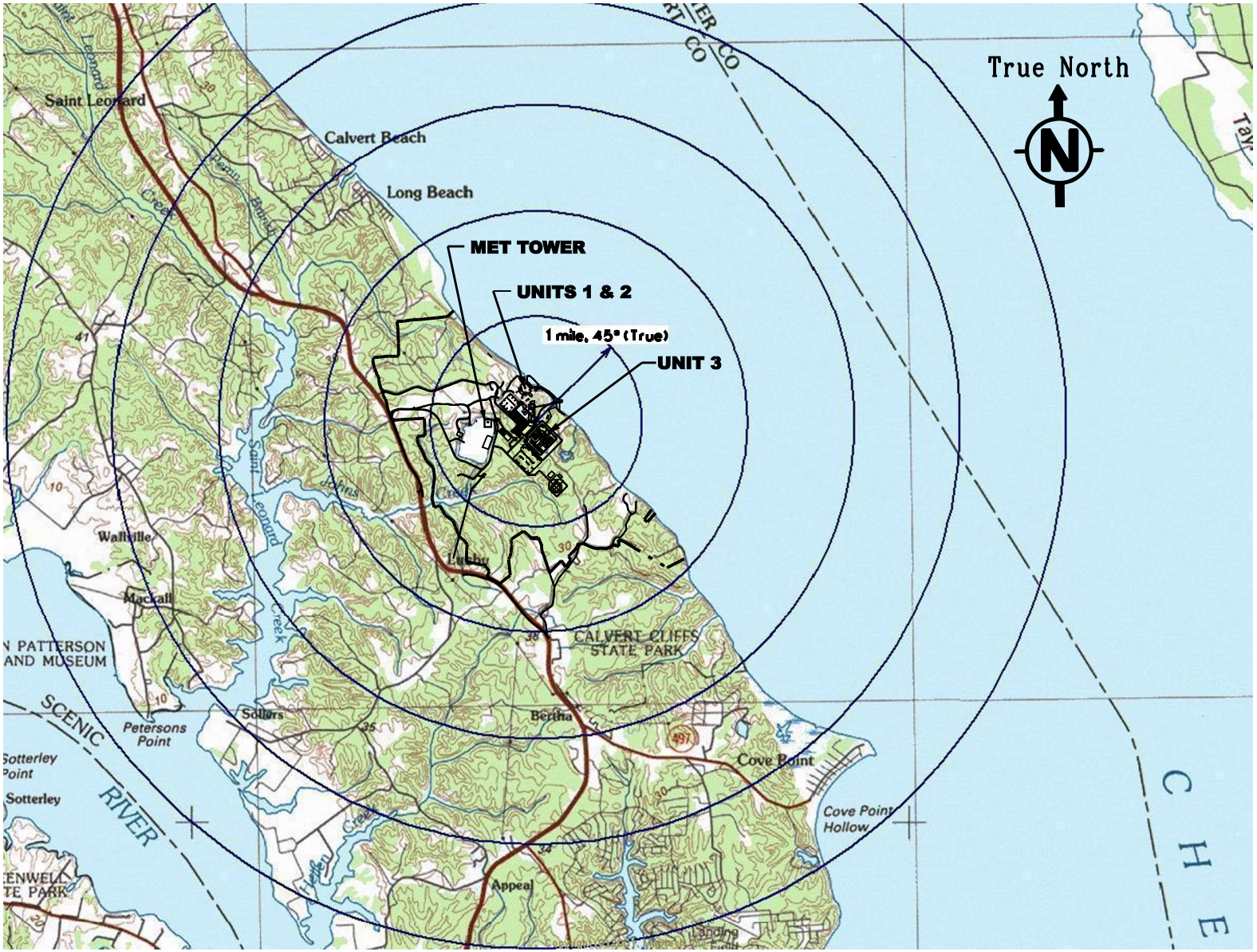

0 .5 1 2
SCALE: Miles

0 1 2 3 4
SCALE: Kilometers

FIGURE 6.4-2 **Rev. 2**

DETAILED TOPOGRAPHY WITHIN
5 mi (8 km)

