cell phone tower
- Visitor center
- Educational center
- Chimneys
- Transformers
- PUP facility
- Dog training facility
- Historical tobacco barns

From the analysis of CWA Section 316(a, b) and related cooling water system issues, the use of once-through cooling for the circulating water system was not a feasible option for a proposed nuclear power plant at the CCNPP site (Bechtel, 2006). Therefore, a closed cooling water system is the best option for the licensing, construction, and commissioning of a new nuclear plant at the CCNPP site.

For the CWIS, Alternative C would allow for a single site protected area connected with the existing protected area for CCNPP Units 1 and 2. Alternative C would make better use of land currently zoned I-1 but would present a greater impact to the 1000-ft CBCA. Alternative C would also present greater construction challenges, including a longer distance from the barge area and construction facilities, and would require all construction activities to cross under the transmission lines. Alternative C would also cause for greater redesign of the current entrance and security facilities for the existing plant.

At this time, Unit 4 will not be permitted or constructed. As a result, Alternative C was revised. Because the project area delineated by Tetra Tech Nuclear Utility Services (Tetra Tech NUS) encompassed the proposed impact area under the Preferred Alternative (Tetra Tech NUS, 2007; Section 4.3.4), impacts to wetlands due to construction of Alternative C were calculated using the Tetra Tech NUS delineation and supplemented with National Wetlands Inventory (NWI) data (Figure 4.3-1). Alternative C results in approximately 22.7 acres of impacts to potentially jurisdictional wetlands and approximately 0.6 acre of impacts to potentially nonjurisdictional wetlands. The total impact to wetland areas is 23.3 acres. Other impacts associated with this alternative include impacts to 10,409 linear feet (lf) of stream.

Under Alternative C, impacts to 0.04 acre of estuarine/marine deepwater areas would occur as a result of construction of the heavy haul road, and impacts to 0.1 acre of freshwater pond would occur as a result of the construction of the heavy haul and construction access roads. The remainder of the impacts (approximately 22.6 acres) would occur to freshwater forested, scrub/shrub, and emergent wetlands.

4.3.4 Proposed Alternative

The Proposed Alternative originally consisted of locating the new units on the south side of the existing units in the Camp Conoy Fishing Pond area outside of the 1000-ft CBCA. The reactor buildings and turbine buildings of the two units were oriented side by side, north to south, reactor building towards the east, switchyard west, and cooling towers south. The Proposed Alternative provides better construction access, circulating water system layout, and security separation. With this arrangement, construction materials and activities can flow from the west for both units without crossing over each other. Based on the site topography, site preparation would involve lower amount of excavation for this location. Natural valleys exist on the southern side for location of the power block.

At this time, Unit 4 will not be permitted or constructed. As a result, the Proposed Alternative was revised. For the Proposed Alternative, the existing switchyard would be expanded south and the transition would be made from the Unit 3 switchyard to the existing switchyard. Reconfiguring of the outgoing transmission lines would not be required. With the Proposed Alternative, the cooling towers are significantly further from the transmission lines and therefore, would not be affected by the drift and plume.

Less grubbing, clearing, and cut and fill are anticipated for the Proposed Alternative. Proposed locations for the batch plant, laydown, and parking areas are either clear fields or lightly forested areas. The Lake Davies area is proposed for the laydown yard. Areas around Camp Conoy are also clear fields. Wetlands and surface waters in the southern location consist primarily of the Camp Conoy Fishing Pond and three pond structures that lead from the fishing pond to the Chesapeake Bay.

Construction of the Proposed Alternative provides for a natural separation of the construction activities and site from the operating plant. No demolition and/or relocation of the main access road and security access point would be required. The facilities that would require demolition and/or relocation include Camp Conoy and its associated cabins, outbuildings, and recreational facilities.

The Proposed Alternative for the CWIS is located entirely within the Farm and Forestry District, which would result in the need for an exemption from the current zoning, absent a CPCN being issued. However, the power block and cooling towers for the Proposed Alternative could be located entirely outside the 1000-ft CBCA. The Proposed Alternative would result in better flow for construction activities and would make better use of the barge location, heavy haul road, batch plant, laydown, and parking facilities. The Proposed Alternative would not disrupt the current traffic entrance and flow for the operating plant and would maintain the existing security facilities and would better segregate the construction traffic and activities from the operating plant traffic and activities. However, the Proposed Alternative would require a separate protected area due to the distance and location from the protected area for CCNPP Units 1 and 2.

In addition, a preliminary evaluation of effects from the Cove Point Liquefied Natural Gas (LNG) Facility on the southern layout location was conducted. The Cove Point terminal resumed importation of LNG in 2003. This facility is relatively close to CCNPP Units 1 and 2 and would be slightly closer to Unit 3, located south of the existing units in the Proposed Alternative. Due to the location of Cove Point, any accidental release of LNG will have some impact on the safety of the proposed Unit 3.

The previous evaluation was based on a maximum hazard distance that would have a 3 pounds per square inch (psi) overpressure criterion. The maximum hazard distance with the 850,000 barrel LNG tank will be 0.22 mile. Since the tank will be located approximately 3 miles from the proposed site for expansion at CCNPP, the hazard distance will not stretch closer than approximately 2.75 miles from the plant.

Regarding shipping vessels, the Coast Guard has committed to establish approach and docking procedures that keep vessels outside the 3.4 mile exclusionary range from CCNPP. The Proposed Alternative is located farther inland than CCNPP Units 1 and 2 to stay outside the 1000-ft CBCA from the shore. Since the Proposed Alternative is farther inland, the 3.4-mile exclusionary zone from CCNPP would be maintained.

The Proposed Alternative initially resulted in 14.3 acres of impacts to wetlands. Of these total impacts, 13.7 acres were associated with impacts to jurisdictional wetland areas. Approximately 0.6 acre of nonjurisdictional wetlands (i.e., a former sediment basin associated with the Lake Davies dredged material disposal area) would be impacted under this design plan. Other impacts associated with this alternative include impacts of 10,199 lf to perennial and intermittent stream channels. Overall impacts to jurisdictional wetlands were reduced from 22.7 acres to 13.7 acres. This is an approximately 9.0-acre decrease in jurisdictional wetland impacts over Alternative C. The majority of the impacts (11.6 acres) are to jurisdictional forested and emergent wetlands; however, 2.6 acres of impacts are to open water habitats associated with the construction of Laydown Area 1 and Retention Basin 5. The proposed impacts to the stream channels on the site would decrease from 10,409 lf to 10,199 lf from Alternative C to the Proposed Alternative. Based on the results of the alternative site layout analysis, the Proposed Alternative was selected as the proposed site layout that best addresses avoidance and minimization of wetland and stream impacts.

Following the selection of the Proposed Alternative, the proposed impacts to wetlands and streams on the CCNPP Unit 3 site were further reduced through the relocation or shifting of some of the facility components. The Improved Proposed Alternative will result in 11.7 acres of impacts to jurisdictional (USACE and/or MDE) wetlands. Overall impacts to jurisdictional wetlands were reduced from 13.7 acres to 11.7 acres. This is an approximately 2.0-acre decrease in jurisdictional wetland impacts over the original design plan for the Proposed Alternative. The proposed impacts to the stream channels on the site would decrease from 10,199 lf to 8,350 lf (i.e., a reduction in stream impact of 1,849 lf) from the original design plan to the improved design plan for the Proposed Alternative.

Table 4.3-1 compares the potential impacts to wetlands and streams on the CCNPP Unit 3 site for Alternative C, Proposed Alternative – original design plan, and Proposed Alternative – improved design plan as discussed above. Details of impacts to jurisdictional wetlands and streams as a result of construction of the Proposed Alternative are presented in Section 6.0.

Table 4.3-1 Potential Impacts to Wetlands and Streams for Alternative Site Layouts, CCNPP Unit 3, Calvert County, Maryland

Alternative Site Layouts	Potential Impacts		
	Jurisdictional Wetlands (Acres)	Nonjurisdictional Wetlands (Acres)	Streams (Linear Feet)
Alternative C	22.7	0.6	10,409
Proposed Alternative Original Design Plan	13.7	0.6	10,199
Proposed Alternative Improved Design Plan	11.7	1.1	8,350

4.4 NO ACTION ALTERNATIVE

Under this alternative, CCNPP would not develop an additional EPR unit at the site. The CCNPP site is an existing nuclear power facility and would likely continue in this capacity for quite some time. Considering the current condition of the on-site wetlands and current land use, wetland impacts could be expected to occur under the No Action Alternative. Due to the strict regulations promulgated by State and federal programs regarding jurisdictional waters impacts, it is unlikely that substantial unregulated impacts to jurisdictional waters, including wetlands, would occur. However, some impacts from this category would be expected. No impact to federal or State listed threatened or endangered animals or plants, or their habitats, would occur under this alternative. In addition, no impact to the existing on-site cultural resources would occur under this alternative. On the other hand, adverse impact to the public would result from this alternative because of the anticipated need for additional base load electric supply.

5.0 WATERS OF THE U.S./WETLANDS

5.1 OVERVIEW

Jurisdictional waters of the U.S., including wetlands, are defined by 33 CFR Part 328.3(b) and are protected by Section 404 of the CWA (33 United States Code [USC] 1344), which is administered and enforced in Maryland (Environmental Article §5-901 to §5-90, Annotated Code of Maryland) by the USACE, Baltimore District. The CCNPP site consists of 2,070 acres on the western shore of the Chesapeake Bay in Calvert County, Maryland. The two existing CCNPP units (Units 1 and 2) are located in the east-central part of the CCNPP Site. The remainder of the CCNPP site not associated with the existing power plant facilities is predominantly forest with some cleared land. The Chesapeake Bay shoreline (eastern perimeter) consists mostly of steep cliffs with little beach area. South of the existing units is a former recreational area known as Camp Conoy. Camp Conoy is accessed using a single-lane paved roadway (Camp Conoy Road) that runs north from the southern perimeter of the CCNPP site. Under current plans, the new generating unit and associated facilities (CCNPP Unit 3) would be located within an area of the CCNPP site south and west of the existing CCNPP Units 1 and 2. For this report, the CCNPP Unit 3 project area is termed the “Wetland Delineation Project Area” (Figure 5.1-1) (Tetra Tech NUS, 2007).

5.2 RELEVANT BACKGROUND INFORMATION

The Wetland Delineation Project Area consists primarily of forested areas south and southwest of the two existing reactors (CCNPP Units 1 and 2). It includes Camp Conoy; the Camp Conoy Fishing Pond; Lake Davies, a disposal area for dredge materials; and other forested and grassy areas that form part of a buffer of undeveloped lands surrounding the two existing reactors. The Wetland Delineation Project Area does not include the existing reactors, associated parking and appurtenant facilities, or the existing 500-kV transmission corridor. The following paragraphs provide background information on the project site relevant to the wetland delineation.

5.2.1 Topography

Elevations on the Wetland Delineation Project Area range from sea level on the Chesapeake Bay shore (bay shore) to nearly 150 ft above msl (United States Geological Survey [USGS], 1987). The bay shore consists of a narrow sandy beach abutted by sheer sandy cliffs that exceed 100 ft in height at some locations. The remainder of the site consists of a steeply rolling landscape dissected by a dendritic pattern of stream valleys with narrow floodplains adjoined by steep side slopes, the grade of which exceeds 25 percent in places (USGS, 1987; COA, Inc. [COA]; and John A. Hofman, P.C. (JAH), 2006). Large areas in the north-central part of the Wetland Delineation Project Area have been graded to accommodate existing facilities and the dredge material disposal area.

5.2.2 Hydrology

The eastern part of the Wetland Delineation Project Area, including most lands east of Camp Conoy Road, drains directly into the Chesapeake Bay. Runoff enters a series of unnamed intermittent and first-order perennial streams that flow generally eastward. The streams become increasingly incised as they approach the cliffs and then cascade over the cliffs and across the narrow beach into the bay. Tidal water on the CCNPP site is limited to the Chesapeake Bay shoreline; i.e., the streams on the Wetland Delineation Project Area are non-tidal (MDNR, 2005). The cliffs prevent tidal influence from extending west of the beach (USGS, 1987).

The western part of the Wetland Delineation Project Area, west of Camp Conoy Road, drains toward the Patuxent River. Lands west of Camp Conoy Road drain into headwaters of Johns Creek, which flows west under MD 2/4 to St. Leonard Creek and ultimately to the Patuxent River. Most lands in the northwestern part of the Wetland Delineation Project Area drain to Goldstein Branch, a tributary of Johns Creek (USGS, 1987). Goldstein Branch flows south close to the western site perimeter, entering Johns Creek just east of MD 2/4. A small area in the northern part of the Wetland Delineation Project Area drains to the north and east into headwaters of Woodland Branch, which flows to St. Leonard Creek north and west of the existing reactors. Lake Davies, the dredge material disposal area that is now largely comprised of uplands that are vacant or used as material laydown for existing CCNPP operations, drains to old sediment basins that discharge to Johns Creek and Goldstein Branch.

5.2.3 Soils

Figure 5.2-1 depicts the soils which occur within the project. Soils in the Wetland Delineation Project Area are mapped in the Sassafras-Matapeake soil association, which is characterized by gently sloping to steep, well-drained, moderately and severely eroded soils that have a predominantly sandy clay loam to silt loam subsoil (Soil Conservation Service [SCS], 1971). Uplands in the Wetland Delineation Project Area are more specifically mapped in the Sassafras, Westphalia, Rumford, and Evesboro soil series. The Sassafras series consists of deep, well-drained upland soils with a brown loamy fine sand surface layer overlying a yellowish-brown heavy loamy fine sand or light fine sandy loam upper subsoil and a brown, strong brown, or dark brown sandy clay loam subsoil. The Westphalia series consists of deep, well-drained soils with a dark yellowish-brown fine sandy loam over a yellowish-brown fine sandy loam that contains a little more clay. The Rumford series consists of deep, somewhat excessively drained soils with a grayish brown and yellowish brown loamy sand surface layer over strong brown sandy loam subsoil. The Evesboro series consists of very deep, excessively drained soils with a dark grayish-brown loamy sand surface layer that grades from loamy sand to sand with increasing depth. Bottomlands in the Wetland Delineation Project Area occur as narrow strips of low land adjoining Johns Creek, Goldstein Branch, and their tributaries and are mapped as Mixed Alluvial Land. Soils in Mixed Alluvial Land lack a distinctive profile and consist of soil materials washed from uplands and deposited on floodplains and along drainage ways. Mixed Alluvial land is identified as a hydric soil on the hydric soil list for Calvert County, Maryland (NRCS, 1992).

5.2.4 Vegetation

5.2.4.1 Lawns and Developed Areas

Lawns and developed areas occur in the northeastern part of the Wetland Delineation Project Area, as typically adjoining facilities associated with the two existing reactor units, and in Camp Conoy (Figure 5.2-2). Camp Conoy includes several athletic fields and other lawn areas surrounding recreational facilities. Other than scattered trees and shrubs planted as ornamental landscaping, the lawns on the Wetland Delineation Project Area consist only of a groundcover stratum. Most of the lawns consist of cool season grasses (grasses that typically seed during spring and fall) such as tall fescue (*Festuca arundinacea*), bluegrass (*Poa pratensis*), large crabgrass (*Digitaria sanguinalis*), and Bermuda grass (*Cynodon dactylon*). Common broadleaf weeds typical of lawns are also present, such as white clover (*Trifolium repens*), broadleaf plantain (*Plantago major*), dandelion (*Taraxicum officinale*), and yellow hawkweed (*Hieracium pretense*).

5.2.4.2 Old Field

Two main areas of old field vegetation occur on the Wetland Delineation Project Area (Figure 5.2-2). The largest is located on the overgrown dredge materials that comprise Lake Davies. The dredge materials extend west from the existing reactors across the north-central part of the Wetland Delineation Project Area. The dredge materials are covered by a dense stand of phragmites (*Phragmites australis*). Phragmites is a tall, perennial grass that can grow to more than 10 ft tall and will typically infest brackish and fresh tidal and non-tidal marshes. It does not typically occur in well-drained old fields but is common on well-drained dredge material piles in coastal areas. Its presence on dredge material piles such as those on the Wetland Delineation Project Area is likely a result of propagules (seeds and rhizome fragments) contained in the dredge materials. Other plant species typical of old fields, such as common blackberry (*Rubus allegheniensis*) and tall fescue, are present but are not as prevalent as phragmites.

The other old field vegetation on the Wetland Delineation Project Area is located in scattered forest clearings around the perimeter of the dredge materials and in other developed areas, as well as along roadsides. Many such areas were disturbed during the initial construction of the existing reactors and various support facilities. Vegetation in these areas is dominated by tall fescue, sericea lespedeza (*Lespedeza cuneata*), common blackberry, Canada goldenrod (*Solidago canadensis*), and asters (*Aster* spp.).

5.2.4.3 Mixed Deciduous Forest

Most uplands in the southern and western part of the Wetland Delineation Project Area support mixed deciduous forest (Figure 5.2-2) dominated by a canopy of tulip poplar (*Liriodendron tulipifera*), chestnut oak (*Quercus prinus*), white oak (*Quercus alba*), black oak (*Quercus velutina*), southern red oak (*Quercus falcata*), scarlet oak (*Quercus coccinea*), American beech (*Fagus grandifolia*), and Virginia pine (*Pinus virginiana*). Other canopy trees include pignut hickory (*Carya glabra*), bitternut hickory (*Carya cordiformis*), red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), swamp chestnut oak (*Quercus michauxii*), and black gum (*Nyssa sylvatica*). The shrub stratum typically consists of dense patches of mountain laurel (*Kalmia latifolia*), pawpaw (*Asimina trilobata*), and American holly (*Ilex opaca*), with scattered but frequent saplings of canopy species. Ground cover is sparse except where recently fallen trees have left gaps in the tree canopy. Scattered patches of the following species are present in the groundcover: partridgeberry (*Mitchella repens*), Christmas fern (*Polystichum acrostichoides*), common violet (*Viola papilionacea*), and large whorled pogonia (*Isotria verticillata*).

5.2.4.4 Mixed Deciduous Regeneration Forest

Several areas of relatively level highlands that formerly supported mixed deciduous forest (described above) have been subjected to timber harvest activities within the past 20 years (Figure 5.2-2). These areas presently support dense thickets of deciduous trees and Virginia pines. The deciduous trees consist of tulip polar, oaks, sweet gum, and red maple. Virginia pine is generally more frequent in the regenerating forest than in adjoining areas of mature mixed deciduous forest. The regenerating forest lacks a distinct understory, but does contain scattered pockets of mountain laurel and American holly. Little groundcover is present other than along fire roads or in other small openings.

5.2.4.5 Well-Drained Bottomland Deciduous Forest

Areas of well-drained soils in lowlands adjoining Johns Creek, Goldstein Branch, their headwaters, and other streams on the project site support bottomland deciduous forest (Figure 5.2-2) dominated by tulip poplar, American beech, sweet gum, black gum, and red maple. This vegetation represents an ecotone (transition) between the mixed deciduous forest on the adjoining upland slopes and the bottomland hardwood forest in wetter areas closer to the stream channels. The shrub stratum is generally sparse, although some mountain laurel and American holly are present. While groundcover is sparse in many areas of well-drained bottomland deciduous forest, expansive dense patches of New York fern (*Thelypteris noveboracensis*) occur, even in areas of dense canopy cover.

5.2.4.6 Poorly-Drained Bottomland Deciduous Forest

Areas of poorly-drained, seasonally saturated soils in lowlands adjoining Johns Creek, Goldstein Branch, their headwaters, and other streams on the project site support bottomland hardwood forest (Figure 5.2-2) dominated by red maple, sweet gum, and black gum. The shrub stratum is generally sparse. The groundcover is typically dense throughout, dominated by ferns such as New York fern, sensitive fern (*Onoclea sensibilis*), and royal fern (*Osmunda regalis*). Sedges and rushes include tussock sedge (*Carex stricta*), eastern bur-reed (*Sporangium americanum*), and soft rush (*Juncus effusus*). Forb (herbaceous) species include lizard tail (*Saururus cernuus*) and skunk cabbage (*Symplocarpus foetida*).

5.2.4.7 Herbaceous Marsh Vegetation

Herbaceous marsh vegetation occurs throughout much of the broad bottomland areas adjoining Johns Creek in the western part of the Wetland Delineation Project Area, as well as in localized gaps in the forest cover in the narrower bottomlands adjoining the headwaters of Johns Creek, Goldstein Branch, and other streams (Figure 5.2-2). This vegetation is dominated in many places by phragmites. Other areas of herbaceous marsh vegetation on the Wetland Delineation Project Area are dominated by sedges, rushes, bulrushes and wetland forbs, such as lizard tail, dotted smartweed (*Polygonum punctatum*), Pennsylvania smartweed (*Polygonum pensylvanicum*), jewelweed (*Impatiens capensis*), and halberd-leaved tearthumb (*Polygonum arifolium*). These areas include a marshy fringe surrounding the shore of the Camp Conoy Fishing Pond, two smaller impoundments on the wetland/stream drainage way carrying the outflow from Camp Conoy Pond to the Chesapeake Bay, a constructed wetland (mitigation area) in the northwestern part of the Wetland Delineation Project Area, and a marshy fringe surrounding a stormwater pond immediately west of the existing CCNPP Barge Dock on the Chesapeake Bay.

5.2.4.8 Successional Forest Vegetation

Scattered areas on the CCNPP site support forest cover dominated by fast-growing hardwoods (Figure 5.2-2) such as black locust (*Robinia pseudoacacia*), black cherry (*Prunus serotina*), sweet gum, big-tooth aspen (*Populus grandidentata*), and pines such as Virginia pine and loblolly pine (*Pinus taeda*). All are native, fast-growing trees that rapidly form patches of forest cover in old fields, waste areas, roadsides, and fence rows in eastern and central Maryland. Other native tree species with scattered seedlings and saplings in old field vegetation include black cherry, eastern red cedar (*Juniperus virginiana*), and sweet gum. Non-native tree species present as scattered seedlings and saplings in successional forest vegetation on the project site include tree of heaven (*Ailanthus altissima*) and paulownia (*Paulownia tomentosa*). Although tree of heaven and paulownia are listed as invasive exotic plants by the Maryland Department of Natural Resources (MDNR) (MDNR, 1997), neither species has formed dense patches on the project site.

5.3 WETLAND DELINEATION METHODOLOGY

All wetlands within the Wetland Delineation Project Area were delineated by Tetra Tech between May 9, 2006 and September 20, 2006. Potential wetlands in this area were initially identified through consultation of relevant resource information, including available topographic maps (USGS 1987; COA and JAH, 2006), wetland maps (USFWS, 2006; MDNR, 2005), and soils maps (SCS, 1971).

The wetland delineation followed the routine onsite inspection methodology in Part IV, Section D, Subsection 2 of the *Corps of Engineers Wetlands Delineation Manual* (1987 Manual) (Environmental Laboratory, 1987) and the USACE memorandum on clarification and interpretation of that manual. With a few exceptions referred to as problem areas, any area identified as a wetland according to the 1987 Manual must display positive evidence of each of three parameters indicative of wetland conditions:

1. Hydrophytic Vegetation: defined as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present (Environmental Laboratory, 1987).

2. Hydric Soil: defined as soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation (Environmental Laboratory, 1987). This definition was subsequently adjusted as follows: soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994).

3. Wetland Hydrology: defined as the condition of being periodically inundated or having soils saturated to the surface at some time during the growing season (Environmental Laboratory, 1987).

Representative data collection points were established on transects perpendicular to the hydrological boundary of potential wetland areas identified based on initial site reconnaissance and preliminary review of data such as topographic maps (USGS, 1987). Each transect included, at a minimum, one data collection point approximately 10 ft inside of the delineated wetland boundary and another data collection point approximately 10 ft outside of the delineated wetland boundary. Most wetland to upland transitions encountered in the Wetland Delineation Project Area were abrupt and could be adequately documented with only two data collection points per transect. A few wetland to upland transitions were relatively gradual, and the corresponding transects included one or more intermediate points to document the basis for establishing the wetland boundary.

Dominant plant species for each vegetative stratum (tree canopy, saplings, shrubs, herbs, and woody vines) were determined based on percent cover at each data collection point. Plant indicator statuses developed by the USFWS (Reed, 1988) were assigned to each dominant species and used as the basis for determining whether the dominant vegetation was hydrophytic.

A soil pit was hand augured at each data point location to a minimum depth of 18 inches (or auger refusal due to rock) and the color, texture, and other descriptive data were recorded for each soil horizon (layer of distinct soil color and/or texture) encountered. The soil observations were used to determine whether field indicators of hydric soils, as listed in Part II, Sections 44 and 45 of the 1987 Manual and as expanded by the Natural Resources Conservation Service (NRCS) (NRCS, 1998), were present.

Surface and subsurface (in the soil pits) observations were made at each data point to determine whether field indicators of wetland hydrology were present. The primary (i.e., most reliable) field indicators are listed in Part II, Section 49 of the 1987 Manual. Examination for the primary indicators involved observing surface water depth (if any) and depth to soil saturation (if surface water was lacking), as well as looking for visual clues of recent surface water such as watermarks, drift lines, sediment deposits, and drainage patterns on the land surface. A number of secondary field indicators are also recognized for purposes of wetland delineation. Most secondary field indicators involve vegetation and soils characteristics indicative of seasonal soil saturation in wetlands that lack episodes of standing water. While only one primary field indicator is needed to document the presence of wetland hydrology, at least two secondary field indicators must be simultaneously present to document wetland hydrology in the absence of primary field indicators (USACE, 1992).

Wetland delineation data sheets developed by the USACE (USACE, 1992) for each data point were completed. Each wetland boundary was marked in the field using fluorescent orange ribbons. Each flag was labeled “WET” followed by a letter and a number. The letter identified a specific linear sequence of wetland delineation flags, and the number identified the sequential position of the flag on the sequence. The coordinates of each wetland delineation flag were identified by a land surveyor and transferred to topographic base maps to generate wetland delineation maps. Finally, each delineated wetland area was assigned a classification in the field using the wetland classification system developed by the USFWS (Cowardin *et al*., 1979).

Mrs. Kathy Anderson of the Baltimore district office of the USACE inspected the delineated wetland areas and stream channels on the CCNPP Unit 3 site on January 14 and 15 and February 5, 2008. Final USACE verification of the Jurisdictional Determination is forthcoming.

5.4 WETLAND ASSESSMENT AREAS

The wetland delineation is depicted on Figure 5.4-1. Field data sheets presenting vegetation, hydrology, and soil data for representative data collection points in the delineated wetlands were included in the May 2007 Tetra Tech report (Tetra Tech NUS, 2007). The Wetland Delineation Project Area was divided into nine Assessment Areas to facilitate the delineation of wetlands and surface waters on site. Wetland Assessment Areas are defined as contiguous wetland and aquatic areas with a high degree of hydrological interaction and biological similarity (Adamus *et al*., 1991; DeSanto and Flieger, 1995). Assessment Areas I, II, and III correspond to small unnamed watersheds that drain directly to the Chesapeake Bay (Assessment Area III flows out of the Wetland Delineation Project Area before reaching the Chesapeake Bay). Assessment Areas IV, V, and VI form the Johns Creek watershed (upstream of Goldstein Branch). Assessment Area IV constitutes the up-gradient headwaters to Johns Creek and their adjoining wetlands, while Assessment Area V constitutes the main channel and adjoining wetlands. Assessment Area VI comprises a sequence of man-made basins carrying stormwater runoff from the Lake Davies dredged material disposal area to Johns Creek. Assessment Area VII constitutes the headwaters, main channel, and associated wetlands of Goldstein Branch. Assessment Area VIII consists of a small cluster of seepages and headwaters that flow north past the northern perimeter of the Wetland Delineation Project Area and ultimately contribute to Woodland Branch and St. Leonard Creek. Assessment Area IX comprises a series of seepages and headwaters that drain into a storm drain system under the existing developed portion of the CCNPP site.

5.4.1 Wetland Assessment Area I

Assessment Area I consists of a system of streams and narrow strips of adjoining wetlands draining lands north of Camp Conoy and south of the existing reactors. One stream originates in a swale close to the northwest corner of Camp Conoy and flows to the north and east. This portion of the reach includes intermittent and perennial segments. A second stream originates as the outflow from an existing stormwater basin south of the existing reactors. This stream channel carries perennial flow. The two streams join in a forested valley north of Camp Conoy and flow east into the Chesapeake Bay just south of the existing CCNPP Barge Dock. A third stream originates at a small, forested, wetland area north of the central part of Camp Conoy and flows north to the main stream. Its flow regime is ephemeral.

Clean Water Act jurisdiction in Assessment Area I is limited to the stream channels, which are defined by steep embankments. The stream channels are deeply incised and lack abutting floodplain wetlands. Approximately 0.03 acre of forested wetlands occurs north of the central part of Camp Conoy. The hydrology of this forested wetland area appears to be influenced by discharge from a swimming pool occurring landward of the wetland area. The USACE will not exert jurisdiction over this 0.03-acre wetland, as the wetland is presumed to be isolated from waters of the U.S. However, the MDE may exert regulatory jurisdiction over this potential isolated wetland area. Assessment Area I also includes another man-made stormwater basin close to the CCNPP Barge Dock. Unlike the dry basin southwest of CCNPP Units 1 and 2, the basin near the barge dock appears to consist of permanent open water surrounded by a narrow fringe of emergent wetland vegetation. It is presumed, however, that USACE regulatory jurisdiction would not be exerted over either stormwater basin. No natural wetland areas are present in the vicinity of the barge dock. The Chesapeake Bay shoreline is riprap in this area.

The total wetland area for Assessment Area I is 2.20 acres.

5.4.1.1 Vegetation

The stream channels are shaded by deciduous trees, primarily tulip poplar, growing near the tops of the banks in uplands (mixed deciduous forest). Vegetation in the channels is therefore sparse to absent at most locations. Very narrow patches of sedges and rushes (hydrophytes), less than 1 – 2 ft in width, border the running water within the stream banks in a few places. The vegetation in the small, forested, wetland area (north of the central part of Camp Conoy) consists of sweet gum with scattered highbush blueberry (*Vaccinium corymbosum*), pawpaw, and shadbush (*Amalanchier canadensis*) shrubs (poorly drained bottomland deciduous forest). The groundcover consists predominantly of deertongue grass (*Dichanthelium clandestinum*), tussock sedge, soft rush, fimbrystalis (*Fimbrystalis* sp.), poison ivy (*Toxicodendron radicans*), and common greenbrier (*Smilax rotundifolia*).

5.4.1.2 Hydrology

Assessment Area I displays hydrology typical of the upper part of a dendritic stream system in a humid climate. The streams are fed by groundwater discharges and flow increases downstream. The head of the main stream, located in the woods just northwest of Camp Conoy, is a distinct springhead that discharges to a sharply defined channel. The hydrology of the ephemeral stream located north of the central part of Camp Conoy appears to be influenced by discharge from a swimming pool a occurring landward of this stream channel. The stream bottom of the reach consists of heavily scoured soil and lacks substantial cobbles. The small, forested, wetland area at the head of the ephemeral stream was saturated when initially delineated in June 2006 but dry when revisited in July 2006.

5.4.1.3 Soils

Soils adjoining the lower reach of the main stream channel forming Assessment Area I are mapped as Mixed Alluvial Land, described as consisting of soil materials washed from uplands and deposited on flood plains and along drainage ways (SCS, 1971). This description is consistent with the characteristics of the soils within the ordinary high water marks of the streams. Soils elsewhere in the vicinity of Assessment Area I are mapped as Sassafras and Westphalia soils, steep (SCS, 1971).

5.4.1.4 Classification

Portions of Assessment Area I within the banks of the perennial stream features are classified Riverine Upper Perennial Streambed (R3SB). Portions within the banks of the intermittent stream features are classified Riverine Intermittent Streambed (R4SB). Narrow strips of vegetation along the channels are classified Palustrine Forested, Broad-leaved Deciduous, Seasonally Saturated (PFO1E). The small, forested, wetland area at the head of the ephemeral stream feature (north of the central part of Camp Conoy) is also classified Palustrine Forested, Broad-leaved Deciduous, Seasonally Saturated (PFO1E). The stormwater basin near the barge dock is classified as a Palustrine Open Water (POW).

5.4.2 Wetland Assessment Area II

Assessment Area II consists of the Camp Conoy Fishing Pond, constructed by excavation and stream channel impoundment, and associated wetlands and stream channels. It includes 1) three stream channels, seepages, and bordering wetlands that originate up-gradient (west and southwest) of the pond; 2) two small, isolated wetlands (seeps) on forested slopes up-gradient (west and southwest) of the pond; 3) the pond basin and wetland fringe; and 4) the outlet stream channel (with two small impoundments), and bordering wetlands that carry the outflow from the pond northeast to the Chesapeake Bay.

The stream channels up-gradient of the Camp Conoy Fishing Pond begin at distinct seepages and become adjoined by narrow strips of forested wetlands as they flow downhill. These strips vary in width from a few feet to more than 100 ft. The two isolated wetlands on the slopes up-gradient of the pond consist of groundwater seepages that percolate back underground. The USACE will not exert jurisdiction over these two seep areas, as the wetlands have been determined to be isolated from waters of the U.S. by the USACE. However, the MDE may exert regulatory jurisdiction over the two seep areas. Most of the freshwater pond consists of open water no greater than 3 or 4 ft in depth. The pond is fringed by a zone of emergent wetlands generally between 10 and 30 ft in width. The stream channel carrying the outflow from the pond is fringed by forested wetlands, except where two small impoundments (Impoundment 1 and Impoundment 2) occur. Water depth is shallow (generally less than 2 ft) throughout both impoundments, thus both consist primarily of emergent wetlands rather than open waters. The upstream impoundment (Impoundment 1) contains approximately 0.75 acre of emergent wetlands. The downstream impoundment (Impoundment 2) contains approximately 0.25 acre of emergent wetlands. Just down-gradient (northeast) of the eastern of the two impoundments (Pond 2), flow from the stream channel falls over a low cliff onto a narrow sandy beach at the Chesapeake Bay. The cliffs block tidal influence from Assessment Area II.

The total wetland area for Assessment Area II is 6.18 acres.

5.4.2.1 Vegetation

The uppermost reaches of the stream channels up-gradient of the Camp Conoy Fishing Pond are shaded by deciduous trees, primarily tulip poplar and upland oaks (mixed deciduous forest), growing on the tops of the banks and in the adjoining uplands. Vegetation in the channels is therefore sparse to absent. The streams become adjoined by progressively broader zones of vegetated wetlands as they approach the pond. The wetlands support forest vegetation dominated by sweet gum undergrown by sweet gum and red maple saplings and highbush blueberry shrubs (poorly drained bottomland deciduous forest). Groundcover in the drier fringes of the wetlands consists predominantly of ferns such as New York fern, sensitive fern, cinnamon fern (*Osmunda cinnamomea*), and royal fern. Groundcover in the wetter part of the vegetated wetlands consists predominantly of lizard tail and some ferns. One wetland area immediately northwest of the pond supports herbaceous marsh vegetation dominated by phragmites.

Vegetation fringing the Camp Conoy Fishing Pond and in the two smaller down-gradient impoundments is herbaceous marsh vegetation dominated by sedges, rushes, grasses, and forbs typical of freshwater marshes. Examples of frequently occurring plants include lurid sedge (*Carex lurida*), soft rush, deertongue grass, and false nettle (*Boehmeria cylindrica*). Seedlings and saplings of sweet gum and red maple occur at certain locations on the drier edge of the wetland fringe. Segments of the stream down-gradient from pond and outside of the impoundments are bordered by poorly drained bottomland deciduous forest.

5.4.2.2 Hydrology

Assessment Area II displays hydrology typical of the upper part of a dendritic stream system in a humid climate. The streams flowing into the Camp Conoy Fishing Pond are fed by groundwater discharges, and flow increases downstream. The channels become progressively less distinct as they approach the pond, with flow spreading out into the adjacent wetlands. The Camp Conoy Fishing Pond is a man-made impoundment with an earthen dam on the northeast side. Water depth increases slowly away from the shoreline, with a depth of less than 1 ft over most of the pond and with a depth that may exceed 3 ft near the center. An outflow pipe carries water from the pond to a single stream channel flowing northeast to the Chesapeake Bay. Water depths in the two smaller impoundments on that stream channel (Impoundment 1 and Impoundment 2) appeared to not exceed 1-2 ft at most locations at the time of the wetland delineation.

5.4.2.3 Soils

The aerial photographs used in the soil survey (SCS, 1971) were taken prior to construction of the Camp Conoy Fishing Pond and the smaller impoundments, which are therefore not depicted on the survey maps. The maps do not differentiate the soils in the wetlands up-gradient of the present location of the pond from the surrounding uplands, which are mapped as Sassafras and Westphalia soils, steep. Soils along the stream down-gradient of the pond are mapped as Mixed Alluvial Land, described as consisting of soil materials washed from uplands and deposited on flood plains and along drainage ways.

5.4.2.4 Classification

Most wetlands in Assessment Area II are classified Palustrine Forested, Broad-leaved Deciduous, Seasonally Saturated (PFO1E). The open water of the Camp Conoy Fishing Pond is classified Palustrine Open Water (POW). The wetland fringe surrounding the pond, as well as the entirety of the two smaller impoundments, are classified Palustrine Emergent, Persistent (PEM1).

5.4.3 Wetland Assessment Area III

Assessment Area III consists of a stream and bordering wetlands near the southeastern corner of the Wetland Delineation Project Area. The stream originates at four separate seepage points that merge and then flow southeast to the Wetland Delineation Project Area southern boundary, and thence to the Chesapeake Bay. The channels are generally not sharply defined by distinct banks. An intermittent stream channel originates near Camp Conoy Road and flows east into the main stream system. This intermittent stream channel, which carries surface runoff from land near Camp Conoy Road, is deeply incised and lacks adjoining wetlands.

The total wetland area for Assessment Area III is 0.77 acres.

5.4.3.1 Vegetation

Close to the seepages, the stream channels forming Assessment Area III are shaded by deciduous trees, primarily tulip poplar and upland oaks (mixed deciduous forest), growing on the tops of the banks and in the adjoining uplands. Below where the two streams merge, the bordering wetlands become progressively wider, increasing to more than 50 ft wide. The wetlands support forest vegetation dominated by sweet gum undergrown by occasional sweet gum and red maple saplings and highbush blueberry shrubs (poorly drained bottomland deciduous forest). Groundcover in the drier fringes of the wetlands consists predominantly of ferns such as New York fern, sensitive fern, cinnamon fern, and royal fern. Groundcover in the wetter part of the vegetated wetlands consists predominantly of lizard tail and some ferns. No phragmites was observed in Assessment Area III.

5.4.3.2 Hydrology

Assessment Area III displays hydrology typical of the upper part of a dendritic stream system in a humid climate. The stream system appears to be fed primarily by groundwater discharges that emanate from small seepages near the toe of forested slopes. A substantial portion of the flow in the stream system appears to percolate back underground close to the southern perimeter of the Wetland Delineation Project Area. The stream and adjoining wetlands become constricted (less than 5 ft in width) at the point where flow exits the Wetland Delineation Project Area. The intermittent stream channel that originates near Camp Conoy Road does not appear to originate at natural seepages. Although it may carry some groundwater discharge, it likely carries mostly surface runoff from uplands near Camp Conoy Road.

5.4.3.3 Soils

The soil survey does not differentiate the soils in the wetlands in Assessment Area III from the surrounding uplands, which are mapped as Sassafras and Westphalia soils, steep (SCS, 1971). The soils in the delineated wetlands displayed a histic epipedon (deep organic soil layer) and low chroma mineral soils; i.e., field indicators of hydric soil.

5.4.3.4 Classification

Most wetlands in Assessment Area III are classified Palustrine Forested, Broad-leaved Deciduous, Seasonally Saturated (PFO1E). A small area in the southern part of Assessment Area III lacks tree canopy and is classified Palustrine Emergent, Persistent, Seasonally Saturated (PEM1E). The intermittent stream channel is classified Riverine Intermittent Streambed (R4SB).

5.4.4 Wetland Assessment Area IV

Assessment Area IV consists of a system of headwater streams and bordering wetlands forming the upper part of Johns Creek. One headwater stream subsystem and associated wetlands originates at a cluster of seepages to the north, near existing CCNPP plant facilities. It flows generally to the southwest. The other headwater stream subsystem and associated wetlands originates at seepages south on privately owned forested land south of the CCNPP site. It flows generally to the northwest. The two stream subsystems merge at a point approximately 1,800 ft west of Camp Conoy. The ridge separating lands that flow west to Assessment Area IV and east to Assessment Areas I, II, and III roughly corresponds to Camp Conoy Road.

The total wetland area for Assessment Area IV is 12.79 acres.

5.4.4.1 Vegetation

The upper reaches of channels in both stream subsystems are incised and shaded by deciduous trees, primarily tulip poplar and upland oaks (mixed deciduous forest), growing on the tops of the banks and in the adjoining uplands. A level floodplain area adjoins the channels down-gradient, becoming progressively wider and reaching a width of approximately 100 ft at the point where the two subsystems merge. Drier lands at the outer edge of the floodplain support well-drained bottomland deciduous forest dominated by American beech, tulip poplar, black gum, and sweet gum. Wetter floodplain lands support poorly drained bottomland deciduous forest dominated by red maple, black gum, and sweet gum. Dense patches of New York fern occur in both the well-drained and poorly drained forest lands. Patches of other ferns such as sensitive fern, cinnamon fern, and royal fern occur only in the poorly drained forest lands. Small areas along both channels lack closed tree canopy and support herbaceous marsh vegetation consisting of dense stands of phragmites. The transition between forest cover and phragmites cover is generally gradual and irregular. Generally, the phragmites infestations extend to areas where beavers have killed bottomland trees or where water backed up by beaver dams has killed trees.

5.4.4.2 Hydrology

Assessment Area IV displays hydrology typical of the upper part of a dendritic stream system in a humid climate. The headwater streams in both subsystems are fed by groundwater discharges at distinct seepage areas and flow increases downstream. Channels become progressively less distinct downstream from the seepages, with flow spreading out into the adjacent floodplain wetlands. Most uplands in the watersheds contributing surface runoff to both stream subsystems support natural forest cover and thus generate minor quantities of runoff in association with rainfall events. Two deeply incised stream reaches located immediately south and down-gradient from existing plant facilities appear to receive runoff from developed lands. That runoff has resulted in significant channel bed scour. Such scour is not evident elsewhere in Assessment Area IV.

5.4.4.3 Soils

Soils adjoining Johns Creek and its wider headwaters are mapped as Mixed Alluvial Land, described as consisting of soil materials washed from uplands and deposited on flood plains and along drainage ways (SCS, 1971). This appears to be an accurate description of the soils throughout the floodplain, including the areas of well-drained bottomland deciduous forest. Soils elsewhere in the vicinity of Assessment Area IV are mapped as Sassafras and Westphalia soils, steep (SCS, 1971).

5.4.4.4 Classification

Most wetlands in Assessment Area IV are classified Palustrine Forested, Broad-leaved Deciduous, Seasonally Saturated (PFO1E). Some areas in the center of wider wetlands, including the areas of phragmites infestation lack tree canopy and are classified Palustrine Emergent, Persistent, Seasonally Saturated (PEM1E). The uppermost reaches of the stream channels themselves are classified Riverine Intermittent Streambeds (R4SB), while the lower reaches are classified Riverine Upper Perennial Streambed (R3SB).

5.4.5 Wetland Assessment Area V

Assessment Area V consists of the main channel of Johns Creek and bordering wetlands. Johns Creek flows west, exiting the western perimeter of the Wetland Delineation Project Area near the confluence with Goldstein Branch and exiting the CCNPP site just east of MD 2/4. The upstream limit of tidal influence on Johns Creek lies substantially west of MD 2/4, close to St. Leonard Creek. Hence, none of the wetlands in Assessment Area V are under tidal influence. Assessment Areas IV and V are hydrologically connected; however, their division is arbitrary. As a general distinction, Assessment Area IV comprises the headwaters of Johns Creek, while Assessment Area V comprises the main channel. The width of the stream channel and associated floodplain ranges from 100 to more than 200 ft in Assessment Area V, wider than anywhere in Assessment Area IV. A few seepages that form intermittent tributaries on the slope north of the Johns Creek main channel are included in Assessment Area V, even though they are headwaters. The southern Wetland Delineation Project Area perimeter roughly follows the south shore of Johns Creek, and tributaries entering Johns Creek from the slope to the south are therefore not included as part of Assessment Area V.