CCNPP UNIT 3 ER

6.5 ECOLOGICAL MONITORING

The following sections present information regarding ecological monitoring for terrestrial ecology, land use, and aquatic ecology of the **{**Calvert Cliffs Nuclear Power Plant (CCNPP) site**}** areas likely to be affected by site preparation, construction, and operation and maintenance of **{**CCNPP Unit 3**}**. The monitoring programs are designed based on anticipated environmental impacts through the various stages of **{**CCNPP Unit 3**}** project implementation. This section complies with NRC Regulatory Guide Sections 4.7 and 4.11 regarding general site suitability studies and terrestrial environmental studies to allow reasonably certain predictions that there are no significant impacts to the terrestrial ecology associated with the construction or operation of CCNPP Unit 3.

Monitoring programs to detect changes in the ecology begin before application submittal and continue during site preparation and construction and throughout station operation and maintenance. The monitoring programs cover elements of the ecosystem where a causal relationship between station construction and operation and adverse changes are established or strongly suspected. An evaluation of the standardization, adequacy and accuracy of data collection and analytical methods used in the monitoring programs is included.

6.5.1 TERRESTRIAL ECOLOGY AND LAND USE

The following sections present information on monitoring programs for terrestrial ecology and land use likely to be affected by site preparation, construction, or operation and maintenance of the facility. The monitoring programs are designed based on anticipated environmental impacts through the various stages of project implementation.

6.5.1.1 Preapplication Monitoring

Section 2.2.1 describes the site features and land use including a map showing these features. Section 2.2.2 describes the existing and proposed transmission line corridors and Section 2.4.1 describes the field studies performed to determine the major plant communities and important species and habitats. Note that the details of the type, frequency and duration of observations or samples taken at each location are contained in the individual reports for the field studies discussed in Section 2.4.1. The field studies and Section 2.4.1 discuss the distribution and abundance of important species and habitats. Critical life history information including parameters such as feeding areas, wintering areas and migration routes are also discussed in Section 2.4.1. Descriptions of modifications that may affect existing patterns of plant and animal communities including the development of cooling ponds and reservoirs, cooling towers, transmission line corridors and access routes is discussed in Section 4.3.1.

{Mitigation of the unavoidable wetland impacts will be guided by the permit requirements of the U.S. Army Corps of Engineers and Maryland Department of the Environment, according to the current regulations under Section 404 of the Federal Water Pollution Control Act and the Maryland Nontidal Wetlands Protection Act, respectively. Section 1.3 contains a list of the permits required for this project as well as the applicable Federal and State regulations. Monitoring of mitigation success will be defined and executed with reference to these regulations. All wetlands likely to be affected by CCNPP site preparation and construction associated with CCNPP Unit 3 were evaluated to determine their functions and values by a methodology accepted by the U.S. Army Corps of Engineers (USACE) (USACE, 1995) and the State of Maryland Department of Natural Resources. (MDE, 1995) Functions identified will be used as the basis of mitigating loss of wetlands during site development.**}**

As an essential record of overall project area baseline conditions, field surveys and aerial photography of the proposed site and transmission line system were obtained prior to

construction. The resulting map of vegetation types by structure (e.g., herbaceous, shrub-scrub, sapling/small trees) and moisture regime (e.g., emergent wetland, droughty outcrops) serve as a guide to identify suitable habitats of Federal and State-listed species of plants and animals. Following the results of a listed-species field survey, access roads and staging areas within the proposed site were located so as to avoid such habitats to the extent possible. Management plans will be prepared that aim to enhance or at least perpetuate the habitat for target species. Repeated aerial photography every five years including some field observations to verify the information gathered from photo interpretation will serve as a record of forest regrowth in restored areas after completion of construction as proposed in Section 4.3.1.4. It would also provide evidence of any erosion around construction and other work areas, and indicate changes in vegetation that may call for corrective action (e.g., wind throws) or aid in the scheduling of routine transmission corridor right-of-way management.

{Additional baseline work included a survey for nesting activity of the Scarlet Tanager and other forest interior bird species and the Bald Eagle within 1,000 ft (330 m) of the proposed limits of work. Confirmation of breeding will follow accepted Federal and State protocols (Andrle, 1988).

There are no continuous monitoring programs required for terrestrial ecology and land use in this phase of the project. The surveys and studies performed to establish baseline conditions follow general guidelines published by the Maryland Department of Natural Resources as referenced in the field study reports.**}**

6.5.1.2 Site Preparation, Construction and Pre-Operational Monitoring

{A description of site preparation and construction impacts on terrestrial resources, including wetlands, is discussed in Section 4.1. As noted in Section 4.3.1.1, the Showy Goldenrod population identified at Camp Conoy will be relocated to avoid destruction by the CCNPP Unit 3 site preparation and construction area. Since the power line right-of-way require periodic vegetation management, and the resulting open old-field herbaceous plant community accommodates the Showy Goldenrod's habitat requirement for strong light, transplantation of the Showy Goldenrod to an appropriate part of the right-of-way or the open fields on the CCNPP site, followed by periodic monitoring, will prove to be a cost-effective form of mitigation.

Mitigating wetlands lost to CCNPP site development will commence concurrently with project construction through the development of new surface impoundments. Any monitoring required during site preparation, construction and preoperation will follow guidelines developed by the USACE and the State of Maryland in accordance with conditions specified in required permits listed in Table 1.3-1. Additional monitoring requirements including program elements, actions and reporting levels are specified in the CCNPP Stormwater Pollution Prevention Plan and the CCNPP Spill Prevention, Control and Countermeasures Program. This plan and program will be implemented during this phase in order to minimize impacts to wetlands, groundwater and aquatic ecology.

The Bald Eagle site survey will be conducted annually in this phase as well as annual monitoring for the first three years for the transplanted Showy Goldenrod locations in the transmission line corridor or open fields. Field observations versus a formal monitoring program will be documented for these surveys.

In accordance with the baseline studies performed during the preapplication timeframe and existing plant experience at the CCNPP site, no additional monitoring programs are proposed for:

- Bird collisions with plant structures, transmission lines and towers, and cooling towers;
- Salt deposition impacts on vegetation growth and habitat modifications; and

- Impacts to important species and habitats.

These parameters have all been determined to have a small impact on terrestrial ecology as discussed in Section 4.1.1, Section 4.1.2 and Section 4.3.1. Note that there is a commitment to place flashing lights or reduce lighting on the large cooling tower to minimize bird collisions once this structure is built.

There are no continuous monitoring programs required for terrestrial ecology and land use in this phase of the project. The surveys to monitor changes to terrestrial ecology from baseline conditions will follow general guidelines published by the Maryland Department of Natural Resources as referenced in the field study reports.**}**

6.5.1.3 Operational Monitoring

{Operation and maintenance impacts of the proposed transmission system are addressed in Section 5.6.1.

The transplanted Showy Goldenrod population will be monitored annually for the first three years, and every five or ten years thereafter, depending on the perceived need at the transplanted locations in the transmission line corridor or open fields. The Bald Eagle survey will be performed every five years in this phase. The Maryland Natural Heritage Program's Rare Species Reporting Form will serve as the core protocol for data collection (MDNR, 2007). The State passes this information to the National Biological and Conservation Data System operated by NatureServe. Database standards and protocols controlled by NatureServe are followed (NS, 2007).