The total wetland area for Assessment Area V is 9.13 acres.

5.4.5.1 Vegetation

Vegetation in Assessment Area V follows the same general pattern of hydrological zonation described for the floodplain in Assessment Area IV. Drier lands at the outer edge of the floodplain support well-drained bottomland deciduous forest dominated by American beech, tulip poplar, black gum, and sweet gum. Wetter floodplain lands support poorly drained bottomland deciduous forest dominated by red maple, black gum, and sweet gum. Dense patches of New York fern occur in both the well-drained and poorly drained forest lands. Patches of other ferns such as sensitive fern, cinnamon fern, and royal fern occur only in the poorly drained forest lands. The wettest areas of the floodplain lack closed tree canopy and support herbaceous marsh vegetation. The transition between these vegetative zones is generally gradual and irregular. The lower reach of Assessment Area V comprises a broad area of herbaceous marsh vegetation dominated by phragmites. The phragmites generally occurs in areas where beaver activity has killed the canopy trees.

5.4.5.2 Hydrology

Assessment Area V displays hydrology typical of the middle part of a dendritic stream system in a humid climate. Johns Creek is fed by headwater streams comprising Assessment Area IV, as well as by additional headwaters originating on the slopes to the north and south. The channel of Johns Creek is well defined in the northern (upstream) part of Assessment Area V, but the channel becomes less defined and flow becomes more diffuse downstream in the broad phragmites marsh. The stream tributaries and associated wetlands within Assessment Area V originate at seepages on the slopes north or south of Johns Creek and flow north or south through swales to Johns Creek. Groundwater discharge appears to be the principal contributor of flow to the tributaries. Upland watersheds to the tributaries are predominantly forested and undeveloped, without substantial areas of impervious surface or artificially compacted surface soils; hence, surface runoff is likely to be only a minor contributor to flow.

5.4.5.3 Soils

Soils adjoining Johns Creek and its wider headwaters are mapped as Mixed Alluvial Land, described as consisting of soil materials washed from uplands and deposited on flood plains and along drainage ways (SCS, 1971). This appears to be an accurate description of the soils throughout the floodplain, including the areas of well-drained bottomland deciduous forest. Soils on the upper reaches of the stream systems originating on the slopes north and south of Johns Creek, as well as the soils on the other sloping uplands adjoining Assessment Area V, are mapped as Sassafras and Westphalia soils, steep (SCS, 1971).

5.4.5.4 Classification

Most wetlands in Assessment Area V are classified Palustrine Forested, Broad-leaved Deciduous, Seasonally Saturated (PFO1E) or Palustrine Emergent, Persistent, Seasonally Saturated (PEM1E). The main channel of Johns Creek is classified Riverine Upper Perennial Streambed (R3SB). Tributaries entering Johns Creek from the northern slope are classified Riverine Intermittent Streambed (R4SB).

5.4.6 Wetland Assessment Area VI

Assessment Area VI consists of the old Lake Davies sediment basins; i.e., a series of three man-made basins occurring south of the existing Lake Davies dredged material disposal area in the central part of the Wetland Delineation Project Area. These sequentially connected basins carry storm water runoff from the dredge materials area to Johns Creek and Goldstein Branch. Assessment Area VI is hydrologically connected to Johns Creek. However, unlike the natural tributaries contributing flow to Johns Creek in Assessment Areas IV and V, Assessment Area VI consists of wetlands within man-made basins that are the result of extensive grading and dredge material placement. The USACE will not exert jurisdiction over the three man-made sediment basins. It is presumed that the MDE will also determine that these man-made basins are not jurisdictional.

The total wetland area for Assessment Area VI is 14.01 acres.

5.4.6.1 Vegetation

The shoreline of the upper (eastern) basin consists of a broad zone of dense phragmites stands. The phragmites-dominated vegetation does not stop at the wetland boundary but instead extends into the adjoining well-drained dredge material soils. Dense stands of phragmites cover most of the dredge materials, even where well drained, and may have originated from phragmites propagules contained in the dredge materials. Vegetation throughout the middle and lower basins is also dominated by dense stands of phragmites.

5.4.6.2 Hydrology

Water levels in the basins appear to be heavily influenced by surface runoff from the dredge materials. The upper basin also appears to have been excavated to a depth below the water table, hence the deep open water in its center.

5.4.6.3 Soils

The aerial photographs used in the soil survey (SCS, 1971) were taken prior to construction of the existing reactors and establishment of the dredge material disposal area. They depict a mixture of Sassafras and Westphalia soils and Mixed Alluvial Land that likely correspond to conditions at this location prior to development of the existing reactors. A new soil survey would likely depict the area as "made land," udorthents, or some other indication of soils that are a result of human disturbance.

5.4.6.4 Classification

The wetland fringe surrounding the open water in the upper basin, as well as the entirety of the middle and lower basins comprising Assessment Area VI is classified as Palustrine Emergent, Persistent (PEM1). The open water in the upper basin is classified Palustrine Open Water (POW).

5.4.7 Wetland Assessment Area VII

Assessment Area VII consists of Goldstein Branch, its headwaters, associated headwater stream channels and seepages, and narrow strips of adjacent wetlands. Several seepage areas and associated headwaters contribute flow to Goldstein Branch. The northernmost reach of a headwater to Goldstein Branch is located in a forested swale near the northwestern corner of the Wetland Delineation Project Area. Another headwater originates from multiple seepages in sloping forest land south of an open field and wooden barn in the northwestern quadrant of the Wetland Delineation Project Area. Other unnamed headwaters to Goldstein Branch and narrow strips of adjoining wetlands are included in Assessment Area VII. These include a system of headwaters that originate as seepages on sloping lands west of the Lake Davies dredge material area and generally flow south and west into Goldstein Branch and a tributary carrying flow from the main Lake Davies storm water basin west into Goldstein Branch. Finally, a wetland mitigation project (wetland creation area) previously completed by Constellation Generation Group, LLC (now known as Constellation Energy Nuclear Group, LLC) ("Constellation") to offset wetland impacts from a prior construction project on the CCNPP site occurs within the northeast portion of Assessment Area VII.

Goldstein Branch is itself a tributary to Johns Creek. Assessment Area VII is therefore hydrologically connected to other Assessment Areas associated with Johns Creek (Assessment Areas IV, V and VI), although the division is arbitrary. Most surface runoff entering Johns Creek up-gradient (east) of Goldstein Branch originates in a predominantly forested landscape, and most surface runoff entering Assessment Area VI originates on dredge materials. In contrast, most surface runoff entering Goldstein Branch originates in a mixed landscape of forest, crop, and offsite rural residential land uses. Goldstein Branch can therefore be characterized as a distinct stream system from the upper reaches of Johns Creek.

The total wetland area for Assessment Area VII is 11.55 acres.

5.4.7.1 Vegetation

Close to the seepages, the stream channels forming Assessment Area VII are shaded by deciduous trees, primarily tulip poplar and upland oaks (mixed deciduous forest), growing on the tops of the banks and in the adjoining uplands. A level floodplain area adjoining the channel becomes progressively wider, reaching a width of approximately 150 ft at some points. Most lands in the floodplain support poorly drained bottomland deciduous forest dominated by red maple, black gum, and sweet gum. Dense patches of New York fern occur in both the well-drained and poorly drained forest lands. Patches of other ferns such as sensitive fern, cinnamon fern, and royal fern occur only in the poorly drained forest lands. Unlike the floodplain associated with the upper reaches of Johns Creek, there is little well-drained forest land that can be described as Well-Drained Bottomland Deciduous Forest.

As is true for the upper reaches of Johns Creek and its headwaters (Assessment Areas IV and V), small areas along the headwaters of Goldstein Branch lack closed tree canopy and support herbaceous marsh vegetation consisting of dense phragmites. The transition between forest cover and phragmites cover is generally gradual and irregular. The phragmites infestation extends to areas where beavers have killed bottomland trees or where water backed up by beaver dams have killed trees.

5.4.7.2 Hydrology

Assessment Area VII displays hydrology typical of the upper part of a dendritic stream system in a humid climate. The streams are fed by groundwater discharges at distinct seepage areas, and flow increases downstream. Channels become progressively less distinct downstream from the seepages, with flow spreading out into the adjacent wetlands. Surface flow in the main channel of Goldstein Branch appears to diminish in places and reemerge downstream. The channel alternates between wider and narrower reaches as it flows south.

5.4.7.3 Soils

Soils adjoining Goldstein Branch and its wider headwaters are mapped as Mixed Alluvial Land, described as consisting of soil materials washed from uplands and deposited on flood plains and along drainage ways (SCS, 1971). Soils elsewhere in the vicinity of Assessment Area VII are mapped as Sassafras and Westphalia soils, steep (SCS, 1971).

5.4.7.4 Classification

Most wetlands within Assessment Area VII are classified Palustrine Forested, Broad-leaved Deciduous, Seasonally Saturated (PFO1E). A few small clearings within the forested wetlands are classified Palustrine Emergent, Persistent (PEM1). The stream channels are classified Riverine Intermittent Streambed (R4SB) or Upper Perennial Streambed. (R3SB). The existing Constellation wetland mitigation project (wetland creation area) is classified Palustrine Emergent, Persistent (PEM1).

5.4.8 Wetland Assessment Area VIII

Assessment Area VIII consists of headwaters and adjoining wetlands that originate at seepages on a forested slope immediately south of Calvert Cliffs Parkway in the northern part of the Wetland Delineation Project Area. The headwaters merge to form a single main stream channel, adjoined by forested wetlands, at a point approximately 150 ft south of Calvert Cliffs Parkway. The stream flows north under Calvert Cliffs Parkway and ultimately to Woodland Branch, which flows north and west into St. Leonard Creek.

The total wetland area for Assessment Area VIII is 0.45 acres.

5.4.8.1 Vegetation

The upper reaches of the headwaters on the slope are shaded by deciduous trees, primarily tulip poplar and upland oaks (mixed deciduous forest), growing on the tops of the banks and in the adjoining uplands. The forested wetlands in the narrow floodplain adjoining the main stream channel close to Calvert Cliffs Parkway contain poorly drained bottomland deciduous forest dominated by red maple, black gum, and sweet gum.

5.4.8.2 Hydrology

Assessment Area VIII displays hydrology typical of the upper part of a dendritic stream system in a humid climate. The streams are fed by groundwater discharges that merge, forming progressively greater flow downstream. Channels become progressively less distinct downstream, with flow spreading out into the adjoining wetlands.

5.4.8.3 Soils

Soils in the narrow floodplain adjoining the main stream channel south of Calvert Cliffs Parkway are mapped as Mixed Alluvial Land, described as consisting of soil materials washed from uplands and deposited on flood plains and along drainage ways (SCS, 1971). Soils elsewhere in the vicinity of Assessment Area VIII are mapped as Sassafras and Westphalia soils, steep (SCS, 1971).

5.4.8.4 Classification

Wetlands within Assessment Area VIII are classified as Palustrine Forested, Broad-leaved Deciduous, Seasonally Saturated (PFO1E). The stream channels are classified Riverine Intermittent Streambed (R4SB) or Upper Perennial Streambed (R3SB).

5.4.9 Wetland Assessment Area IX

Assessment Area IX consists of seepages, headwaters, and adjoining wetlands within a patch of undeveloped forest land directly west of an existing CCNPP parking lot. The forest land slopes generally east. The headwaters originate at seepages low on the slope and flow generally eastward. Storm drains collecting runoff from around the existing transmission switchyard feed a man-made drainage ditch that contributes additional flow to the wetlands. Assessment Area IX is the only remnant of a stream system that formerly flowed east to the Chesapeake Bay. Most of that stream system was filled to construct the existing power generation units and associated developed areas. Flow from Assessment Area IX enters a storm drain and is piped under the developed area to the east. Flow from the storm drain system is ultimately discharged at a stormwater basin feeding into Assessment Area I.

The total wetland area for Assessment Area IX is 1.12 acres.

5.4.9.1 Vegetation

The upper (western) reaches of the two headwaters originating at natural seepages on the slope are shaded by deciduous trees, primarily tulip poplar and upland oaks (mixed deciduous forest), growing on the tops of the banks and in the adjoining uplands. The broader wetlands occurring at the bottom of the slope support a dense stand of the perennial grass phragmites with only occasional widely spaced deciduous trees, saplings, and shrubs. Phragmites is an invasive plant of poor value as wildlife food and cover that readily invades disturbed wetlands. The predominance of phragmites in the wetlands is likely a result of a history of tree cutting and ground disturbance along the eastern edge of the forest patch. The runoff ditch flowing south into the wetlands is also vegetated by dense stands of phragmites.

5.4.9.2 Hydrology

Like the upslope portions of other stream systems in the Wetland Delineation Project Area (Assessment Areas I, II, III, IV, VII, and VIII), Assessment Area IX displays hydrology typical of the upper part of a dendritic stream system in a humid climate. Unlike those systems, however, Assessment Area IX constitutes only a small remnant of a stream system that has been almost completely covered by existing development. The two headwaters that originate on the slope are fed by groundwater discharges that merge, forming progressively greater flow downstream. The channels become progressively less distinct downstream, with flow spreading out into the adjoining wetlands. The wetlands are also fed by stormwater runoff entering a man-made drainage ditch that abuts the wetlands. Much of this runoff appears to originate from the existing electric switchyard. Significant flow during heavy rain events scour the bottom of the drainage ditch and introduce sediment into the wetland.

5.4.9.3 Soils

Soils in the narrow floodplain adjoining the main stream channel south of Calvert Cliffs Parkway are mapped as Mixed Alluvial Land, described as consisting of soil materials washed from uplands and deposited on flood plains and along drainage ways (SCS, 1971). Soils elsewhere in the vicinity of Assessment Area VIII are mapped as Sassafras and Westphalia soils, steep (SCS, 1971).

5.4.9.4 Classification

The wetland areas within Assessment Area IX are classified Palustrine Emergent, Persistent (PEM1). The headwaters flowing down the slope are classified Riverine Upper Perennial Streambed (R3SB) adjoined by Palustrine Forested, Broad-leaved Deciduous, Seasonally Saturated (PFO1E). The man-made drainage ditch is classified Riverine Upper Perennial Streambed (R3SB).

5.5 FUNCTIONAL ASSESSMENTS

5.5.1 USACE New England Highway Method

Wetland functions are physical, chemical, and biological processes or attributes of wetlands that are vital to the integrity of a wetland system, independent of how those benefits are perceived by society. Wetland values are attributes that are not necessarily important to the integrity of a wetland system but which are perceived as valuable to society (Adamus *et al*., 1991). Table 5.5.1-1 lists several commonly recognized functions and values provided by wetlands (DeSanto and Flieger, 1995). As a component of the wetland delineation for the Wetland Delineation Project Area (May 9, 2006 to September 20, 2006), Tetra Tech conducted a non-quantitative assessment of the functions and values of the delineated wetlands in the nine Assessment Areas. The analysis was based on the descriptive approach for wetland functional assessment developed as part of the *Highway Methodology* by the New England District of the USACE (DeSanto and Flieger, 1995). The functions and values present in each of the nine Assessment Areas are summarized in Table 5.5.1-2 and discussed below. Table 5.5.1-2 also identifies "principal" functions and values for the Assessment Areas. Functions and values are considered principal if they are an important physical component of an ecosystem or of special value to society from a local, regional, or national perspective. In general, Assessment Areas IV and V display the most principal wetland functions and values (DeSanto and Flieger, 1995).

Table 5.5.1-1. Common Functions and Values of Wetlands.

Functions	
Groundwater Recharge	Some wetlands function to catch and detain surface runoff, allowing at least some of the detained water to leach down into underlying aquifers. Wetlands capable of best performing this function tend to receive runoff from a large watershed, support dense vegetation, and have a narrow (constricted) outlet (or no outlet).
Groundwater Discharge	Some wetlands function as areas where groundwater is discharged to the surface. Such wetlands are commonly referred to as seeps or springs and represent a means by which wildlife inhabiting the surface can access water reserves held in the ground.
Floodflow Alteration	Some wetlands function to slow the overland runoff of floodwaters, thereby reducing peak flow levels following heavy precipitation events. Wetlands capable of best performing this function tend to be located in the upper parts of the watershed to stream systems.
Sediment/ Shoreline Stabilization	Vegetation in wetlands bordering streams and other water bodies can stabilize banks and shorelines against erosion caused by currents and waves.

Sediment/ Toxicant Retention	Some wetlands serve to detain surface flow (surface runoff or channel flow) allowing some suspended sediments, toxicants, and/or other pathogens to settle out into the wetland soil, thereby preventing their migration into downstream waters. Wetlands capable of best performing this function tend to support dense vegetation, have constricted (or no) outlets, and be located near disturbed soils or toxicant sources.
Nutrient Removal/ Transformation	Some wetlands serve to detain surface flow (surface runoff or channel flow) allowing nutrients such as nitrogen and phosphorus to settle out into the wetland soil, thereby preventing their migration into downstream waters. High nutrient levels in water bodies cause eutrophication, a condition where undesirable algal growths deplete dissolved oxygen and interfere with other aquatic biota. Wetlands capable of best performing this function tend to support dense vegetation, have constricted (or no) outlets, and be located near areas of heavy fertilizer use.
Production Export	Some wetlands serve as sources of biomass, nutrients, and food sources supporting aquatic ecosystems in down-gradient water bodies. Wetlands capable of best performing this function tend to have dense, diverse vegetation and be connected to areas of open water.
Aquatic Diversity/ Abundance	Wetlands adjoining or forming a part of streams, lakes, and other areas of open water tend to provide specialized habitat for many species of fish and other aquatic biota, thereby enhancing the diversity of aquatic ecosystems.
Wildlife Diversity/ Abundance	Wetlands provide favored habitat for many amphibian, reptile, bird, and mammal species. The exact species of wildlife attracted by a wetland depends largely on the vegetation composition in the wetland.
Values	
Recreation	Many wetlands provide opportunities for recreational activities such as hiking, canoeing, boating, fishing, and hunting. The recreational value of a wetland depends not only on its physical characteristics but also on its public accessibility and proximity to population centers.
Uniqueness/ Heritage	Many wetlands are inherently “special” places that reflect or contribute to the history and/or culture of the surrounding region.
Educational/ Scientific Value	Many wetlands, especially wetlands that have experienced little human alteration or disturbance, are of value for scientific research and/or for public outdoor education. The location of a wetland on public land and/or in close proximity to schools enhances this value.
Visual Quality/ Aesthetics	Especially in urban/suburban settings, many wetlands are visually pleasing natural areas that can buffer, screen, or offset the visual impacts of developed areas.

Source: DeSanto and Flieger, 1995.

Table 5.5.1-2. Summary of Functions and Values for Wetland Assessment Areas, CCNPP Unit 3 Site, Calvert County, Maryland.

Function or Value	Assessment Area								
	I	II	III	IV	V	VI	VII	VIII	IX
Functions									
Groundwater Recharge/Discharge	X	X	X	X	X		X	X	
Floodflow Alteration									
Fish and Shellfish Habitat		X			X		X		
Sediment/Toxicant Retention		X	X	X	X	X	X	X	
Nutrient Removal		X	X	X	X	X	X	X	
Production Export		X	X	X	X	X	X	X	
Sediment/Shoreline Stabilization		X			X	X			
Wildlife Habitat	X	X	X	X	X	X	X	X	X
Values									
Recreation		X	X	X	X		X	X	
Educational/Scientific Value			X	X	X			X	
Uniqueness/Heritage		X	X	X	X			X	
Visual Quality/Aesthetics		X						X	X

Legend:

X: Function or Value Present

X: Function or Value Principal

5.5.1.1 Groundwater Recharge/Discharge

Assessment Areas I, II, III, IV, V, VII, and VIII originate at upgradient spring and seepages where groundwater contributes base flow to down-gradient natural streams. Groundwater discharge is therefore identified as a function for each of those Assessment Areas. Assessment Area VI originates as a series of man-made stormwater basins and thus does not appear to serve a groundwater discharge function. Assessment Area IX is fed by two natural seepages but appears to receive more flow from the runoff ditch to the northeast. It also drains into a man-made storm drain system rather than feeding base flow into natural streams. Hence, groundwater discharge is not identified as a function for Assessment Area IX. None of the Assessment Areas are fed by large watersheds; hence groundwater recharge is not identified as a function for any of the Assessment Areas. Neither groundwater discharge nor recharge is generally of great concern in central Maryland, where natural rainfall is abundant. Hence, neither is identified as a principal function for any of the Assessment Areas.

5.5.1.2 Floodflow Alteration

The CCNPP site, and hence each of the Assessment Areas, is situated close to tidal waters. Streams originating within Assessment Areas I, II, and III each flow for less than 2 miles before entering the Chesapeake Bay. Assessment Areas IV, V, VI, and VII all drain into Johns Creek, which flows less than 5 miles to the west before entering St. Leonard Creek, a tidal tributary to the Patuxent River. Assessment Area VIII contributes flow that travels only a few miles to the northwest before reaching tidal water in St. Leonard Creek. Assessment Area IX flows into a man-made storm drain system. The watersheds contributing runoff to each of the Assessment Areas are small, each less than 1 square mile. None of the Assessment Areas occur in the upper reaches of a long stream system that receives runoff from a large watershed (measured in square miles) capable of contributing substantial flood flows to down-gradient streams and rivers following heavy precipitation. It is therefore likely that none of the Assessment Areas play an important individual or cumulative role in preventing downstream flood events. Floodflow alteration is therefore not identified as a function (or principal function) for any Assessment Area.

5.5.1.3 Fish and Shellfish Habitat

Only Assessment Areas II, V, VI, and VII contain deep enough water under normal conditions to provide fish or shellfish habitat. In Assessment Area II, only the Camp Conoy Fishing Pond provides deep enough water. The basins forming Assessment Area VI are so clogged with phragmites as to be, at best, poor fish or shellfish habitat. An aquatic survey conducted for the CCNPP site in 2006 identified only one fish species in the largest basin in Assessment Area VI (which it designates as “Lake Davies”). The survey attributes the low fish diversity to depressed dissolved oxygen levels caused by algae and duckweed decomposition. Therefore, fish and shellfish habitat is identified as a function only for Assessment Areas II, V, and VII. Fish and Shellfish Habitat has been identified as a principal function for Assessment Area V, which contain broad areas of permanently inundated wetlands (over 100 ft) wide at many locations) and a shallow, gentle stream channel in a generally undisturbed natural setting that likely provides quality habitat for freshwater fish typical of non-tidal streams in central Maryland. The aquatic survey noted that the greatest diversity of fish in streams on the CCNPP site was in the downstream station on Johns Creek (west of Assessment Area V).

5.5.1.4 Sediment/Toxicant Retention

Sediment/toxicant retention is identified as a function for Assessment Areas II, III, IV, V, VI, VII, and VIII. All contain areas of densely vegetated emergent wetlands that can slow flow velocities and thereby trap suspended sediments or filter dissolved toxicants. These wetlands serve as the last line of defense separating the Chesapeake Bay and downstream reaches of Johns Creek and St. Leonard Creek from sediment or chemical substances on the ground in the existing developed areas on the CCNPP site. Sediment/toxicant retention was not identified as a function for Assessment Area I, which consists mostly of deeply incised stream channels with little emergent vegetation, or Assessment Area IX, which flows into storm sewers lacking vegetation to trap sediment or toxicants. Sediment/toxicant retention is identified as a primary function for Assessment Area V, which consists of broad, sinuous, poorly defined stream channels that traverse broad areas of dense, emergent wetland vegetation.

5.5.1.5 Nutrient Removal

Nutrient removal is identified as a function for Assessment Areas II, III, IV, V, VI, VII, and VIII. All contain areas of densely vegetated emergent wetlands that can slow flow velocities and thereby trap dissolved nutrients such as nitrates and phosphates. Nutrient removal was not identified as a function for Assessment Area I, which consists mostly of deeply incised stream channels with little emergent vegetation, or Assessment Area IX, which flows into storm sewers. Nutrient removal is identified as a primary function for Assessment Area V, which contains exceptionally broad areas of dense emergent vegetation, and Assessment Area VII, which contains emergent vegetation in places and receives runoff from lawns on private property close to MD 2/4.

5.5.1.6 Production Export

Production export is identified as a function for Assessment Areas II, III, IV, V, VI, VII, and VIII. All contain areas of densely vegetated emergent wetlands that likely contribute substantial quantities of allochthonous biomass to down-gradient aquatic food chains in Johns Creek and near-shore waters of the Chesapeake Bay. Production export was not identified as a function for Assessment Area I, which consists mostly of deeply incised stream channels with little emergent vegetation, or Assessment Area IX, which flows into storm sewers. Production export is identified as a primary function for Assessment Area V, which consists of broad, sinuous, poorly defined stream channels that traverse broad areas of dense, emergent wetland vegetation.

5.5.1.7 Sediment/Shoreline Stabilization

Sediment/shoreline stabilization is identified as a function for Assessment Areas II, V, and VI. None of the other Assessment Areas contain broad areas of open water capable of causing shoreline erosion. Assessment Areas II and VI contain man-made lakes of a few acres each, and Assessment Area V contains broadly inundated areas formed by beaver dams. The emergent wetlands fringing the lakes and providing cover throughout the areas flooded by the beaver dams help protect the shoreline against water erosion. However, none of the water areas are large enough to justify identifying sediment/shoreline stabilization as a principal function.

5.5.1.8 Wildlife Habitat

Wildlife habitat is identified as a function for all of the Assessment Areas. The undeveloped lands on the CCNPP site provide a diversity of large areas of different types of upland and wetland wildlife habitat. Assessment Areas II, III, IV, V, VI, and VII are largely intact natural systems of stream channels, wetlands, and uplands in settings largely free of urban or agricultural development; hence, wildlife habitat is identified as a principal function for those Assessment Areas. Wildlife habitat is not identified as a principal function for Assessment Area I, where the deeply incised channel is not readily accessible as a drinking water source for wildlife; Assessment Area VI, where the wetlands are dominated by the non-native invasive plant phragmites, which provides poor food and limited cover to wildlife; and Assessment Area IX, which is surrounded by developed areas.

5.5.1.9 Recreation

Recreation is identified as a value for Assessment Areas II, III, IV, V, VII, and VIII, primarily because they contribute to the natural experience that could potentially be enjoyed by hikers, if Constellation were to open undeveloped CCNPP lands to hikers in the future. The value is minimized, however, by the fact that CCNPP lands are presently not open to the public for hiking. The Camp Conoy Fishing Pond (part of Assessment Area II) has a long history of enjoyment by Constellation employees and their families, though is no longer used for this purpose; recreation is therefore identified as a principal function for Assessment Area II.

5.5.1.10 Educational/Scientific Value

Assessment Areas III, IV, V, and VIII could be of value for purposes of education or scientific research because of they are largely free of human disturbance and their watersheds are mostly undeveloped and forested. They could be of interest to students and researchers interested in the pre-settlement conditions of wetlands in Calvert County. Their educational potential is reduced by the fact that the public does not have access, but that fact could be beneficial to researchers wanting to conduct ecological experiments. Education and scientific research are not identified as principal values for any of the Assessment Areas.

5.5.1.11 Uniqueness/Heritage

As southern Calvert County becomes increasingly urbanized, the undeveloped forested lands on the CCNPP site become increasingly valuable as remnants of the County's natural heritage. Uniqueness/heritage is therefore identified as a value for Assessment Areas II, III, IV, V, and VIII, which all occur in predominantly wooded, natural settings. Assessment Area I consists mostly of stream channels that have become artificially incised by runoff and thus not reflective of the region's natural heritage. Assessment Area VI consists of man-made basins adjoining dredged materials. Assessment Area VII adjoins areas of private development to the west and therefore does not constitute a stream valley uniquely free from development. Uniqueness/heritage has been identified as a principal value for Assessment Areas IV and V, which together form one of the largest stream systems in southern Calvert County that still remains largely free of adjoining development.

5.5.1.12 Visual Quality/Aesthetics

Visual quality/aesthetics has been assigned as a value for Assessment Areas II, VIII, and IX. Although not visible to the public and no longer used for recreation, the Camp Conoy Fishing Pond in Assessment Area II was long enjoyed as a scenic spot for Constellation employees to fish and picnic. Assessment Area VIII is part of the forest lands adjoining the Calvert Cliffs Parkway, a scenic entryway for employees and visitors to the Calvert Cliffs facilities. Assessment Area IX is readily visible from a road regularly traversed by Constellation employees and adjoins a walkway used by employees and guests walking the grounds of the existing facilities. The other Assessment Areas are not generally visible from roads used either by the public or Constellation employees and visitors.

5.5.1.13 Summary of Functions and Values Assessment

The functions and values present in each of the nine Assessment Areas delineated on the Wetland Delineation Project Area are summarized in Table 5.5.1-2. Considered holistically, the greatest overall functions and values are provided by Assessment Area V, which consists of the main channel of Johns Creek and its adjoining wetlands. Within the CCNPP site, Johns Creek remains largely free of human disturbance. It flows through a stream valley bounded throughout on both sides by mature deciduous forest cover free of agricultural or urban development. The channel is generally diffuse and poorly defined, spreading its flow through dense wetland vegetation that is more than 100 ft in width at many locations. The vegetation is capable of attenuating flow velocity, filtering out dissolved nutrients or contaminants in the water, and causing suspended sediment to settle out before flowing downstream to the tidal waters of St. Leonard Creek. Many of the same functions and values are provided by Assessment Area IV, which consists of the seepages, springs, and headwaters that flow into the upper end of Johns Creek. The reach of Johns Creek east of MD 2/4 constitutes one of the largest remaining systems of headwaters and stream whose watershed is still largely forested. The Assessment Areas with the least overall apparent function and value are Assessment Areas I, VI, and IX. Assessment Area I consists mostly of deeply incised stream channels that have been scoured by runoff from areas of existing development. There is very little vegetated wetland adjoining the channels. The channel is therefore not capable of substantially attenuating flow and thereby helping to reduce downstream movement of sediment, nutrients, and toxicants. Assessment Area VI consists of man-made basins overrun by phragmites, an invasive grass that is of poor or minimal value as food or cover for wildlife. Assessment Area IX consists of wetlands in a small fragment of forest surrounded by existing development. The wetlands flow into a storm drain system under the existing CCNPP facilities.

5.5.2 Ohio Rapid Assessment Method

5.5.2.1 Overview

The existing conditions of the wetland areas at the CCNPP Unit 3 project site were evaluated in the field on February 20 and 21, 2008 using the Ohio Rapid Assessment Method (ORAM), as outlined in the *Ohio Rapid Assessment Method for Wetlands* (Version 5.0 updated February 2001) (Mack, 2001). The ORAM was selected as an appropriate methodology to quantify the functions and quality of on-site wetland communities in order to determine the appropriate level of mitigation that should be required to permit the destruction, alteration, or degradation of a particular wetland community. The existing conditions of various wetland areas, as measured by ORAM, can then be compared to facilitate determinations of potential mitigation opportunities under post-development conditions. The ORAM also serves as a complimentary wetland assessment procedure to the *Highway Methodology* (New England District of the USACE), which is a more subjective approach intended to estimate the ecologic or human value of a wetland area. The ORAM separates wetlands into distinct areas where significant changes in the hydrologic regime occur between contiguous wetlands. Therefore, wetland assessment areas chosen using ORAM (i.e., those assessment areas which include proposed impacts to wetlands and streams) are smaller than the wetland assessment areas outlined in the Tetra Tech *Final Wetland Delineation Report* (Tetra Tech NUS, 2007), and can be smaller than the wetland areas delineated using the routine onsite inspection methodology outlined in the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987).

The six major variables assessed by ORAM include wetland size, upland buffers/surrounding land use, hydrology, habitat alteration and development, special wetland communities, and plant communities/interspersion/microtopography. Each major variable is assigned a score based on the presence or absence of a range of relevant attributes. A final Quantitative Rating score ranging from 0-

100 points is then used to determine the appropriate category of the wetland. The ORAM designates three primary categories of wetlands that correspond to wetlands of low, medium, or high “quality.” Category 1 wetlands are defined as “limited quality waters” and receive lower regulatory consideration. Category 2 wetlands “…support moderate wildlife habitat, or hydrological or recreational functions.” Category 3 wetlands are considered to contain “...superior habitat, or superior hydrological or recreational functions” and can support the presence of listed species. There is also a fourth implied category, a Modified Category 2, which are degraded Category 2 wetlands that “have a reasonable potential for restoration.” Category 1 wetlands receive the least regulatory protection, while Category 2 wetlands receive identical regulatory protection as Category 3 wetlands. Impacts to Category 3 wetlands should be minimized to the greatest extent practicable.

5.5.2.2 Results

Twenty ORAM sampling locations were selected based on the jurisdictional delineation conducted between May and September 2006 and the area of proposed impacts for construction of CCNPP Unit 3. ORAM field data point (sampling) locations are presented in Figure 5.5-1. A summary of the ORAM data is presented in Table 5.5.2.2-1. ORAM Worksheets are provided in Appendix A.

Table 5.5.2.2-1. Ohio Rapid Assessment Method Summary Data, CCNPP Unit 3 Site, Calvert County, Maryland.

TTNUS AREA[1]	ORAM ID	SIZE (Acres)[2]	SCORE	CATEGORY	IMPACTED AREA
Area II	WA-1	0.25	58.0	2	No
Area II	WA-2	0.30	72.0	3	Yes
Area II	WA-3	0.42	50.5	2	Yes
Area II	WA-4N	0.16	44.0	Modified 2	Yes
Area II	WA-4S	0.60	52.0	2	Yes
Area IVS	WA-5	0.32	61.0	2	Yes
Area IVS	WA-6	0.08	56.0	2	Yes
Area IVN	WA-7	1.66	81.0	3	No
Area IVN	WA-8	N/A	N/A	N/A	No
Area IVN	WA-9	0.70	67.0	3	Yes
Area IVN	WA-10	1.00	56.0	2	Yes
Area VII	WA-11	0.16	59.0	2	Yes
Area VII	WA-12	0.28	52.0	2	Yes

TTNUS AREA[1]	ORAM ID	SIZE (Acres)[2]	SCORE	CATEGORY	IMPACTED AREA
Area VII	WA-13	0.30	57.0	2	Yes
Area VII	WA-14	0.37	34.0	2	Yes
Area VII	WA-15	0.84	54.0	2	No
Area IX	WA-16A	0.29	45.5	2	Yes
Area IX	WA-16B	0.36	49.0	2	Yes
Area IX	WA-16C	0.51	30.0	1	Yes
Area VII	WA-17	0.30	62.0	2	Yes

1 Corresponds to wetland assessment areas designated in the Tetra Tech NUS 2007 *Final Wetland Delineation Report*.

2 Size is a gross approximation based on ORAM scoring boundaries, field observations, and GIS mapping.

ORAM scores ranged from 30.0 (WA-16C, Assessment Area IX) to 81.0 (WA-7, Assessment Area IV North) with a mean score of 54.7. Wetland WA-16C in Assessment Area IX received the lowest score due to habitat alteration presumably caused by construction of an adjacent road and parking lot associated with the existing CCNPP facility. Wetland WA-7 in Assessment Area IV received the highest score due to its large relative size, landscape position in a mature forested area, and significant hydrologic inputs due to its association with a high-order stream. Wetland WA-4 in Assessment Area II received a score of 44.0 and is designated as a Modified Category 2 wetland, which would be a candidate for restoration if it were not being potentially impacted by construction of the CCNPP Unit 3 facility. Wetland WA-8 in Assessment Area IVN was not scored per ORAM guidelines because it is an incised stream that lacks an abutting wetland area.

5.5.3 Comparison of Functional Assessment Methods

The ORAM evaluation and scoring for the wetlands that may be impacted by CCNPP Unit 3 construction were presented in Section 5.5.2. The USACE New England Highway Method was used to assess the functions and values present in each of the nine Assessment Areas, with the results being presented in Section 5.5.1. According to the ORAM guidelines, Wetland WA-16C (Assessment Area IX), a Category 1 wetland, should receive the least amount of regulatory consideration. Under the Highway Method, Assessment Area IX was reported to have the fewest functions and values (along with Assessment Area I); i.e., wildlife habitat (function) and visual quality/aesthetics (value). Wetlands WA-2 (Assessment Area II) and WA-9 (Assessment Area IVN), both Category 3 wetlands, would potentially receive more regulatory consideration than would be expected for Category 2 or Category 1 wetlands, as based on the results of the ORAM. As evaluated under the Highway Method, Assessment Area II and Assessment Area IVN exhibited a high number of functions and values; i.e., seven functions and three values for Assessment Area II and five functions and three values for Assessment Area IVN. Based on the ORAM results, the highest score (81.0) was reported for Wetland WA-7 in Assessment Area IV. Wetland WA-7 is representative of the higher quality wetlands that occupy the downstream portion of

Johns Creek and Goldstein Branch. A substantial portion of the impacts to wetland areas on the CCNPP Unit 3 site are to wetland systems which are degraded. The higher quality wetlands within the project site, i.e., those with a greater number of functions and values, will not be impacted. For example, no impacts are proposed for Assessment Area V. As evaluated under the Highway Method, Assessment Area V exhibited seven functions and three values. Although Assessment Area V was not sampled under the ORAM, this downstream portion of Johns Creek would potentially receive a high score similar to the score that was reported for Wetland WA-7 in Assessment Area IV (81.0), i.e., upstream portion of Johns Creek. The site development plan for CCNPP Unit 3 was developed and refined to exclude these higher quality wetlands from the construction footprint.

5.6 WATERS OF THE U.S.

The CCNPP site is located on a high bluff on the Calvert peninsula within the Chesapeake Bay watershed. The Chesapeake Bay, with a watershed area in excess of 64,000 square miles, is the largest estuary in the United States. The Calvert peninsula is formed by the Chesapeake Bay to the east and the Patuxent River to the west. It has a width of approximately 5 miles near the CCNPP site. The Patuxent River flows near the CCNPP site from the northwest to the southeast direction, and it discharges into the Chesapeake Bay approximately 8 miles south of the CCNPP site. Drainage in the vicinity of the CCNPP site includes several small streams and creeks, which fall within two sub-watersheds of the Chesapeake Bay with the drainage divide running nearly parallel to the shoreline. These sub-watersheds include the Patuxent River watershed and the Maryland Western Shore watershed.

The CCNPP site is well drained by a natural network of short, ephemeral, intermittent, and perennial streams within the two sub-watersheds. Approximately 80% of the CCNPP site is drained through the St. Leonard Creek drainage basin of the Lower Patuxent River watershed. The remaining 20% drains through the Maryland Western Shore watershed discharging northeastward and directly into the Chesapeake Bay by two unnamed creeks, identified as Lone Creek and Conoy Creek in Figure 5.6-1. All the streams that drain the CCNPP site that are located east of MD 2/4 are nontidal. Runoff from the CCNPP site that lies within the St. Leonard Creek watershed mainly drains through Johns Creek, a tributary to St. Leonard Creek (see Figure 5.6-2). The tributaries located upstream of MD 2/4 that contribute to Johns Creek are the Goldstein Branch, Laveel Branch, and two unnamed branches. The St. Leonard Creek watershed has a drainage area of approximately 35.6 square miles and mainly includes St. Leonard Creek and its tributaries, including the Perrin Branch, Woodland Branch, Planters Wharf Creek, Johns Creek and its tributaries, Grovers Creek, Rollins Cove, and Grapevine Cove. The combined flow from these streams discharges into the Patuxent River through St. Leonard Creek. St. Leonard Creek is tidally influenced at the confluence with Johns Creek.

At the top of the watersheds within the CCNPP site, the valleys (Type II) exhibit moderately steep, gentle sloping side slopes. “B” type streams are most commonly found in these Type II valleys and are typically stable, with a low sediment supply. These valleys often exhibit exposed bedrock and have cascading or rapids-like features. Less common are "G" type streams, usually observed under disequilibrium conditions. Further downstream, the valleys become broadened and more alluvial (Type VIII). Type VIII valleys are characterized by their wide, gentle slope and a well-developed floodplain adjacent to river terraces. Alluvial terraces and floodplains are the predominant depositional landforms which produce a high sediment supply. Soils are developed predominantly over alluvium originating from combined riverine, lacustrine and possibly residual historic estuarine depositional processes. Stable "C" or "E" type streams are characterized by slight entrenchment and meandering channels that develop a riffle/run/pool bed-form. Unstable "D," "F," and "G" type streams are also present onsite. Typically, the more broad alluvial valleys with well developed floodplains generally indicate the presence of "C" and "E" type streams. However, because of historic farming and timber operations, and associated flux in the hydrologic regime, they have degraded into over widened and incised “F” and “G” type streams. As a result, these channels fail to maintain storm or high water flows access to the floodplain, and continue along their degraded evolutionary trend. This results in excessive contribution of sediment to downstream receiving waters and degraded habitat throughout the watershed. As the channels degraded, the process perpetuates upstream resulting in a valley transformation toward a Type IV. Until restoration measures are employed, this cycle and degradation will continue.

6.0 PROPOSED WATERS/WETLAND IMPACTS

6.1 OVERVIEW

The construction footprint for the proposed facilities has been designed to minimize encroachment into areas delineated as wetlands or other waters of the U.S. After developing the initial layout, further analysis was performed to move or reconfigure components of the project, where possible, to avoid impacts to wetlands. This lead to a reduction of wetlands impacts from more than 18 acres (as described in the 2007 Environmental Report filed with the NRC) to 11.71 acres.

The Co-Applicants have concluded that construction of the proposed facilities would not be possible without permanently impacting approximately 8,350 lf of intermittent and upper perennial, jurisdictional stream channels and approximately 11.71 acres of jurisdictional (USACE and/or MDE) wetland areas (Table 6.1-1 and Figure 6.1-1). The project would therefore require an Individual Permit (IP) under Section 404 of the Federal Water Pollution Act (USC, 2007) from the Baltimore District of the USACE. The project does not qualify for approval under the Maryland Programmatic General Permit because of the extent of the affected regulated areas and because constructing the intake and discharge pipelines and dredging to allow larger vessels to access the existing CCNPP barge slip requires work within the traditionally navigable waters of the Chesapeake Bay.

The project would require a permit from the MDE under the Maryland Non-tidal Wetlands Protection Act (COMAR, 2005). The project would also disturb approximately 30.85 acres of land defined as non-tidal wetland buffer by Calvert County under the Maryland Non-tidal Wetlands Protection Act (COMAR, 2005). Non-tidal wetland buffer is defined by Calvert County as lands within 50 ft of the landward (up-gradient) edge of non-tidal wetlands, as delineated using the federal methodology. The act also regulates expanded non-tidal wetland buffers extending as far as 100 ft from the landward edge of Wetlands of Special State Concern. However, no Wetlands of Special State Concern have been identified for the CCNPP site.

The proposed activity complies with the enforceable policies of the State of Maryland's approved coastal zone management program and will be conducted in a manner consistent with such program.

Table 6.1-1: Nontidal Wetlands and Nontidal Wetland Buffer Losses from Construction of Proposed CCNPP Unit 3 Site, Calvert County, Maryland.