Repeated aerial photography backed by field observations every five years will serve as a record of forest re-growth discussed in Section 4.3.1.4. It would also provide evidence of any erosion around future construction and other work areas, and indicate changes in vegetation that may call for corrective action (e.g., wind throws) or aid in the scheduling of routine transmission corridor right-of-way management.

There are no continuous monitoring programs required for terrestrial ecology and land use in this phase of the project. The surveys to monitor changes to terrestrial ecology from baseline conditions will follow general guidelines published by the Maryland Department of Natural Resources as referenced in the field study reports.**}**

6.5.2 AQUATIC ECOLOGY

The following sections present information regarding ecological monitoring for aquatic ecology likely to be affected by site preparation, construction, or operation and maintenance of the facility. The monitoring programs are designed based on anticipated environmental impacts through the various stages of project implementation.

Section 2.3.3 documents the pre-existing water quality characteristics of the freshwater bodies in the vicinity of the plant and the Chesapeake Bay. The principle aquatic ecological features of the **{**CCNPP**}** site and vicinity are described in Section 2.4.2, including freshwater systems on the **{**CCNPP**}** site and the intake and discharge areas of the **{**Chesapeake Bay**}**. Impacts to aquatic systems from construction of the facilities are described in Section 4.3.2. Impacts to aquatic systems from operation of the cooling system are described in Section 5.3.1.2 and Section 5.3.2.2. Impacts from waste discharges are described in Section 5.5.

6.5.2.1 Preapplication Monitoring

{Preapplication monitoring has been conducted, consisting of historical CCNPP Units 1 and 2 data, data collected and reported in Section 2.4.2, and the CCNPP Units 1 and 2 icthythoplankton in-plant entrainment and baffle wall study. The data provides a sufficient basis

for describing the ecological resources existing on and in the vicinity of the CCNPP site. Sampling locations, sampling methods and quality control is discussed in these reports and in Section 2.4.2.

No rare or unique aquatic species were identified in nearby freshwater systems. The aquatic species that occur onsite are ubiquitous, common, and easily located in nearby waters. Typical fish species include the eastern mosquito fish and the bluegill and the American eel. The most important aquatic invertebrate species in the impoundments and streams are the juvenile stages of flying insects. Table 2.4-6 provides a list of important species and habitat found in the Chesapeake Bay. Figure 2.4-1 is a map showing open water areas.

One important species, because it is commercially harvested, is the American eel (Anguilla rostrata). It is found in most of the water bodies onsite and in the Chesapeake Bay. The American eel is abundant year round in all tributaries to the Chesapeake Bay (CBP, 2006a).

Critical life history information including parameters such as spawning areas, nursery grounds, food habits, feeding areas, wintering areas, and migration routes are discussed in Section 2.4.2. Descriptions of modifications that may affect existing patterns of plant and animal communities such as dams, impoundments, dredging, filling of wetlands, and clearing of stream banks is discussed in Section 4.3.2.

There are no continuous monitoring programs required for aquatic ecology in this phase of the project. The surveys performed to establish baseline conditions follow the guidelines published by the Maryland Department of Natural Resources and the U.S. Department of Environmental Protection as referenced in the aquatic field study report.**}**

6.5.2.2 Construction and Pre-Operational Monitoring

{Construction and preoperational monitoring programs are proposed for resources that may affect aquatic ecology, including thermal monitoring (as discussed in Section 6.1), hydrological monitoring (as discussed in Section 6.3) and chemical monitoring (as discussed in Section 6.6). No aquatic ecology monitoring in addition to the current monitoring requirements for CCNPP Units 1 and 2 in the Chesapeake Bay are proposed during CCNPP Unit 3 site preparation and plant construction and preoperational monitoring mainly consists of drainage from excavations which are pumped to a storm water discharge point. Approval of storm water management and erosion/sediment control plans will be obtained in accordance with the National Pollution Discharge Elimination System (NPDES) permit. The Maryland Department of Environment will issue a new permit to include pollutants typically found at a construction site such as turbidity and petroleum hydrocarbons.