Wetland Assessment Area (Potential Jurisdiction)	Permanent Grading Losses				Temporary Grading Losses				Total Losses	
	PFO	PEM	POW	Buffer	PFO	PEM	POW	Buffer	Wetland	Buffer
I- Total (MDE only)	0.03	-	-	2.00	-	-	-	-	0.03	2.00
II- Total (USACE & MDE)	1.46	0.75	2.63	6.79	-	-	-	-	4.84	6.79
II- Total (MDE only)	0.05	-	-	-	-	-	-	-	0.05	-
III- Total	No Impacts to Wetland Assessment Area III									
IV-Total (USACE & MDE)	4.97	-	-	15.84	-	-	-	-	4.97	15.84
V-Total	No Impacts to Wetland Assessment Area V									
VI-Total	No Impacts to Wetland Assessment Area VI									
VII-Total (USACE & MDE)	0.72	-	-	3.41	-	-	-	-	0.72	3.41
VIII-Total	No Impacts to Wetland Assessment Area VIII									
IX-Total (USACE & MDE)	0.64	0.46	-	2.81	-	-	-	-	1.10	2.81
Total	7.87	1.21	2.63	30.85	-	-	-	-	11.71	30.85

Notes: USACE = U.S. Army Corps of Engineers; MDE = Maryland epartment of Environmental; PFO = Palustrine Forested; PEM = Palustrine Emergent; POW = Palustrine Open Water.

Most of the wetland fill would take place in Wetland Assessment Areas II and IV. Minor or lesser wetland impacts are proposed for Wetland Assessment Areas I, VII, and IX. None of the wetlands directly adjacent to Johns Creek (in Wetland Assessment Area V) or Goldstein Branch (in Wetland Assessment Area VII) would be filled, although some wetlands adjacent to headwaters to those streams would be filled. No wetlands or non-tidal wetland buffers would be disturbed in Wetland Assessment Area III, which is located more than 500 ft south of where the permanent laydown area south of the power block would be constructed, Wetland Assessment Area V, or Wetland Assessment Area VIII, which is located more than 500 ft north of where the construction access road would be constructed. The following are the major components of the project expected to have wetland impacts:

- Construction of the power block (reactor, turbine, and safety-related structures) will impact 0.03 acre of potentially isolated (MDE jurisdictional) wetlands in Wetland Assessment Area I and 0.23 acre of jurisdictional wetlands in Wetland Assessment Area II;

- Construction of Laydown Area 1 will impact 0.05 acre of isolated (MDE jurisdictional) wetlands in Wetland Assessment Area II, 4.61 acres of jurisdictional wetlands in Wetland Assessment Area II, and 0.09 acre of jurisdictional wetlands in Wetland Assessment Area IV;

- Construction of the cooling tower will impact 0.75 acre of jurisdictional wetlands in Wetland Assessment Area IV;

- Construction of the switchyard will impact 4.13 acres of jurisdictional wetlands in Wetland Assessment Area IV;

- The construction access road will impact 0.72 acre of jurisdictional wetlands in Wetland Assessment Area VII; and

- Construction of Laydown Area 2, followed by a parking lot, will impact 1.10 acres of jurisdictional wetlands in Wetland Assessment Area IX.

6.2 WETLAND ASSESSMENT AREAS

6.2.1 Wetland Assessment I

The total wetland area in Wetland Assessment Area I is 2.20 acres. Grading to construct the power block will fill 0.03 acre of wetlands in Wetland Assessment Area I. The hydrology of the 0.03-acre wetland appears to be influenced by discharge from a swimming pool occurring landward of the wetland area. The USACE will not exert jurisdiction over this 0.03-acre wetland, as the wetland is presumed to be isolated from waters of the U.S. However, the MDE may exert regulatory jurisdiction over this potential isolated wetland area. Construction activities will also disturb 2.00 acres of uplands designated as non-tidal wetland buffer by Calvert County (50-ft buffer width). Of the total impact to the upland buffer, 1.66 acres will occur from construction of the power block and 0.34 acre will occur from the construction of the heavy haul road. The affected buffer consists mostly of undeveloped forested land.

No Practicable Alternative

Because the structural components of the power block must be closely spaced over an evenly graded surface for effective operation, it is not possible to fragment the pad to allow preservation of the stream or wetlands.

Together, the nuclear island and turbine island requires a square of approximately 28 acres. For security reasons, the protected area boundary around the nuclear and turbine islands encompasses approximately 48 acres. All the facilities within this square have a distinct function and all are necessary to function together. These facilities could not be economically or functionally separated to avoid impacting wetlands. The power block has been located to limit the impact to the CBCA and take advantage of the CCNPP Units 1 and 2 supporting facilities, such as shops, office space, and parking.

No wetland impacts will occur within 100 ft of mean high tide on the Chesapeake Bay shoreline of the CBCA Buffer. Construction within the CBCA, including the eastern (down-gradient) portions of Wetland Assessment Area I, is necessary to connect the proposed power block to an existing barge dock that presently serves CCNPP Units 1 and 2.

Impacted Wetland Features

The losses of the wetland features in Wetland Assessment Area I would not represent a substantial loss in terms of wetland functions or values. Based on the results of the wetland functional assessment (see Section 5.0 of this report) only two functions (and no values) are present in Wetland Assessment Area I: groundwater recharge/discharge and wildlife habitat. Neither was identified as principal, i.e., of high importance to regional ecosystems or society at a local, regional, or national level. The low number of functions and values identified for Wetland Assessment Area I generally reflects the severely eroded and scoured condition of the stream channels and banks, the narrowness of the adjacent vegetated wetlands, and the proximity to existing developed areas associated with CCNPP Units 1 and 2.

6.2.2 Wetland Assessment II

The total wetland area in Wetland Assessment Area II is 6.18 acres. Construction of the power block will fill 0.23 acre of wetlands in Wetland Assessment Area II. The preparation of the permanent construction laydown area south of the power block will fill a total of 4.66 acres of wetlands in this area. Filled areas will include the Camp Conoy Fishing Pond and forested wetlands adjacent to or abutting the pond. Currently, a total of 4.89 acres of wetlands are proposed for impact in Wetland Assessment Area II. Of this total area of impact, 0.05 acre is comprised of two, small, isolated wetlands (seeps). The USACE will not exert jurisdiction over these two small seeps, as the wetlands have been determined to be isolated from waters of the U.S. by the USACE. However, the MDE may exert regulatory jurisdiction over the two seep areas.

Construction activities will also disturb 6.79 acres of uplands designated as non-tidal wetland buffer by Calvert County. Of the total impact to the upland buffer, 6.36 acres will occur from preparation of the permanent construction laydown area and 0.44 acre will occur from the construction of the power block. The affected buffer consists mostly of undeveloped forested land. No areas of Wetland Assessment Area II within 800 ft of Chesapeake Bay will be impacted, including the two small impoundments on the wetlands complex flowing northeast from the Camp Conoy Fishing Pond to the Chesapeake Bay waters.

No Practicable Alternative

The construction activities, laydown, and office space south of Unit 3 must be located as decribed in order to be within necessary proximity to the power block and turbine block construction site. This will impact the Camp Conoy Fishing Pond because the pond would be filled to an elevation of 85 ft mean sea level. As two of the four sides of the power block cannot be accessed due to the critical area to the east and the heavy haul road and CCNPP Units 1 and 2 parking area to the north, it is necessary to use the area immediately to the south for construction. Further compounding the construction congestion is that a third side will be closed off two to three years into the schedule for construction of the switchyard. To maintain the construction flow the entire south side needs to be available for construction activities.

In the construction of a nuclear power station, various facilities are necessary to perform safety-related construction and maintain the security of the site. A climate controlled warehouse for storage of safety-related components and sensitive electrical and electronic equipment would be located in this laydown area. A test laboratory would also be located within this area. This laboratory would contain, for example, non-destructive examination and radiograph equipment and a calibration lab. Items tested include concrete, rebar, etc. Several different fabrication shops would be located within this area. Some of these shops would construct safety-related components and would require controlled processes to achieve the required level of quality. In addition, the construction of certain large components, such as the bottom shell of the containment liner, will require precise fabrication in an area adjacent to the power block and will then be lifted in place by large construction cranes. The containment liner is safety-related and is approximately 175 ft in diameter. Other facilities that are planned for location on the south side include security, badging, first aid, safety, training, change facility, and lunch room. Location of these facilities near the work site is important as they support a controlled, secure, and safe work environment. Maintaining a controlled construction site is especially important because of the proximity to CCNPP Units 1 and 2.

Although the power block could be constructed without disturbing Wetland Assessment Area II or its associated non-tidal wetland buffer, relocating the proposed construction laydown area to a more distant upland location will require transporting workers and equipment over distances greater than one mile on a regular basis. The laydown area will be graded to a size, shape, and grade suitable for use for a laydown area during construction and as needed for operation. It may be possible to reconfigure the proposed permanent laydown area to avoid some of the affected wetlands or buffer. However, the area would then not be suitable for future use as a laydown area during plant operation.

Impacted Wetland Features

The evaluation of wetland functions and values included in Section 5.0 of this report identified seven functions (groundwater recharge/discharge, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, and wildlife habitat) and three values (recreation, visual quality/aesthetics, and uniqueness/heritage) present in Wetland Assessment Area II. Of these, wildlife habitat and recreation have been identified as principal. Wildlife habitat was identified as a principal function because of the diversity of vegetative cover in the wetlands and adjoining uplands. Recreation was identified as a principal value because of the trails, dock, and other facilities at the Camp Conoy Fishing Pond. The loss of the wetlands and wetland buffer in Wetland Assessment Area II therefore represents some impact to the local availability of wildlife habitat. The loss of the Camp Conoy Fishing Pond, however, would not constitute the loss of an outdoor recreational facility because the property has been closed to recreational use as a result of heightened security concerns related to CCNPP Units 1 and 2.

6.2.3 Wetland Assessment III

The total wetland area in Wetland Assessment Area III is 0.77 acres. Within Wetland Assessment Area III, no wetlands and other waters of the U.S. or the associated non-tidal wetland buffer designated by Calvert County would be impacted by the construction of the CCNPP Unit 3 project.

6.2.4 Wetland Assessment IV

The total wetland area in Wetland Assessment Area IV is 12.79 acres. Construction of the proposed switchyard will require permanently filling 4.97 acres of jurisdictional forested wetlands in Wetland Assessment Area IV. Wetland impacts for construction of the switchyard will total 4.13 acres. Construction of the cooling tower will result in 0.75 acre of wetland impact, while preparation of the permanent construction laydown area will fill 0.09 acre of wetlands. Construction will also disturb 15.84 acres of uplands designated as non-tidal wetland buffer by Calvert County. The upland buffer impacts encompass: 3.17 acres for the cooling tower, 1.34 acres for the heavy haul road, 1.47 acres for the construction laydown area, and 9.86 acres for the switchyard. The affected buffer consists mostly of undeveloped forest land.

No Practicable Alternative

The wetland and wetland buffer impacts are unavoidable because the switchyard must be constructed adjacent to the power block.

The switchyard contains the electrical equipment necessary to connect the generator output to the high voltage transmission system. The switchyard provides the interface point between the power plant and the 500kV electric transmission system. As such, it has been located so as to provide the most advantageous location with respect to the power plant, and to the existing transmission system. The various electrical switches, breakers and transformers need to be located on an area of land adjacent to the turbine building where the transformers are located. Transmission lines connect the transformers with the switchyard and the planned configuration provides for the least intrusive transmission line routing, avoiding the use of large expanses of land to accommodate transmission towers and the transmission line routing and bending radius transition. The further west the switchyard is located, the greater the impact to Johns Creek. Its current location at the headwaters of Johns Creek provides the least impact to wetlands.

The switchyard is an electrically interconnected set of breakers and take-off towers. The interconnection of all the components in the switchyard provides the functionality and reliability that the connection to the grid requires to support safe plant operation. Splitting the switchyard into separate areas would decrease the reliability and flexibility of the installation. Therefore, the switchyard is designed as a continuous block of approximately 24 acres.

The size of the switchyard is dictated by the transmission system voltage, 500kV, and the number and the configuration of the breakers, and the number of lines leaving the switchyard. The Unit 3 switchyard provides the optimum combination of operational and economic considerations and is widely employed in switchyard layouts. The design dictates that the switchyard must be deep enough to accommodate three 500kV breakers in each bay, in addition to the buses and take-off towers. The width of the switchyard is dictated by the number of bays required to service the connections to the switchyard. A total of six bays are required to connect four transmission lines, six transformers, and provide an allowance for two additional future connections.

The power block of Unit 3 is laid out with all the power transformers located on the west end of the power block. Consequently, in order to facilitate overhead extra high voltage (EHV) line connections, the switchyard should be arranged closest to the west side of the power block area. The three existing transmission lines enter the area from the north, and two of the three will be rerouted to the new Unit 3 switchyard. In order to avoid crossing lines, the two lines closest to Unit 3 will be extended along their existing trajectory on the Calvert Cliffs property, and angled into the new switchyard. Placing the new switchyard at an angle to reduce the route length would only provide a small benefit, and would require a larger overall switchyard footprint if the switchyard is expanded in the future.

New transmission lines are planned to connect the existing Units 1 and 2 switchyard to the new Unit 3 yard. This is required in order to avoid disruption to the existing offsite power supply connections to Units 1 and 2. This provides the additional benefit of allowing Unit 3 the option to receive or transmit power through these lines. These new connecting lines are routed along the same right of way area as the rerouted transmission lines mentioned above. This prevents creation of a second 500kV corridor and minimizes the overall acreage that is required to route the power lines.

The switchyard cannot be moved to the north to shorten the new lines due to existing structures and improvements in this area. Moving the switchyard to the south or west would increase the area required to install the new transmission lines and towers. The switchyard area is used initially as a construction laydown area to lessen the impact to land use and to stage equipment/materials near the construction site. As construction progresses, this area would transition to switchyard construction. If the switchyard were not located in this area, a large portion of land would still be required to be disturbed. Conversion of the area from a construction lay down/production/access area is expected to take place approximately two to three years into the plant construction process.

Lands east of the power block are in the CBCA, lands south are needed for the cooling tower and laydown area, and lands north contain existing facilities. Hence, the only practicable location for the switchyard is west of the power block. The need for closely clustering the switchyard facilities over a contiguous, evenly graded area would prevent preserving the subject stream channels, springs, and wetlands. Jurisdictional wetland impacts for the construction of the switchyard will total 4.13 acres in Wetland Assessment Area IV.

Construction of the proposed CWS cooling tower will require permanently filling 0.75 acre of jurisdictional wetlands in Wetland Assessment Area IV. The cooling tower should be located as close as practicable to the turbine island. Locating the cooling tower further from the turbine island increases the construction and operating cost. Additional piping lengths increase the material, excavation, and labor costs during construction. Operating costs increase due to greater auxiliary loads from larger pumps and motors to move the cooling water greater distances.

The Unit 3 cooling tower will be located to minimize salt deposition in forested areas and in the CBCA. The location of the cooling tower also minimizes drift over the substation structures to avoid safety and engineering concerns. Finally, locating the Unit 3 cooling tower in this area will allow for potential site expansion. This location permits use of the area to the east for cooling tower expansion. Construction of a second cooling tower would be accomplished without having the 4 large (11 ft diameter) circulating water pipes crossing over each other which would present significant engineering concerns.

0.09 acre of wetlands within Wetland Assessment Area IV will also be filled as part of the preparation of the proposed laydown area south of the power block (Laydown Area 1), described in Section 6.2.2, above.

Impacted Wetland Features

The evaluation of wetland functions and values included in Section 5.0 of this report identified five functions (groundwater recharge/discharge, sediment/toxicant retention, nutrient removal, production export, and wildlife habitat) and three values (recreation, educational/scientific value, and uniqueness/heritage) present in Wetland Assessment Area IV. Of these, wildlife habitat and uniqueness/heritage were identified as principal. Wildlife habitat was identified as principal because of the presence of the wetlands within a large block of contiguous forest that provides habitat for Forest Interior Dwelling Species (FIDS). Uniqueness/heritage was identified as principal because of the fact that Johns Creek and its headwaters east of MD 2/4 represent one of the few stream systems in southern Calvert County that still remains largely free of development. The loss of the wetlands and wetland buffer in Assessment Area IV therefore represents a reduction in the local availability of quality wildlife habitat, including FIDS habitat, and a reduction in the availability of outdoor passive recreation facilities in the region.

6.2.5 Wetland Assessment V

The total wetland area in Wetland Assessment Area V is 9.13 acres. Within Wetland Assessment Area V, no wetlands and other waters of the U.S. or the associated non-tidal wetland buffer designated by Calvert County would be impacted by the construction of the CCNPP Unit 3 project. The functional assessment included in Section 5.0 of this report identified more principal functions and values for Wetland Assessment Area V than for any other Wetland Assessment Area. The principal functions included wildlife habitat, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, and production export. Uniqueness/heritage was identified as a principal value. Some key properties of Wetland Assessment Area V contributing to its functional superiority include the juxtaposition of forest and emergent wetland vegetation, the meandering and braided course of Johns Creek through the wetlands, and the extensive coverage by mature forest cover in the adjoining uplands. Avoiding encroachment into

Wetland Assessment Area V and its associated non-tidal wetland buffers was therefore a key objective when selecting a route for the construction access road.

6.2.6 Wetland Assessment VI

The total wetland area in Wetland Assessment Area VI is 14.01 acres. However, these wetland areas are nonjurisdictional; i.e., they encompass former sediment basins associated with the Lake Davies dredged material disposal area. The evaluation of wetland functions and values included in Section 5.0 of this report identified five functions (sediment/toxicant retention, nutrient removal, production export, sediment/shoreline stabilization, and wildlife habitat) but no values for Wetland Assessment Area VI. None of the identified functions were reported to be principal. The former Lake Davies sediment basins are man-made features rather than natural wetlands and are infested throughout by dense growth of the non-native invasive grass phragmites, which is of generally low value as food or cover by wildlife. The phragmites cover extends over most of the emergent wetlands and under the tree canopy in most of the forested wetlands, as well as most of the abutting uplands. No USACE and/or MDE jurisdictional wetlands or other waters of the U.S. would be impacted by the construction of the CCNPP Unit 3 project within Wetland Assessment Area VI.

6.2.7 Wetland Assessment VII

The total wetland area in Wetland Assessment Area VII is 11.55 acres. Construction of the access road will require filling 0.72 acre of jurisdictional forested wetlands in Wetland Assessment Area VII. Construction, however, will not involve disturbing the main channel of Goldstein Branch or its directly adjoining wetlands. Construction will also disturb 3.41 acres of uplands designated as non-tidal wetland buffer by Calvert County. A portion of the laydown area north of Lake Davies consists of a 0.62-acre wetland mitigation area (created marsh). This wetland and its 50-foot buffer totaling 2.07 acres will not be impacted, but protected by a maintained super silt fence.

No Practicable Alternative

The construction access road was originally sited near Johns Creek, as this was the most direct route (given the existing topography) to the power block construction site. To minimize the impact to the wetlands associated with Johns Creek and Goldstein Branch, the construction road was relocated. In addition, the original proposed location of a concrete batch plant was moved so as to preserve the maximum amount of wetlands and wetland buffer in Wetland Assessment Area VII.

Impacted Wetland Features

The evaluation of wetland functions and values included in Section 5.0 of this report identified six functions (groundwater recharge/discharge, fish and shellfish habitat, sediment/toxicant retention, nutrient removal, production export, and wildlife habitat) and one value (recreation) present in Wetland Assessment Area VII. Of these, nutrient removal and wildlife habitat have been identified as principal. Nutrient removal was identified as principal because the assessment area contains emergent vegetation in places and receives runoff from lawns on private property close to MD 2/4. Wildlife habitat was identified as principal in nature because the assessment area is a largely intact natural system largely free of urban or agricultural development. This area was considered important based on the quality of its wildlife habitat and on its contribution to nutrient removal in the local region.

6.2.8 Wetland Assessment VIII

The total wetland area in Wetland Assessment Area VIII is 0.45 acre. Within Wetland Assessment Area VIII, no wetlands and other waters of the U.S. or the associated non-tidal wetland buffer designated by Calvert County would be impacted by the construction of the CCNPP Unit 3 project.

6.2.9 Wetland Assessment IX

The total wetland area in Wetland Assessment Area IX is 1.10 acres. Wetland Assessment Area IX consists of a small remnant area of forest land surrounded by existing roadways and parking lots. The construction of a temporary laydown area (Laydown Area 2) will require filling 0.46 acre of emergent wetlands and 0.64 acre of forested wetlands.

No Practicable Alternative

Once construction of the switchyard begins and the area can no longer be used for laydown, it will be used as a parking lot. Construction will also disturb 2.81 acres of uplands designated as non-tidal wetland buffer by Calvert County. The affected buffer consists of undeveloped forested land and mowed grassland adjoining existing roadways.

Impacted Wetland Features

The affected wetlands and associated buffers are of low functional quality. The evaluation of wetland functions and values included in Section 5.0 of this report identified only one function (wildlife habitat) and one value (visual quality/aesthetics). Neither was identified as principal. The small size of the forest and the proximity to areas of heavy human and vehicular use make it generally unattractive to most terrestrial wildlife. Surface flow in the wetlands is all directed into existing storm sewers rather than into natural streams; therefore, the opportunity for the wetlands to perform water quality functions or production export to aquatic food chains is minimal. With these considerations, the loss of wetlands in Wetland Assessment Area IX represents a minimal loss of wetland functions and values.

6.3 IMPACTS TO STREAM FEATURES

A total of approximately 8,350 lf of jurisdictional (perennial and intermittent) stream channels were identified within the proposed impact area (limits of clearing) on the CCNPP Unit 3 project site. Within the proposed impact area, 5,076 lf of streams have wetland areas immediately abutting them, while 3,274 lf of streams do not contain abutting wetlands. The boundaries of these stream channels are presented in Figure 5.4-1. Proposed impacts to the jurisdictional stream channels, within individual wetland assessment areas, are presented in Table 6.3-1 and Figure 6.3-1. The CCNPP Unit 3 proposed impact area contains approximately eleven stream reaches. To better understand the current conditions of each stream impact reach a resource assessment was conducted on site during April 2008. A photographic log of the stream reaches is provided in Appendix B.

The resource assessment included observation and measurement of stream quality, function, general dimension and biology. By using the Rapid Bioassessment Method (USEPA, 1999), a reach representative of each stream impact segment was assessed for habitat quality (see Table 6.3-2). In-situ water quality was measured in each reach using a multi-parameter water quality monitoring system, the Horiba-U22. Stream function, width, and depth were observed and estimated by a Rosgen trained professional. In addition, a benthic macro-invertebrate assessment was conducted in each stream reach that qualified as “sampleable”-as discussed in the Maryland Biological Stream Survey (MBSS) guidelines

(Kazyak, 2001). Appendix C includes the stream habitat assessment field data sheets.

Stream impact assessment reaches have been assigned an alphanumeric qualifier (see second column of Table 6.3-1); i.e., each qualifier identifies the wetland assessment area and the specific stream reach within the assessment area where the impact is to occur. The "RA" prefix was assigned during the USACE site inspection (Jurisdictional Determination) of stream features and wetland areas on the CCNPP Unit 3 site.

Table 6.3-1: Proposed Impacts to Jurisdictional Stream Channels, CCNPP Unit 3 Site, Calvert County, Maryland.

Wetland Assessment Area	Stream Reach Identification No.	Impact Length (lf)	12-Digit Hydrologic Unit Code
I	RA-I-A	729	020600040403
IV Central	RA-IVC-A	1,595	020600060706
IV North	RA-IVN-A	102	020600060706
IV North	RA-IVN-B	2,943	020600060706
IV North	RA-IVN-C	555	020600060706
IV North	RA-IVN-D	1,342	020600060706
VII North	RA-VIIN-A	521	020600060706
VII South	RA-VIIS-A	563	020600060706
Total		8,350	

Table 6.3-2: Stream Functional Biological Conditions by Proposed Impact Reach, CCNPP Unit 3 Site, Calvert County, Maryland.

Location / Sample ID	Stream Reach Identification No.	Impact Length (lf)	RBP Score
UT-JC-I-1	RA-IVC-A	1,595	105—Sub-Optimal
UT-JC-I-2	RA-IVN-D	1,342	138—Sub-Optimal
UT-JC-I-3	RA-IVN-A,B,C	combined	129—Sub-Optimal
UT-JC-I-4	RA-IVN-B	2,943	126—Sub-Optimal
UT-JC-I-5	RA-IVN-C	555	111—Sub-Optimal
UT-JC-I-6	RA-IVN-A	102	132—Sub-Optimal

Location / Sample ID	Stream Reach Identification No.	Impact Length (lf)	RBP Score
UT-GB-I-1	RA-VIIN-A	261	124—Sub-Optimal
UT-GB-I-2	RA-VIIN-A	260	134—Sub-Optimal
UT-GB-I-3	RA-VIIS-A	563	60—Marginal
LC-I-1 of 1	RA-I-A	729	129—Sub-Optimal

Notes: RBP = Rapid Bioassessment Protocols.

6.3.1 Stream Impact Reach Number RA-I-A

Construction of the power block of CCNPP Unit 3 will require the loss of approximately 617 lf of jurisdictional stream channel, an unnamed tributary to the Chesapeake Bay. Construction of the heavy haul road will impact 112 lf of jurisdictional stream channel. The construction activities in or adjacent to the stream segment will require: (1) removal of canopy and understory vegetation along stream banks, (2) filling the stream channel with clean earthen material, and (3) providing subsurface drainage. The affected intermittent and first order perennial stream channels have been deeply scoured by surface runoff and are adjoined by very narrow strips of floodplain wetlands that are less than 5 ft in width and bounded by steep, eroding banks.

6.3.2 Stream Impact Reach Number RA-IVC-A

Construction of the cooling tower in or adjacent to this stream segment will require: (1) removal of canopy and understory vegetation along stream banks, (2) filling the stream channel with clean earthen material, (3) providing subsurface drainage, and (4) placing of additional fill material on top of the clean earthen material to complete grading. This effort will require the loss of approximately 1,445 lf of jurisdictional stream channel, an unnamed tributary to John's Creek. The laydown area associated with construction will require the loss of approximately 150 lf of jurisdictional stream channel.

6.3.3 Stream Impact Reach Number RA-IVN-A

Construction of the heavy haul road and the construction access road in or adjacent to this stream segment will require: (1) removal of canopy and understory vegetation along stream banks, (2) filling the stream channel with clean earthen material, and (3) providing subsurface drainage. This effort will require the loss of approximately 102 lf of jurisdictional stream channel, as the northern most reach of an unnamed tributary to John's Creek.

6.3.4 Stream Impact Reach Number RA-IVN-B

Construction of the switchyard in or adjacent to this stream segment will require: (1) removal of canopy and understory vegetation along stream banks, (2) filling the stream channel with clean earthen material, and (3) providing subsurface drainage. This effort will require the loss of approximately 2,515 lf of jurisdictional stream channel, as two unnamed tributaries to John's Creek. Construction of the heavy haul road for CCNPP Unit 3 will require the loss of approximately 428 lf of jurisdictional stream channel.

6.3.5 Stream Impact Reach Number RA-IVN-C

Construction of the switchyard for CCNPP Unit 3 will require the removal of canopy and understory vegetation along stream banks. This effort will require degradation of an unnamed tributary to John's Creek, approximately 555 lf of jurisdictional stream channel.

6.3.6 Stream Impact Reach Number RA-IVN-D

Construction of the switchyard in or adjacent to this stream segment will require: (1) removal of canopy and understory vegetation along stream banks, (2) filling the stream channel with clean earthen material, and (3) providing subsurface drainage. This effort will require the loss of an unnamed tributary to John's Creek, approximately 1,107 lf of jurisdictional stream channel. Construction of the laydown area for construction of CCNPP Unit 3 will require the loss of approximately 235 lf of jurisdictional stream channel.

6.3.7 Stream Impact Reach Number RA-VIIN-A

Construction of a construction access road in or adjacent to this stream segment will require: (1) removal of canopy and understory vegetation along stream banks, (2) filling the stream channel with clean earthen material, and (3) providing subsurface drainage. This effort will require the loss of approximately 521 lf of jurisdictional stream channel, an unnamed tributary to Goldstein Branch.

6.3.8 Stream Impact Reach Number RA-VIIS-A

Construction of a construction access road in or adjacent to this stream segment will require: (1) removal of canopy and understory vegetation along stream banks, (2) filling the stream channel with clean earthen material, and (3) providing subsurface drainage. This effort will require the loss of approximately 563 lf of jurisdictional stream channel, an unnamed tributary to Goldstein Branch. The Construction will not involve disturbing the main channel of Goldstein Branch. The project proposes to use bridges and culverts to minimize disruption to jurisdictional stream channels.

6.4 IMPACTS TO CHESAPEAKE BAY

Impacts to the waters of Chesapeake Bay as a result of the construction of the CCNPP Unit 3 are discussed in Section 10.0 of this report.

7.0 WETLAND/STREAM COMPENSATORY MITIGATION PLAN

7.1 OVERVIEW

The distribution, structure, and species composition of the vegetative communities that occur at the CCNPP site reflect historic and current land use practices, such as selective silviculture, agriculture, recreational hunting, and construction. The wetland communities that occur at the site primarily include poorly-drained bottomland deciduous forest and herbaceous marsh. The forested wetlands are areas of poorly-drained, seasonally saturated soils in lowlands adjoining Johns Creek, Goldstein Branch, their headwaters, and other streams on the site. The herbaceous marsh habitat includes a marshy fringe surrounding the shore of the Camp Conoy Fishing Pond, two smaller impoundments on the wetland/stream drainage way carrying the outflow from Camp Conoy Fishing Pond to the Chesapeake Bay, a constructed wetland (mitigation area) in the northwestern part of the project site, and a marshy fringe surrounding a stormwater pond immediately west of the existing CCNPP Barge Dock on the Chesapeake Bay. Open water habitat exists within the Camp Conoy Fishing Pond and in the largest of the three sediment basins at the Lake Davies Disposal Area.

The CCNPP site is well drained by a natural network of short, ephemeral, intermittent, and perennial streams. Approximately 80% of the land area of the site is drained through the St. Leonard Creek drainage basin of the Lower Patuxent River watershed. The remaining 20% drains through the Maryland Western Shore watershed discharging northeastward and directly into the Chesapeake Bay by two unnamed creeks, known as Lone Creek and Conoy Creek. All the streams that drain the site (located east of MD 2/4) are nontidal. Runoff from the site that lies within the St. Leonard Creek watershed mainly drains through Johns Creek, a tributary to St. Leonard Creek. The tributaries located upstream of MD 2/4 that contribute to Johns Creek are the Goldstein Branch, Laveel Branch, and two unnamed branches. The St. Leonard Creek watershed includes St. Leonard Creek and its tributaries, including the Perrin Branch, Woodland Branch, Planters Wharf Creek, Johns Creek and its tributaries, Grovers Creek, Rollins Cove, and Grapevine Cove. The combined flow from these streams discharges into the Patuxent River through St. Leonard Creek. St. Leonard Creek is tidally influenced at the confluence with Johns Creek.

The construction footprint for the proposed facilities has been designed to minimize encroachment into areas delineated as wetlands or other waters of the U.S. However, construction of the proposed facilities would not be possible without permanently impacting approximately 8,350 lf of intermittent and upper perennial stream channels (jurisdictional) and approximately 11.71 acres of the delineated wetland and open water areas (USACE and/or MDE jurisdictional). Most of the impacts to jurisdictional wetlands and streams would take place in Wetland Assessment Areas II, IV and VII. Minor impacts are proposed for Wetland Assessment Areas I, VI, and IX. The proposed impacts to the jurisdictional wetlands and streams will require compensatory mitigation by the USACE and the MDE. The principal components of the wetland mitigation plan and the stream mitigation plan are discussed below.

The USACE and the USEPA have issued regulations governing compensatory mitigation for activities authorized by permits issued by the USACE. The regulations establish performance standards and criteria for the use of permittee-responsible compensatory mitigation, mitigation banks, and in-lieu programs to improve the quality and success of compensatory mitigation projects for activities authorized by USACE permits. The Final Compensatory Mitigation Rule is presented in the April 10, 2008 Federal Register as *Compensatory Mitigation from Losses of Aquatic Resources* (USACE - 33 CFR Parts 325 and 332; USEPA - 40 CFR Part 230). Maryland has similar mitigation standards (COMAR 26.23.04.02). The compensatory mitigation plan for the CCNPP Unit 3 site was prepared pursuant to these rules. In addition, the mitigation monitoring program for the CCNPP Unit 3 site was prepared following the guidance presented in Special Public Notice Number 06-50 (Compensatory Mitigation Monitoring

Requirements), as released by the Baltimore District of the USACE on September 27, 2006 and the Maryland regulations (COMAR 26.23.04.04). Finally, the compensatory mitigation plan for the CCNPP Unit 3 site was prepared pursuant to the following guidance: *Model Compensatory Mitigation Plan Checklist for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act*, Memorandum to the Field, as issued by the USACE and USEPA, 2003. The aforementioned guidance is also utilized by the MDE.

7.2 WETLAND MITIGATION PLAN

7.2.1 Development Plan/Wetland Mitigation Overview

Based on the site development plan and the boundaries of the wetlands and surface water areas on the CCNPP Unit 3 project site, a total of 11.71 acres of wetlands and surface waters (USACE and/or MDE jurisdictional) will be impacted during the construction of the proposed facility. The proposed impacts and types of impacts are presented in Table 6.1-1. The impacts encompass 7.87 acres of forested wetlands (0.08 acres are isolated), 1.21 acres of emergent wetlands, and 2.63 acres of open water. The wetland impact areas are specifically characterized as poorly drained bottomland hardwood forest and freshwater marsh. The open water impacts include Camp Conoy Fishing Pond. No temporary wetland impacts are proposed for the construction of the proposed facility.

To determine the required compensatory mitigation for wetland impacts, the Baltimore District of the USACE was consulted to determine the appropriate mitigation strategies for the project. The proposed compensatory "in kind" mitigation for the scheduled impacts to wetlands and surface waters on site is intended to meet the mitigation requirements of the USACE Baltimore District and includes the creation and enhancement of wetlands to conditions more suitable for use by wildlife species native to the region. Appropriate and practicable steps to minimize the adverse impacts were conducted through analysis of multiple site development plan concepts. The mitigation areas were chosen after a mitigation site selection process was conducted. Four general mitigation strategies were initially identified: (1) on site and in kind; (2) on site and not in kind; (3) off site and in kind; and (4) off site and not in kind. The mitigation strategy chosen for the CCNPP Unit 3 project was on site and in kind mitigation, as this strategy, or mitigation action, would replace nontidal wetland acreage and functional losses more effectively than the other three strategies (COMAR 26.23.04.03).

The proposed wetland and stream impacts on the CCNPP Unit 3 site occur within the same hydrologic units as the wetland enhancement and creation areas and the stream enhancement and restoration areas; i.e., the Patuxent River Lower and West Chesapeake Bay hydrologic units. The geographic relationship between the areas of nontidal wetland and stream losses and the proposed mitigation sites provide an opportunity to mitigate impacts at an upper watershed level (Figure 7.2-1). These mitigation sites or either located adjacent to, or within one-quarter mile of the areas of impact. The watershed approach used in the design of the compensatory mitigation plan for CCNPP Unit 3 is consistent with the ongoing natural resource management activities that have been conducted at CCNPP over the years and USACE mitigation guidance. The mitigation activities will also be compatible with comprehensive watershed management plans for CCNPP. No purchase of bank credits will be made to satisfy compensatory mitigation requirements, as the project site does not lie within the service area of any approved, State of Maryland, wetland/stream mitigation bank (COMAR 26.23.04.03).

The wetland mitigation plan will encompass on site wetland enhancement and wetland creation, as described in the following section. The goal of the mitigation plan is "no net loss" of wetlands.

7.2.2 On site Wetland Enhancement/Wetland Creation

Compensatory mitigation for unavoidable impacts to approximately 11.71 acres of jurisdictional forested wetlands, emergent (herbaceous) wetlands, and surface waters (including Camp Conoy Fishing Pond) (USACE and/or MDE jurisdictional) will include: (1) the enhancement of one manmade, abandoned, sediment basin within the Lake Davies Disposal Area; (2) the enhancement of a portion of Johns Creek; (3) the creation of forested and herbaceous wetland habitat within the largest manmade, abandoned, sediment basin of the Lake Davies Disposal Area; and (4) the creation of forested wetland habitat within the Camp Conoy area which lies within the CBCA (Figure 7.2-1). The primary goal of the mitigation plan is to establish viable bottomland hardwood forest habitat and emergent wetland habitat within a historically-altered upland area (Lake Davies Disposal Area), along with enhancement of existing poorly drained bottomland hardwood forest habitat within Johns Creek and the creation of forested wetland habitat within the Camp Conoy area. The Calvert County Soil and Water Conservation District (CCSWCD) has been contacted and this agency can assist the Co-Applicants with wetland creation needs; i.e., potential offsite mitigation areas that could be acquired to meet any deficit in wetland creation for the project.

Within the Lake Davies Disposal Area (Assessment Area VI), wetland creation will be provided for the northernmost, abandoned, sediment basin through the establishment of the following vegetative zones: (1) an interior open water (pond) area will be planted with floating aquatic species; (2) a surrounding freshwater marsh fringe will be planted with herbaceous plant species; and (3) an outer zone will be planted with woody bottomland hardwood species. Fill material will be deposited within the sediment basin to raise the ground elevation across the entire basin. The undesirable, exotic, plant species phragmites, which is currently infesting the sediment basin, will be eradicated through the application of chemical herbicide prior to the aforementioned filling and planting activities. The hydroperiod of this created wetland area will be manipulated through the establishment of a water control structure. Through these mitigation activities, approximately 0.9 acre of open water (pond) habitat and 1.3 acres of freshwater marsh habitat will be created. The planting of approximately 7.2 acres of bottomland hardwood forest is characterized as forested wetland creation.

The central sediment basin will be enhanced through the eradication of phragmites, by application of chemical herbicide, and the planting of woody bottomland hardwood species. These mitigation activities will provide approximately 2.4 acres of wetland enhancement.

Wetland enhancement will also be provided within a significant portion of Johns Creek system through the eradication of phragmites, by application of chemical herbicide, and the planting of woody bottomland hardwood species. The target areas encompass: (1) the eastern (upstream) and western (downstream) portions of Johns Creek in the vicinity of the confluence of Johns Creek and a remnant stream system that extends northward into the Lake Davies Disposal Area and (2) the aforementioned remnant stream system within the Lake Davies Disposal Area. These mitigation activities will provide approximately 15.7 acres of wetland enhancement.

The planting of desirable woody species within the enhancement areas of Johns Creek, along with phragmites control, will provide wildlife habitat within this poorly-drained bottomland hardwood forest community. The phragmites-infested portions of Johns Creek have been significantly degraded over time as a result of recruitment of this invasive species. Therefore, the proposed mitigation activities will replace the loss of one or more functions within the targeted wetland community.

Phragmites are a perennial grass that can grow to more than 10 ft in height. Flowering and seed set occur between July and September. Germination occurs in spring on exposed moist soils. Vegetative spread by below-ground rhizomes (roots) can result in dense patches with up to 20 stems per square foot (Tetra Tech NUS, 2007). Phragmites are capable of vigorous vegetative reproduction and often forms dense, nearly monospecific stands, as has been observed in Johns Creek and other forested wetland areas on the CCNPP Unit 3 site. Therefore, the benefits of eradicating phragmites would be the replacement of a somewhat sterile environment with a more diverse community through the planting of desirable plant species (COMAR 26.23.04.03). The likelihood of the long-term success of the enhancement activity will be increased through the control of phragmites during the monitoring period (COMAR 26.23.04.03). Finally, there should be no adverse impact on natural resources from the enhancement activity. For example, if phragmites have impeded the flow of water between wetland systems on site, then the control of this invasive species will improve hydrology among the infested wetlands (COMAR 26.23.04.03).

Finally, compensatory mitigation for unavoidable impacts is proposed through the creation of forested wetland habitat within the Camp Conoy area. The wetland creation area will be located between the existing tennis courts and the Camp Conoy Fishing Pond (Assessment Areas I and II). The appropriate wetland hydroperiod will be achieved through the capture of stormwater runoff from the power block. The wetland creation area will be planted with seedlings of hydrophytic tree and shrub species. Approximately 4.6 acres of forested wetlands will be created in this location. Finally, wildlife habitat for wetland dependent and wetland independent species will be created. These created wetlands will provide waterfowl habitat; i.e., winter flooded conditions for resident and migratory species, with drawdown in the spring to maintain the vitality of the planted tree species and provide a suitable substrate for plant regeneration.

7.2.3 Wetland Mitigation Planting Plan

The following areas will be planted with native hydrophytic trees and shrubs: (1) the wetland creation area at Camp Conoy; (2) the bottomland hardwood forest component of the northern and central sediment basins of the Lake Davies Disposal Area; and (3) the bottomland hardwood forest component of the eastern (upstream) and western (downstream) portions of Johns Creek in the vicinity of the confluence of Johns Creek and the Lake Davies Disposal Area. The tree and shrub species will be planted at a density of 680 stems per acre (eight-foot centers). This actual planting density of 680 stems per acre will be higher than the design density of 436 stems per acre (ten-foot centers); i.e., to allow for anticipated mortality from wildlife depredation by deer or other browsers and defoliation by insects during early seedling establishment. The plant material will be representative of the species composition of the adjacent forested wetlands and native to the region. In addition, the plant material will include species that have been identified as suitable for installation on wetland mitigation projects by the CCSWCD. The final selection of plant stock may be determined to some extent by availability. The selected trees and shrubs will consist of two gallon containerized stock protected by tree shelters (i.e., TUBEX® or Miracle Tube tree shelters). The tree shelters will provide protection from wildlife depredation, wind, or other influences. The tree material for installation will include willow oak (*Quercus phellos*), water oak (*Quercus nigra*), black gum (*Nyssa sylvatica*), green ash (*Fraxinus pennsylvanica*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), and/or tulip tree (*Liriodendron tulipifera*). The shrub material will include silky dogwood (*Cornus amomum*), inkberry (*Ilex glabra*), shadbush (*Amelanchier canadensis*), highbush blueberry (*Vaccinium corymbosum*), possum-haw (*Viburnum nudum*), elderberry (*Sambucus canadensis*), and Virginia willow (*Itea virginica*). The palette of tree and shrub species will be finalized before installation. Additional species may be added if they are determined to be highly suitable for installation in the target wetland creation areas.

The open water (pond) habitat within the northernmost sediment basin will be planted with pondweed (*Potamogeton* sp.), water lily (*Nymphaea* sp.), or other suitable floating aquatic species. The marsh fringe of the northernmost sediment basin will be planted with native hydrophytic herbaceous species. The herbaceous species will be planted at a density of 4,800 stems per acre (three-foot centers). The plant material will be representative of the species composition of adjacent herbaceous wetlands and native to the region. In addition, the plant material will include species that have been identified as suitable for installation on wetland mitigation projects by the CCSWCD. The final selection of plant stock may be determined to some extent by availability. The herbaceous material for installation will include arrow arum (*Peltandra virginica*), duck potato (*Sagittaria latifolia*), water plantain (*Alisma subcordatum*), and/or pickerelweed (*Pontederia cordata*). The palette of herbaceous species will be finalized before installation. Additional species may be added if they are determined to be highly suitable for installation in the target wetland enhancement areas. The eradication of phragmites will be conducted through the application of approved herbicide. The eradication of phragmites will be completed before the installation of plant material.

7.2.4 Mitigation Monitoring Program

Following the completion of the on site wetland creation and wetland enhancement activities, a five-year annual monitoring plan will be implemented pursuant to the Maryland Department of the Environment, Water Management Administration (MDEWMA) mitigation monitoring guidelines and protocols. This effort will entail the establishment of sample plots and/or belt transects within the mitigation areas to obtain data on survivorship, growth, and vitality of the planted vegetation. Additional data to be reported at the mitigation areas will include: (1) species composition of recruited, desirable plant species; (2) species composition and areal cover of nuisance/non-native plant species; (3) wildlife utilization and depredation; (4) hydrologic conditions (surface inundation or depth to groundwater); and (5) current site conditions at fixed photographic points.

The monitoring program will include an initial baseline (time-zero) monitoring event, to be conducted immediately following the planting of the mitigation areas. After the baseline event is completed, a five-year monitoring schedule will be initiated, to include annual sample events during September-October of each year. A baseline report and five annual monitoring reports will be prepared for review by regulatory staff. The reports will include the vegetative sampling results, current hydrologic conditions, photo-documentation, descriptions of problems encountered, and discussion of maintenance actions taken. Monitoring reports will be submitted within 90 days of each monitoring event. Monitoring reports will be submitted to the USACE and the MDEWMA. Following agency review and coordination, remedial/contingency measures will be implemented, if required.

The targets for the creation and enhancement efforts will be divided into two specific areas: (1) creation and enhancement of wetland communities and (2) creation or sustainment of adequate hydrology. The specific success criteria for the monitoring program will be identified prior to the implementation of planting and monitoring activities, but will include, at a minimum, the success of the planted vegetation, as measured through survivorship counts and observations of vitality and growth, and the existence of adequate hydrology. If success criteria have been satisfied at the completion of the five-year monitoring program, a request for release from monitoring will be made to the USACE and/or MDEWMA.

7.2.5 Performance Standards

Performance standards will be conducted in accordance with the MDE guidelines and with consideration of other permitting agencies as mandated by the state of Maryland.

7.2.5.1 Specific Success Criteria

The target for the wetland creation/enhancement effort is vegetation-habitat creation/enhancement. The primary success criteria are discussed below:

A minimum density of 370 stems per acre (85% survivorship) of woody tree and shrub species (planted and naturally regenerated/recruited stems) within wetland creation areas;

a. Positive growth indicators on planted species, such as height and/or ground level diameter, within wetland creation areas; and

b. Zero percent (0%) areal cover of phragmites within treated (enhancement and created) areas.

7.2.5.2 Contingency

If success criteria are not met within the proposed mitigation area by the fifth (or otherwise determined final) year of the monitoring program, some additional replanting, re-grading, or hydrologic modification may be necessary at the mitigation site. Sufficient funding for this potential activity will be provided in the form of a Performance Bond or Letter of Credit. The amount of the Performance Bond or Letter of Credit will be determined and justified based on the required land management strategies and activities required to achieve ecological success.

The protection of the environment through the mitigation process cannot be denied. However, if the mitigation area(s) were to fail (i.e., not provide adequate compensatory mitigation for authorized impacts and causing a net loss in wetland function), some form of contingency would need to be in place to assure that remedial activities can be funded to bring the site into compliance. Financial guarantees provide assurances to the permitting agencies that monies will be available to perform remedial activities should they be required. The financial assurances for the proposed mitigation plan for the CCNPP Unit 3 site will be established in accordance with the USACE Regulatory Guidance letter (RGL) No. 05-1 (February 14, 2005) Guidance on the Use of Financial Assurances and may be provided in the form of a Performance Bond or Letter of Credit.

7.2.5.3 Legal Protection of Wetland Mitigation Areas

The wetland mitigation areas shall be protected in perpetuity through establishment of a legally-binding deed restriction, or other protection mechanism such as conservation easement or restrictive covenant (COMAR 26.23.04.03). These deed restrictions generally will follow the standard USACE Baltimore District model for such instruments. However, the deed restriction will allow the removal of dead and/or diseased trees, management of wildlife, and other conservation management strategies. In addition, easements will accommodate possible future utility crossings. The following items shall be provided with the deed restriction:

- A title insurance policy updated to the date of conveyance, after the recording of the protective mechanism for the mitigation area;

- A survey (or plat) and legal description of the mitigation area, showing all existing easements and encumbrances (if any), as identified in the title document submitted in recordable form; and

- A publicly recorded, certified copy of the protective mechanism.

The protection mechanism that is ultimately chosen for the wetland mitigation areas on CCNPP Unit 3 will include the following provisions (COMAR 26.23.04.03):

- Language granting the recipient agency, or any successor agency, access to the mitigation sites for inspections during the monitoring period and for construction of the mitigation project, if the permittee or person conducting the proposed activity forfeits a bond and the recipient agency decides to complete construction of the mitigation project;

- In the case of an easement agreement, language allowing assignment of a permittee's, or person conducting the proposed activity's, interest under the easement agreement to the recipient agency, if the bond is forfeited and the recipient agency decides to complete construction of the mitigation project;

- An absolute prohibition on the draining, dredging, removal, or filling of the created or enhanced nontidal wetland sites; and

- Language that the restriction is perpetual, binding on the grantor's personal representatives, heirs, successors, and assigns and runs with the land.

7.2.5.4 Long-Term Management Responsibilities

Long-term management and maintenance of the wetland mitigation sites will be assured through the placement of deed restrictions on the mitigation area. Formal management/maintenance of the mitigation site beyond the monitoring period will be the responsibility of the site owner. Ownership of the mitigation area will likely reside with CCNPP, Inc., CC3 or their respective assigns, until such time as the property is sold or donated to a public agency or private conservation organization. If the mitigation area should ever be sold, all appropriate protective mechanisms (which will have been recorded) will remain in effect and will remain with the site into perpetuity. The Co-Applicants propose that a Performance Bond be provided for the mitigation effort (COMAR 26.23.04.03).

7.3 STREAM MITIGATION PLAN

Stream restoration and stream enhancement, mitigation efforts, are intended to compensate for the direct loss of physical, biological and, or riparian function of impacted streams. Impacted streams are those unavoidable impacts such as physical, biological and riparian function that may be adversely affected during or after future development activity. In general, the physical functions are divided into hydrologic and hydraulic components. Hydrologic function compromised by development includes infiltration/ groundwater recharge, channel/floodplain storage and routing of precipitation and runoff. Hydrologic function also includes the resultant timing and quantity of surface runoff delivered to the receiving streams as discharge. Similarly, hydraulic function often disrupted by watershed development includes efficient flow conveyance and effective sediment transport. Because of the complex nature of riparian systems, impacts to the watershed hydrology and channel/riparian hydraulics can produce changes to the biology of associated aquatic resources. Aquatic resources can be adversely affected by any temporary or permanent change to physical, biological, and, or riparian component in an otherwise natural environment.

A complete walkthrough and inventory of plausible stream resources on CCNPP Unit 3 was conducted on February 21 and 22, 2008. Following this walkthrough, field notes and photographic logs were compiled and the opportunity for physical, biological and, or riparian "lift" and corresponding compensatory mitigation activity was realized at various locations throughout CCNPP. CCNPP stream restoration and enhancement (SR-X and SE-X) sites selected as candidates for compensatory mitigation are shown in Table 7.3-1 and on Figure 7.2-1. These areas contain the following references: SR-1 (Lower Woodland Branch); SR-2 (Upper Woodland Branch); SR-3 (Lone Creek); SR-4 (Johns Creek Mainstem); SR-5 (Unnamed Tributary to Johns Creek); SE-1(Unnamed Tributary to Lower Woodland Branch); SE-2 (Middle Woodland Branch); SE-3 (Unnamed Tributary to Upper Woodland Branch); SE-4 (Conoy Creek); and SE-5 (Unnamed Tributary to Johns Creek). Table 7.3-1 summarizes the mitigation activity (enhancement/restoration) by site, and provides location information:

Table 7.3-1. Stream Mitigation Summary, CCNPP Unit 3 Site, Calvert County, Maryland.

Stream Segment	Segment Length (lf)	Width (ft) of Up-lift	Area (ac)
SR-1 (Lower Woodland Branch)	2,114	varies*	6.78
SR-2 (Upper Woodland Branch)	1,534	varies*	2.90
SR-3 (Lone Creek)	1,237	varies*	0.77
SR-4 (Johns Creek mainstem)	951	varies*	2.76
SR-5 (Unnamed trib. Johns Creek)	447	varies*	1.15
Stream Restoration Total	6,283		14.36
SE-1 (Unnamed trib. L.W. Branch)	1,160	30	0.80
SE-2 (Middle Woodland Branch)	655	30	0.45
SE-3 (Unnamed trib. U.W. Branch)	507	30	0.35
SE-4 (Conoy Creek)	920	30	0.63
SE-5 (Unnamed trib. Johns Creek)	904	30	0.62
Stream Enhancement Total	4,146		2.86

*Varies per measurement of valley width.

Stream restoration intended to establish physical, biological and riparian function where once existed but has since been lost will include the adjustment of horizontal/vertical channel alignment and channel cross section performed on approximately 6,283 lf as follows: Lone Creek ~1,237 lf; Johns Creek (mainstem) ~ 951 lf; Johns Creek (unnamed tributary) ~ 447 lf; and Woodland Branch upstream and downstream (mainstem, two locations) ~ 2,114 lf and 1,534 lf, respectively. Additional restoration treatments include: instream habitat structures (cover logs, lateral/longitudinal diversity, root wads), bank stabilization (vegetative and bioengineering treatments) and riparian wetland enhancements (hydraulic and vegetative).

Stream enhancement activities, intended to increase existing functions include less intense grading operations and minor adjustments such as horizontal alignment and channel cross section, only at isolated features throughout. Additional proposed stream enhancements include: improvements to aquatic habitat, bank stabilization and native riparian planting. Enhancement activities will be performed on approximately 4,146 lf as follows: Conoy Creek ~920 lf; Johns Creek (unnamed tributary) ~ 904 lf; Woodland Branch (mainstem) ~ 655 lf; and Woodland Branch (unnamed tributaries, two total) ~ 507 lf and 1,160 lf.

Stream restoration and enhancement of proposed mitigation sites, combined with the proposed stormwater management plan, will offset losses to watershed functions by increasing the ability to provide flood storage, naturally recharge local aquifers, perform water quality improvement, and maintain stream and riparian functions that support corresponding ecology.

7.3.1 On Site Stream Restoration and Enhancement

After thorough field reconnaissance of all potential on-site restoration opportunities, the selected stream mitigation sites were chosen based on demonstrated tendency toward instability. Instability has been defined as the failure of a stream to self-maintain a state of dynamic-, or quasi-equilibrium. Within a stable system, specific parameters may exhibit change, but the overall properties of dimension, pattern and profile (over time) should fall within an acceptable range.

At the top of the watersheds within the CCNPP site, the valleys (Type II) exhibit moderately steep, gentle sloping side slopes. “B” type streams are most commonly found in these Type II valleys and are typically stable, with a low sediment supply. These valleys often exhibit exposed bedrock and have cascading or rapids-like features. Less common are "G" type streams, usually observed under disequilibrium conditions. Because these headwater streams demonstrate sufficiently better resistance and resilience to changes in hydrology (i.e. watershed development), they typically did not provide as great an opportunity for physical, biological and, or riparian “lift” as those further downstream in the selected systems, where the valleys become broadened and more alluvial (Type VIII). Type VIII valleys are characterized by their wide, gentle slope and a well-developed floodplain adjacent to river terraces.

Typically, the more broad alluvial valleys with well developed floodplains generally indicate the presence of "C" and "E" type streams. Stable “C” or “E” type streams are characterized by slight entrenchment and meandering channels that develop a riffle/run/pool bed form. However, because of historic farming and timber operations, and associated flux in the hydrologic regime, on site C and E streams have degraded into over widened and incised “F” and “G” type streams. As a result, these channels fail to maintain storm or high water flows access to the floodplain, and continue along their degraded evolutionary trend. This results in excessive contribution of sediment to downstream receiving waters and degraded habitat throughout the watershed. As the channels degraded, the process perpetuates upstream resulting in a valley transformation toward a Type IV. Until restoration measures are employed, this cycle and degradation will continue.

CCNPP sites were studied in detail to determine existing condition and the corresponding available physical, biological and, or riparian “lift.” Field studies included evaluations such as geomorphic and hydraulic for each site including: soils, representative cross sections, bank erosion hazard index (BEHI), near bank shear stress (NBS), and Phankuch channel stability.

Soils data include generalized classification obtained from a custom soils report provided by the NRCS, site observations, and channel bed/bar samples. Measured cross sections provided the opportunity to evaluate the following: (1) Entrenchment Ratio - A computed index value which is used to describe the degree of vertical containment of a river channel (width of the flood prone area at an elevation twice the maximum bankfull depth/bankfull width); (2) Width/Depth Ratio - An index value which indicates the shape of the channel cross-section (ratio of bankfull width/mean bankfull depth): and (3) Dominant Channel Materials - A selected particle size index value, the D_{50}, which represents the most prevalent of one of six channel material types or size categories, as determined from a channel material size distribution analysis. With these measurements, we can develop a more strongly supported understanding of state, process, and existing hydraulic properties.

BEHI, NBS, and Phankuch data provide additional means by which the existing channels can be compared and departure from stability determined. Provided calibration data exists (only obtained through multiple bank pin surveys), the combination of BEHI and NBS erodibility estimation tools can provide predictive erosion rates. This application involves continuous evaluation of bank characteristics and flow distribution along a reach and mapping their associated risk ratings along with bank and channel changes. An estimate of erosion rate is made, and then multiplied times the bank height times the length of bank of a similar condition, providing an estimate of cubic yards and/or tons of sediment/year/ linear foot. This information can be compared to the sediment yield data to apportion the amount of sediment potentially contributed by streambanks. However, even without locally significant calibration data, this method provides an index useful to develop a relative understanding of erosion rates. The Phankuch incorporates considerations of bank and bed form (including substrate, vegetation, active processes of aggradation/deposition) and rates the existing condition against the potential condition based on morphological characteristics associated with the rating. Preliminary interpretations are identified for potential vertical stability, width/depth ratio condition and sediment supply.

The following summarizes site specific existing conditions and generalizes the proposed mitigation.

> *SR-1 (Lower Woodland Branch)* – Located near the northern boundary on the CCNPP property, this site begins below a significant head-cut. Because of the extreme degree of entrenchment, practical improvements to the channel would include Priority I restoration. Priority 1 restoration would include relocating the main channel alignment away from the existing “F” type channel, beginning at a severe headcut and continuing downstream to an area where floodplain access is more available. As is typical for proposed relocation, the abandoned reach of channel will be plugged throughout to prevent bypass, however it will still retain depressional qualities allowing it to serve as an ephemeral pond.
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> *SR-2 (Upper Woodland Branch)* - Located in the northeast section of the CCNPP property, this site begins at an identified intermittent/perennial (I/P) transition of flow, and continues down valley until bank height ratios provide the opportunity to reconnect with the existing, semi-active floodplain. Similar to SR-1, practical improvements to Upper Woodland Branch would require Priority I restoration inclusive of relocating the main channel alignment away from the existing “G” type channel, or gully, beginning at a severe headcut upstream of the I/P point and continuing downstream to an area where floodplain access is more available.
>
> *SR-3 (Lone Creek)* – This channel, which is adjacent to the proposed power plant improvements, provides a unique opportunity to offset stream impacts by providing mitigation within the CBCA. Because of the extreme nature of the over widening and incision, this stream allows for Priority II restoration in the form of establishing a “new” active floodplain within the existing “F” type channel. However, this can only be accomplished through bank (future valley wall) grading and substantial adjustment of the existing alignment and profile. This restoration activity will begin immediately below the proposed fill zone, and continue downstream until reconnection with the adjacent floodplain becomes practical, near an existing culvert. From that point downstream to the confluence with the bay adjacent to a barge facilities active pier access road, Priority I restoration will be applied.

SR-4 (Johns Creek mainstem) – Located along Johns Creek between the proposed wetland enhancement zone (phragmites eradication) downstream and the reference reach site upstream, *SR-4* has been affected by a series of headcut activities resulting in this section of stream channel being over widened and incised. To remediate this, Priority I restoration is proposed whereby the existing channel will be abandoned and relocated toward the center of the valley, allowing for restored stream function. This treatment will continue for over 950 lf until acceptable access to the active floodplain is achieved.

SR-5 (Unnamed Tributary to Johns Creek) – Located southeast of John Creek in the southwest portion of the CCNPP property, this unnamed tributary to John's Creek is located upstream and adjacent to a proposed wetland enhancement zone. An entrenched, G type channel exhibits a series of medium size headcuts. Priority I restoration is proposed whereby the existing channel will be abandoned and relocated toward the center of the valley, allowing for restored stream function. This treatment will continue nearly 450 lf until acceptable access to the active floodplain is achieved.

SE-1 (Unnamed Tributary to Lower Woodland Branch) **-** This unnamed tributary is located in the northern portion of the site. The confluence of this tributary with Lower Woodland Branch is approximately 100 lf upstream from the terminus of the mainstem restoration. The existing channel shows signs of degradation occurring from various head cut activities suspected to be caused from down-cut and entrenched condition of Lower Woodland Branch at the confluence. Similar to other stream segments found in the Woodland Branch watershed, woody debris has softened the impacts of the downstream confluence. Enhancement in the form of adjustment of channel dimension along with re-vegetation would decrease the average channel shear stress and increase the resistance.

SE-2 (Middle Woodland Branch) **-** This site begins below an existing stream crossing/culvert (12" CMP). The culvert has acted to protect the upstream from further degradation by: (1) arresting upstream migration of headcuts; (2) providing flood storage upstream of the roadway embankment, suppressing modified peak discharge and timing; and (3) capturing excess sediment from downstream transport. The entrenchment of this stream reach has not escalated to unmanageable proportions, thereby allowing corrective measures to be addressed through minor changes to existing channel dimension. Maintaining the existing channel alignment, slight adjustments to the profile and channel cross section will allow the stream to transform from an existing "F" type channel toward a more stable "C" or "E" type channel.

SE-3 (Unnamed Tributary to Upper Woodland Branch) **-** This tributary is located in the northeastern portion of the CCNPP and forms part of the headwater of Woodland Branch. The existing channel shows signs of degradation occurring from various headcuts. The existence of in stream woody debris has softened the impacts of the headcuts. However, the current condition exhibits vulnerability to repeat occurrences and combined with restoration of the main channel, enhancement in the form of adjustment of channel dimension and assertive revegetation would decrease the average channel shear stress and increase the resistance.

SE-4 (Conoy Creek) – This stream orginates in Camp Conoy flowing from Lake Conoy toward the Chesapeake Bay and does not suffer from excessive degradation. This stream includes a sequence of impoundments built decades ago, which have since naturalized and function as wetlands. The primary element of enhancement at this site involves providing a major channel stabilization grade control feature at the confluence with the Chesapeake Bay. By preventing upstream migration of a single 15-foot headcut, this feature will preserve the upstream sequence of wetlands and stream channels. Additional enhancement throughout this reach includes riparian revegetation and minor bank grading where knickpoints have initiated.

SE-5 (Unnamed Tributary to Johns Creek) – This stream mitigation reach is located in the southwest portion of the CCNPP near the southern property boundary. This unnamed stream channel is a tributary to John's Creek and is located upstream of SR-5. The degradation seen in this stream segment is likely due to a combination of the downstream degraded SR-5 and that of historical land use in the valley. This segment appears to be in a state of transition from a slightly entrenched Bc to a highly entrenched G. Enhancement activity in the stream segment would include the grading of streambanks back to an angle more representative of natural stream slopes. The reduced streambank slope angle would allow the stream to better access its floodplain and improve ecological connectivity. Success of this enhancement reach could be contingent, in part, to effective re-establishment of grade control in the downstream, SR-5.

The total proposed impact to on site, jurisdictional, intermittent or perennial stream channels is 8,350 lf. To offset these proposed impacts, compensatory mitigation will be provided in the form of riparian and stream restoration and enhancement throughout onsite areas located completely within the contiguous CCNPP site. As a condition of mitigation, deed restrictions will be placed on all of the restored/enhanced streams establishing a conservation easement in perpetuity. The proposed mitigation will compensate for impacts to waters of the U.S. as a result of expansion of the CCNPP facilities.

7.3.2 Mitigation Determination for Streams

The stream mitigation credits were established in accordance with the USACE Standard Operating Procedure (SOP), Compensatory Stream Mitigation Guidelines. According to the SOP, up to 70 percent of the mitigation offered can be provided through preservation and 30 percent of the compensatory mitigation must be derived from in kind mitigation, including on site enhancement and/or stream channel/buffer restoration.

7.3.3 Stream Mitigation Plan Components

For identifying locations as mitigation opportunities for CCNPP Unit 3, on site and in kind mitigation was most practical to consider and initially investigate. This determination was made based on the availability of on site streams in areas outside the proposed impact area, and these areas are within the same watersheds as the proposed project. These strategies are the preferred methods of the USACE.

7.3.4 Performance Standards

Performance standards will be conducted in accordance with the MDE guidelines and with consideration of other permitting agencies as mandated by the state of Maryland.

7.3.4.1 Specific Success Criteria

The target for the restoration/enhancement effort is vegetation-habitat restoration/enhancement. The specific success criteria are presented below:

Mean density of approximately 435 stems per acre (planted and naturally regenerated/recruited stems), which match the dominant species of the reference areas, or

- A minimum of 320 stem survival of all planted species (as determined through vegetation monitoring), and

- Positive growth indicators on planted species (as determined through vegetation monitoring).

7.3.4.2 Contingency

If success criteria are not met within the proposed mitigation area by the fifth (or otherwise determined final) year of the monitoring program, some additional replanting, re-grading, or hydrologic modification may be necessary at the mitigation site. Sufficient funding for this potential activity will be provided in the form of a Performance Bond or Letter of Credit. The amount of the Performance Bond or Letter of Credit will be determined and justified based on the required land management strategies and activities required to achieve ecological success.

The protection of the environment through the mitigation process cannot be denied. However, if the mitigation area(s) were to fail (i.e., not provide adequate compensatory mitigation for authorized impacts causing a net loss in wetland function), some form of contingency would need to be in place to assure that remedial activities can be funded to bring the site into compliance. Financial guarantees provide assurances to the permitting agencies that monies will be available to perform remedial activities should they be required. The financial assurances for the proposed mitigation plan for the CCNPP Unit 3 site will be established in accordance with the USACE RGL No. 05-1 (February 14, 2005) Guidance on the Use of Financial Assurances and may be provided in the form of a Performance Bond or Letter of Credit.

7.3.4.3 Legal Protection of Stream Mitigation Areas

The stream mitigation areas shall be protected in perpetuity through establishment of a legally-binding deed restriction. These deed restrictions generally will follow the standard USACE Baltimore District model for such instruments. However, the deed restrictions will allow the removal of dead and/or diseased trees, management of wildlife, and other conservation management strategies. In addition, easements will accommodate possible future utility crossings. The following items shall be provided with the deed restriction:

- A title insurance policy updated to the date of conveyance, after the recording of the protective mechanism for the mitigation area;
- A survey (or plat) and legal description of the mitigation area, showing all existing easements and encumbrances (if any), as identified in the title document submitted in recordable form; and
- A publicly recorded, certified copy of the protective mechanism.

The protection mechanism that is ultimately chosen for the stream mitigation areas on CCNPP Unit 3 will include the following provisions (COMAR 26.23.04.03):

- Language granting the recipient agency, or any successor agency, access to the mitigation sites for inspections during the monitoring period and for construction of the mitigation project, if the permittee or person conducting the proposed activity forfeits a bond and the recipient agency decides to complete construction of the mitigation project;
- In the case of an easement agreement, language allowing assignment of a permittee's, or person conducting the proposed activity's, interest under the easement agreement to the recipient agency, if the bond is forfeited and the recipient agency decides to complete construction of the mitigation project;

- An absolute prohibition on the draining, dredging, removal, or filling of the restored or enhanced stream channels; and

- Language that the restriction is perpetual, binding on the grantor's personal representatives, heirs, successors, and assigns and runs with the land.

7.3.4.4 Long-Term Management Responsibilities

Long-term management and maintenance of the stream and wetland restoration sites will be assured through the placement of deed restrictions on the mitigation areas. Formal management/maintenance of the mitigation site beyond the monitoring period will be the responsibility of the site owner. Ownership of the mitigation area will likely reside with CCNPP, Inc., CC3 or their respective assigns, until such time as the property is sold or donated to a public agency or private conservation organization. If the mitigation area should ever be sold, all appropriate protective mechanisms (which will have been recorded) will remain in effect and will remain with the site into perpetuity. The Co-Applicants propose that a Performance Bond be provided for the mitigation effort (COMAR 26.23.04.03).

7.3.5 Monitoring Plan

Following mitigation activities, a minimum five-year annual monitoring plan will be implemented per the Interagency Mitigation Task Force's, *Maryland Compensatory Mitigation Guidance*, (August, 1994) and the USACE Baltimore District's, *Mitigation and Monitoring Guidelines,* (November, 2004). Multiple monitoring plots will be established and monitored for vegetative survivorship, vegetative growth indicators, and habitat attributes. At least one additional reference wetland plot will also be established for data comparison to the mitigation monitoring plots. The annual monitoring events will be conducted during September and October of each year.

This effort will begin with the initial baseline (existing) monitoring and establishment of a representative number of one-tenth acre vegetation monitoring plots along the proposed riparian buffer restoration/enhancement areas. The Year 1 monitoring event will begin with the post-construction monitoring event. During each subsequent annual monitoring event, vegetation on the channel banks and across the riparian buffer will be monitored at permanently located 0.1-acre rectangular sample plots at each restoration reach and reference reach cross-section. The sample plot dimensions will be 16 ft by 66 ft with the long side parallel to and congruent with the channel bank toe. The data gained from this monitoring will be compared to the number of specimens originally planted within each unit. The minimum acceptable survivability will be 320 trees (planted and recruited species). Indicators of growth (such as root collar diameter and seedling height) will be measured for each planted seedling within the monitoring plot during each annual monitoring visit. The reference monitoring plots will be used to monitor species composition for comparison to the mitigation area monitoring plots.

The planted woody species along the streambanks and within the stream riparian zones will include box elder (*Acer negundo*), common pawpaw (*Asimina triloba*), Virginia willow (*Itea virginica*), possumhaw (*Ilex decidua*), silky dogwood (*Cornus amomum*), tag alder (*Alnus serrulata*), ninebark (*Physocarpus opulifolius*), and/or elderberry (*Sambucus canadensis*). The final selection of plant stock may be determined to some extent by availability. The selected woody plants will consist of one gallon stock or live stakes. The palette of species will be finalized before installation. Additional species may be added if they are determined to be highly suitable for installation along the target streambanks and within stream riparian zones. Invasive/nuisance species which may need to be controlled within the mitigation site include phragmites.

Each annual monitoring report will include the following information:

- Total number of planted species on site;
- Observed plant diversity on site;
- Estimated survivorship (in monitoring plots);
- Observed natural recruitment (species and abundance);
- Tree and shrub health/vigor (*e.g.*, root collar diameter and tree height);
- Herbaceous vegetation growth/development;
- Wildlife observations; and
- Photographic documentation (conditions in each monitoring plat and throughout site).

Annual monitoring reports will include monitoring data, photographic documentation, descriptions of problems encountered, and discussion of maintenance actions taken. Reports will describe vegetation health and survival (*e.g.*, root collar diameter, seedling height, vigor score, etc.), wildlife observations, soil characteristics, habitat attributes, and nuisance/invasive species. Monitoring reports generally will be submitted within 90 days of the conclusion of each monitoring event.

Following agency review and coordination, remedial/contingency measures will be implemented, if required. Monitoring will then continue for an additional two years, or until success criteria have been met. Please note that once mitigation success has been achieved, active control of the wildlife including beaver will cease. No further protection of the mitigation areas from natural events beyond the presented plan is expected.

7.3.6 Adaptive Management Plan

The principal components of the Adaptive Management Plan are itemized below:

- Party(ies) responsible for adaptive management;

- Identification of potential challenges (e.g., flooding, drought, invasive species, seriously degraded site, extensively developed landscape) that pose a risk to project success. Discuss how the design accommodates these challenges;

- Discussion of potential remedial measures in the event mitigation does not meet performance standards in a timely manner; and

- Description of procedures to allow for modifications of performance standards if mitigation projects are meeting mitigation goals, but in unanticipated ways.

8.0 PROTECTED SPECIES

8.1 POTENTIAL FOR OCCURRENCE

Floral and faunal surveys were conducted on the CCNPP Unit 3 project site from May 2006 through April 2007 by Tetra Tech NUS to document quality and extent of habitat for animal and plant species, including protected (listed) species. More recently, MACTEC conducted general site reconnaissance of representative wetland and upland habitats from November 2007 through February 2008. An assessment of potential for occurrence of protected animal and plant species was conducted during the site reconnaissance. The protected animals and plants included those species that are listed pursuant to the U.S. Endangered Species Act (ESA) of 1973, 16 USC 1531-1544, December 28, 1973, as amended 1976-1982, 1984, and 1988 and the Maryland Nongame and Endangered Species Conservation Act (Annotated Code of Maryland 10-2A-01 and Code of Maryland Regulations 08.03.08), which are known to occur or potentially occur within Calvert County. Presence or absence of protected species was confirmed through direct observation or sign (sighting, tracks, scat, nests, dens, or call). No federally-listed species were observed during the surveys. The following state-listed species were observed: Shumard's oak (*Quercus shumardii*), showy goldenrod (*Solidago speciosa*), and the bald eagle (*Haliaeetus leucocephalus*). Potential for occurrence of protected (listed) species was also determined through confirmation of presence or absence of critical habitat on site or near the site. Finally, the USFWS and the DNR were contacted to obtain information on protected animal and plant species (element records of occurrence) in Calvert County.

Table 8.1-1 presents information on the potential for occurrence of protected species of animals and plants for Calvert County, Maryland (DNR, 2007). The likelihood of occurrence, as listed within this table, is based on a comparison of the known habitat use by these species and the habitats found within the CCNPP Unit 3 project site and the quantity, quality, and proximity of these habitats, as well as any observations of these species during field reconnaissance. The likelihood of occurrence for listed species was rated as high, moderate, low, or unlikely based on knowledge of a species' habitat preference and site conditions and whether or not it was observed during site surveys. A likelihood of occurrence given as "unlikely" indicates that no suitable habitat, or limited habitat, for this species exists on site.

Affected federal, State and regional agencies will be contacted regarding the potential impacts to the terrestrial ecosystem resulting from CCNPP Unit 3 plant construction. The Maryland Natural Heritage Program (MNHP), operated by the DNR, was consulted for information on known occurrences of federally-listed and State-listed threatened, endangered, or special status species and critical habitats (Byrne, 2006). Identification of the listed species discussed herein was based in part on information provided by that consultation. The USFWS was consulted via letter dated April 12, 2007 and responded on May 22, 2007 stating that no federally protected, threatened, or endangered species are known to exist within the proposed project area except for the occasional transient species, but qualified the response by stating that "if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered" (Ratnaswamy, 2007).

Table 8.1-1. Potential for Occurrence of State and Federally Listed Species, CCNPP Unit 3 Site, Calvert County, Maryland.

Common Name (*Scientific Name*)	Federal Status	State Status	General Habitat Description	Habitat Potentially Present on site?	Potential for Occurrence
FAUNA					
Shortnose Sturgeon (*Acipenser brevirostrum*)	E	--	Anadromous, living mainly in slower moving riverine waters or nearshore marine waters and migrating periodically into faster moving freshwater areas to spawn.	Limited to Chesapeake Bay waters	Unlikely
Northeastern Beach Tiger Beetle (*Cicindela dorsalis dorsalis*)	T	E	Ideal habitat for the adult beetles and their larvae are wide, undisturbed, dynamic, fine sand beaches. They feed, mate, and bask at the water's edge on warm, sunny days. Foraging occurs in the damp sand of the intertidal zone.	Best cliff habitat (larvae) and beach habitat (adults) occurs in southern portion of CCNPP property	Small numbers of adults (<25 individuals) have been observed in the past at northern end of CCNPP property
Puritan Tiger Beetle (*Cicindela puritana*)	T	E	Ideal habitat includes sandy beach habitats and beach shoreline areas with scattered vegetation and sandy clay soils.	Best cliff habitat (larvae) and beach habitat (adults) occurs in southern portion of CCNPP property	Observed on site (Chesapeake Bay cliff shoreline) since 1997 and as recently as 2006
Sedge Wren (*Cistothorus platensis*)	--	E	Inhabits the damp margins of wetlands dominated by grasses and sedges, wet meadows, wet pastures, and other damp grassland habitats. They also can be found in coastal marshes, but prefer grassy habitats in freshwater or in brackish situations where salinity levels are low.	Marginal	Low

Common Name **(*Scientific Name*)**	**Federal Status**	**State Status**	**General Habitat Description**	**Habitat Potentially Present on site?**	**Potential for Occurrence**
Eastern Narrow-mouthed Toad (*Gastrophryne carolinensis)*	--	E	Prefers moist areas and cover and can be found near ponds with fallen logs, and other debris. It can be found underground and hidden in debris during the day until night falls. Breeding takes place from April through October with rain.	Yes	Low to Moderate
Bald Eagle (*Haliaeetus leucocephalus)**	--	T	High pine, scrubby high pine, maritime hammock, mesic temperate hammock, pine rockland, scrubby flatwoods, mesic pine flatwoods, hydric pine flatwoods, dry prairie, wet prairie, freshwater marsh, seepage swamp, flowing water swamp, pond swamp, mangrove, saltmarsh, and seagrass. In general, habitats include riparian areas along the coast and near major rivers, wetlands, and reservoirs. Typically nest in large, tall open-topped trees near open water.	Yes	Observed on site
Black Rail (*Laterallus jamaicensis)*	--	E	Small bird that rarely flies and prefers to walk or run. Typical habitat is coastal salt and brackish marshes, with nests in areas of elevated marsh that are flooded only during extremely high tides. Nests can be found in marshes dominated by salt hay (*Spartina patens*). Freshwater marsh habitat utilized less frequently.	Marginal freshwater marsh habitat	Unlikely
Least Tern (*Sterna antillarum*)	--	T	Riverine nesting areas include sparsely vegetated sand and gravel bars within a wide unobstructed river channel or salt flats along lake shorelines.	No	Unlikely

Common Name **(*Scientific Name*)**	**Federal Status**	**State Status**	**General Habitat Description**	**Habitat Potentially Present on site?**	**Potential for Occurrence**
Loggerhead Sea Turtle (*Caretta caretta*)	T	--	Nests on ocean beaches, generally preferring high energy, relatively narrow, steeply sloped, coarse-grained beaches. Predominant foraging areas for western North Atlantic adult loggerheads are found throughout the relatively shallow continental shelf waters of the United States, Bahamas, Cuba, and the Yucatán Peninsula, Mexico.	Limited to Chesapeake Bay waters	Unlikely
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	E	--	Adult ridley turtles are found primarily in the Gulf of Mexico (nesting occurs in spring on Mexican beaches), but juveniles have been observed throughout the Atlantic Ocean. These sea turtles prefer shallow coastal waters.	Limited to Chesapeake Bay waters	Unlikely
Green Sea Turtle (*Chelonia mydas*)	T	--	Green sea turtles live in warm tropical waters from New England to South Africa and in the Pacific from Western Africa to the Americas. In Atlantic and Gulf of Mexico waters, green turtles are found in inshore and nearshore waters from Texas to Massachusetts, the U.S. Virgin Islands, and Puerto Rico.	Limited to Chesapeake Bay waters	Unlikely
Leatherback Sea Turtle (*Dermochelys coriacea*)	E	--	Leatherbacks mate in the waters adjacent to nesting beaches and along migratory corridors. The Caribbean (primarily Puerto Rico and the Virgin Islands) and southeast Florida support minor nesting colonies but represent the most significant nesting activity within the United States.	Limited to Chesapeake Bay waters	Unlikely
			FLORA		
Sensitive Joint-vetch (*Aeschynomene virginica*)	T	--	This species grows low in the intertidal zone where soils may be mucky, sandy, or gravelly.	No	Unlikely

Common Name (***Scientific Name***)	**Federal Status**	**State Status**	**General Habitat Description**	**Habitat Potentially Present on site?**	**Potential for Occurrence**
Blunt-leaved Gerardia (*Agalinis obtusifolia*)	--	E	Preferred habitat includes dry or seasonally dry habitats or sandy substrates. Habitat also includes seasonally wet pine savannas and flatwoods and hillside bogs in pinelands.	Yes	Low
Thread-leaved Gerardia (*Agalinis setacea*)	--	E	Prefers habitat in the coastal plain and adjacent to piedmont regions, including dry sandy woods and openings.	Yes	Low
Single-headed Pussytoes (*Antennaria solitaria*)	--	T	Slopes or stream banks in moist, rich, deciduous woodlands; occasionally in forest openings. Flowers early-mid spring.	Yes	Low to Moderate
Wooly Three-awn (*Aristida lanosa*)	--	E	Dry sandy soils	Yes	Low
Small-fruited Beggar-ticks (*Bidens mitis*)	--	E	Marshes, shallows in ponds or lakes, broad bands in shallow water at the shores of ponds or lakes, and open swampy woodlands and ditches.	Yes	Low
Red Turtlehead (*Chelone obliqua*)	--	T	Cypress swamps and wet woods.	Yes	Low
Standley's Goosefoot (*Chenopodium standleyanum*)	--	E	Waste places, cultivated land, and roadsides.	Yes	Low to Moderate
Linear-leaved Tick-trefoil (*Desmodium lineatum*)	--	E	Sandhills and other dry forests and woodlands.	Yes	Low

Common Name **(*Scientific Name*)**	**Federal Status**	**State Status**	**General Habitat Description**	**Habitat Potentially Present on site?**	**Potential for Occurrence**
Cream-flowered Tick-trefoil (*Desmodium ochroleucum*)	--	E	Along roadsides, rights-of-way, prairies or prairie-like openings, and in openings in mixed hardwood temperate forests. Suitable soil conditions are dry sandy loam soil, especially over limestone.	Yes	Low
Few-flowered Tick-trefoil (*Desmodium pauciflorum*)	--	E	Rich woods and wooded banks.	Yes	Low to Moderate
Rigid Tick-trefoil (*Desmodium rigidum*)	--	E	Dry pine woodlands, fields, woodland borders, and disturbed areas.	Yes	Low to Moderate
Glade Fern (*Diplazium pycnocarpon*)	--	T	Rich, calcareous, wooded slopes, ravines, and bottoms. Prefers continuous moisture and partial shade.	No	Unlikely
Tobaccoweed (*Elephantopus tomentosus*)	--	E	Found in open or shaded, dry to wet places in pine forests and mixed forests, often on sandy soils.	Yes	Low to Moderate
Rough-leaved Aster (*Eurybia radula*)	--	E	Can be found in fens, sphagnum bogs, lake and creek shores, edges of openings in wet spruce or tamarack forests, open boggy woods, wet meadows, and ditches.	Yes	Low
Broad-leaved Beardgrass (*Gymnopogon brevifolius*)	--	E	Pine savannas, sandhills, dry woodlands, prairies, and calcareous glades.	Yes	Low
Star Duckweed (*Lemna trisulca*)	--	E	Slow moving waters of ponds, lakes, beaver ponds, and swamps.	Yes	Low to Moderate

Common Name **(*Scientific Name*)**	**Federal Status**	**State Status**	**General Habitat Description**	**Habitat Potentially Present on site?**	**Potential for Occurrence**
American Frog's-bit (*Limnobium spongia*)	--	E	Can be found floating on slow-moving water of streams and lakes or stranded along the shore.	Yes	Low to Moderate
Climbing Fern (*Lygodium palmatum*)	--	T	Moist acid soil of thickets, marshes, and open woods.	Yes	Low
Anglepod (*Matelea carolinensis*)	--	E	Moist woods and thickets, rich wooded slopes bordering streams, river banks, low thickets, woods and less frequently in fields, ditches and along fence rows.	Yes	Low to Moderate
Narrow Melicgrass (*Melica mutica*)	--	T	Forests and woodlands, including coastal fringe and maritime forests.	Yes	Low to Moderate
Creeping Cucumber (*Melothria pendula*)	--	E	Prefers bottomland hardwood forests, moist roadsides and disturbed areas, as well as marshes.	Yes	Low to Moderate
Sweet Pinesap (*Monotropsis odorata*)	--	E	Prefers dry to mesic upland woods under oaks and/or pines, especially slopes or bluffs with abundant heaths.	Yes	Low
Evergreen Bayberry (*Morella caroliniensis*)	--	E	Prefers pocosins, wet savannas and pine flatwoods, sandhill seepage bogs, as well as other peaty or sandy-peaty wetlands.	No	Unlikely
Kidneyleaf Grass-of-Parnassus (*Parnassia asarifolia*)	--	E	Bogs, sphagnuous seeps, brook banks, and acidic habitats.	Yes	Low

Common Name **(*Scientific Name*)**	**Federal Status**	**State Status**	**General Habitat Description**	**Habitat Potentially Present on site?**	**Potential for Occurrence**
Marsh Fleabane (*Pluchea camphorata*)	--	E	Fresh to brackish marshes, shores, and ditches.	Yes	Low to Moderate
Dense-flowered Knotweed (*Polygonum densiflorum*)	--	E	Wet swamps, thickets, and margins of shallow pools.	Yes	Low to Moderate
Leafy Pondweed (*Potamogeton foliosus*)	--	E	Fresh, often calcareous, or brackish waters.	Yes	Low
Shumard's Oak (*Quercus shumardii*)	--	T	Prefers full sun, moist, well-drained soil and can be drought tolerant.	Yes	Observed on site
Hairy Snoutbean (*Rhynchosia tomentosa*)	--	T	Xeric woodlands and forests, sandhills, edges of woods and open areas.	Yes	Low
Englemann's Arrowhead (*Sagittaria engelmanniana*)	--	T	Blackwater stream banks, sphagnum bogs, pocosins, and beaver ponds.	Yes	Low
Sea-purslane (*Sesuvium maritimum*)	--	E	Island end flats, sea beaches, and salt flats.	No	Unlikely
Showy Goldenrod (*Solidago speciosa*)	--	T	Dry to moist thickets, open woods, and prairies.	Yes	Observed on site

Common Name (*Scientific Name*)	Federal Status	State Status	General Habitat Description	Habitat Potentially Present on site?	Potential for Occurrence
Rough Rushgrass (*Sporobolus clandestinus*)	--	T	Glades, barrens, thin soil of woodlands, and also in dry sands.	Yes	Low
Silvery Aster (*Symphyotrichum concolor*)	--	E	Dry sandy open oak-pine woods and barrens, and can also be found along roadsides.	Yes	Low
Southern Wildrice (*Zizaniopsis miliacea*)	--	E	Swamps and margins of stream, often tidal.	No	Unlikely

E Endangered

T Threatened

* Bald eagles have been delisted as a protected species by USFWS as of June 29, 2007. Though no longer afforded protection by the Endangered Species Act, the bald eagle is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act, both of which protect bald eagles by prohibiting killing, selling or otherwise harming eagles, their nests, or eggs.

Source: *Current and Historical Rare, Threatened, and Endangered Species of Calvert County, Maryland*; Maryland Department of Natural Resources, Wildlife and Heritage Service; December 13, 2007 List.

8.2 THREATENED AND ENDANGERED ANIMALS

8.2.1 Shortnose Sturgeon

Shortnose sturgeon (*Acipenser brevirostrum*) are typically large, long-lived fish that inhabit a great diversity of riverine habitats. The shortnose sturgeon is the smallest of the three sturgeon species that occur in eastern North America (National Marine Fisheries Service [NMFS] - National Oceanic and Atmospheric Administration [NOAA] Web Site: http://www.nmfs.noaa.gov/pr/species/fish/shortnosesturgeon.htm). The species is anadromous, living mainly in slower moving riverine waters or nearshore marine waters, and migrating periodically into faster moving freshwater areas to spawn. It prefers the nearshore marine, estuarine, and riverine habitat of large river systems. Shortnose sturgeon are benthic feeders. Juveniles are believed to feed on benthic insects and crustaceans. Mollusks and large crustaceans are the primary food of adult shortnose sturgeon.

The range of the species extends along the east coast of North America from the St. John River in Canada to the St. Johns River in Florida. In the northern portion of the range, shortnose sturgeon are found in the Chesapeake Bay system, Delaware River from Philadelphia, Pennsylvania to Trenton, New Jersey; the Hudson River in New York; the Connecticut River; the lower Merrimack River in Massachusetts and the Piscataqua River in New Hampshire; the Kennebec River in Maine; and the St. John River in New Brunswick, Canada.

No estimate of the historical population size of shortnose sturgeon is available. While the shortnose sturgeon was rarely the target of a commercial fishery, it often was taken incidentally in the commercial fishery for Atlantic sturgeon (*Acipenser oxyrhynchus oxyrhychus*). Construction of dams and pollution of many large northeastern river systems during the period of industrial growth in the late 1800's and early 1900's may have resulted in substantial loss of suitable habitat. In addition, habitat alterations from discharges, dredging or disposal of material into rivers, or related development activities involving estuarine/riverine mudflats and marshes, remain constant threats. Commercial exploitation of shortnose sturgeon occurred throughout its range starting in colonial times and continued periodically into the 1950's. The shortnose sturgeon was listed as endangered throughout its range on March 11, 1967 under the Endangered Species Preservation Act of 1966 (a predecessor to the ESA of 1973). The NMFS later assumed jurisdiction for shortnose sturgeon under a 1974 government reorganization plan (38 FR 41370). (NMFS - NOAA Web Site: http://www.nmfs.noaa.gov/pr/species/fish/shortnosesturgeon.htm).

In 1979, BGE researchers captured a shortnose sturgeon during trawl studies in the vicinity of the CCNPP site. Other isolated individuals may use the area intermittently; however, no shortnose sturgeon are known to have spawned in the Chesapeake in decades. In numerous fisheries studies conducted at CCNPP over the decades since Units 1 and 2 were built and with the exception of the aforementioned BGE reported element of occurrence, the shortnose sturgeon has not been observed in the vicinity of the plant. As an example, in twenty years of impingement monitoring from 1975 to 1995, no shortnose sturgeon were represented in any of the samples (Ringger, 2000). The potential for occurrence of the shortnose sturgeon on the CCNPP Unit 3 project site, or specifically within the Chesapeake Bay waters that abut the site, is therefore unlikely. With these considerations, a determination of “no effect” has been made for the shortnose sturgeon, as related to the construction of the proposed facility and its affect on this species and its habitat.

8.2.2 Northeastern Beach Tiger Beetle

The northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*) is listed as a federally threatened species and a State endangered species. It is known to occur on sandy cliffs and beaches in Calvert County.

There are two extant populations of the northeastern beach tiger beetle in southeastern Massachusetts, and the beetle has been found in the Chesapeake Bay region at 55 sites in Virginia and 13 sites in Calvert County, Maryland. The Chesapeake Bay populations include 15 with more than 500 adults (USFWS, 1994). This species does not have an established population within the boundaries of the CCNPP site, and consequently this site has not been one of the target sites that are annually surveyed for northeastern beach tiger beetle in Calvert County. However, in some years, small numbers of adults (<25 individuals) have been observed at the far north end of the CCNPP site. These adults were found to be confined to an approximate 330 ft section bordering Flag Ponds Nature Park, having apparently moved south from that area where a breeding population exists. However, no larvae or other evidence of a breeding population of northeastern beach tiger beetle has been known in this northern section of the CCNPP site. No adults were found on the CCNPP site in 2006 during field surveys conducted for this project (Knisley, 2006) nor were there any in the bordering section of Flag Ponds Nature Park. At Flag Ponds Nature Park, most of the adults and all larvae of northeastern beach tiger beetle are restricted to the northern half of this area, and only occasionally are small numbers of adults found in the southern end near the CCNPP northern site boundary.

The beach ecosystem conducive to northeastern beach tiger beetle survival is typically undisturbed by heavy human use, highly dynamic, and subject to natural erosion and accretion processes. Larvae dig vertical burrows over a relatively narrow band of the upper intertidal to high drift zone, capturing small arthropod prey passing nearby. In the Chesapeake Bay region, adults emerge in mid-June, reach peak abundance by very early July, and begin to decline through August. The adults are active on warm, sunny days along the water's edge, where they are commonly seen feeding, mating, or basking. Mating and egg laying occur from late June through August. Egg laying occurs in burrows. Populations are highly variable from year to year; i.e., the beetle is subject to local population extinctions and capable of dispersal and recolonization. The extirpation of the northeastern beach tiger beetle from most of its range has been attributed primarily to destruction and disturbance of natural beach habitat from shoreline developments, beach stabilization structures, and high recreational use.

The proposed construction activities for the CCNPP Unit 3 project should have no potential to affect the northeastern beach tiger beetle. This species has highly specific habitat requirements that limit its potential for occurrence on the entire CCNPP site to the sandy cliffs adjoining undeveloped shoreline stretches of the Chesapeake Bay (USFWS, 1994). No construction activities would take place on or within 500 ft of any cliff or beach habitats which are all located further south of CCNPP Units 1 and 2. The proposed intake and discharge pipelines and heavy haul road have been routed to impact the Chesapeake Bay shoreline at either the existing CCNPP Units 1 and 2 intake structure or just to the south near the barge slip where the shoreline consists of armored fill soil, a habitat unsuitable for the northeastern beach tiger beetle. The results of the 2006 survey (Knisley, 2006) indicated that the work proposed at the CCNPP Unit 3 project site will not have any effect on the northeastern beach tiger beetle or its habitat. However, since the beach south of the barge slip is favorable habitat for this species, mitigation measures will consist of administrative controls such as posting signage or fencing off the beach south of the barge slip area to restrict personnel access.

In summary, the northeastern beach tiger beetle does occur at CCNPP; i.e., as sporadic elements of occurrence of adults within the extreme northern portion of the CCNPP property. The species does not occur, however, on the portion of the property (Unit 3) that will be affected by this proposed action. No adults were found on the CCNPP site in 2006 during field surveys conducted for this project (Knisley, 2006). Furthermore, no larvae or other evidence of a breeding population of northeastern beach tiger beetle has been known for the CCNPP site. As none of the sandy cliff or beach areas on the CCNPP Unit 3 site that provide suitable habitat for the northeastern beach tiger beetle will be disturbed, a determination of "no effect" has been made for this species, as related to the construction of the proposed facility and its affect on the species and its habitat.

8.2.3 Puritan Tiger Beetle

The puritan tiger beetle (*Cicindela puritana*) is listed as a federally threatened species and a State endangered species. The species is known to presently inhabit only three locations: the Chesapeake Bay shoreline in Calvert County; around the mouth of the Sassafras River in eastern Maryland; and along the Connecticut River in Connecticut and Massachusetts. The Calvert County population has fluctuated greatly from peak numbers of over 9,000 in 1998 and 1988 to less than 6,000 in the past three years. A population of the puritan tiger beetle has been known to be present at the shoreline of the CCNPP site since 1997. This site, like all others, has exhibited dramatic fluctuations in population size since that time. Counts of adults at the CCNPP site have varied more than some other locations, with the following yearly estimates of adult numbers: 1997 count = 119; 1998 count = 616; 1999 count = 49; 2000 count = 367; 2002 count = 80; 2003 count = 226; 2004 count = 121; and 2006 count = 111 (Knisley, 2006).

The puritan tiger beetle has very specific habitat requirements. In Maryland, the larvae live in deep burrows, which they dig in sandy deposits on non-vegetated portions of bluff faces. They may also burrow at the base of bluffs in sediment deposits that have eroded from bluff faces. Chesapeake Bay populations are most abundant where bluffs are long and high, with little or no vegetation, and composed at least in part of yellow or red sandy soil. Wave-producing storms and concomitant erosion of bluffs are necessary to maintain the bare-bluff faces required for larval habitat. Larvae will not utilize densely vegetated bluffs.

Puritan tiger beetles typically undergo a two-year larval period before emergence. Larvae hatch in late July or August as first instars. This stage lasts 2 to 4 weeks; larvae then molt and become second instars. Larvae generally over-winter as second instars and become active again (as evidenced by open burrows) the following spring, when they molt to the third instar.

Population variations are caused by year-to-year variations in climatic and other factors that affect survival and reproduction. Variations in recorded populations may, to a lesser extent, depend on survey conditions.

The proposed construction activities for the CCNPP Unit 3 project should have no potential to affect the puritan tiger beetle. This species has highly specific habitat requirements that limit its potential for occurrence on the entire CCNPP site to the sandy cliffs adjoining undeveloped shoreline stretches of the Chesapeake Bay. No construction activities would take place on or within 500 ft of any cliff or beach habitats, which are all located further south of CCNPP Units 1 and 2. The proposed intake and discharge pipelines and heavy haul road have been routed to impact the Chesapeake Bay shoreline at either the existing CCNPP Units 1 and 2 intake structure or just to the south near the barge slip where the shoreline consists of armored fill soil, a habitat unsuitable for the puritan tiger beetle. The results of the 2006 survey (Knisley, 2006) indicated that the work proposed at the CCNPP Unit 3 project site will not have any effect on the puritan tiger beetle or its habitat. However, since the beach south of the barge slip is favorable habitat for this species, mitigation measures will consist of administrative controls such as posting signage or fencing off the beach south of the barge slip area to restrict personnel access.

In summary, the puritan tiger beetle does occur at CCNPP but not on the portion of the property (Unit 3) that will be affected by this proposed action. As none of the sandy cliff or beach areas on the CCNPP Unit 3 site that provide potentially suitable habitat for the puritan tiger beetle will be disturbed, a determination of “no effect” has been made for this species, as related to the construction of the proposed facility and its affect on the species and its habitat.

8.2.4 Sedge Wren

The sedge wren (*Cistothorus platensis*) ranges from southeastern Saskatchewan to southern Maine, south to Arkansas, West Virginia and Virginia. It also occurs in eastern New Brunswick and Nova Scotia. The species winters from southern Texas and eastern Mexico through the lower Mississippi Valley and Gulf Coast to southern Florida and north along the Atlantic. The species inhabits wetlands dominated by grasses and sedges, wet meadows, wet pastures, and other damp grassland habitats. Along the Atlantic Coast, sedge wrens also inhabit coastal marshes but prefer grassy habitats in freshwater or brackish wetlands where salinity levels are low. Erratic migratory movements and flexible breeding schedules have been reported for this species. During recent decades, the species has experienced a decline in the northeastern United States, where only a small number of breeding pairs remain (Gibbs and Melvin, 1992). Habitat loss is believed to be the most important factor in their negative population trend. Across the United States, the sedge wren has experienced an overall reduction in the availability of suitable habitats, during recent decades, as a result of the continued drainage of wetlands (Tiner, 1984). The sedge wren is listed as a State endangered species.

Sedge wrens migrate through most of Maryland but are found year-round in marshes on the Eastern Shore. The species prefers sedge and freshwater meadows where grasses and sedges grow with scattered shrubs. (DNR - Wildlife and Heritage Program Web Site: http://www.dnr.state.md.us/wildlife/wawren.asp). Suitable habitat, such as wetlands dominated by grasses and sedges, wet meadows, and wet pastures, is limited on the CCNPP Unit 3 site. Portions of the emergent wetlands onsite are overgrown with phragmites. The floodplain habitat which encompasses some of the onsite stream channels includes areas comprised of grasses and sedges; however, this type of habitat is scattered, extremely linear, or not expansive. No freshwater or brackish coastal marsh habitat occurs within the subject site. The littoral zone of the Camp Conoy Fishing Pond or some of the damp, open grassy areas on the subject site may provide foraging habitat for the species, although such habitat is marginal. The potential for occurrence of the sedge wren on the CCNPP Unit 3 project site is presumed to be low. This species was not observed on the CCNPP Unit 3 site during numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “no effect” has been made for this species, as related to the construction of the proposed facility and its affect on the species and its habitat.

8.2.5 Eastern Narrow-Mouthed Toad

The eastern narrow-mouthed toad (*Gastrophryne carolinensis*) is listed as a State endangered species. It is not a true toad, but a small frog with an egg-shaped body, pointed snout, and a fold of skin across the back of the head. The body color is reddish-brown to dark gray, often with light stripes along sides. The voice is similar to the weak bleat of a sheep. Breeding generally occurs from April to October, as initiated by rains. The eggs float on the water surface as a thin sheet. Suitable habitat is near water, especially along the edge of ponds or ditches and under moist debris and decaying vegetative matter. Eastern narrow-mouthed toads require habitats that provide moisture and shelter. This species spends most of its life in damp soils, near bodies of water, or under vegetative debris. Termites and ants seem to be the major food items, although a variety of insects are also taken. The range of the species is from southern Missouri east through southern Kentucky and Tennessee, from southern Maryland south through the Florida Keys, and west to eastern Texas and Oklahoma. Isolated populations have been reported from areas near western and northern borders. (Enature Web Site: http://www.enature.com/fieldguides/detail.asp?recnum=AR0544).

Suitable habitat for the eastern narrow-mouthed toad is present on the CCNPP Unit 3 site. The potential for occurrence of this species is presumed to be low to moderate. This species was not observed on the CCNPP Unit 3 site during numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to effect" has been made, however, for the eastern narrow-mouthed toad, as related to the construction of the proposed facility and its affect on the species and its habitat. This determination is based on the presumption that areas of suitable habitat for the eastern narrow-mouthed toad will be present post-development, within the CCNPP property and within adjoining properties. A pedestrian survey and frog call survey of areas of potentially suitable habitat on the CCNPP Unit 3 site will be conducted in May 2008. The results of the survey will be provided in an addendum to this report, to be submitted to the USACE and MDE by June 30, 2008. If warranted, the "not likely to effect" determination could be amended at that time.

8.2.6 Bald Eagle

Bald eagles occur only in North America and are found throughout most of the United States and Canada. A large raptor, the bald eagle has a wingspan of about 7 feet. Adults have a dark brown body and wings, white head and tail, and a yellow beak. Juveniles are mostly brown with white mottling on the body, tail, and undersides of wings. Adult plumage usually is obtained by the sixth year. In flight, the bald eagle often soars or glides with the wings held at a right angle to the body. In the southeast, breeding begins in late September and egg laying peaks in late December. The bald eagle was on the brink of extinction throughout most of its range in the early 1970s; however, due to recovery efforts and the banning of DDT pesticide, this species is returning in much of its historic range. On June 28, 2007, the Interior Department removed the American bald eagle from the Endangered Species List. However, the bald eagle is still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The species is listed as State threatened species.

The bald eagle is the only wildlife species observed during the 2006 to 2007 field surveys conducted by Tetra Tech or anecdotally reported by site personnel to occur on the CCNPP site that is designated threatened or endangered on the federal or state level, or candidates for such listing. Bald eagles prefer to nest in tall trees within sight of lakes, rivers, and other open waters. Bald eagles feed primarily on fish but also feed on waterfowl, seagulls, and small mammals. Therefore, the optimal bald eagle nesting habitat on the CCNPP site is presumed to be the forested areas at the top of the cliffs overlooking the Chesapeake Bay. As of the end of 2006, three bald eagle nests were known to exist on the CCNPP site. However, these nests were located outside of the CCNPP Unit 3 project area. Chicks were reported at two of the three nest locations during site reconnaissance conducted in April 2008; i.e., a nest located along Johns Creek near the Lake Davies Dredge Disposal Area and a nest located at Rocky Point to the east of Camp Conoy Road. The third eagle nest, which was located to the northwest of CCNPP Units 1 and 2, blew down prior to 2007. In April 2007, a new, active, bald eagle nest (i.e., a fourth nest) was observed in a mature Virginia pine (*Pinus virginiana*) tree close to Camp Conoy Road, near the southwestern corner of a baseball field. The Camp Conoy nest (i.e., the fourth nest) is located more than 1,500 ft inland from the Chesapeake Bay but is within sight of the Camp Conoy Fishing Pond. In April 2008, at least one eaglet was observed in this nest, with both parents engaged in rearing activity. The fourth eagle nest is the only nest at CCNPP which occurs within the construction footprint of CCNPP Unit 3. A figure showing the location of all existing and known prior nests will be provided upon request.

Bald eagles tend to return and reuse nests from previous years. Any construction close to active bald eagle nests within CCNPP could discourage use of those nests in the future. Any construction during courtship and nesting activities can affect nesting success and reuse of existing nests. Trees on top of the cliffs adjoining the Chesapeake Bay along the eastern edge of the CCNPP property provide suitable bald eagle habitat in Calvert County. A portion of the forested habitat adjoining the cliffs will not be impacted by site construction; therefore, eagles may continue to use remaining forested areas post-development. The Chesapeake Bay is presumed to be a better fishery resource for eagles than the Camp Conoy Fishing Pond; therefore, the filling of the pond during site construction would not be expected to affect the resident eagles in search of food. A determination of "likely to affect" has been made for this species at this time, as related to the nest at Camp Conoy, the reported adult eagle pair, and young that may fledge from this nest, and the construction of the proposed facility and its affect on the species and its habitat. Discussions have been initiated among UniStar, the USFWS, and DNR regarding the potential affect the development of the CCNPP Unit 3 site will have on the nesting eagles. The conclusions and recommendations for action derived from these discussions will be included in an addendum to this report.

8.2.7 Black Rail

The black rail (*Laterallus jamaicensis*) is a mouse-sized member of the Rallidae family of birds and is listed as a State endangered species. It is found in scattered parts of North America (from southern New England to the Gulf coast states) and the Pacific region of South America, usually in coastal salt marshes but also in some freshwater marshes. The black rail spends winters from the southern Atlantic coast states south to Central America. It is extirpated or threatened in many locations due to habitat loss. The largest populations in North America are in Florida and California. The preferred habitats include marshes, swamps, and wet meadows. Black rails appear to be omnivorous, feeding primarily on small invertebrates but also on seeds of some marsh plants. They are preyed on by many avian (including hawks, egrets, and herons) and mammalian (including foxes and cats) predators and rely on the cover of thick marsh vegetation for protection. They are territorial and call loudly and frequently during the mating season. The black rail is rarely seen and rather than flying when flushed prefers running in the cover of the dense marsh vegetation. It will often make its presence known, however, with its distinctive ki-ki-krr call or an aggressive, presumably territorial, growl. The best opportunity to see a black rail is during an extremely high tide when the birds are forced out of the coastal marshes into nearby fields and brush for cover. These high tides are dangerous time for black rails as they are quite vulnerable to predation outside the marsh. The black rail will nest in freshwater as well as brackish marshes. (Audubon Web Site: http://www.audubon2.org/watchlist/viewSpecies.jsp?id=37)

The primary threat to black rails is the loss and fragmentation of habitat. It is estimated that half of the historical coastal wetlands have been filled or drained along the eastern coastline. This loss of habitat has drastically reduced the amount of suitable land available to this species. Although the rate of wetland loss has now slowed, changes are still occurring. Mosquito control programs include measures to change the hydrology of wetlands and often include the use of pesticides, both of which could have unintended consequences for black rails. (Audubon Web Site: http://www.audubon2.org/watchlist/viewSpecies.jsp?id=37).

The black rail's preference for brackish/salt marsh habitat limits the occurrence of this species to areas where such habitat conditions exist. No brackish/salt marsh habitat exists on the CCNPP Unit 3 site and freshwater marsh habitat is limited to small, phragmites-infested, emergent wetlands within the interior of the site. This species was not observed on the CCNPP Unit 3 site during numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. With these considerations, the potential for occurrence of the black rail is deemed to be unlikely. A determination of "no effect" has been made for this species, as related to the construction of the proposed facility and its affect on the species and its habitat.

8.2.8 Least Tern

Least terns (*Sterna antillarum*) are the smallest members of the gull family. The least tern is listed as a threatened species by the State of Maryland. Throughout North America, least terns nest in areas with similar habitat attributes. The riverine nesting areas of least terns are sparsely vegetated sand and gravel bars within a wide unobstructed river channel. Other suitable nesting habitat includes salt flats along lake shorelines and coastal beach dune complex. Nesting locations usually are at the higher elevations and away from the water's edge because nesting starts when the river flows are high and small amounts of sand are exposed. The size of nesting areas depends on water levels and the extent of associated sandbars. Many nesting islands in rivers have been permanently inundated or destroyed by reservoirs and channelization projects. Alteration of natural river dynamics has caused unfavorable vegetational succession on many remaining islands, curtailing their use as nesting sites by terns. Man-made disturbances along the bay shoreline, however, have created new nesting habitats (e.g., dredged material islands and development spoils) that least terns have frequently used. (USFWS Web Site: http://ecos.fws.gov/docs/life_histories/B07N.html).

No suitable nesting habitat for the least tern is present along the Chesapeake Bay shoreline of the CCNPP Unit 3 site. The stream habitat within the interior (landward) portion of the site is not suitable; i.e., nesting habitat comprised of sparsely vegetated sand and gravel bars within a wide unobstructed river channel is not present within the proposed development area. The potential for occurrence of this species is presumed to be unlikely. This species was not observed on the CCNPP Unit 3 site during numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “no effect” has been made for the least tern, as related to the construction of the proposed facility and its affect on the species and its habitat. This determination is based on the presumption that areas of suitable habitat for the least tern occur elsewhere within Calvert County and the Chesapeake Bay area.

8.2.9 Loggerhead Sea Turtle

The loggerhead sea turtle (*Caretta caretta*) is a federally threatened species. The loggerhead sea turtle is named for its relatively large head, which supports powerful jaws and enables it to feed on hard-shelled prey, such as whelks and conch. Loggerheads reach sexual maturity at around 35 years of age. In the southeastern United States, mating occurs in late March to early June, and females lay eggs between late April and early September. Females lay three to five nests, and sometimes more, during a single nesting season. The eggs incubate approximately two months before hatching sometime between late June and mid-November.

Loggerheads occupy three different ecosystems during their lives; i.e., the terrestrial zone, the oceanic zone, and the neritic zone. The neritic zone, or sublittoral zone, is the part of the ocean extending from the low tide mark to the edge of the continental shelf, with a relatively shallow depth extending to about 600 ft. Loggerheads nest on ocean beaches, generally preferring high energy, relatively narrow, steeply sloped, coarse-grained beaches. Immediately after hatchlings emerge, they move from their nest to the surf, swim and are swept through the surf zone, and continue swimming away from land for about one to several days. Once individuals get transported by ocean currents farther offshore, they've entered the oceanic zone. Sometime between the ages of 7 to 12 years, oceanic juveniles migrate to nearshore coastal areas (neritic zone) and continue maturing until adulthood. In addition to providing critically important habitat for juveniles, the neritic zone also provides crucial foraging habitat, inter-nesting habitat, and migratory habitat for adult loggerheads in the western North Atlantic. The predominant foraging areas for western North Atlantic adult loggerheads are found throughout the relatively shallow continental shelf waters of the United States, Bahamas, Cuba, and the Yucatán Peninsula, Mexico. Migration routes from foraging habitats to nesting beaches (and vice versa) for a portion of the population are restricted to the continental shelf, while other routes involve crossing oceanic waters to and from the Bahamas, Cuba, and the Yucatán Peninsula. Seasonal migrations of adult loggerheads along the mid- and southeast United States coasts have also been documented. In the Atlantic, the loggerhead turtle's range extends from Newfoundland to as far south as Argentina. During the summer, nesting occurs primarily in the subtropics. Although the major nesting concentrations in the United States are found from North Carolina through southwest Florida, minimal nesting occurs outside of this range westward to Texas and northward to southern Virginia.

Loggerheads face threats on both nesting beaches and in the marine environment. The greatest cause of decline and the continuing primary threat to loggerhead turtle populations worldwide is incidental capture in fishing gear, primarily in longlines and gillnets, but also in trawls, traps and pots, and dredges. The loggerhead turtle was listed under the ESA as threatened throughout its range on July 28, 1978. In the United States, NOAA - NMFS and the USFWS have joint jurisdiction for marine turtles, with NMFS having the lead in the marine environment and USFWS having the lead on the nesting beaches. (NOAA Fisheries – Office of Protected Resources Web Site: http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.htm).

The loggerhead sea turtle was not observed in the Chesapeake Bay waters adjacent to CCNPP during numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. In addition, no anecdotal reports of observations of the species by CCNPP site personnel have been made to date. A determination of "no effect" has been made for the loggerhead sea turtle, as related to the construction of the proposed facility and its affect on the species and its habitat.

8.2.10 Kemp's Ridley Sea Turtle

Kemp's ridley sea turtles (*Lepidochelys kempii*) are small sea turtles, with a relatively flat, round carapace with a gray to grayish-green hue and are federally endangered. Adult Kemp's ridley turtles are found primarily in the Gulf of Mexico, but juveniles have been observed throughout the Atlantic Ocean. These sea turtles prefer shallow coastal waters. Nesting occurs in spring on Mexican beaches. After leaving the nesting beach, hatchlings are believed to become entrained in eddies within the Gulf of Mexico, where they are dispersed within the Gulf and Atlantic by oceanic surface currents until they reach about 7.9 inches in length (or about two years of age), at which size they enter coastal shallow water habitats. A sizeable group of the species spends the summers in the Chesapeake Bay, although most remain in the higher salinity waters of the Virginia portion of the bay. This sea turtle is a shallow water benthic feeder with a diet consisting primarily of crabs.

Kemp's ridley sea turtles face threats on both nesting beaches and in the marine environment. The greatest cause of decline and the continuing primary threat to these sea turtles is incidental capture in fishing gear, primarily in shrimp trawls, but also in gill nets, longlines, traps and pots, and dredges in the Gulf of Mexico and North Atlantic. Egg collection was an extreme threat to the population, but since nesting beaches were afforded official protection in 1966, this threat no longer poses a major concern. Restoration of the species requires protecting sub-adult and adult animals by the use of turtle excluder devices on shrimp trawls wherever turtles occur. The Kemp's ridley sea turtle was first listed under the Endangered Species Conservation Act of 1970 on December 2, 1970, and subsequently under the ESA of 1973 as an endangered species. (NOAA Fisheries - Office of Protected Resources Web Site: http://www.nmfs.noaa.gov/pr/species/turtles/kempsridley.htm).

The Kemp's ridley sea turtle was not observed in the Chesapeake Bay waters adjacent to CCNPP during numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. In addition, no anecdotal reports of observations of the species by CCNPP site personnel have been made to date. A determination of "no effect" has been made for the Kemp's Ridley sea turtle, as related to the construction of the proposed facility and its affect on the species and its habitat.

8.2.11 Green Sea Turtle

Green sea turtles (*Chelonia mydas*) are the largest of all the hard-shelled sea turtles, but have a comparatively small head. Adult green turtles are unique among sea turtles in that they are herbivorous, feeding primarily on sea grasses and algae. This diet is thought to give them greenish colored fat, from which they take their name. A green turtle's carapace (top shell) is smooth and can be shades of black, gray, green, brown, and yellow. Their plastron (bottom shell) is yellowish white. Scientists estimate green turtles reach sexual maturity between 20 and 50 years, at which time females begin returning to their natal beaches (i.e., the same beaches where they were born) every 2-4 years to lay eggs.

Green sea turtles live in warm tropical waters from New England to South Africa and in the Pacific from Western Africa to the Americas. In Atlantic and Gulf of Mexico waters, green turtles are found in inshore and nearshore waters from Texas to Massachusetts, the U.S. Virgin Islands, and Puerto Rico. The species primarily use three types of habitat: oceanic beaches (for nesting); convergence zones in the open ocean; and benthic feeding grounds in coastal areas. Adult females migrate from foraging areas to mainland or island nesting beaches and may travel hundreds or thousands of miles each way. After emerging from the nest, hatchlings swim to offshore areas, where they are believed to live for several years, feeding close to the surface on a variety of pelagic plants and animals. Once the juveniles reach a certain age/size range, they leave the pelagic habitat and travel to nearshore foraging grounds. Once they move to these nearshore benthic habitats, adult green turtles are almost exclusively herbivores, feeding on sea grasses and algae. The nesting season varies depending on location. In the southeastern United States, females generally nest between June and September, while peak nesting occurs in June and July. During the nesting season, females nest at approximately two week intervals, laying an average of five clutches.

The principal cause of the historical, worldwide decline of the green turtle is long-term harvest of eggs and adults on nesting beaches and juveniles and adults on feeding grounds. These harvests continue in some areas of the world and compromise efforts to recover this species. Incidental capture in fishing gear, primarily in gillnets, but also in trawls, traps and pots, longlines, and dredges is a serious ongoing source of mortality that also adversely affects the species' recovery. Green turtles are also threatened, in some areas of the world, by a disease known as fibropapillomatosis. The green sea turtle was listed under the ESA on July 28, 1978. The breeding populations in Florida and the Pacific coast of Mexico are listed as endangered, while elsewhere the species is listed as threatened. (NOAA Fisheries - Office of Protected Resources Web Site: http://www.nmfs.noaa.gov/pr/species/turtles/green.htm)

The green sea turtle was not observed in the Chesapeake Bay waters adjacent to CCNPP during numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. In addition, no anecdotal reports of observations of the species by CCNPP site personnel have been made to date. A determination of "no effect" has been made for the green sea turtle, as related to the construction of the proposed facility and its affect on the species and its habitat.

8.2.12 Leatherback Sea Turtle

The leatherback sea turtle (*Dermochelys coriacea*) is the largest turtle and the largest living reptile in the world. The leatherback is the only sea turtle that lacks a hard, bony shell. A leatherback's carapace consists of leathery, oil saturated connective tissue overlaying loosely interlocking dermal bones. Adult leatherbacks are primarily black with a pinkish white mottled ventral surface and pale white and pink spotting on the top of the head. The ridged carapace and large flippers are characteristics that make the leatherback uniquely equipped for long distance foraging migrations.

Female leatherbacks lay clutches of approximately 100 eggs on sandy, tropical beaches. Females nest several times during a nesting season, typically at 8-12 day intervals. After 60-65 days, leatherback hatchlings emerge from the nest. Leatherbacks lack the crushing chewing plates characteristic of sea turtles that feed on hard-bodied prey. Instead, they have pointed tooth-like cusps and sharp edged jaws that are perfectly adapted for a diet of soft-bodied pelagic (open ocean) prey, such as jellyfish and salps.

Leatherbacks are commonly known as pelagic animals but also forage in coastal waters. The species is the most migratory and wide ranging of the sea turtle species. Leatherbacks mate in the waters adjacent to nesting beaches and along migratory corridors. After nesting, female leatherbacks migrate from tropical waters to more temperate latitudes, which support high densities of jellyfish prey in the summer. Leatherback turtle nesting grounds are located around the world, with the largest remaining nesting assemblages found on the coasts of northern South America and west Africa. The Caribbean (primarily Puerto Rico and the Virgin Islands) and southeast Florida support minor nesting colonies but represent the most significant nesting activity within the United States. Adult leatherbacks are capable of tolerating a wide range of water temperatures and have been sighted along the entire continental coast of the United States as far north as the Gulf of Maine and south to Puerto Rico, the Virgin Islands, and into the Gulf of Mexico.

Leatherback turtles face threats on both nesting beaches and in the marine environment. The greatest causes of decline and the continuing primary threats to leatherbacks worldwide are long-term harvest and incidental capture in fishing gear. Harvest of eggs and adults occurs on nesting beaches while juveniles and adults are harvested on feeding grounds. Incidental capture primarily occurs in gillnets, but also in trawls, traps and pots, longlines, and dredges. Together these threats are serious ongoing sources of mortality that adversely affect the species' recovery. The leatherback sea turtle was listed under the ESA as endangered in 1970. (NOAA Fisheries - Office of Protected Resources Web Site: http://www.nmfs.noaa.gov/pr/species/turtles/leatherback.htm).

The leatherback sea turtle was not observed in the Chesapeake Bay waters adjacent to CCNPP during numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. In addition, no anecdotal reports of observations of the species by CCNPP site personnel have been made to date. A determination of “no effect” has been made for the leatherback sea turtle, as related to the construction of the proposed facility and its affect on the species and its habitat.

8.3 THREATENED AND ENDANGERED PLANTS

A series of focused rare plant surveys were conducted in late July/early August 2006, October 2006, and April 2007 by qualified botanists with Tetra Tech NUS (Tetra Tech NUS, 2007) to coincide with the flowering period for each plant listed by the DNR as threatened or endangered for Calvert County, Maryland. No federally-listed plant species were observed at CCNPP during those surveys. Two plant species listed as threatened by the state of Maryland were observed on site; i.e., the showy goldenrod and

Shumard's oak. Available habitats were evaluated for suitability to support other listed species, which are discussed in more detail below.

8.3.1 Sensitive Joint Vetch

The sensitive joint vetch (*Aeschynomene virginica*) is a legume native to the eastern United States. The species flowers from July to September and fruits can be produced from July to October, concurrent with flowering. The species prefers fresh to slightly brackish tidal river systems or intertidal zones where it is flooded twice daily. The sensitive joint vetch prefers marshes with little competition and occurs at the outer fringe of marshes or shores. When found in the interior of a marsh, it could be a result of herbivory or local nutrient deficiencies. It tends to be found in areas with high plant diversity and for the plant to establish itself, there must be little to no vegetated substrates (USFWS, 1994).

Suitable habitat for the sensitive joint vetch is not present on the CCNPP Unit 3 site. The species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "no effect" can be made for the sensitive joint vetch, which is listed as a threatened species by the USFWS (i.e., federally listed), but is not listed by the state of Maryland.

8.3.2 Blunt-leaved Gerardia

The blunt-leaved gerardia (*Agalinis obtusifolia*) is listed by the State of Maryland as an endangered species. The species flowers in September and fruits can be produced in October. The species prefers dry to seasonally dry habitats composed of clayey or sandy substrates. In Maryland, the soil preference tends to be dry to moist sandy soils. The habitats preferred by the species can include seasonally wet pine savannas and flatwoods and hillside bogs in pinelands (NatureServe, 2008).

Suitable habitat for the blunt-leaved gerardia is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed. This determination is based on the presumption that areas of suitable habitat for the blunt-leaved gerardia will be present post-development, within the CCNPP property and within adjoining properties.

8.3.3 Thread-leaved Gerardia

The thread-leaved gerardia (*Agalinis setacea*) is listed by the State of Maryland as an endangered species. The species flowers from September to October and bears fruit in October, it also prefers habitat found in the coastal plain and adjacent to piedmont regions. The habitat includes dry sandy woods and openings (NatureServe, 2008).

Suitable habitat for the thread-leaved gerardia is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed. This determination is based on the presumption that areas of suitable habitat for the thread-leaved gerardia will be present post-development, within the CCNPP property and within adjoining properties.

8.3.4 Single-headed Pussytoes

The single-headed pussytoes (*Antennaria solitaria*) is a perennial native to the eastern United States and is listed as threatened by the State of Maryland. The species flowers in March through May and bears fruits beginning in May. This species prefers habitats that are on slopes or stream banks in moist, rich, deciduous woodlands, forests, or sometimes in forest openings.

Suitable habitat for the single-headed pussytoes is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed. This determination is based on the presumption that areas of suitable habitat for the single-headed pussytoes will be present post-development, within the CCNPP property and within adjoining properties.

8.3.5 Wooly Three-awn

The wooly three-awn (*Aristida lanosa*) is listed by the State of Maryland as an endangered species. The species flowers in August through September and bears fruit in October. The species prefers dry sandy soils (Weakley, 2006).

Suitable habitat for the wooly three-awn is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed. This determination is based on the presumption that areas of suitable habitat for the wooly three-awn will be present post-development, within the CCNPP property and within adjoining properties.

8.3.6 Small-fruited Beggar-ticks

The small-fruited beggar-ticks (*Bidens mitis*) is listed as an endangered species by the State of Maryland. The species flowers from September to November, prefers habitat of marshes, shallows in ponds or lakes, and can often be found in narrow to broad bands in shallow water at the shores of ponds or lakes. Small-fruited beggar-ticks can also be found in open, swampy woodlands and ditches (Godfrey and Wooten, 1981).

Suitable habitat for the small-fruited beggar-ticks is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed. This determination is based on the presumption that areas of suitable habitat for the small-fruited beggar-ticks will be present post-development, within the CCNPP property and within adjoining properties.

8.3.7 Red Turtlehead

The red turtlehead (*Chelone obliqua*) flowers from July through August and prefers habitat along stream banks and swamp forest, such as cypress swamps and wet woods (Weakley, 2006). The State of Maryland lists the red turtlehead as threatened.

Suitable habitat for the red turtlehead is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect” can be presumed. This determination is based on the presumption that areas of suitable habitat (wet woods) for the red turtlehead will be present post-development, within the CCNPP property and within adjoining properties.

8.3.8 Standley’s Goosefoot

The Standley’s goosefoot (*Chenopodium standleyanum*) is an annual native to the eastern United States and is listed by the State of Maryland as an endangered species. The species flowers from June through September and bears fruit in September. The Standley’s goosefoot prefers partial sun, mesic to slightly dry conditions, and soil that is loamy or rocky. The habitat includes open woodlands, woodland borders, thickets, rocky bluffs, and partially shaded roadsides. (Illinois Wildflowers Web Site: http://www.illinoiswildflowers.info/savanna/plants/wd_goosefoot.htm).

Suitable habitat for the Standley’s goosefoot is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted during 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “not likely to adversely affect” can be presumed. This determination is based on the presumption that areas of suitable habitat for the Standley’s goosefoot will be present post-development, within the CCNPP property and within adjoining properties.

8.3.9 Linear-leaved Tick-trefoil

The linear-leaved tick-trefoil (*Desmodium lineatum*) is a legume native to the eastern United States. The species flowers from June to August and bears fruit from August to October. The linear-leaved tick-trefoil prefers sandhills and other dry forests and woodlands (Weakley, 2006). The State of Maryland lists this species as endangered.

Suitable habitat (dry forests and woodlands) for the linear-leaved tick-trefoil is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “not likely to adversely affect” can be presumed. This determination is based on the presumption that areas of suitable habitat (dry forests and woodlands) for the linear-leaved tick-trefoil will be present post-development, within the CCNPP property and within adjoining properties.

8.3.10 Cream-flowered Tick-trefoil

The cream-flowered tick-trefoil (*Desmodium ochroleucum*) is a legume native to the eastern United Sates. The species flowers from June to August and bears fruit from August to October. The cream-flowered tick-trefoil prefers dry woodlands, especially over calcareous soils (Weakley, 2006).

Suitable habitat for the cream-flowered tick-trefoil is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “not likely to adversely affect” can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the cream-flowered tick-trefoil will be present post-development, within the CCNPP property and within adjoining properties.

8.3.11 Few-flowered Tick-trefoil

The few-flowered tick-trefoil (*Desmodium pauciflorum*) is a legume native to the eastern United States. The species flowers from June to August and bears fruit from August to October. The few-flowered tick-trefoil prefers moist forests (Weakley, 2006).

Suitable habitat for the few-flowered tick-trefoil is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the few-flowered tick-trefoil will be present post-development, within the CCNPP property and within adjoining properties.

8.3.12 Rigid Tick-trefoil

The rigid tick-trefoil (*Desmodium rigidum*) is listed as endangered by the State of Maryland. The species flowers from June to September and bears fruit from August to October. The rigid tick-trefoil prefers dry pine woodlands, fields, woodland borders, and disturbed areas (Weakley, 2006).

Suitable habitat for the rigid tick-trefoil is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed. This determination is based on the presumption that areas of suitable habitat for the rigid tick trefoil will be present post-development, within the CCNPP property and within adjoining properties.

8.3.13 Glade Fern

The glade fern (*Diplazium pycnocarpon*) is a fern to the native eastern United States. The species bears spores July through September. The glade fern prefers very nutrient rich, loamy or seepy forests, over calcareous sedimentary (such as limestone or dolostone) or mafic metamorphic or igneous rocks (such as greenstone or amphibolite) (Weakley, 2006).

Suitable habitat for the glade fern is not present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "no effect" can be presumed for the species, which is listed as threatened by the State of Maryland.

8.3.14 Tobaccoweed

The tobaccoweed (*Elephantopus tomentosus*) is a forb native to the United States. The species flowers from August to November. Tobaccoweed can be found in woodlands and woodland borders, usually in fairly dry areas (Weakley, 2006).

Suitable habitat for the tobaccoweed is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the tobaccoweed will be present post-development, within the CCNPP property and within adjoining properties.

8.3.15 Rough-leaved Aster

The rough-leaved aster (*Eurybia radula*) is a forb native to the United States. The species flowers from July to September and prefers habitats that are circumneutral to calcareous wet meadows, possibly stream banks (Weakley, 2006).

Suitable habitat for the rough-leaved aster is present along stream banks on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “not likely to adversely affect” can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat (stream banks) for the rough-leaved aster will be present post-development, within the CCNPP property and within adjoining properties.

8.3.16 Broad-leaved Beardgrass

The broad-leaved beardgrass (*Gymnopogon brevifolius*) is listed as endangered by the State of Maryland. The species flowers and bears fruits from August to October. Broad-leaved beardgrass prefers pine savannas, sandhills, dry woodlands, prairies, and calcareous glades (Weakley, 2006).

Suitable habitat (dry woodlands) for the broad-leaved beardgrass is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “not likely to adversely affect” can be presumed. This determination is based on the presumption that areas of suitable habitat (dry woodlands) for the broad-leaved beardgrass will be present post-development, within the CCNPP property and within adjoining properties.

8.3.17 Star Duckweed

The star duckweed (*Lemna trisulca*) is an aquatic plant native to the eastern United States. Star duckweed prefers still to slow moving waters of ponds, lakes, beaver ponds, and swamps. Flowering is rarely observed in this plant in the wild (Weakley, 2006).

Suitable habitat for the star duckweed is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “not likely to adversely affect” can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the star duckweed will be present post-development, within the CCNPP property and within adjoining properties.

8.3.18 American Frog’s-bit

The American frog’s-bit (*Limnobium spongia*) is a native aquatic plant to the eastern United States. The species flowers from June to September. American frog’s-bit prefers swamps, marshes, ponds, and pools (Weakley, 2006).

Suitable habitat for the American frog’s bit is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “not likely to adversely affect” can be presumed for the species, which is listed as endangered by the State of Maryland.

This determination is based on the presumption that areas of suitable habitat for the American frog's-bit will be present post-development, within the CCNPP property and within adjoining properties.

8.3.19 Climbing Fern

The climbing fern (*Lygodium palmatum*) is a fern native to the eastern United States. The fern produces spores from July to September. Climbing fern prefers bogs, moist thickets, and swamp forests in strongly acid soils (Weakley, 2006).

Suitable habitat for the climbing fern is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as threatened by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the climbing fern will be present post-development, within the CCNPP property and within adjoining properties.

8.3.20 Anglepod

The anglepod (*Matelea carolinensis*) is a vine native to the eastern United States. The species flowers from April to June and bears fruit from July to October. The anglepod prefers moist to dry, nutrient-rich forests (Weakley, 2006).

Suitable habitat for the anglepod is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting projects. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the anglepod will be present post-development, within the CCNPP property and within adjoining properties.

8.3.21 Narrow Melicgrass

The narrow melicgrass (*Melica mutica*) is listed as threatened by the State of Maryland. The species bears fruit from April to May. The narrow melicgrass prefers forests and woodlands, including coastal fringe and maritime forests (Weakley, 2006).

Suitable habitat for the narrow melicgrass is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed. This determination is based on the presumption that areas of suitable habitat for the narrow melicgrass will be present post-development, within the CCNPP property and within adjoining properties.

8.3.22 Creeping Cucumber

The creeping cucumber (*Melothria pendula*) is a native vine of the eastern United States. The species fruits from June to November. The creeping cucumber prefers bottomland hardwoods forests, moist roadsides and disturbed areas, as well as marshes (Weakley, 2006).

Suitable habitat for the creeping cucumber is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the creeping cucumber will be present post-development, within the CCNPP property and within adjoining properties.

8.3.23 Sweet Pinesap

The sweet pinesap (*Monotropsis odorata*) is listed as endangered by the State of Maryland. The species flowers from September to November and February to April and then bears fruit from October to November and May to June. Flowers of the sweet pinesap are very fragrant and can be described as a smell similar to cloves, nutmeg, cinnamon, and violets. The sweet pinesap prefers dry to mesic upland woods under oaks and/or pines, especially slopes or bluffs with abundant heaths (Weakley, 2006).

Suitable habitat for the sweet pinesap is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed. This determination is based on the presumption that areas of suitable habitat for the sweet pinesap will be present post-development, within the CCNPP property and within adjoining properties.

8.3.24 Evergreen Bayberry

The evergreen bayberry (*Morella carolinensis*) is a shrub native to the eastern United States. The species flowers in April and bears fruit from August to October. The evergreen bayberry prefers pocosins, wet savannas and pine flatwoods, sandhill seepage bogs, as well as other peaty or sandy-peaty wetlands (Weakley, 2006).

Suitable habitat for the evergreen bayberry is not present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "no effect" can be presumed for the species, which is listed as endangered by the State of Maryland.

8.3.25 Kidneyleaf Grass-of-Parnassus

The kidneyleaf grass-of-Parnassus (*Parnassia asarifolia*) is a native forb of the eastern United States. The species flowers in July and bears fruit from August to October. The kidneyleaf grass-of-Parnassus prefers bogs, sphagnous seeps, brook banks, and acidic habitats (Weakley, 2006).

Suitable habitat for the kidneyleaf grass-of-Parnassus is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the kidneyleaf grass-of-Parnassus will be present post-development, within the CCNPP property and within adjoining properties.

8.3.26 Marsh Fleabane

The marsh fleabane (*Pluchea camphorata*) is a forb native to the eastern United States. The species flowers from August to October. The marsh fleabane prefers bottomland sloughs, clay flatwoods, and other freshwater wetlands (Weakley, 2006).

Suitable habitat for the marsh fleabane is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the marsh fleabane will be present post-development, within the CCNPP property and within adjoining properties.

8.3.27 Dense-flowered Knotweed

The dense-flowered knotweed (*Polygonum densiflorum*) is a herb native to the eastern United States. The species flowers from June to October. The dense-flowered knotweed prefers swamp forests (Weakley, 2006).

Suitable habitat for the dense-flowered knotweed is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the dense-flowered knotweed will be present post-development, within the CCNPP property and within adjoining properties.

8.3.28 Leafy Pondweed

The leafy pondweed (*Potamogeton foliosus*) is a aquatic plant native to the United States. The plant flowers from May to October. The leafy pondweed prefers ponds or lakes (Weakley, 2006).

Suitable habitat for the leafy pondweed is limited to aquatic habitat (i.e., Camp Conoy Fishing Pond) on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that leafy pondweed was not observed in the Camp Conoy Fishing Pond during site evaluations. Suitable aquatic habitat for the leafy pondweed will be present post-development within adjoining properties.

8.3.29 Shumard's Oak

The Shumard's oak (*Quercus shumardii*) is a native deciduous tree whose leaves and bark closely resemble the more common red oak (*Quercus rubra*). It is a State-listed threatened species. The species blooms in May and bears acorns in the fall. Shumard's oak prefers full sun, moist, well-drained soil and can be drought tolerant. (UConn Plant Database of Trees, Shrubs and Vines Web Site: http://www.hort.uconn.edu/plants/q/queshu/queshu1.html).

Suitable habitat for the Shumard's oak is present on the CCNPP Unit 3 site (Figure 8.3-1). Furthermore, the tree has been observed at one location in the Johns Creek floodplain in 2006 and 2007 (Tetra Tech NUS, 2007). A determination of "not likely to adversely affect" can be made for the species due to the fact that the known location is outside the development footprint.

8.3.30 Hairy Snoutbean

The hairy snoutbean (*Rhynchosia tomentosa*) is a native forb of the eastern United States. The species flowers from June to August and bears fruits from August to October. The hairy snoutbean prefers xeric woodlands and forests, sandhills, edges of woods, and open areas (Weakley, 2006).

Suitable habitat (edges of woods and open areas) for the hairy snoutbean is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as threatened by the State of Maryland. This determination is based on the presumption that areas of suitable habitat (edges of woods and open areas) for the hairy snoutbean will be present post-development, within the CCNPP property and within adjoining properties.

8.3.31 Englemann's Arrowhead

The Englemann's arrowhead (*Sagittaria engelmanniana*) is a forb native to the eastern United States. The species flowers from June to October and prefers blackwater stream banks, sphagnum bogs, pocosins, and beaver ponds (Weakley, 2006).

Suitable habitat for the Englemann's arrowhead is present on the CCNPP Unit 3 site but is potentially limited to the more expansive downstream reach of Johns Creek. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "not likely to adversely affect" can be presumed for the species, which is listed as threatened by the State of Maryland. This determination is based on the presumption that areas of suitable habitat (downstream reach of Johns Creek) for the Englemann's arrowhead will be present post-development and within adjoining properties. Development impacts to Johns Creek will be essentially limited to the upper reach of a small number of unnamed tributaries to this system.

8.3.32 Sea-Purslane

The sea-purslane (*Sesuvium maritimum*) is a forb native to the eastern United States. The species flowers and fruits from May to December and prefers island end flats, sea beaches, and salt flats (Weakley, 2006).

Suitable habitat for the sea-purslane is not present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "no effect" can be made for the species, which is listed as endangered by the State of Maryland.

8.3.33 Showy Goldenrod

The showy goldenrod is a forb native to the eastern United States and is listed as threatened in the State of Maryland. The species flowers in August to September with a showy yellow flower head. The tops typically die in late October, and the roots over-winter underground and regenerate new tops in the spring. The showy goldenrod prefers pastures, forests, woodlands, and road banks. It is listed as threatened in the State of Maryland (Weakley, 2006).

Suitable habitat for the showy goldenrod is present on the CCNPP Unit 3 site (Figure 8.3-1). Furthermore, clusters of showy goldenrod were observed at the edges of forested areas at the Camp Conoy area in October 2006 (Tetra Tech NUS, 2007). A determination of "may affect" can be presumed for the species. Mitigation for impact on the observed population will be to transplant individuals likely to be impacted to suitable habitat elsewhere on the CCNPP property. This species has been documented as being transplant tolerant.

The landowner will keep the remaining unforested upland not impacted by the construction of CCNPP Unit 3 as old field habitat to maintain site biodiversity and provide a suitable location to transplant the showy goldenrod from the Camp Conoy area. A field survey will be necessary during construction activities to determine the appropriate areas for on site mitigation as forested and other naturally vegetated areas (meadows, shrub/scrub) and the best old field habitats to replant with the showy goldenrod. Therefore, the exact locations for transplant will be determined by qualified biologists in the field during construction activities. The mitigation plans will be developed in consultation with the federal, State, and local resource agencies.

The monitoring program for the showy goldenrod will include an initial baseline (time-zero) monitoring event, to be conducted immediately following the planting (transplant effort) of the mitigation areas. After the baseline event is completed, a five-year monitoring schedule will be initiated, to include annual sample events during September - October of each monitoring year. A baseline report and five annual monitoring reports will be prepared for review by the appropriate resource agencies. The reports will include the vegetative sampling results (i.e., transplant survivorship data), photo-documentation, site maps, descriptions of problems encountered, and discussion of maintenance actions taken. Monitoring reports will be to the appropriate resource agencies within thirty days of each monitoring event. Following agency review and coordination, remedial and/or contingency measures will be implemented, if required.

8.3.34 Rough Rushgrass

The rough rushgrass (*Sporobolus clandestinus*) is a grass native to the eastern United States. The species fruits from September to October and prefers glades, barrens, thin soil of woodlands, and also in dry sands (Weakley, 2006).

Suitable habitat for the rough rushgrass is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “not likely to adversely affect” can be presumed for the species, which is listed as threatened by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the rough rushgrass will be present post-development, within the CCNPP property and within adjoining properties.

8.3.35 Silvery Aster

The silvery aster (*Symphyotrichum concolor*) is a forb native to the eastern United States. The species flowers from early August to late November. The silvery aster prefers dry sandy open oak-pine woods and barrens, and can also be found along roadsides. (Kentucky State Nature Preserves System Web Site: http://eppcapps.ky.gov/nprareplants/details.aspx?species=Symphyotrichum+concolor).

Suitable habitat (woodlands and roadsides) for the silvery aster is present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of “not likely to adversely affect” can be presumed for the species, which is listed as endangered by the State of Maryland. This determination is based on the presumption that areas of suitable habitat for the silvery aster will be present post-development, within the CCNPP property and within adjoining properties.

8.3.36 Southern Wildrice

The southern wildrice (*Zizaniopsis miliacea*) is a grass native to the eastern United States. The species is superficially similar to the genus *Zizania* in its habitat and size, while the distinguishing feature is the inflorescence and stout horizontal rhizomes. The flowering period is from May to July. The species occurs in brackish and freshwater marshes (Weakley, 2006).

Suitable habitat for the southern wildrice is not present on the CCNPP Unit 3 site. This species was not observed on the CCNPP property during the numerous field studies conducted in 2006, 2007, and 2008 in support of the environmental permitting requirements for this project. A determination of "no effect" can be made for the species, which is listed as endangered by the State of Maryland.

9.0 CULTURAL RESOURCES

gai consultants
transforming ideas into reality®

May 12, 2008

Project C080212.00

Mr. Mike Lukey
MACTEC Engineering & Consulting, Inc.
1725 Louisville Drive
Knoxville TN 37921

Re: Management Summary

Phase II National Register Evaluations for Sites 18CV474, 18CV480, 18CV481, and 18CV482

and Assessment of Effects for Historic Resources

Calvert Cliffs Nuclear Power Plant, Calvert County, Maryland

Dear Mr. Lukey,

GAI Consultants, Inc. (GAI) is pleased to submit this Management Summary for Phase II National Register Evaluations of Sites 18CV474, 18CV480, 18CV481 and 18CV482 and an Assessment of Effects for historic resources at the Calvert Cliffs Nuclear Power Plant (CCNPP), in Calvert County, Maryland. GAI conducted this work for MACTEC Federal Programs Inc. (MACTEC) on behalf of UniStar Nuclear Development, LLC (UniStar). Phase II investigations included site-specific archival research, fieldwork, and laboratory analysis. Phase II fieldwork was conducted between March 17 and May 3, 2008. Detailed results of GAI's cultural resources studies will be presented in a combined Phase I/II Technical Report and a separate Assessment of Effects report, to be submitted at a later date.

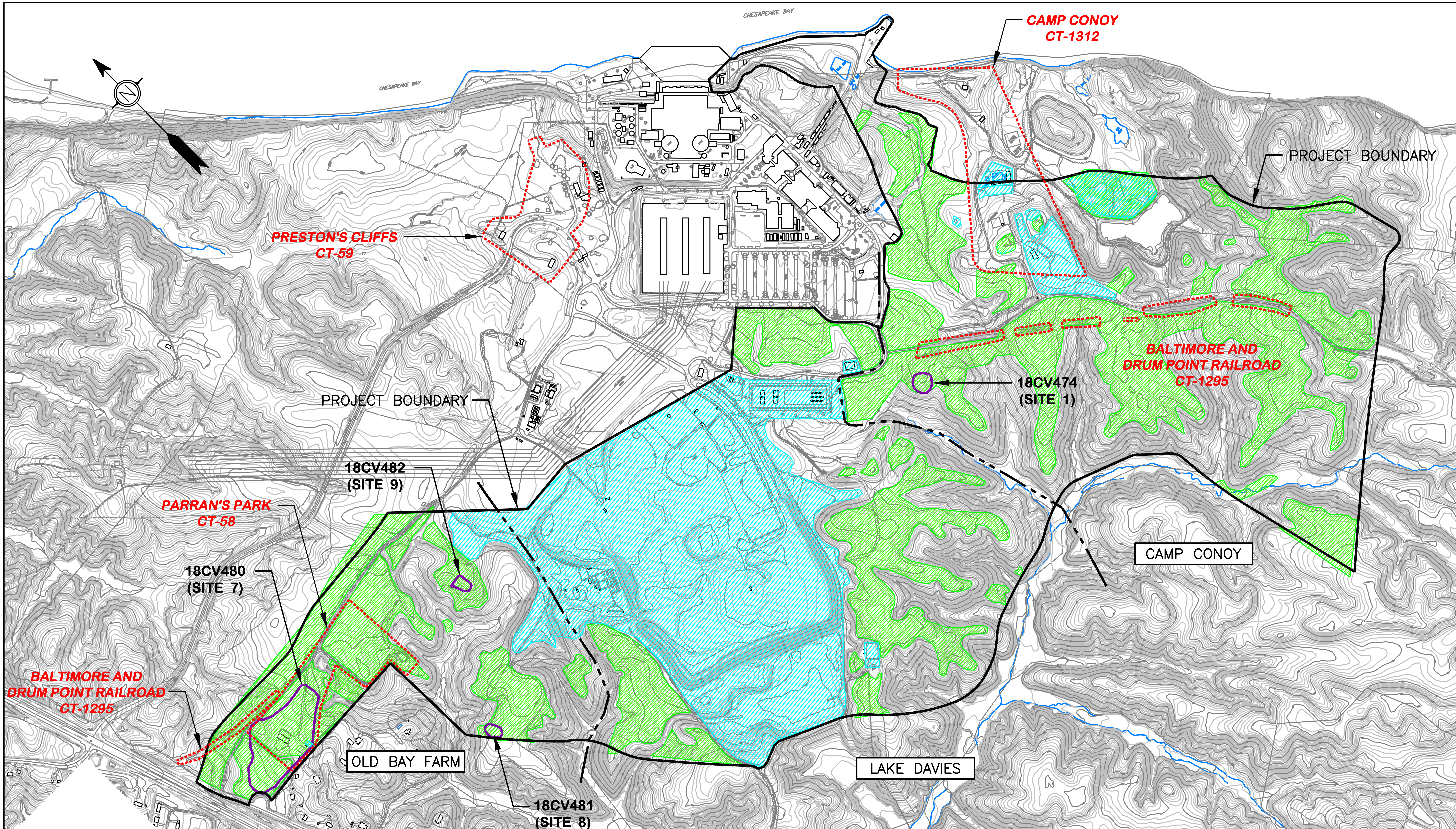
Introduction and Project Description

The cultural resources investigated during this study lie within the Area of Potential Effect (APE) of the 600-acre proposed project area for a new nuclear power generation unit (CCNPP-3) situated adjacent to the existing CCNPP facility (Figure 1). GAI conducted Phase I cultural resources investigations of the proposed project area in 2006-2007 (Munford and Hyland 2007), resulting in the identification of 14 archaeological sites and five architectural resources. Based on the results of this investigation and review by the Maryland Historical Trust (MHT), four sites were recommended as potentially eligible for listing in the National Register of Historic Places (NRHP) and four architectural resources were recommended as NRHP eligible. The goal of GAI's Phase II archaeological study is to evaluate the eligibility of Sites 18CV474 (Site 1), 18CV480 (Site 7), 18CV481 (Site 8) and 18CV482 (Site 9) for listing in the NRHP. The Assessment of Effects study evaluated the proposed project's effects on four NRHP-eligible historic resources: Parran's Park (CT-58), Preston's Cliffs (CT-59), the Baltimore and Drum Point Railroad (CT-1295), and Camp Conoy (CT-1312).

Work was conducted in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, guidelines developed by the Advisory Council on Historic Preservation, the amended *Procedures for the Protection of Historic and Cultural Properties* as set forth in 36 CFR 800, the Secretary of Interior's *Standards and Guidelines for Archaeology and Historic Preservation*, the *Standards and Guidelines for Archeological Investigations in Maryland* (Shaffer and Cole 1994) and *Standards and Guidelines for Architectural and Historical Investigations in Maryland* (MHT 2000).

Figure 1. Project Area Showing Phase II Archaeological Sites and NRHP Boundaries of Architectural Resources

11x17



LEGEND

- PHASE IB TEST AREA
- DISTURBED AREA
- PHASE II ARCHAEOLOGICAL SITE
- ARCHITECTURAL RESOURCE

SCALE 1"=800'

800 0 800

gai consultants

Pittsburgh Office
385 East Waterfront Drive
Homestead, PA 15120-5005
412-476-2000

PROJECT AREA SHOWING LOCATION OF
PHASE II ARCHAEOLOGICAL SITES AND
NRHP BOUNDARY OF ARCHITECTURAL RESOURCES

CALVERT CLIFFS NUCLEAR POWER PLANT
CALVERT COUNTY, MARYLAND

DWN. JL	CHKD. ---	SCALE:
APPD. ---	DATE 5/12/08	1"=800'
DRAWING NUMBER C060570-10-000-00-C-B001		REV –

PLOTTER FILE: ENV COLOR

Phase II National Register Evaluations

Site-Specific Archival Research

For each of the four archaeological sites, GAI conducted chain-of-title research, census research and historic map reviews at the Maryland Hall of Records in Annapolis, and Calvert County Courthouse, the Calvert County Historical Society, and the Calvert County Department of Planning and Zoning in Prince Frederick. Additional sources such as tax records, rent rolls, appropriate published and unpublished histories, and on-line sources were also consulted.

Phase II Field Investigations

GAI conducted Phase II investigations of Sites 18CV474, 18CV480, 18CV481 and 18CV482 to evaluate their National Register eligibility. Phase II fieldwork at each site consisted of close-interval (15 to 25-foot/5 to 7.5-meter) shovel testing and test unit excavations. Table 1 presents a summary of Phase II work effort and results for each site.

Table 1. Summary of Phase II Field Results by Site

Site	GAI Site #	STPs	Total TUs*	Total Sq. Ft. TUs	Artifacts	Features
18CV474	Site 1	142	12	164	2,647	3
18Cv480	Site 7	591	16	223	14,770	23
18CV481	Site 8	97	7	127	899	0
18Cv482	Site 9	131	11	151	4,360	2
Totals		961	46	665	22,673	28

*various sizes--ranging from 5x5-feet to 1x3-feet

Site 18CV474 (Site 1)

Site 18CV474 is located on a wooded ridge approximately 250 feet (76 meters) west of Road C in the Camp Conoy section of the project area. It is centered on a stone foundation and measures 165 x 165 feet (50 x 50 meters) (Photograph 1). The Drum Point Railroad grade lies approximately 200 feet (60 meters) to the east. A large, developed spring is located approximately 210 feet (64 meters) west (and downslope) of the southwest corner of the foundation and is likely associated with the site. No other cultural landscape features were observed in the immediate vicinity.

Photograph 1. Site 18CV474: Overview of Stone Foundation (Partially Intact Chimney Stack near Southeast Corner) and Surrounding Yard Area, View to North

The dry-laid stone foundation (Feature 1) has dimensions of approximately 16 x 18 feet (4.9 x 5.5 meters) (Photograph 2). A partially-intact portion of the chimney stack along the structure's eastern wall stands 4.35 feet (1.33 meters) high. A 12 x 18-foot (3.7 x 5.5-meter) northern addition to the main cell has a dry-laid stone foundation along its west side, while its north and east sides may have been placed on piers.

Photograph 2. Site 18CV4784: View of Stone Foundation (Feature 1), View to Southwest

Soils. GAI's Senior Soil Scientist examined a sample of test unit excavations and confirmed an A-Bt soil horizon sequence across the site. The A horizon varied from approximately 0.1-0.3 ft (3-9 cm) thick and lacked evidence of plow disturbance. The lack of an upper BE horizon in TU5 and TU3 indicates that (pre-occupation) erosion was extensive at this site.

Excavations. GAI excavated 142 shovel test pits at 15-foot (5 meter) intervals across the site. Shovel test artifact distributions were plotted on site maps and the distribution of architecture- and kitchen-related artifacts were, in part, used to guide the placement of subsequent test units. GAI excavated 12 test units of varying sizes, totaling 164 square feet (15 square meters), to further investigate structural remains, possible features, and localities of higher artifact density.

Features. Phase II testing identified three features (Features 1-3), and a possible activity area. Features include the stone foundation and chimney base (Feature 1), a possible builders trench (Feature 2) (visible along west foundation and west foundation addition only) and a stone 'walkway' (Feature 3). The activity area, situated approximately 40 feet (12 meters) south of the foundation, consists of a high artifact concentration (nails, metal springs, container glass, drain tile) marked by a surface scatter of three to five large stones, several bricks and brick bats and daffodils. Two cedar trees were located on the north side of this locus.

Artifacts. Based on preliminary field counts, shovel testing produced 203 artifacts from 47 positive STPs. Unit excavations produced an additional 2,441 artifacts. Three artifacts observed on the surface were also collected, resulting in a total field count of 2,647 artifacts. Preliminary review indicates that artifacts consist largely of kitchen ceramics (*n*=317) and glass (*n*=1302) and architectural-related items including nails (*n*=350), window glass (*n*=232), brick (*n*=122), and mortar (*n*=851). There were 683 other specimens collected including 456 shell and 14 bone.

A variety of diagnostic artifacts were produced from the excavations. Cut nails (c. 1790s-1890s) were the only type of nails identified to date (Nelson 1968). Diagnostic ceramics include pearlware (1775-1820), whiteware with transfer print (1828-1860), annular (1830-1860), hand-painted (1840-1860), and sponge spatter (1830-1871) decoration, yellowware (1830-1900), white ball clay and red clay tobacco pipes (c. 17th-19th centuries) (Ketchum 1987, Majewski and O'Brien 1984, Mullins 1988, Robacker and Robacker 1978, South 1977). Diagnostic bottle glass includes an improved tool bottle finish (c. 1870-1915) (Deiss 1981). No machine-made (post-1903) bottle glass was observed. Based on the preliminary estimates of quantities and types of diagnostic artifacts observed, it appears that this site dates to the mid- to late-nineteenth-century.

Archival research. Archival research provided a chain-of-title for Site 18CV474 from its current owners (Calvert Cliffs Nuclear Power Plant, Inc.) back to Bell Sewell Dowell in 1889. Court house fires make it difficult to trace the chain-of-title before 1889; however, it is likely that this chain of ownership continues through the Dowell family back to the Somervell family based on two equity cases (No. 8 and No. 39) in which commissioners sold portions of the estates of Charles T. Somervell and Margaret E. Somervell to Willis G. Dowell and John B. Dowell. The Margaret Somervell tract is also associated with Sites 18CV480 and 18CV482. Site 18CV474 is likely associated with either a slave (or freed slave), tenant, or sharecropper living on the property rather than the landowner, who may have resided at Site 18CV480.

Summary and Evaluation. Site 18CV474 is a tenant, sharecropper, or slave and/or freed African-American domestic habitation site dating to the nineteenth-century. This domestic habitation site is located away from the landowner's domestic complex (Parran's Park/Site 18CV480) in an area that may be considered marginal land (since it was not cultivated). The site size of 165 x 165 feet (50 x 50 meters) reflects the size of the domestic complex (house and yard area). Ancillary areas, such as the spring located about 210 feet (64 meters) to the west of the former house, are located outside of the current site boundary. The site possesses integrity and does not exhibit evidence of plow disturbance or twentieth-century refuse. Site 18CV474 has the potential to address research questions relating to domestic agricultural sites of the nineteenth-century in Maryland's Western Shore region. GAI recommends that Site 18CV474 is eligible for listing in the National Register under Criterion D. Therefore, GAI recommends that this site be avoided by proposed project impacts. If avoidance is not feasible, then GAI recommends Phase III data recovery excavations at this site to mitigate the adverse effects.

Site 18CV480 (Site 7)

Site 18CV480 occupies a broad, rolling upland north of Goldstein Branch in the northeastern corner of the project area. It is bounded by Route 2/4 to the west, Road B to the north and the project boundary to the south. The site measures 500 x 1025 feet (152 x 312 meters) and encompasses a western low lying field (Area 1) and a larger upper field (Area 2). Phase I background research indicated that the site is the location of the former Parran's Park Farmstead (CT-58), and it currently contains two twentieth-century frame tobacco barns (Structures 3 and 4 [CT-58A]), a shed, a modern metal garage and a trailer. The Parran's Park residence, demolished by BG&E in 1972, was formerly located immediately west of the metal garage. Phase Ib survey defined an area of higher artifact density, designated Locus 1 (Photographs 3 and 4), in the vicinity of the former residence, at the western edge of the upper field (Area 2).

Photograph 3. Site 18CV480: Overview Showing Test Unit Excavations at North Edge of Locus 1, View to Northeast

Photograph 4. Site 18CV480: Test Unit Excavations (TU 5) in Locus 1, Modern Garage and Twentieth-Century Tobacco Barn in Background, View to Southeast.

GAI's Phase II geomorphological assessment concluded that portions of the site have been disturbed by modern activities. No evidence of the historic era house, buildings, or trees remains on the site. (The level area where the house once stood was evidently bulldozed when the house was razed.) Area 2, the field west of the former house location, is an excavated basin that may have been used as a source of borrow materials during power plant construction and, according to CCNPP staff, has been used as a disposal area for water intake sediments during plant operation. The domestic site is separated from the basin by a steep escarpment that has obviously been cut. Immediately north of Locus 1 is a small basin that also appears to have been excavated or otherwise widened through earthmoving.

Soils. Shovel tests and unit excavations in Locus 1 (domestic complex) exposed varying soil horizon sequences which serve to distinguish areas of disturbance from intact soils. The area around the former house location exhibited fill mixed with topsoils (CA/A horizon) overlying subsoils. This disturbed locality likely reflects bulldozing associated with demolition/removal of the house. The northern portion of Locus 1 (on the slope above/adjacent to the machine excavated basin), exhibited fill (CA horizon) over a buried A horizon which capped subsoil. Along the modern metal garage (to the east side of the former house location), the soil sequence indicated a relatively undisturbed topsoil over subsoil. Shovel testing within previously cultivated fields generally documented an Ap-Bt soil horizon sequence within eroded soils (i.e., the topsoil has been eroded/removed and the upper portion of the subsoil has been plowed).

Excavations. GAI excavated 591 shovel test pits at 15-foot (5 meter) intervals across the site. Within Locus 1 (former house location) and around the two former tobacco barns shovel testing was conducted at 15-foot (5 meter) intervals. In the remainder of the site (upper and lower fields), shovel tests were excavated at 25-foot (7.5-meter) intervals. Based on preliminary field counts, shovel testing produced 2,574 artifacts from 230 positive STPs. Artifacts densities ranged from a concentration of 1 to 100 artifacts per STP in Locus 1 to a low density scatter of 1 to 9 per STP across the remainder of the site.

Based on the results of STP excavations, Phase II test unit excavations were restricted to Locus 1--the vicinity of the former residence—which measures 330 x 140 feet (101 x 43 meters). Artifact distributions from shovel tests in Locus 1 were plotted on the site map and distribution of architecture- and kitchen-related artifacts were, in part, used to guide the placement of subsequent test units. GAI excavated 16 test units (six 5x5-foot units, six 3x3-foot units, one 2x5-foot unit and three 1x3-foot units), totaling 223 square feet (20.7 square meters), to investigate structural remains, possible features, and localities of higher artifact density. Based on field counts, test unit excavations yielded 12,196 artifacts, for a total of 14,770 Phase II artifacts.

Features. Phase II testing identified 23 cultural features, some of which appear to represent remnants of an intact Ab horizon, while others appear to be associated structural features (Table 2). Features include stone walls/ foundations, post holes and post molds, a deep pit, a buried A horizon/sheet midden, and features of unknown type.

Table 2. Site 18CV480 Phase II: Summary of Features

Feature No.	Feature Type	Test Unit Location
1	Deep Pit Feature	TUs 5 and 16
1a	Stones Associated with Feature 1	TU 16
2	Midden/Ab horizon associated with Feature 4 and 4A	STP N365 E480, TU 8
3	Stone Pier and wall (?)	TU 2
4	Midden/Ab horizon associated with Features 2 and 4a	TUs 1, 3, 7 and 15
4a	Midden/Ab horizon associated with Features 2 and 4	TUs 4 and 14
5	Rock and Mortar Rubble	TU 2
6	Building Floor/Ab horizon	TUs 5 and 16
7*	Non-Cultural Feature - BE horizon	TU 2
8	Rock Wall associated with Feature 12	TUs 1, 3, 7 and 15
8a	Rock Wall or Pier	TU 14
8b	Builder's Trench associated with Feature 8	TU 15 and TU 7
9*	Non-Cultural Feature - BE horizon	TU 5
10	Postmold	TU 1
11	Posthole	TU 2
12	Stone Pier (?) associated with Feature 8a	TU 4
13	Rock Cluster	TU 6
14	Possible Posthole	TU 12
15	Driveway (?)	TU 10
16	Filled-in Hole in Driveway (?)	TU 10
17a	Posthole	TU 13
17b	Postmold	TU 13
18	Posthole	TU 13
19a	Postmold associated with Feature 19b	TU 15
19b	Postmold associated with Feature 19a	TU 15

* determined to be natural soil horizon upon excavation

A deep pit, identified as Feature 1 was encountered in a STP and further investigated with Test Units 5 and 16. The feature had a maximum diameter of 5.3 ft. and a ***depth of over 6.2 ft below ground surface*** (in TU 16 based on soil auger probes). Stone (Feature 1a) lined the southern edge of the feature in TU 16. The base of the feature was encountered at a depth of 2.0 ft below ground surface in TU 5, but no rock lining was observed. Feature fill consisted of dark yellowish-brown silt loam. An excavated sample, from the upper 1.3 feet of feature fill, yielded modern artifacts including plastic, a pencil, and battery. The function of the feature has not yet been determined.

A sheet midden-like deposit (Features 4 and 4A) found on the northern hillslope is approximately 0.3 -0.4 ft thick and has two distinct layers of shell: one near the interface with subsoil, and another layer near the interface with overlying fill deposits. Diagnostic artifacts indicate a mid-nineteenth to mid-twentieth temporal affiliation for these deposits.

Artifacts. Field counts indicate that Phase II excavations produced 14,770+ artifacts, consisting of more than 4,000 kitchen-related glass (i.e., bottles, jars, tumblers, canning jar lid liners, pressed glass bowls) (*n*=8754). Other types of artifacts well represented in the assemblage includes kitchen-related ceramics (*n*=1609) and architectural-related items including nails (*n*=2026), window glass (*n*=1825), brick (*n*=480), and cement/mortar (*n*=437). Other specimens included shell (*n*=2960+), bone (*n*=144), and miscellaneous metal pieces (*n*=510). Other types of artifacts observed in this diverse assemblage includes gun shells, lamp chimney glass, marbles, buttons, and jaw harp.

Based on a review of a sample of the field specimen bags, a variety of diagnostic artifacts were produced from the excavations. Cut nails (ca. 1790s-1890s) were common (Nelson 1968). Diagnostic ceramics include transfer print (1828-1860) and edge decorated (1830-1890s) whiteware, and annular decorated yellowware (1822-1922) (Majewski and O'Brien 1984; Miller and Hunter 1990). Diagnostic glass includes improved tool bottle finishes (early 1870s-c.1915), blown-in-mold jar finishes with ground lip (1800-early 1870s), canning jar lid liners (c. 1869-1950), and machine-made jar and bottle finishes (1903-present) (Deiss 1981; Toulouse 1971). Some of the artifacts appear modern (c. 1950s – present) including ointment tube end, lipstick tube (with lipstick intact), thermos top, and plastic screw lids. Based on a limited review of diagnostic artifacts, this site has a mid-nineteenth to mid-twentieth century temporal affiliation.

Archival research. Archival research provided a chain-of-title for Site 18CV480 from its current owners (Calvert Cliffs Nuclear Power Plant, Inc.) back to Goodman Goldstein, et. ux. in 1926. At that time the property included three separate parcels. Two of the parcels may have included Site 18CV480. One parcel was part of "Locust Grove" identified in court proceedings for Margaret E. Somervell's estate. The other parcel was identified in court proceedings as part of Goodman Goldstein's estate. (Sites 18CV474 and 18CV482 have a similar chain of title.)

Summary and Evaluation. Site 18CV480 is a mid-nineteenth to mid-twentieth century domestic site centering on Locus 1, the 330 x 140 feet (101 x 43 meters) location of the former house and yard area. The habitation area is heavily disturbed, as much of the house area was (mechanically) stripped of its A horizon (along with most of the artifacts) and lacks integrity. There are limited areas with integrity within the habitation area. The outlying tobacco barns, activity areas, and fields have a low density artifact scatter creating a total site area of 510 ft (N-S) by 990 ft (E-W).

While part of the habitation area (Locus 1) does possess intact deposits and features, the majority of the former house location and the adjacent yard area lacks integrity. The site appears to have been occupied for a long period and includes modern artifacts mixed with older artifacts. Based on these conditions, GAI concludes that Site 18Cv480 does not possess the potential to address important questions relating to the history of this region. Based on the results of Phase II field investigations and archival research, GAI recommends that Site 18CV480 is Not Eligible for listing on the National Register under Criterion D. Accordingly, GAI recommends no further investigations of this site.

Site 18CV481 (Site 8)

Site 18CV481 lies at the northern edge a fallow field on a broad ridgetop above Goldstein Branch, in the Old Bay Farm section of the project area (Photograph 5). It has dimensions of 130 x 140 feet (40 x 43 meters). Woodlands lie to the north of the site and two finger-like projections of the field extend to its west and south.

Photograph 5. Site 18CV481: Overview of Shovel Testing in Fallow Field, View to Northwest

Soils. Shovel testing within this previously cultivated field documented an Ap-Bt soil horizon sequence within eroded soils (i.e., the topsoil has been eroded/removed and the upper portion of the subsoil has been plowed) across the site. The Ap horizon varied from approximately 0.35 x-1.3x ft (10-40 cm) thick.

Excavations. GAI excavated 97shovel test pits at 15-foot (5 meter) intervals across the site to delineate the site limits. Based on field counts, shovel tests yielded a low density (1 to 9 artifacts per shovel test) of 142 artifacts from 43 positive STPs. Shovel test artifact distributions were plotted on site maps and the distribution of architecture- and kitchen- related artifacts were, in part, used to guide the placement of subsequent test units.

GAI excavated seven test units of varying sizes, totaling 127 square feet (11.8 square meters), to further investigate localities of higher artifact density. Based on field data, test unit excavations yielded 757 artifacts. No cultural features were identified.

Artifacts. Field counts indicate that Phase II excavations produced 882 artifacts (all from the plowzone), consisting largely of kitchen-related glass (*n*=367) and ceramics (*n*=381). Only 67 architectural-related items including nails (*n*=12), window glass (*n*=41), and brick (*n*=14) were recovered. There were 67 other artifacts including clothing fasteners, lamp chimney glass, shell, toy and white ball clay pipe fragments. The high ratio of kitchen- to architectural- related artifacts (11:1) is more indicative of a refuse disposal pattern (in fields or a dump) rather than a domestic complex.

Based on a review of the artifact assemblage, a variety of diagnostic artifacts were produced from the excavations. Diagnostic ceramics include pearlware (1780-1830), whiteware with transfer print (1828-1860), edge-decorated (1830-1890s), hand-painted (1840-1860) decorations, and white ball clay pipe pieces (c. 17th-19th centuries) (Majewski and O'Brien 1984; Miller and Hunter 1990; South 1977). Diagnostic glass includes an applied bottle finish (late 1820s-early 1870s), sun colored amethyst glass (1880-1915), and machine-made bottle with a crown finish (1903-present) (Deiss 1981; Miller and Pacey 1985). Plastic buttons and pieces of modern plastic were also recovered.

Archival research. Archival research provided a chain-of-title for Site 18CV480 from Baltimore Gas and Electric Company in 1985 back to James Pardoe in 1973. Prior to 1973, this 29.4-acre parcel was divided into two smaller tracts. Approximately 13 acres of the land was held by the Pardoe family at least as early as 1870. (The other tract, covering about 15 acres and referred to as the “Gideon Johnson Tract,” was traced back to Harry B. Trueman’s ownership in 1946.)

Summary and Evaluation. Site 18CV481 is a nineteenth – twentieth century field scatter located on a broad ridgetop in the Old Bay Farm section of the project area. This site measures approximately 130 x 140 feet (40 x 43 meters). No features were identified. All of the artifacts were recovered from the plowzone. The site lacks integrity and does not possess the potential to address important questions relating to the history of this region. Based on the results of Phase II field investigations and archival research, GAI recommends that Site 18CV481 is Not Eligible for listing on the National Register under Criterion D. Accordingly, GAI recommends no further investigations of this site.

Site 18CV482 (Site 9)

Site 18CV482 is a domestic site located on a wooded ridge above a tributary of Goldstein Branch and south of Road B, in the project area’s Old Bay Farm Section (Photograph 6). A wetland, created during construction of the existing CCNPP facility, lies west of this ridge. The site measures 150 x 180 feet (46 x 55 meters) and is bisected by an old NW-SE trending road bed. A deteriorated barbed wire and post fenceline follows the northeast side of the road.

Photograph 6. Site 18CV482: Overview of Site on Wooded Ridgetop with Line of Pine Trees Marking Edge of Old Road Bed, View to Southwest

Soils. GAI’s Senior Soils Scientist examined a sample of test unit excavations from this site. Excavations documented that across much of the site area the soils were disturbed (possibly from logging activities) and/or heavily eroded and had an organic layer (Ao horizon) over subsoil (BE or Bt horizon). The road bed located within the site appears to have been constructed with heavy machinery removing the historic-era A horizon. There is a fairly prominent, straight rut to the southwest of, and parallel to, the road, which also disturbed part of the site. Two small loci within the site appeared to have intact soils. In the south locus, unit excavations exposed an Ap-BE-Bt horizon sequence. This is the only area within the site where a plowzone was identified. In the north locus, located just off the crest of the hilltop on the northeast side of the road, unit excavations exposed an A-BE-Bt horizon sequence. The A horizon includes an area with an organic rich sheet midden with shell and nineteenth-century artifacts covered by duff or an Ao Horizon.

Excavations. GAI excavated 131 STPs at 15-foot (5-meter) intervals across the site. Shovel test artifact distributions were plotted on site maps and distribution of architecture- and kitchen- related artifacts were used to guide the placement of test units. GAI excavated 11 test units (four 5x5-foot units, five 3x3-foot units, two 1x3-foot units), totaling 151 square feet (14 square meters), to further investigate possible features and localities of higher artifact density.

Features. Phase II excavations identified two cultural features (Feature 1/3 and Feature 5). Feature 1/3 is a possible sheet midden identified in TUs 3 and 4. Feature 5 is a dry-laid, stone wall corner remnant that was identified in TUs 1, 8, and 9. (Features 2 and 4 were identified as plow scars upon excavation.) Plow scars appeared both inside and outside of the Feature 5 wall corner, indicating that the area was plowed before the wall was constructed.

Artifacts. Based on preliminary field counts, shovel testing produced 225 artifacts from 49 positive STPs. Unit excavations produced an additional 4,135 artifacts, for a total of 4,360 Phase II artifacts. Preliminary review of artifacts recovered from Site 18CV482 indicates that they consist largely of kitchen- (282 ceramics and 1296 container glass) and architecture- (662 brick, 221 nails, 193 mortar and cement, and 1325 window glass) related specimens. Other types of artifacts, such as ball clay pipe piece, metal hook, hinge, washer, gun cartridge, buttons, lamp parts, plastic comb, and safety pin, were represented in smaller quantities.

A variety of diagnostic artifacts were produced from the site excavations. The artifact sample reviewed in the laboratory include cut nails (ca. 1790s-1890s), whiteware with transfer print (1828-1860) and hand-painted (1840-1860) decorations, white ball clay tobacco pipe pieces (c. 17th-19th centuries), amethyst bottle glass (1880-1915), blown-in-mold jar with ground finish (1800-early 1870s), and improved tool bottle finishes (early 1870s- c. 1915) (Deiss 1981; Majewski and O'Brien 1984; Miller and Pacey 1985; Nelson 1968). Based on the types of diagnostic artifacts observed it appears that this site dates to the mid- nineteenth to early twentieth century.

Archival research. Archival research provided a chain-of-title for Site 18CV482 from its current owners (Calvert Cliffs Nuclear Power Plant, Inc.) back to Goodman Goldstein, et. ux. in 1926. At that time the property included three separate parcels. Two of the parcels may have included Site 18CV482. One parcel was part of "Locust Grove" identified in court proceedings for Margaret E. Somervell's estate. The other parcel was identified in court proceedings as part of Goodman Goldstein's estate. (The Margaret Somervell tract is also associated with Sites 18CV474 and 18CV480.) Site 18CV482 is likely associated with either a slave (or freed slave), tenant, or sharecropper living on the property rather than the landowner, which may have resided at Site 18CV480.

Summary and Evaluation. Site 18CV482 is a mid- nineteenth to early twentieth century domestic habitation site measuring approximately 150 x 180 feet (46 x 55 meters). The site lacks integrity and does not possess the potential to address important questions relating to the history of this region. Based on the results of Phase II field investigations and archival research, GAI recommends that Site 18CV482 is Not Eligible for listing on the National Register under Criterion D. Accordingly, GAI recommends no further investigations of this site.

Assessment of Effects to Historic Resources

GAI conducted an architectural survey of the project viewshed concurrent with 2006-2007 Phase Ib field investigations. GAI evaluated five historic resources during this study, four of which were subsequently recommended as NRHP eligible. A brief summary of the project's effects to these four resources is presented in Table 3 and described below (see Figure 1).

Table 3. Summary of NRHP-Eligible Architectural Resources

MHT-No	Name	Date	Resource Type	NRHP Status	Recommended Effects Evaluation
CT-58	Parran's Park	C1750	Abandoned Farmstead	NRHP Eligible, Criterion A	Adverse Effect
CT-59	Preston's Cliffs (Charles's Gift, The Wilson Farm)	C1690	Ruins and Tobacco Barns	NRHP Eligible, Criteria A and C	No Effect
CT-1295 (18CV172)	Baltimore & Drum Point Railroad	C1890	Abandoned Railroad	NRHP Eligible, Criterion A and C	Adverse Effect
CT-1312	Camp Conoy	C1930	YMCA Camp	NRHP Eligible, Criteria A	Adverse Effect

Parran's Park (CT-58)

Parran's Park (CT-58) is located in the northwest corner of the project area (see Figure 1). This resource currently consists of three former tobacco barns (Structures 3, 4 and 5). The main residence at Parran's Park was built circa 1750, but sustained severe fire damage in 1955, was abandoned, and then demolished by Baltimore Gas and Electric Company in 1972. Two modern buildings (a metal garage and a trailer) are located within the property. Based on the results of GAI's architectural survey and subsequent review by the Maryland Historical Trust's (MHT), Parran's Park (CT-58) is NRHP-eligible under Criterion A, for association with agricultural history.

CT-58 will be impacted by at-grade road construction within the resource's NRHP boundary. Proposed construction activities at CT-58 will likely adversely affect the resource.

Preston's Cliff (CT-59)

Preston's Cliffs (CT-59), is situated north of the existing CCNPP facility and within the proposed project's viewshed (see Figure 1). The property presently consists of three large tobacco barns (CT-59A, CT-59B, and CT-59C), a modern frame building, and the ruins of a seventeenth-century house. One tobacco barn has served as a Visitor's Center (currently closed) and a second barn has been used for public display purposes. The former residence was demolished 1972 and is represented by four brick chimney stacks. Based on the results of GAI's architectural survey and MHT's review, this resource is NRHP-eligible under Criterion A, for its association with tobacco culture and agricultural history at the local level, and Criterion C, for tobacco house architecture.

CT-59 will not be impacted by the designation of a wetland mitigation easement area which encompasses the northern edge of the resource's NRHP boundary (including tobacco barn CT-59A. To date, designs for wetland mitigation will have No Effect on CT-59 and its contributing resources.

Baltimore and Drum Point Railroad (CT-1295/18CV172)

The Baltimore and Drum Point Railroad (CT-1295/18Cv172), a previously-listed NRHP-eligible resource, consists of the discontinuous remains of a linear railroad bed extending in a southeast-northwest orientation through the project area (see Figure 1). Constructed between 1888 and 1891, the railroad project was abandoned and ties and rails were never installed. Portions of this resource have been previously-recorded in other locations in Calvert County (CT-1295 Capsule Summary MHT Inventory Form) and, in 1996, the MHT concurred with recommendations that the resource is NRHP-eligible under Criteria A and C, for its association with a significant local endeavor and as an example of the materials and techniques of late-nineteenth-century railroad construction. The portions of CT-1295 within the project area are NRHP-eligible as contributing elements to the resource's significance.

Within the project APE, contributing segments of CT-1295, will be impacted physically by road construction and plant expansion and visually impacted by construction of a cooling tower and a desalinization facility in the vicinity of the resource. Proposed construction activities at the location of non-contiguous, contributing segments of CT-1295 will adversely affect the characteristics and attributes that qualify the resource for inclusion in the NRHP.

Camp Conoy (CT-1312)

Camp Conoy (CT-1312), situated in the southeast portion of the project area, is a former YMCA camp dating from 1931 to 1967 (see Figure 1). Subsequent to Baltimore Gas & Electric's purchase of the property in 1967, the land and buildings were modified and many of the camp's buildings were demolished. The resource currently encompasses six buildings, two pavilions, a swimming pool, tennis courts and a playground. Based on the results of GAI's architectural survey and review by MHT, Camp Conoy is NRHP-eligible under Criterion A, for association with entertainment/recreation and social history at the local level.

CT-1312 will be impacted physically by grading and construction activities within the NRHP boundary of the resource. Activities include demolition of buildings that convey the historic significance of Camp Conoy. Proposed construction activities at CT-1312 will adversely affect the characteristics and attributes that qualify the resource for NRHP listing.

Evaluations and Recommendations

As presented in Table 4, based on the preliminary results of GAI's Phase II National Register evaluations Site 18CV474 is recommended as eligible to the NRHP under Criterion D. GAI recommends avoidance of this site by the proposed project. If avoidance is not feasible, GAI recommends Phase III data recovery investigations of Site 18CV474.

Sites 18CV480, 18CV481 and 18CV482 are recommended as Not Eligible to the National Register of Historic Places, under Criterion D (see Table 4). GAI recommends no further archaeological investigations of these sites.

Table 4. Summary of Evaluations and Recommendations

Site #	GAI Site #	Site Type	Estimated Age	National Register Recommendation	Recommendations for further work
18CV474	Site 1	Domestic Site	19th c	Eligible, Criterion D	Avoidance or Phase III
18Cv480	Site 7	Domestic Site	Mid 19th to mid 20th c	Not Eligible	No Further Work
18CV481	Site 8	Field scatter	19th – 20th c	Not Eligible	No Further Work
18Cv482	Site 9	Domestic Site	Mid 19th-early 20th c	Not Eligible	No Further Work

Based on GAI's Assessment of Effects for architectural resources the proposed project will result in an adverse effect to three resources (Parran's Park/CT-58; Baltimore & Drum Point Railroad/CT-1295; and Camp Conoy/CT-1312) and will result in No Effect to one resource (Preston's Cliffs/CT-59).

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Sincerely,
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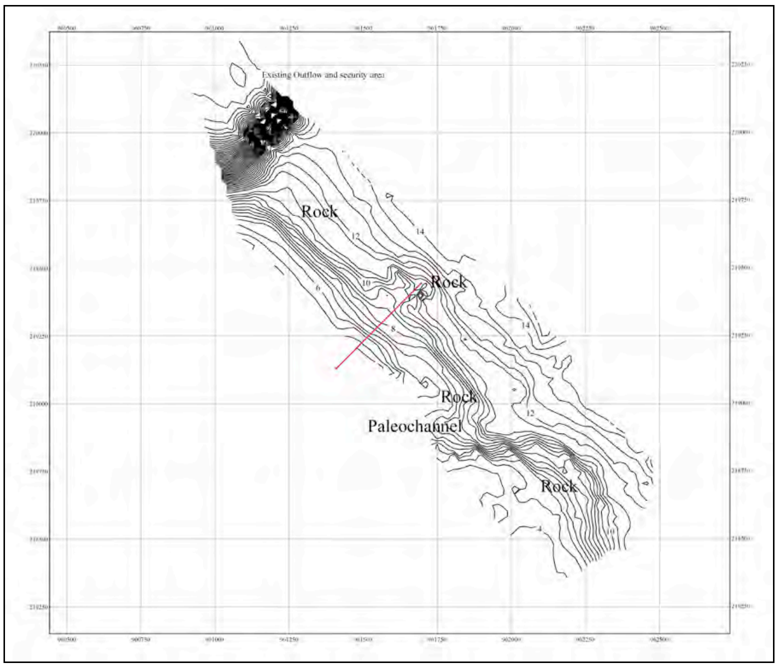
BAM:BR/lms

cc: Mr. Patrick Garrow

SUBMERGED CULTURAL RESOURCES SURVEY OF A PROPOSED OUTFALL PIPE, CALVERT CLIFFS NUCLEAR POWER PLANT UNIT 3 CONSTRUCTION, CALVERT COUNTY, MARYLAND



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CONDUCTED UNDER:

MACTEC Work Order No. 200806568
MACTEC Project No. 8093076565

DRAFT REPORT ♦ MAY 2008

DRAFT REPORT

SUBMERGED CULTURAL RESOURCES SURVEY OF A PROPOSED OUTFALL PIPE, CALVERT CLIFFS NUCLEAR POWER PLANT UNIT 3 CONSTRUCTION, CALVERT COUNTY, MARYLAND

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ABSTRACT

During March 2008, archaeologists with Panamerican Consultants, Inc. of Memphis, Tennessee conducted an intensive submerged cultural resources remote sensing survey of a proposed outflow pipeline at the Calvert Cliffs Nuclear Power Plant in Calvert County, Maryland, north of both Solomons Point and the mouth of Patuxent River. The project area that required survey is 650-×-1,400 feet and is centered on the proposed outfall pipeline. Performed under contract to MACTEC Federal Programs, Inc. of Herndon, Virginia, the investigation was comprised of a magnetometer, sidescan sonar, and subbottom profiler survey, the primary focus of which was to determine the presence or absence of anomalies representative of potentially significant submerged cultural resources eligible for listing on the National Register of Historic Places.

Results of the survey identified a total of 9 magnetic anomalies and 5 sidescan sonar targets. None of the magnetic anomalies or sidescan targets are considered potentially significant for the purposes of this investigation, and no further archaeological work is recommended. However, the reconstruction of the bay bottom with sidescan and subbottom revealed a paleolandscape setting with a paleochannel to the south of the proposed pipeline and an indurated hillock and large rock outcrop at the location of the proposed pipeline alignment. It is thought that the location of the rock outcrop will adversely effect pipeline construction. Because the area between the line of the current proposed pipeline and the paleochannel feature to the south and east of the pipeline has a potential for submerged prehistoric cultural resources, this area should be avoided if the pipeline alignment is to be moved. The optimum realignment area would be to the north and west of the current proposed route.

ACKNOWLEDGEMENTS

Panamerican Consultants, Inc. would like to thank the following people for their assistance during this project. First and foremost, we would like to acknowledge Mr. William Burch of MACTEC, Inc., for allowing us the opportunity to conduct this investigation. Tim Koller and the staff at the Plant deserve acknowledgement for ensuring the efficiency and safety of thisi project.

The crew deserves acknowledgment for their hard work, dedication, and attention to detail in conducting this project effectively and safely. Mr. Ron Caudill served as boat captain.

In-house Panamerican personnel who must be thanked, as well, include Kate Gilow, office manager, and Jessie Flanders, report editor. In closing and as always, Jim Duff must be thanked for his efforts in the field, especially for his expert boat handling during the running of survey lines.

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1. INTRODUCTION

During March 2008, archaeologists with Panamerican Consultants, Inc. of Memphis, Tennessee (Panamerican) conducted an intensive submerged cultural resources remote sensing survey under contract to MACTEC Federal Programs, Inc. of Herndon, Virginia (MACTEC) of a proposed outflow pipeline at the Calvert Cliffs Nuclear Power Plant (Figure 1). Located in Calvert County, Maryland and north of both Solomons Point and the mouth of Patuxent River, the project area that required survey measures 650-×-1,400 feet and is centered on the proposed outfall pipeline. The outfall will extend 550 feet into Chesapeake Bay from an area that contains existing bulkheads, and construction of the outflow pipe will include excavation of a trench with a dredge, placement of the outfall line, and then covering the line and trench with dredged spoil (Figure 2).

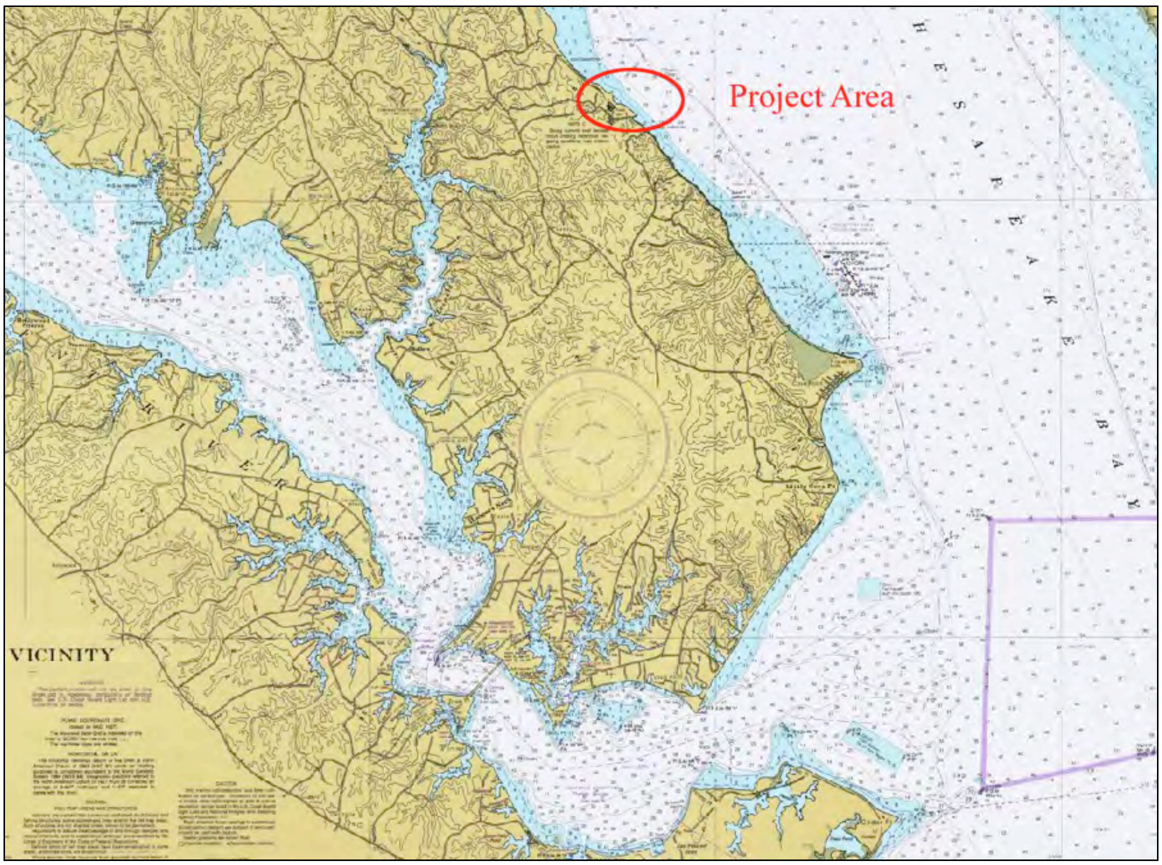

Figure 1. Project area location map (excerpt from NOAA Navigational Chart "Patuxent River and Vicinity, MD," Chart No. 12264).

Comprised of a magnetometer, sidescan sonar, and subbottom profiler survey, the primary focus of the investigation was to determine the presence or absence of anomalies representative of potentially significant submerged cultural resources eligible for listing on the National Register of Historic Places (NRHP), and if present, which, subsequently, might require additional investigations. A secondary aspect was the identification of hazards to the proposed pipeline construction.

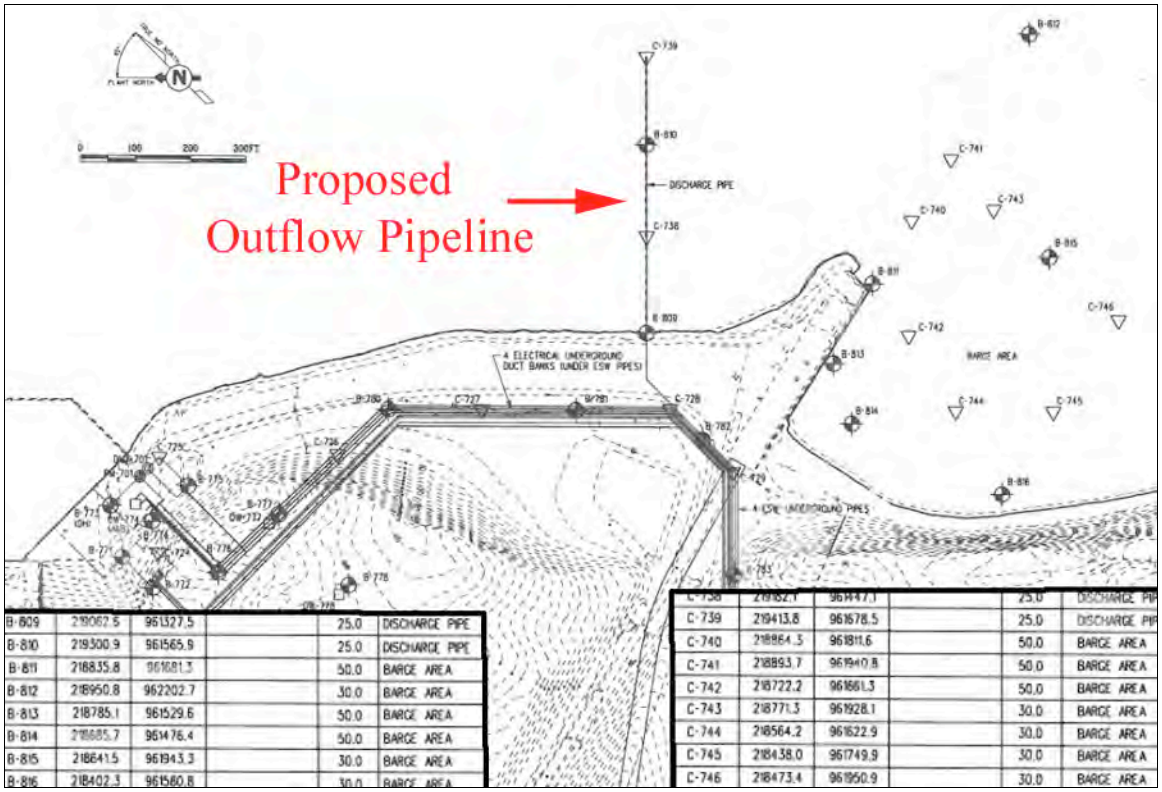

Figure 2. Plan for the outflow pipe, showing its location, the location of the barge jetty, and various survey points (courtesy of MACTEC).

The project was conducted relative to responsibilities under various Federal and State statutes, and was performed in compliance with Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (36 CFR 800, *Protection of Historic Properties*), and the Abandoned Shipwreck Act of 1987 (*Abandoned Shipwreck Act Guidelines*, National Park Service, *Federal Register*, Vol. 55, No. 3, December 4, 1990, pages 50116-50145), as well as State of Maryland guidelines for submerged cultural resources surveys.

Results of the remote sensing survey identified a total of 9 magnetic anomalies and 5 sidescan sonar targets. None of the magnetic anomalies or the sidescan sonar targets are considered potentially significant for the purposes of this investigation, and no further archaeological work is recommended. The reconstruction of the bay bottom with sidescan and subbottom revealed a paleolandscape setting with a paleochannel to the south of the proposed pipeline and an indurated hillock and large rock outcrop that extends approximately 90 feet on either side of the proposed pipeline at the location of the proposed pipeline alignment. It is thought that the location of the rock outcrop will adversely effect pipeline construction. Because the area between the line of the current proposed pipeline and the paleochannel feature to the south and east of the pipeline has a potential for submerged prehistoric cultural resources, this area should be avoided if the pipeline alignment is to be moved. The optimum realignment area would be to the north and west of the current proposed route.

2. HISTORICAL BACKGROUND

Limited archival investigations were conducted for this project to understand the potential for both historic (shipwreck) resources and submerged prehistoric resources. Presented below, the background information has been divided into descriptions of the local environmental setting, and cursory historic period and prehistoric period potentials.

Panamerican reviewed company reports dealing with Maryland maritime history, visited the Calvert Marine Museum in Solomons seeking information about known shipwrecks in the area or the potential for their existence, and interviewed local geoarchaeologist Darrin Lowery with regard to known locations of submerged prehistoric sites and the potentials for same.

No shipwrecks were known for the area and it was considered low potential that they might occur along the straight, exposed shoreline. No submerged prehistoric sites were known for the area, but the potential for Paleoindian through Archaic remains was considered likely.

ENVIRONMENTAL SETTING

Most of the Maryland shoreline is broken and sinuous because sediments of the coastal plain offer little resistance to erosion and since low-lying portions are easily inundated. Only the bay shore of Calvert County is marked by higher bank or relatively straighter shorelines and the eroding sediment hills.

Calvert Cliffs are remnant hillocks of sediment beds sheared by erosion and calving (Figures 3 and 4). The geologic beds of the cliffs (eroded portions of old sediment beds) apparently continue underwater according to the sidescan record.

Figure 3. Viewing approximately west, toward the power plant in the center and the barge jetty to the left.

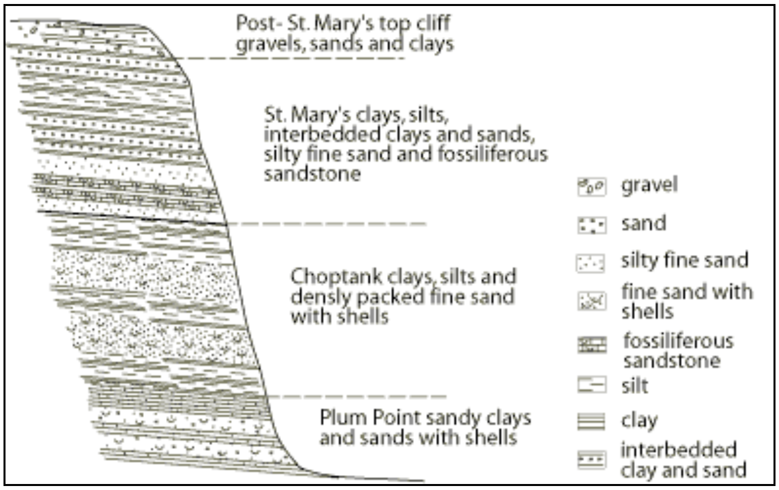

Figure 4. Sediment beds of the cliffs showing the sandy constituents potential in the bay as runoff and as similar, older, additional beds below the water line.

The nearest ice sheet to Chesapeake Bay was approximately 200 km north of Maryland during the last continental glaciation (around 25,000 B.P.). Sea level changes and sediment deposits around Chesapeake Bay are the indirect effects of this nearby glaciation.

Evidence suggests the Chesapeake Bay is very young, perhaps no more than 8,000 to 10,000 years old, depending on when isostasy and sea level rise coincided to breach the mouth of the bay. The bay and the lands that surround it are the result of changes in sea levels associated with the fluctuations of major ice sheets during the Pleistocene.

Chesapeake Bay is the result of the Holocene drowning of the drainage system of the ancestral Susquehanna River (PaleoSusquehanna). The evolution of the bay includes the continued submergence of this feature.

There are rich records locally of prehistory, protohistory, colonial history, and United States history, but these are only outlined here for purposes of brevity.

PREHISTORIC POTENTIALS

Prehistorically, the record of Maryland includes a full sequence from the Paleoindian era through Archaic, Woodland, Protohistoric, and colonial times for Native Americans.

Since sea levels have risen over the time that people were in the area, the potential exists for submerged prehistoric sites in Chesapeake Bay (Blanton and Margolin 1994). These sites can be predicted to occur in paleolandscape situations similar to terrestrial landscape settings where sites are known to occur on land (i.e., on river terraces, near chipping stone outcrops, etc.).

Potential prehistoric components include Paleoindian, Early Archaic, and Middle Archaic. Woodland and later remains would only be flotsam or jetsam, and would be interesting but not significant, save remains of canoes or fishing weirs and the like (Blanton and Margolin 1994).

HISTORIC POTENTIALS

Since its discovery and exploration, the Chesapeake Bay area has seen the development of a rich maritime history, with several maritime museums and displays in different states around its margins. Much of this history is with regard to various kinds of sail-powered vessels; however, steam-powered vessels were introduced by 1813. Nevertheless, the exposed coastline of the

Calvert Cliffs remote sensing survey project area is not as conducive to vessel abandonment and scuttling as the inlets. Thus, catastrophic encounters with the coast provide greater potential for ship remains, although none are known (Dodds, personal communication 2008). Known vessel types within Chesapeake Bay include the following (Lydecker and Krivor 2004):

- Brig/brigantine
- Barkentine
- Clipper Ship
- Canoe, Brogan and Bugeye
- Sailing work vessels
- Sloop
- Schooner, Pungy, Baltimore clipper
- Skiff
- Skipjack
- Sharpie
- Steamboats

Of the eleven types of vessels listed above, most would have been scuttled or otherwise abandoned inside more protected waters such as up in the Patuxent River, and not on the windward and wave-ward side of Chesapeake Bay.

3. METHODS

Project Personnel

The personnel assigned to this project met training and qualification requirements outlined in the U.S. Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1). All team members were current in their Red Cross training for first aid and Cardio-Pulmonary Resuscitation (CPR). Andrew D.W. Lydecker, Michael Faught, and James Duff served as the maritime archaeologists. Lydecker and Faught are both maritime archaeologists with graduate degrees in Anthropology (Archaeology), and all three have extensive experience in remote sensing surveys.

Safety was of paramount concern during the remote sensing and diving phases of this project. Panamerican personnel registered with the Plant guards and attended a safety meeting the day before the survey with Plant Safety Officer, Tim Koller.

Remote Sensing Survey Equipment

The remote sensing survey was conducted with equipment and procedures intended to facilitate the effective and efficient search for magnetic and/or sidescan sonar anomalies and to determine their exact location. The positioning system used was a Trimble DSM12/212, Integrated 12-channel Global Positioning System (DGPS). Remote sensing instruments included a Marine Magnetics SeaSPY overhauser magnetometer, a Marine Sonic Technology sidescan sonar, and an Edgetech 424 XSE-500 Shallow Tow X-Star subbottom profiler system.

Differential Global Positioning System

A primary consideration in the search for magnetic anomalies is positioning. Accurate positioning is essential during the running of survey tracklines and for returning to recorded locations for supplemental remote sensing operations or ground-truthing activities. These positioning functions were accomplished on this project through the use of a Trimble Navigation DSM12/212 global-based positioning system (Figure 5).

Figure 5. Trimble Navigation DSM 12/212 global-based positioning system used during the investigation.

The DSM12/212 is a global positioning system that attains differential capabilities by internal integration with a Dual-channel MSK Beacon receiver. This electronic device interprets transmissions both from satellites in Earth's orbit and from a shore-based station, to provide accurate coordinate positioning data for offshore surveys. This Trimble system has been specifically designed for survey positioning. The differential system corrects for the difference between received and known positions. The DGPS aboard the survey vessel constantly monitored navigation beacon radio transmissions in order to provide a real-time correction to any variation between the satellite-derived and actual positions of the survey vessel.

For this project, the magnetometer and DGPS data were integrated with a Sony VAIO laptop computer via NMEA protocols, utilizing Hypack Max® software applications for survey control, data storage, and data analysis. Hypack Max® was developed specifically for marine survey applications by Coastal Oceanographics, Inc.

The computer and associated hardware and software calculated and displayed the corrected positioning coordinates every second, and stored the data along with magnetic readings at that location. The level of precision for the system is considered by the manufacturer to achieve sub-meter accuracy (Trimble Navigation Limited 1998:1-2).

Each of the remote sensing devices was measured for "layback," which is their orientation relative to the antenna (Figure 6). This information is critical in the accurate positioning of targets during the data analysis phase of the project and in repositioning for any subsequent archaeological activities. The magnetometer was run 50 feet off the stern, the sidescan amidships the port side, and the subbottom amidships the starboard side.

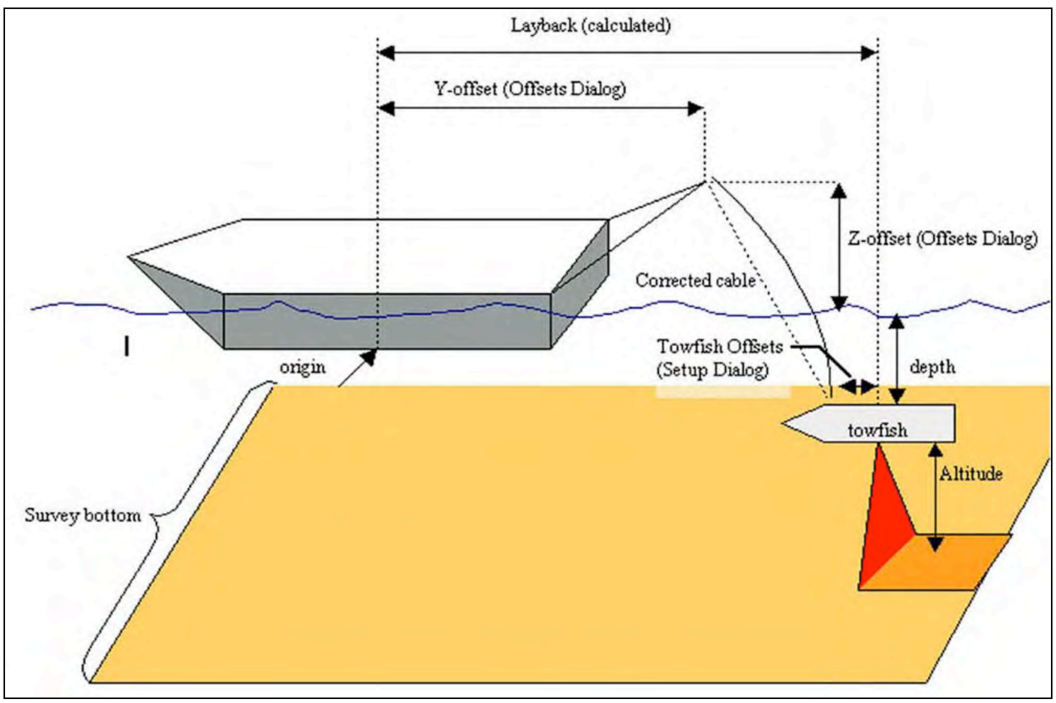

Figure 6. Equipment schematic illustrating layback (courtesy of Coastal Oceanographics, Inc.).

MAGNETOMETER

The remote sensing instrument used to search for ferrous objects on or below the ocean floor of the survey area was a Marine Magnetics SeaSPY overhauser magnetometer (Figure 7). The magnetometer is an instrument that measures the intensity of magnetic forces. The sensor measures and records both the Earth's ambient magnetic field and the presence of magnetic anomalies (deviations from the ambient background) generated by ferrous masses and various other sources. These measurements are recorded in gammas, the standard unit of magnetic intensity (equal to 0.00001 gauss). The SeaSPY is capable of sub-second repeatability, but data was collected at one-second intervals both digitally and graphically, providing a record of both the ambient field and the character and amplitude of anomalies encountered. This data was stored electronically in the navigation computer and backed up to CD-ROM.

The ability of the magnetometer to detect magnetic anomalies, the sources of which may be related to submerged cultural resources such as shipwrecks, has caused the instrument to become a principal remote sensing tool of marine archaeologists. While it is not possible to identify a specific ferrous source by its magnetic field, it is possible to predict shape, mass, and alignment characteristics of anomaly sources based on the magnetic field recorded. It should be noted that there are other sources, such as electrical magnetic fields surrounding power transmission lines, underground pipelines, navigation buoys, or metal bridges and structures, that may significantly affect magnetometer readings. Interpretation of magnetic data can provide an indication of the likelihood of the presence or absence of submerged cultural resources. Specifically, the ferrous components of submerged historic vessels tend to produce magnetic signatures that differ from those characteristic of isolated pieces of debris.

While it is impossible to specifically identify the source of any anomaly solely from the characteristics of its magnetic signature, this information, in conjunction with other data (historic accounts, use patterns of the area, diver inspection), other remote sensing technologies, and prior knowledge of similar targets, can lead to an accurate estimation.

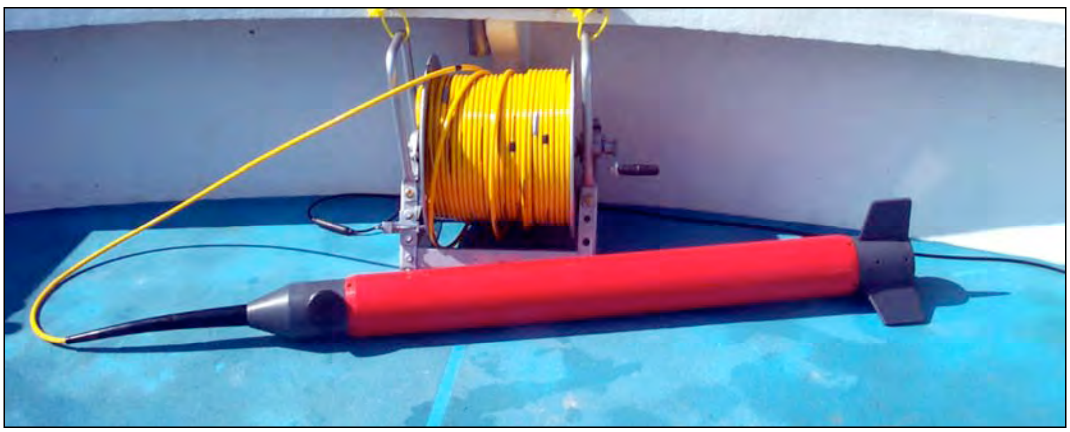

Figure 7. Marine Magnetics SeaSPY overhauser magnetometer used during the survey.

SIDESCAN SONAR

The remote sensing instrument used to search for physical features on or above the ocean floor was a Marine Sonic Technology (MST) Sea Scan sidescan sonar system (Figure 8). The sidescan sonar is an instrument that, through the transmission of dual fan-shaped pulses of sound and reception of reflected sound pulses, produces an acoustic image of the bottom. Under ideal circumstances, the sidescan sonar is capable of providing a near-photographic representation of the bottom on either side of the trackline of a survey vessel. This range was set at 20 m during the Calvert Cliffs Survey.

The MST Sea Scan sidescan sonar unit utilized on this project was operated with an integrated single frequency 600 kHz towfish. The Sea Scan PC has internal capability for removal of the water column from the instrument's video printout, as well as correction for slant range distortion. This sidescan sonar was utilized with the navigation system to provide manual marking of positioning fix points on the digital printout. Sidescan sonar data are useful in searching for the physical features indicative of submerged cultural resources. Specifically, the record is examined for features showing characteristics such as height above bottom, linearity, and structural form. Additionally, potential acoustic targets are checked for any locational match with the data derived from the magnetometer and the subbottom profiler.

The MST Sea Scan PC sidescan sonar was linked to a towfish that employed a 600 kHz power setting and a variable side range of up to 100 meters-per-channel (200 m coverage per line) on each of the run sidescan lines. The 20-meters-per-channel setting was chosen to provide detail and enough overlapping coverage with the 100 ft. line spacing to insure full coverage of the survey area. The power setting was selected in order to provide maximum possible detail on the record generated; 600 kHz was the preferred frequency. The 20-meters-per-channel selection made it possible to collect acoustic data over a 40 m (131 ft.) wide area on each line that the sidescan sonar was employed.

The sidescan sonar images were merged and mosaiced using Chesapeake SonarWEB Pro software. These images were combined with other data in ArcView 3.3.

Figure 8. Marine Sonic Technology (MST) Sea Scan sidescan sonar system.

SUBBOTTOM PROFILER

The Calvert Cliffs underwater remote sensing survey deployed an Edgetech 424 XSE-500 Shallow Tow X-Star System of topside processor and towfish (Figure 9). This system included a Model 3100-G Topside Processor with DISCOVER Subbottom Software and a 4-24 kHz SB-424 towfish.

Subbottom profilers generate low frequency acoustic waves capable of penetrating the seabed and then reflect off boundaries or objects within the subsurface. These returns are received by hydrophone or hydrophone array operated in close proximity to the source. The data are then processed and reproduced as a cross section scaled in two-way travel time (the time taken for the pulse to travel from the source to the reflector and back to the receiver). This travel time can then be interpolated to depth in the sediment column by reference to the travel time of the sound (averaging 1,500 m/s).

These seismic cross sections can be studied visually and the shapes and extent of reflectors used to identify bottom and subbottom profile characteristics.

There are several types of subbottom profilers: sparkers, pingers, boomers, and CHIRP systems. Sparkers operate at the lowest frequencies and afford deep penetration but low resolution. Boomers operate from .5 kHz to 5 kHz and can penetrate to between 30 m and 100 m with resolution of 0.3 m to 1.0 m. Pingers operate from 3.5 kHz and 7 kHz and penetrate seabeds from a few meters to more than 50 m depending on sediment consolidation, with resolution to about 0.3 m. CHIRP systems operate around a central frequency that is swept electronically across a range of frequencies between 3 kHz to 40 kHz and resolution can be on the order of 0.1 m in suitable near-seabed sediments. The Edgetech 424 XSE-500 Shallow Tow X-Star System used for the Calvert Cliffs survey was operated at a range of 4-16 kHz for best penetration of sand.

Figure 9. The Edgetech subbottom processor and 424 towfish used in the survey.

Unconformities and other stratal contacts can be determined by seismic remote sensing because these surfaces make acoustic impedance contrasts when printed (or projected). In general, high and low amplitude reflectors (light and dark returns) distinguish between stratigraphic beds; parabolic returns indicate point source objects of sufficient size to be sensed by the wavelength and frequency of the power source. Erosional or non-depositional contacts can be identified by discontinuities in extent, slope angle, and shape of the reflector returns. This latter fact is important when identifying drowned channel systems and other relict and buried fluvial system features (e.g., estuarine, tidal, lowland, upland areas around drainage features).

There are five types of spurious signals that may cause confusion in the two dimensional records: direct arrivals from the sound source, water surface reflection, side echoes, reflection multiples, and point source reflections. Judicious analysis is required to inspect them.

Sand is notoriously difficult to penetrate with frequencies equal to 4 kHz or higher. Much of the Calvert Cliffs sediment beds appear to be sand or pebbly sand, and sedimentary rocks probably composed of sand. There was no need to penetrate these beds because of their age.

SURVEY VESSEL

The vessel used for the survey was the 27 ft. MV Fishing C, with 225 Honda four stroke. It was chartered locally and captained by Ron Caudill. There was abundant covered deck space for the electronic gear, generator, and towfishes. James Duff (Figure 10) drove the vessel during the remote sensing operations.

Figure 10. Showing the covered area on the survey vessel behind Tim Koller (left) and James Duff (right).

Figure 11. Showing the sidescan, magnetometer, and subbottom profiler towfishes (left to right), as well as the generator and cables, in transit to survey location.

GIS MAPPING LOCATIONAL CONTROL AND ANALYSES

Programs used in the analysis process included ArcView 3.3® and Hypack Max®, plus proprietary software with the sidescan and subbottom profiler systems. Magnetometry data were contoured in Hypack®. Sidescan sonar data were mosaiced in SonarWeb.

The subbottom profiler data was mined for bathymetric data and a bathymetric map was produced for inclusion in the results section of this report. In addition, the margins of the possible paleochannel feature were located and recorded. All data were translated from decimal minutes latitude longitude and (from the subbottom profile software from Edgetech) to Maryland State Plane Coordinates (1,900) in feet by USACOE Corpscon. Coordinates from the sidescan record were translated from degrees decimal minutes. These conversions allowed all locational data from the magnetometer, sidescan sonar, and subbottom profiler to be compared in a GIS format.

Planned lines are shown in Figure 12.

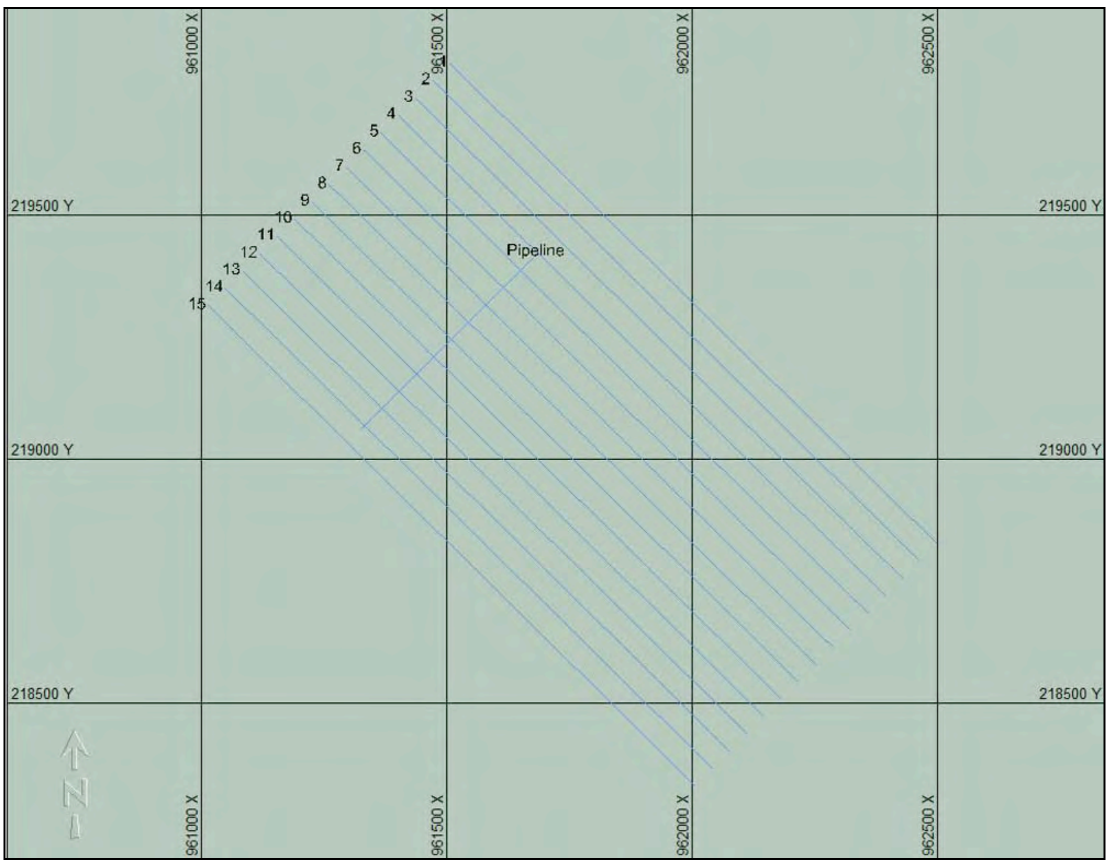

Figure 12. Planned tracklines for the Calvert Cliffs remote sensing survey.

4. RESULTS

The remote sensing data conditions were only slightly choppy (Figure 13), allowing for good sidescan and subbottom imagery. The magnetometer data is not as affected by sea conditions as the acoustic data.

Figure 13. Looking westward toward the barge dock area. This is essentially looking in the direction of the paleochannel feature described in this section.

In the field, the initial set of planned lines included a larger area; sidescan and subbottom records of that area were included as a benefit to understanding the bottom morphology. This area was reduced in the field to avoid going into the protected area around the current outflow pipe. No lines were run closer to the shoreline because of shoal areas.

The geodetic parameters for this project are Maryland State Plane coordinates (MD-1900), 1927 North American Datum (NAD 27), in feet.

MAGNETOMETER RESULTS

Fourteen lines of magnetometry data were recorded (Figure 14) and processed for contouring and analysis of anomalies.

Figure 14 shows magnetic strength contours at the Calvert Cliffs survey area with the proposed pipeline alignment in light blue. Contour intervals are at 20 gammas, blue contours are below background (51875 +/-10), and red contours are above background. Details of the individual target characteristics are presented in Table 1.

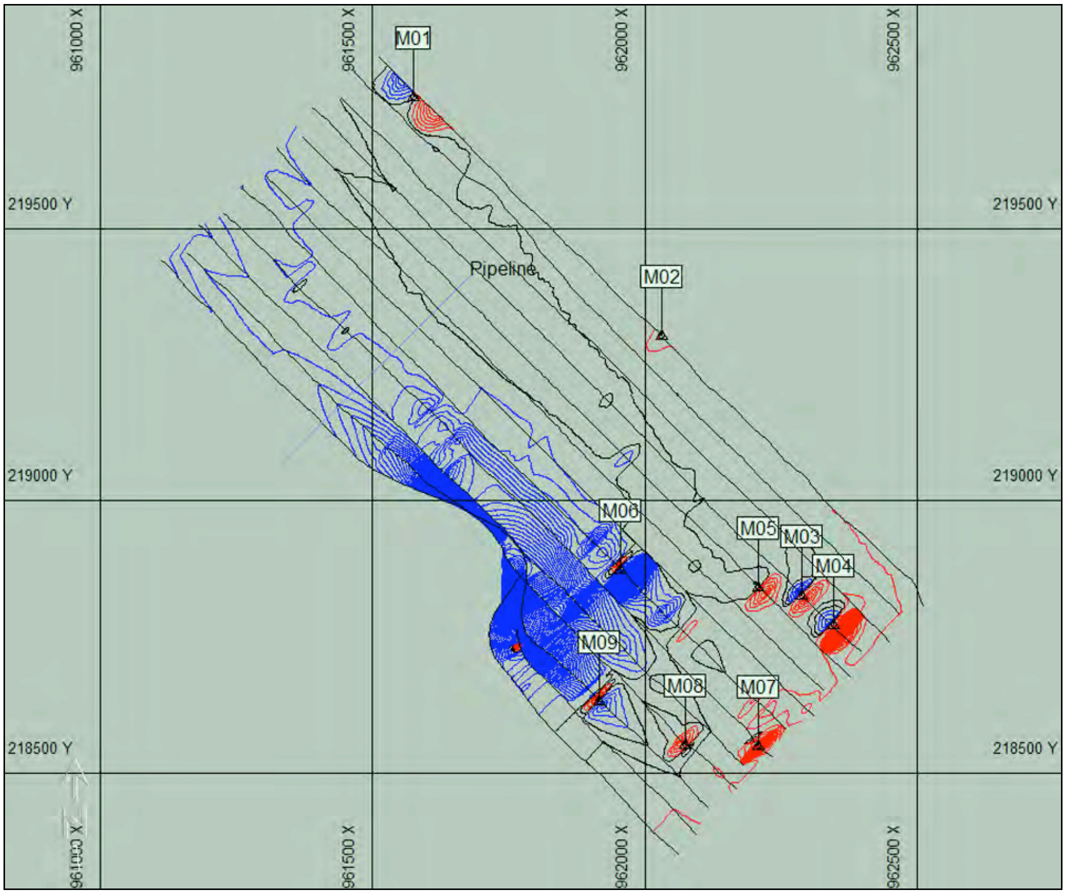

Figure 14. Tracklines and magnetic strength contours and anomalies at the Calvert Cliffs survey area. Proposed pipeline alignment in blue. Contour intervals 20 gamma, blue contours below background, red contours above. Target details presented in Table 1.

Table 1. Magnetic anomalies from the Calvert Cliffs remote sensing survey.

Anomaly No.	Easting	Northing	Reading at target point	Deviation above background	Deviation below background	Duration in seconds	Duration in feet	Type
M01	961585.4	219742	51869.3	133	157	23		dipole
M02	962032.2	219302.7	51905.8	30	0	10		monopole
M03	962289.5	218826.3	51892.6	133	130	9		dipole
M04	962344.8	218770.1	51913.2	554	103	10		dipole
M05	962209.2	218842.9	51846.7	118	37	15		dipole
M06	961956.3	218874.2	51781.1	136	906	29		complex dipole
M07	962207.6	218549.6	52869.4	994	0	5		monopole
M08	962075.1	218551.7	51926.5	96	47	7		dipole
M09	961918.8	218630.7	51804.2	76	132	5		dipole

Of the nine anomalies listed above in Table 1, none occur over two or more lines. All targets appear to be isolated single-source items that are likely ferrous materials with the exception of anomalies 3-5, which are clustered and show up near a sidescan target (object on bottom 1).

SIDESCAN SONAR AND SUBBOTTOM PROFILER RESULTS

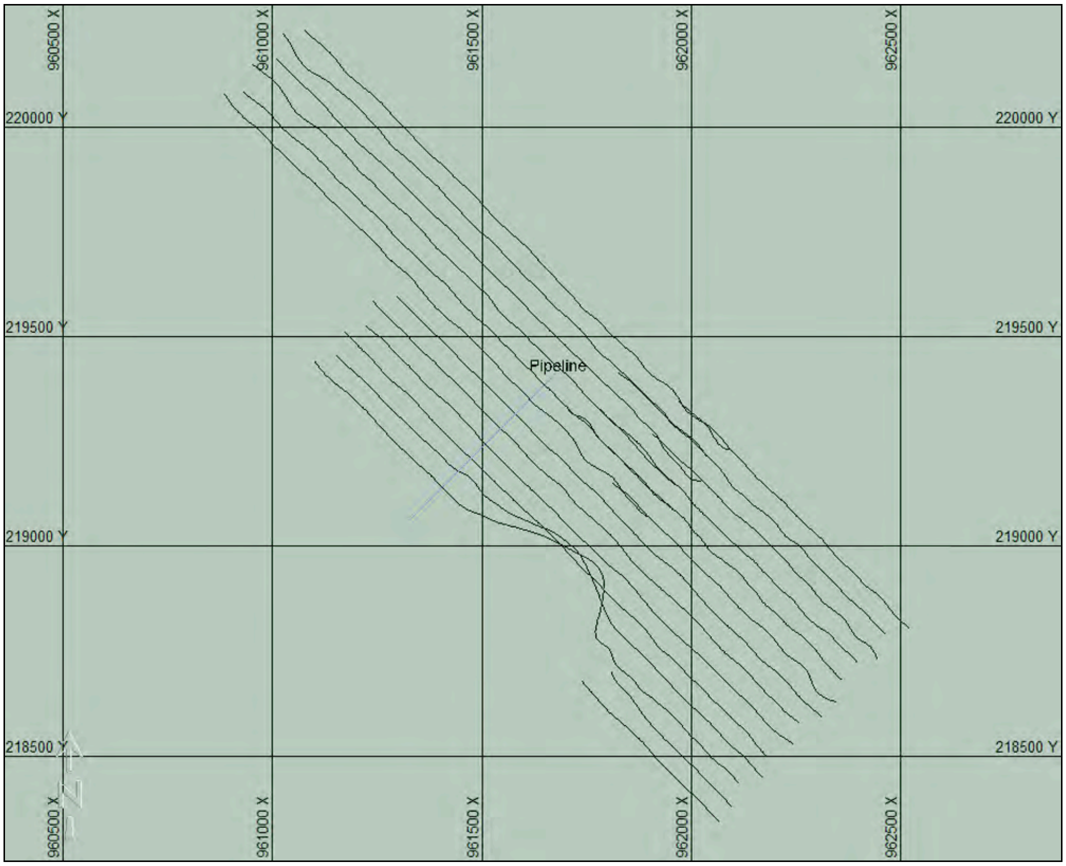

Figure 15. Showing the area of recorded data for the sidescan sonar and subbottom profiler devices. Lines 1 through 6 were elongated to the northwest.

The sidescan record is at 20 m range (40 m swath; Figure 16). The record included 174 files of data, which were merged to the 14 line segments and then mosaiced on the project grid (Figures 17 and 18; Maryland State Plane 1900, NAD 27).

Five isolated objects were identified on the sidescan record (see Figure 17). Most of these objects appear to be logs or lumber, but some could be limestone rocks of rectangular shape. The sidescan record also revealed the rocky nature of the bottom of the bay, and the layering of the cliffs nearby seems to be continued below the waterline (see Figure 18).

Much of the Calvert Cliffs sediment beds appear to be sand, or pebbly sand, and sedimentary rocks probably composed of sand. These beds created high backscatter returns (bright returns) indicating rocky areas and low backscatter areas (dark returns) that indicate silty sediments and these were associated with the paleochannel feature identified with the subbottom profiler.

Table 2. Sidescan sonar objects on bottom.

Description	X	Y
Object on bottom 1 log or beam	962254	218785
Object on bottom 2 log or beam	961797	218857
Object on bottom 3 log or beam	961796	218850
Object on bottom 4 log or beam	962122	219123
Object on bottom 5 two beams	961059	220041

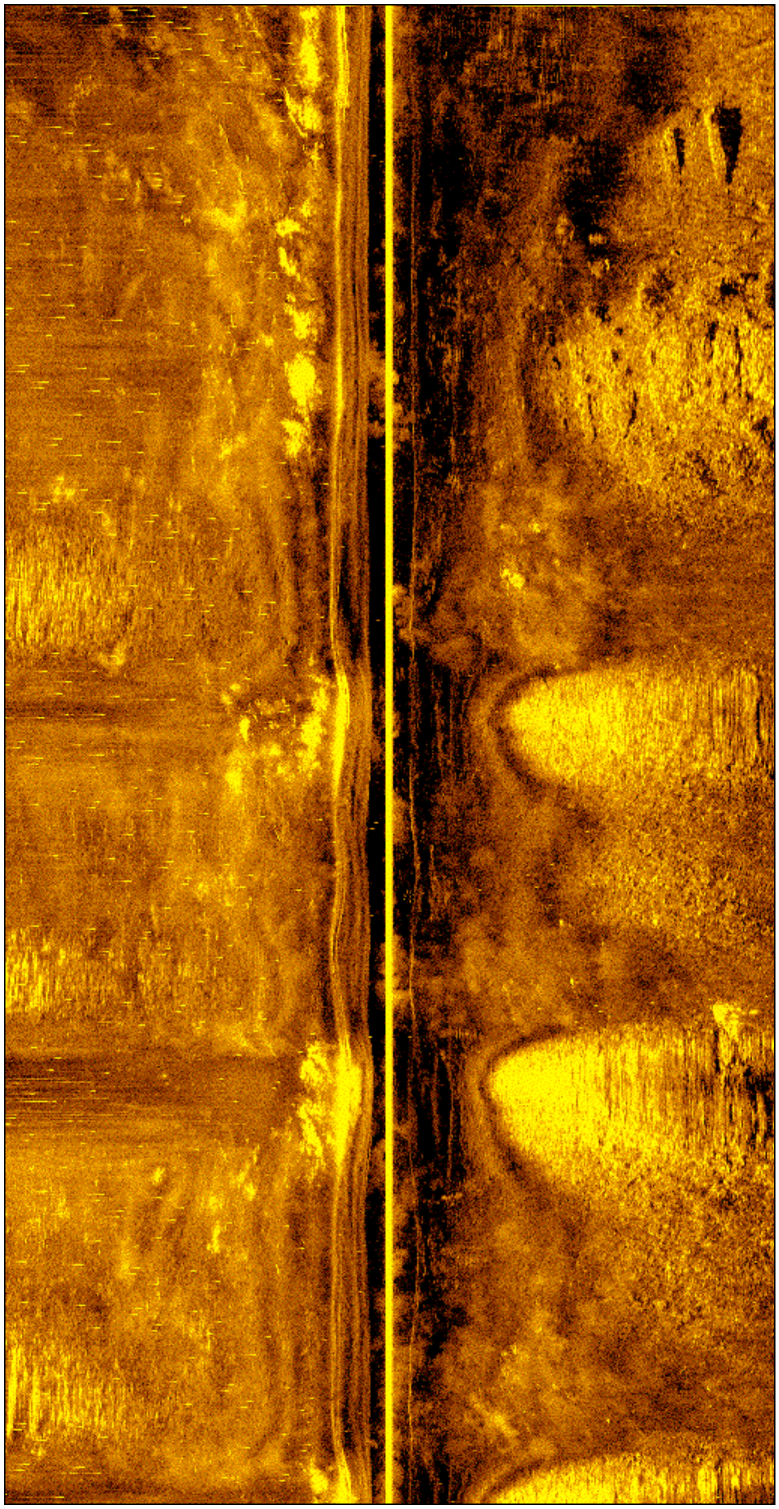

Figure 16. Sidescan file number 11APR046, an example of object on bottom #5 (top of image). These objects could be lumber wood or possibly rectangular rocks. Note: width 40 m overall (20 m on either side of the yellow centerline; trackline proceeding from NW (top) to SE (bottom).

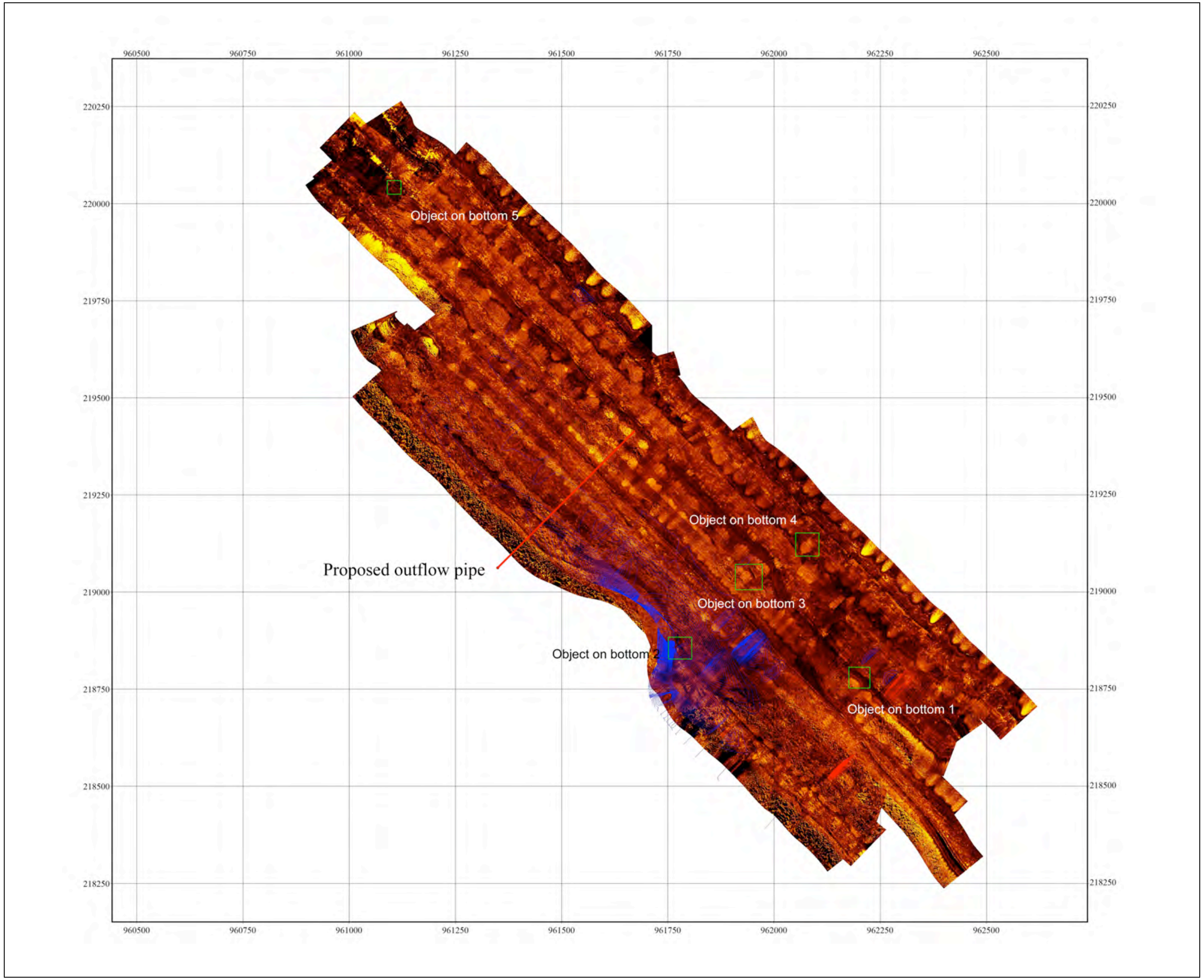

Figure 17. Sidescan sonar mosaic showing locations of five isolated objects identified on the bottom (see Table 2).

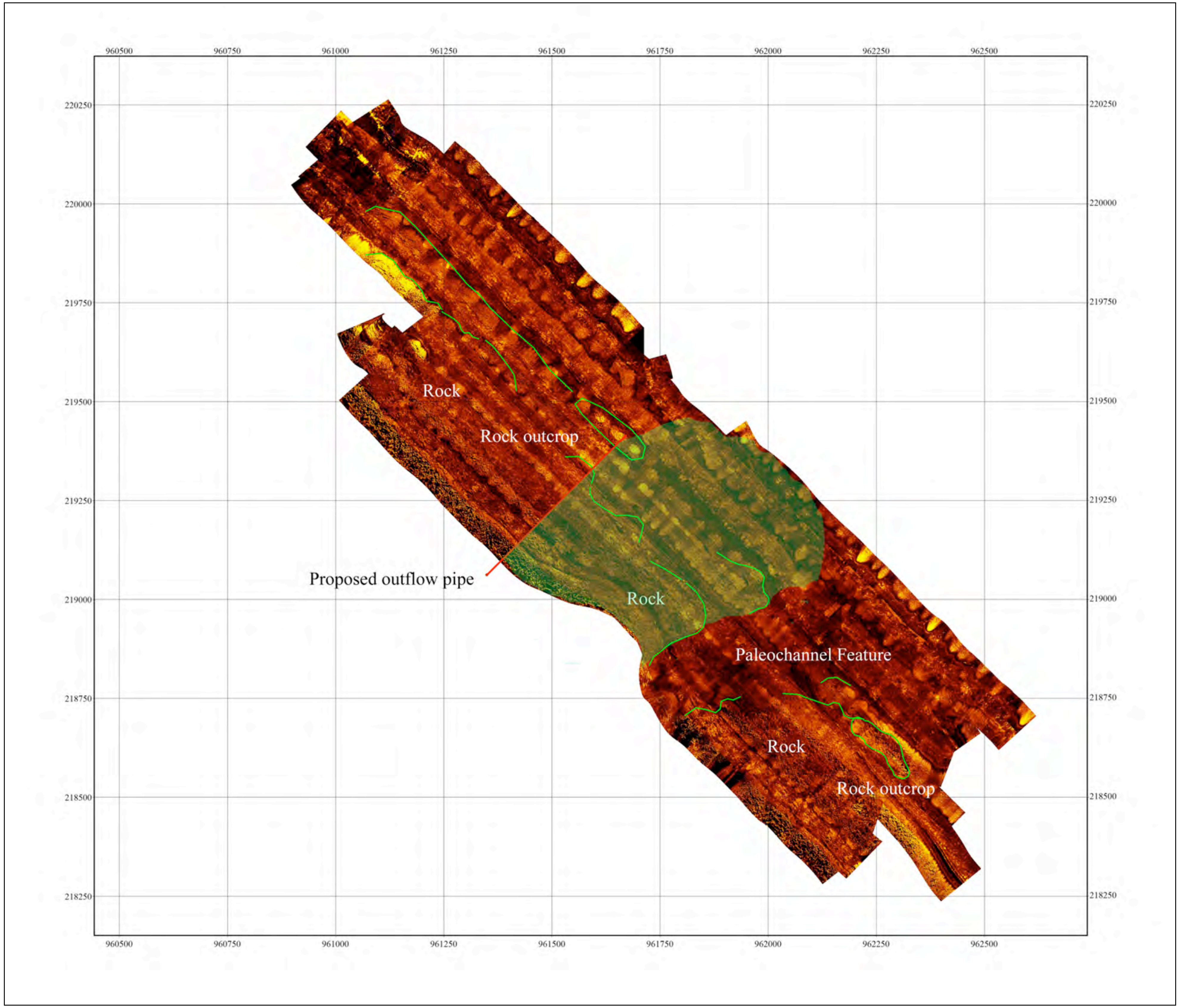

Figure 18. Sidescan sonar mosaic showing rocky areas, rock outcrop at pipeline, location of paleochannel feature, and high-probability zone for submerged evidence of prehistoric activity (green shaded area).

5. CONCLUSIONS AND RECOMMENDATIONS

Panamerican conducted an intensive submerged cultural resources remote sensing survey of a proposed outflow pipeline at the Calvert Cliffs Nuclear Power Plant in Calvert County, Maryland. Comprised of a magnetometer, sidescan sonar, and subbottom profiler survey, the primary focus of the investigation was to determine the presence or absence of anomalies representative of potentially significant submerged cultural resources eligible for listing on the NRHP, and if present, which, subsequently, might require additional investigations. A secondary aspect was the identification of hazards to the proposed pipeline construction.

Results of the survey identified a total of 9 magnetic anomalies and 5 sidescan sonar targets within the project area. None of the magnetic anomalies or sidescan targets are considered potentially significant for the purposes of this investigation, and no further archaeological work is recommended. However, the reconstruction of the bay bottom with sidescan and subbottom revealed a paleolandscape setting with a paleochannel to the south of the proposed pipeline and an indurated hillock and large rock outcrop that extends approximately 90 feet on either side of the proposed pipeline at the location of the proposed pipeline alignment. It is thought that the location of the rock outcrop will adversely effect pipeline construction. Because the area between the line of the current proposed pipeline and the paleochannel feature to the south and east of the pipeline has a potential for submerged prehistoric cultural resources, this area should be avoided if the pipeline alignment is to be moved. The optimum realignment area would be to the north and west of the current proposed route.

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10.0 ESSENTIAL FISH HABITAT

Essential Fish Habitat (EFH) is defined under the Magnuson-Stevens Fishery Conservation Management Act (16 USC §§ 1801 to 1883), as amended by the Sustainable Fisheries Act (SFA) of 1996, as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NOAA, 2008). "Waters" include aquatic areas and their physical, chemical and biological properties that are used by fish (NOAA, 2008). "Substrate" includes sediment, hard bottom, structures, and associated biological communities that are under the water column (NOAA, 2008). Waters and substrates necessary for fish spawning, breeding, feeding or growth to maturity, covering all stages within the life cycle of a particular species, refers to those habitats required to support a sustainable fishery and a particular species' contribution to a healthy ecosystem (50 Code of Federal Regulations [CFR] 600.10).

Section 303(a)(7) of the Magnuson-Stevens Act requires that the eight Regional Fishery Management Councils (RFMC) describe and identify EFH for each federally managed species and minimize adverse impacts from fishing activities on EFH. Section 305(b)(2)-(4) of the Magnuson-Stevens Act outlines the process for providing the National Marine Fisheries Service (NMFS) within the NOAA and the RFMC with the opportunity to comment on activities proposed by federal agencies that have the potential to adversely impact EFH areas. Federal agencies are required to consult with NMFS (using existing consultation processes for NEPA, the Endangered Species Act, or the Fish and Wildlife Coordination Act) on any action that they authorize, fund, or undertake that may adversely impact EFH.

Adverse effects to EFH, as defined in 50 CFR 600.910(A), include any impact that reduces the quality and/or quantity of EFH. Adverse effects may include:

- Direct impacts such as physical disruption or the release of contaminants;
- Indirect impacts such as the loss of prey or reduction in the fecundity (number of offspring produced) of a managed species; and
- Site-specific or habitat-wide impacts that may include individual, cumulative or synergetic consequences of a federal action.

An EFH assessment of a federal action that may adversely affect EFH must contain:

- A description of the proposed project;
- An analysis of the effects, including cumulative, on EFH, the managed species and associated species such as major prey species, and the life history stages that may be affected;
- The agency's conclusions regarding the effects of the action on EFH; and
- Proposed mitigation if applicable (50 CFR 600.920(g)).

The Mid-Atlantic RMC, which is responsible for EFH in Maryland, has established EFH for various life stages of nine species of fish in the northern Chesapeake Bay, where CCNPP is located (Table 10-1).

Table 10-1: Important Estuarine Species in the Chesapeake Bay near the CCNPP Site

Species (Scientific Name)	Commercially Harvested	Recreational Target	Keystone Species	Indicator Species
Threatened and Endangered Species				
Shortnose sturgeon * Acipenser brevirostrum				
Atlantic sturgeon Acipenser oxyrhynchus oxyrhynchus	X (Moratorium since 1997)			
Atlantic loggerhead turtle * Caretta caretta				
Kemps ridley turtle * Lepidochelys kempii				
Harvested Fish				
American shad Alosa sapidissima	X			
Bay anchovy Anchoa mitchilli	X		X	
Atlantic menhaden Brevoortia tyrannus	X		X	X
Atlantic croaker Micropogonias undulatus	X	X		
Striped bass Morone saxitilis	X	X		
Spot Leiostomus xanthurus	X	X		
White perch Morone americana	X	X		
Bluefish Pomatomus saltatrix	X	X		
American eel Anguilla rostrata	X	X		
Harvested Invertebrates				
Blue crab Callinectes sapidus	X	X		
American oyster Crassostrea virginica	X			X
Other Important Resources				
Submerged Aquatic Vegetation (SAV)			X	X
Plankton			X	X

Note:

* Threatened and Endangered Species are not allowed to be taken in the Chesapeake Bay.

The EFH for these species includes the entire northern Chesapeake Bay and are depicted on Figure 10.1-1 in relation to the area proposed to be impacted during additional CWIS, discharge, and barge facility construction. However, NMFS indicated that the EFH designations for cobia, king mackerel, and Spanish mackerel are overly broad and should not be considered for this evaluation (Chiarella, 2008); therefore, these fish species are not included in further EFH discussions.

Habitat Areas of Particular Concern (HAPC) are discrete subsets of EFH that provide extremely important ecological functions or are especially vulnerable to degradation (NMFS, 2008). RFMCs may designate a specific habitat area as an HAPC based on one or more of the following reasons:

- Importance of the ecological function provided by the habitat
- Extent to which the habitat is sensitive to human-induced environmental degradation
- Whether, and to what extent, development activities are, or will be, stressing the habitat type
- Rarity of the habitat type

The HAPC designation does not confer additional protection or restrictions on an area, but can help prioritize conservation efforts. Healthy populations of fish require not only the relatively small habitats identified as HAPCs, but also other areas that provide suitable habitat functions.

10.1 EFH SPECIES

NMFS Mid-Atlantic RMC, which is responsible for EFH in Maryland, has established EFH for various life stages of nine species of fish in the northern Chesapeake Bay, where CCNPP is located. These fish species are butterfish, cobia, king mackerel, Spanish mackerel, red drum, bluefish, black sea bass, windowpane flounder, and summer flounder. The EFH for these species includes the entire northern Chesapeake Bay and are depicted on Figure 10-1.1 in relation to the area proposed to be impacted during additional CWIS, discharge, and barge facility construction. However, NMFS indicated that the EFH designations for cobia, king mackerel, and Spanish mackerel are overly broad and should not be considered for this evaluation (Chiarella, 2008); therefore, these fish species are not included in further EFH discussions. Potential impacts to the remaining species and EFH within the construction area are presented below.

10.1.1 Butterfish

EFH has been designated in the vicinity of the proposed CWIS, discharge, and barge facility construction area for eggs, larvae, juvenile and adult butterfish. Butterfish are a pelagic species, and they spawn offshore from May to July in the Chesapeake Bay region (Murdy, et al., 1997). Butterfish larvae are often associated with jellyfish, living in their tentacles for protection but also sometimes falling victim to their hosts (Bigelow and Schroeder, 1953). This association is not essential, however, as butterfish larvae have been observed swimming at the surface without the company of jellyfish (Bigelow and Schroeder, 1953) and may also shelter in floating seaweed mats (Murdy, et al., 1997). No butterfish eggs or larvae were collected during entrainment sampling conducted at CCNPP from March 2006 to March 2007 (EA, 2007b). Eggs do not drift to nearshore areas, so it is unlikely that impacts to EFH for eggs will occur as a result of the proposed cooling water system construction and operation, or the barge facility construction activities.

Butterfish juveniles usually end their association with jellyfish/seaweed and start exhibiting adult schooling behavior around 60 mm standard length (SL) (Bigelow and Schroeder, 1953). Butterfish juveniles may occur in the vicinity of CCNPP from May to November, and if so, may experience avoidance impacts during the temporary physical disruption of habitats associated with dredging, discharge pipe installation, and barge facility construction. Direct impacts from contaminant releases from construction equipment are unlikely. Compared with the expanse of EFH in the Chesapeake Bay, however, the proposed area of impact is not expected to adversely effect the recruitment of butterfish juveniles in the Bay. In addition, butterfish juveniles were not collected during entrainment sampling conducted from March 2006 to March 2007 at CCNPP (EA, 2007b); therefore, impacts to butterfish recruitment are not expected from CWIS, discharge, and barge construction activities.

Butterfish adults occur in the Chesapeake Bay from March to November and occur occasionally in the upper bay in the vicinity of CCNPP (Murdy, et al., 1997). They form large schools in both inshore and offshore waters, usually over sand bottoms (Cross, et al., 1999). As a result, because substrates in the vicinity of the proposed construction activities are 93 percent sand (EA, 2007a), impacts to butterfish adult EFH may be evident in the form of localized avoidance during the temporary physical disruption of habitats associated with dredging, discharge pipe installation, and barge facility construction. Indirect impacts from contaminant releases from construction equipment are unlikely. Indirect impacts from loss of prey or reduction of fecundity are not expected given the small size of the impact area relative to area of available EFH. Butterfish has been represented in impingement samples collected at CCNPP Units 1 and 2 in 15 out of the 21 years sampled from 1975 to 1995 (Ringger, 2000), but was never one of the five most abundant taxa. Impingement of this species is expected to continue with Units 1 and 2, but DNR has concluded that impingement losses are small compared to mortality from other causes, and that impingement does not adversely affect regional populations (Ringger, 2000). Potential impingement rates associated with the proposed Unit 3 are expected to be minimal, given the relatively low flow rates, low intake velocities (<0.5 fps), and the relatively large expanse of EFH in the Chesapeake Bay. Consequently, no adverse impacts to adult butterfish in the Bay are expected.

Butterfish mainly feed on planktonic prey, including: thaliacians (primarily Larvacea and Hemimyaria), mollusks (primarily squid), crustaceans (amphipods, copepods, and decapods), coelenterates (primarily hydrozoans), small fishes, and ctenophores (NOAA, 1999d). These organisms are subject to entrainment, impingement and physical disruption due to construction and operation at CCNPP; however, given the diversity of the butterfish's diet, the high availability of these prey species, and the localized and short term effects of construction activities, would limit indirect impacts to the species associated with these prey items.

10.1.2 Red Drum

EFH has been designated in the vicinity of the proposed CWIS, discharge, and barge facility construction area for eggs, larvae, juvenile, and adult red drum. Red drum is a euryhaline fish species that supports a healthy recreational sportfishery throughout most of its range (FAO, 2008c). Red drum spawn in nearshore coastal waters from late summer through fall, and the eggs drift until they hatch (Murdy, et al., 1997). Information regarding spawning of red drum near CCNPP is not available; however, sciaenid eggs collected in entrainment samples at the CCNPP CWIS are not likely to be red drum eggs because they were collected outside the documented spawning season for red drum (EA, 2007b). Consequently, it is unlikely that impacts to red drum EFH will occur as a result of dredging in the vicinity of the existing CWIS and barge facility and during installation of the discharge pipe. Similarly, indirect impacts from potential contaminant releases from construction equipment are unlikely given the low level of release and the short duration of the construction activity. Compared with the expanse of EFH in the Chesapeake Bay, the proposed area of impact is not expected to adversely effect the reproduction of red drum in the Bay.

Red drum larvae (approximately 6-8 mm SL) are transported via currents into estuaries, where they utilize seagrass beds and SAV as nursery habitats (FAO, 2008c). An SAV survey was conducted in Fall 2006 within waters adjacent to the CCNPP (EA, 2007a). SAV or critical habitat for any SAV species was not observed during this survey. In addition, a review of SAV observation data (1994-2006) available through VIMS reveals that SAV has not been observed along the shoreline in the vicinity of the study area during the period from 1994-2004. Based on a lack of SAV presence during the September 2006 survey, and a lack of observations of SAV as part of the VIMS annual surveys, it is unlikely that SAV occurs within the study area (EA, 2007a). As a result, impacts to red drum larval EFH are not expected due to construction activities. In addition, red drum larvae were not collected in entrainment samples collected at CCNPP from March 2006 to March 2007 (EA, 2007b); therefore, impacts to red drum nursery habitat and larval recruitment are not expected from the proposed construction activities.

Red drum juveniles are generally found in shallow estuarine areas with little tidal influence and grassy or muddy bottoms (Buckley, 1984). Because the 2006 SAV survey did not find SAV in the vicinity of CCNPP and 93 percent of the substrate in the vicinity of CCNPP is sand (EA, 2007a), impacts to red drum juvenile EFH are not expected due to construction activities. In addition, red drum juveniles were not collected in entrainment samples collected at CCNPP from March 2006 to March 2007 (EA, 2007b); therefore, impacts to red drum recruitment are not expected from the proposed construction activities.

Adult red drum occur in the Chesapeake Bay from May to November and are most abundant in the spring and fall near the bay mouth in salinities above 15 parts per thousand (Murdy, et al., 1997). The species ranges as far north as the Patuxent River (Murdy, et al., 1997). As a result, red drum may be uncommon near CCNPP; however, impacts to red drum adult EFH may occur. Potential localized impacts to red drum adult EFH may occur during the construction phase from direct physical alteration of the habitat from dredging, discharge pipe installation, and barge facility construction. Indirect impacts from contaminant releases from construction equipment are unlikely given the low level of release and the short duration of the construction activity. Indirect impacts from loss of prey or reduction of fecundity are not expected because of the high availability of prey species and the localized and short term effects of construction activities. While potential localized impacts to red drum adult EFH may occur as a result of construction activities in the vicinity of the existing CWIS and barge facility and during installation of the discharge pipe, these activities will be localized and of short duration. Potential effects may also occur to adult red drum during the operational phase as a result of impingement. However, red drum were only collected in one year (1983) during the impingement sampling conducted at CCNPP Units 1 and 2 from 1975 to 1995 (Ringger, 2000). Compared with the expanse of EFH in the Chesapeake Bay, however, the proposed area of impact is not expected to adversely affect adult red drum in the Bay.

Prey items selected by adult red drum vary by season but include moderate-sized crustaceans (e.g., blue crab and white shrimp [*Penaeus* spp.]) and fishes (e.g., clupeids) (Murdy, et al., 1997). Blue crabs and clupeids have been collected in impingement samples at CCNPP. Blue crabs are a highly impinged species at Units 1 and 2; however, they also have a greater than 99 percent survival rate after impingement (Ringger, 2000). As a result, impacts to this prey base for adult red drum are not expected. Clupeids are also highly impinged species at Units 1 and 2: Atlantic menhaden (*Brevoortia tyrannus*) are usually in the top five impinged species per year, and blueback herring (*Alosa aestivalis*), alewife (*A. pseudoharengus*), and gizzard shad (*Dorosoma cepedianum*) are also highly impinged species. Atlantic menhaden and blueback herring exhibited a 52 and 47 percent impingement survival rate, respectively (Ringger, 2000). In addition, clupeids are highly fecund, and as a result, impacts to this prey base for adult red drum are not expected.

10.1.3 Bluefish

EFH has been designated in the vicinity of the proposed CWIS, discharge, and barge facility construction area for juvenile and adult bluefish. The bluefish is a highly migratory, pelagic schooling fish species that is considered a voracious predator of other fish, is known to kill fish that it does not eat, and supports important recreational and commercial fisheries (Murdy, et al., 1997). After offshore spring spawning, bluefish move shoreward, and smaller fish may enter the Chesapeake Bay (Murdy, et al., 1997). Early juveniles enter the lower bay and its tributaries in late summer and early fall (May through October) but may migrate out of the bay and move south along the coast later in the fall (Murdy, et al., 1997). All major estuaries between Penobscot Bay, Maine and St. Johns River, Florida are EFH for bluefish juveniles, and they generally occur in the “mixing” and “seawater” zones. While the area in the vicinity of the proposed construction activities is EFH for bluefish juveniles, salinities may be less than ideal in this area (EA, 2007b). As a result, impacts to bluefish juvenile EFH are not expected due to the proposed construction activities. In addition, bluefish juveniles were not collected in entrainment samples collected at CCNPP from March 2006 to March 2007 (EA, 2007b); therefore, impacts to bluefish recruitment are not expected from the proposed construction activities.

Adult bluefish occur in the Chesapeake Bay from spring to fall, are abundant in the lower bay, and are common most years in the upper bay, although they are rare north of Baltimore (Murdy, et al., 1997). The adults form large schools, generally comprised of like-sized fish, which can cover tens of square miles (Murdy, et al., 1997). Bluefish begin to migrate out of the bay in early autumn (Murdy, et al., 1997). As a result, the proposed construction activities may affect the EFH for adult bluefish. Impacts to bluefish adult EFH may occur from direct avoidance related impacts from physical disruption due to dredging, discharge pipe installation, and barge facility construction. Indirect impacts from contaminant releases from construction equipment are unlikely given the low level of release and the short duration of the construction activity. Potential effects may also occur to adult red drum during the operational phase as a result of impingement. Bluefish were collected in impingement samples collected at CCNPP Units 1 and 2 in 9 out of the 21 years sampled from 1975 to 1995 (Ringger, 2000). While impacts to adult bluefish EFH may occur as a result of construction activities in the vicinity of the existing CWIS and barge facility and during installation of the discharge pipe, these activities will be localized and of short duration. Compared with the expanse of EFH in the Chesapeake Bay, however, the proposed area of impact is not expected to adversely affect bluefish adults in the Bay.

Adult and juvenile bluefish are indiscriminate feeders on a variety of fish species (and invertebrate species for juveniles; Murdy et al., 1997). Given the diversity of the bluefish’s diet, the high availability of these prey species, and the localized and short term effects of construction activities, would limit indirect impacts to the species associated with these prey items so it is unlikely that impacts to prey species as a result of CCNPP construction and operation will not adversely affect bluefish. Indirect impacts from loss of prey or reduction of fecundity are not expected.

10.1.4 Black Sea Bass

EFH has been designated in the vicinity of the proposed CWIS, discharge, and barge facility construction area for juvenile and adult black sea bass. The black sea bass is a warm temperate species that is usually associated with structured habitats (shipwrecks, reefs) on the continental shelf. Spawning occurs over the continental shelf. Most juvenile settlement occurs in coastal areas, and the juveniles migrate into estuaries, usually from July to September (NOAA, 1999b). Juvenile black sea bass are generally found in deep vegetated flats (Murdy, et al., 1997). Because the 2006 SAV survey did not find SAV in the vicinity of CCNPP and 93 percent of the substrate in the vicinity of CCNPP is sand (EA, 2007a), impacts to black sea bass juvenile EFH are not expected due to the proposed construction activities. In addition, black sea bass juveniles were not collected in entrainment samples collected at CCNPP from March 2006 to March 2007 (EA, 2007b). Consequently, impacts to black sea bass recruitment are not expected from the proposed construction activities.

Black sea bass adults are most often found on rocky bottoms near pilings, wrecks, and jetties (Murdy, et al., 1997) and may also occur around oyster bars (NOAA, 1999a). Large adults are also more common offshore than in the bay (Murdy, et al., 1997). A survey of the oyster community near CCNPP was conducted in fall 2006 (EA, 2007a). Surveys of oyster communities within the Chesapeake Bay found that oyster densities were very low (0.015 oysters/m^2). Based on GIS analysis of the oysters recovered from the survey, the site has an estimated population of 2,387 oysters (approximately 9.6 bushels) within the approximately 40 acres covered by the survey (EA, 2007a). Furthermore, the area of oyster occurrence will not be impacted by construction or operational activities. Black sea bass adults may, however, also associate with the existing barge facility. Black sea bass were collected in impingement samples collected at CCNPP Units 1 and 2 (Ringger, 2000). As a result, the proposed construction activities may affect the EFH for adult black sea bass. Construction phase impacts to black sea bass adult EFH may occur from direct impacts from physical disruption due to dredging, discharge pipe installation, and barge facility construction. Indirect impacts from potential contaminant releases from construction equipment are unlikely given the low level of release and the short duration of the construction activity. While impacts to black sea bass adult EFH may occur as a result of dredging in the vicinity of the existing CWIS and barge facility and during installation of the discharge pipe, these activities will be localized and of short duration. Compared with the expanse of EFH in the Chesapeake Bay, however, the proposed area of impact is not expected to adversely affect black sea bass adults in the Bay. Potential effects may also occur to adult black sea bass during the operational phase as a result of impingement. As stated previously, black sea bass were collected in impingement samples collected at CCNPP Units 1 and 2 in 6 out of the 21 years sampled from 1975 to 1995 (Ringger, 2000), but were never among the top five most abundant taxa. While impacts to adult black sea bass EFH may occur as a result of construction activities in the vicinity of the existing CWIS and barge facility and during installation of the discharge pipe, these activities will be localized and of short duration. In addition, habitat for adult black sea bass is limited in the vicinity of CCNPP, and as a result, impacts to adult black sea bass are expected not to be significant.

Black sea bass adults feed chiefly on crabs, mussels, razor clams, and fishes, while juvenile black sea bass feed on shrimp, isopods, and amphipods (Murdy, et al., 1997). These prey items are potentially susceptible to impingement, entrainment, and physical disruptions from dredging and construction activities. However, given the diversity of the black sea bass's diet, the high availability of these prey species, and the localized and short term effects of construction activities, would limit indirect impacts to the species associated with these prey items. Impacts to prey items as a result of construction and operation are therefore not expected to adversely impact black sea bass.

10.1.5 Windowpane Flounder

EFH has been designated in the vicinity of the proposed CWIS, discharge, and barge facility construction area for juvenile and adult windowpane flounder. Juvenile windowpane flounders are found generally in waters less than 90 feet deep when water temperatures are generally greater than 50˚F (NOAA, 1999a). As a result, the proposed construction activities may affect the EFH for windowpane flounder juveniles. Juveniles may experience direct impacts from physical disruption due to dredging, discharge pipe installation, and barge facility construction. Direct impacts from contaminant releases from construction equipment are unlikely based on the short duration of the activities. While impacts to windowpane flounder juvenile EFH may occur as a result of dredging in the vicinity of the existing CWIS and barge facility and during installation of the discharge pipe, these activities will be of short term duration and localized in their effect. Compared with the expanse of EFH in the Chesapeake Bay, however, the proposed area of impact is not expected to adversely effect the recruitment of windowpane flounder in the Bay. In addition, windowpane flounder larvae were not collected during entrainment sampling conducted from March 2006 to March 2007 at CCNPP (EA, 2007b); therefore, impacts to windowpane flounder recruitment are not expected from CWIS, discharge, and barge construction activities.

Adult windowpane flounders are year-round residents in the Chesapeake Bay that are occasional to common in the upper bay, extending as far north as the Choptank River (Murdy, et al., 1997). Temperature seems to be the one environmental factor controlling adult distribution (NOAA, 1999a). Based on the temperatures observed in the Chesapeake Bay near CCNPP in various studies (EA, 2007a, b), adult windowpane flounder are likely to occur in vicinity of the proposed construction activities. As a result, the proposed construction activities may affect the EFH for adult windowpane flounder. In addition, windowpane flounder were collected in impingement samples collected at CCNPP Units 1 and 2 in 5 out of the 21 years sampled from 1975 to 1995 (Ringger, 2000). Impacts to windowpane flounder adult EFH may occur from direct impacts from physical disruption due to dredging, discharge pipe installation, and barge facility construction. Indirect impacts from potential contaminant releases from construction equipment are unlikely given the low level of release and the short duration of the construction activity. While impacts to adult windowpane EFH may occur as a result of dredging in the vicinity of the existing CWIS and barge facility and during installation of the discharge pipe, these activities will be localized and of short term duration. Additionally, in consideration of the expanse of EFH in the Chesapeake Bay, however, the proposed area of impact is not expected to adversely affect windowpane flounder adults in the Bay.

The windowpane flounder is reported to feed on fishes, crustaceans, and worms (Murdy, et al., 1997). These prey items are potentially susceptible to impingement, entrainment, and physical disruptions from dredging and construction activities. However, the area to be disturbed by dredging and construction activities is small relative to the available habitat for these species in the vicinity of CCNPP. Consequently, potential impacts to prey items as a result of construction and operation are not expected to adversely impact windowpane flounder.

10.1.6 Summer Flounder

EFH has been designated in the vicinity of the proposed CWIS, discharge, and barge facility construction area for larval, juvenile, and adult summer flounder. Summer flounder spawn offshore, and larvae enter the Chesapeake Bay from October to May (Murdy, et al., 1997), entering inshore coastal and estuarine areas to complete transformation. After metamorphosis, the larvae settle from the water column to the substrate, where they may start to exhibit burial behavior (NOAA, 1999c). Summer flounder bury themselves in sandy substrates, which comprise approximately 93 percent of the substrate in the vicinity of the proposed construction activities (EA, 2007a). As a result, the proposed construction activities may affect the EFH for transforming summer flounder larvae. Juveniles may experience direct impacts from physical disruption due to dredging, discharge pipe installation, and barge facility construction. Indirect impacts from contaminant releases from construction equipment are unlikely due to the short duration of construction activities. Compared with the expanse of EFH in the Chesapeake Bay, however, the proposed area of impact is not expected to adversely effect the recruitment of summer flounder in the Bay. In addition, summer flounder larvae were not collected during entrainment sampling conducted from March 2006 to March 2007 at CCNPP (EA, 2007b); therefore, impacts to summer flounder recruitment are not expected from CWIS, discharge, and barge construction activities.

Juvenile summer flounder utilize eelgrass beds as nursery habitats in the Chesapeake Bay (Murdy, et al., 1997). Because the 2006 SAV survey did not find SAV in the vicinity of CCNPP and 93 percent of the substrate in the vicinity of CCNPP is sand (EA, 2007a), impacts to summer flounder juvenile EFH are not expected due to construction activities. In addition, summer flounder juveniles were not collected in entrainment samples collected at CCNPP from March 2006 to March 2007 (EA, 2007b); therefore, impacts to summer flounder recruitment are not expected from construction activities.

Most adult summer flounder migrate into the Chesapeake Bay from spring to autumn and then migrate offshore during the winter months; however, some are year-round residents (Murdy, et al., 1997). The summer flounder is more common in the lower bay than in the upper bay, extending as far north as the Gunpowder River (Murdy, et al., 1997). Adult summer flounder typically occur in deep channels, ridges, or sandbars. Summer flounder greater than 3 years in age primarily inhabit coastal waters (Murdy, et al., 1997). Adults have often been reported as preferring sandy habitats (NOAA, 1999c), and because the substrate in the vicinity of the proposed construction activities is 93 percent sand (EA, 2007a), proposed construction activities may affect the EFH for adult summer flounder. In addition, summer flounder were collected in impingement samples collected at CCNPP Units 1 and 2 in 18 out of the 21 years sampled from 1975 to 1995 (Ringger, 2000). In 1984, summer flounder was the fifth most abundant fish species impinged at CCNPP (Ringer, 2000). Impacts to summer flounder adult EFH may occur from direct impacts from physical disruption due to dredging, discharge pipe installation, and barge facility construction. Indirect impacts from contaminant releases from construction equipment are unlikely. Indirect impacts from loss of prey or reduction of fecundity are not expected. Compared with the expanse of EFH in the Chesapeake Bay, however, the proposed area of impact is not expected to adversely affect summer flounder adults in the Bay.

The only known HAPC designated for this region of the Chesapeake Bay determined from the present review is for summer flounder larvae and juveniles. The HAPC is SAV and macroalgae beds in nursery habitats (Dobrzynski and Johnson, 2001). As mentioned earlier in this section, the 2006 SAV survey did not find SAV in the vicinity of CCNPP (EA, 2007a); therefore, it does not appear that HAPC for the summer flounder exists near CCNPP.

The diet of the summer flounder consists primarily of shrimps, fishes, and squids (Murdy, et al., 1997). These prey items are potentially susceptible to impingement, entrainment, and physical disruptions from dredging and construction activities. Shrimp and squid have not been collected during entrainment or impingement sampling at CCNPP. In addition, the area to be disturbed by dredging and construction activities is small relative to the available habitat for these species in the vicinity of CCNPP. Impacts to prey items as a result of construction and operation are not expected to adversely impact summer flounder.