Storm water discharges from impervious surfaces at the new facility will be controlled and minimized by provisions of the Storm Water Pollution Prevention Plan. This plan calls for periodic monitoring and record keeping of the engineered controls to ensure they are effective in minimizing silt runoff and evaluating the need to repair or replace the installed controls such as silt fences, hay bales, berms and settling ponds. The U.S. Army Corps of Engineers 404 Permit may contain requirements for aquatic monitoring as it relates to chemical spills or control of silt discharging into water bodies. Implementation of the Spill Prevention, Control and Countermeasures Plan requires periodic monitoring and record keeping ensuring spill controls are established and maintained to minimize impacts to the aquatic environment.

Details as to monitoring program elements, sampling procedures and equipment, data analysis, quality control and reporting will be contained in the various permits and approvals required for construction.

CCNPP Unit 3 will be designed to meet the Phase I, New Facility requirements published at 40 CFR 125.80 to 89, under Track I (CFR, 2007a). The cited EPA requirements meet the Clean Water Act 316(b) (USC, 2002) (CFR, 2007a) rules to verify there will be minimal increases in fish and benthic community impingement and entrainment for the new intake structure.

The following monitoring requirements are required by 40 CFR 125.87 (CFR, 2007a):

Biological monitoring for both impingement and entrainment of the commercial, recreational, and forage base fish and shellfish species identified in the Source Water Baseline Biological Characterization data required by 40 CFR 122.21(r)(3) (CFR, 2007b) will be required for CCNPP Unit 3 in order to comply with Track I.

The monitoring methods used are consistent with those used for the Source Water Baseline Biological Characterization data required in 40 CFR 122.21(r)(3). The monitoring frequencies identified below are followed for at least 2 years after the initial permit issuance. After that time, the State of Maryland may approve a request for less frequent sampling in the remaining years of the permit term and when the permit is reissued, if supporting data show that less frequent monitoring would still allow for the detection of any seasonal and daily variations in the species and numbers of individuals that are impinged or entrained.

Impingement samples are collected to monitor impingement rates (simple enumeration) for each species over a 24 hour period and no less than once per month when the cooling water intake structure is in operation.

Entrainment samples are collected to monitor entrainment rates (simple enumeration) for each species over a 24 hour period and no less than biweekly during the primary period of reproduction, larval recruitment, and peak abundance identified during the Source Water Baseline Biological Characterization required by 40 CFR 122.21(r)(3) (CFR, 2007b). Samples are collected only when the cooling water intake structure is in operation.

Velocity monitoring is required for surface intake screen systems to monitor head loss across the screens and correlate the measured value with the design intake velocity. The head loss across the intake screen must be measured at the minimum ambient source water surface elevation (best professional judgment based on available hydrological data). The maximum head loss across the screen for each cooling water intake structure must be used to determine compliance with the velocity requirement in 40 CFR Section 125.84(b)(2) or 40 CFR Section 125.84(c)(1) (CFR, 2007c). Head loss or velocity is monitored during initial facility startup, and thereafter, at the frequency specified in the NPDES permit, but no less than once per quarter.

Visual or remote inspections are conduced using visual inspections or employing remote monitoring devices during the period the cooling water intake structure is in operation. Visual inspections are conducted at least weekly to ensure that any design and construction technologies required in 40 CFR Section 125.84(b)(4) and (5), or 40 CFR Section 125.84(c)(3) and (4) (CFR, 2007c) are maintained and operated to ensure that they will continue to function as designed. Alternatively, inspection via remote monitoring devices to ensure that the impingement and entrainment technologies are functioning as designed is required.**}**

6.5.2.3 Operational Monitoring

{Operational aquatic ecology monitoring will be required as a condition of a new NPDES permit (CFR, 2007d) and for compliance with the Clean Water Act 316(b) (USC, 2002). The permit will require flow and temperature monitoring and monitoring of certain chemical constituents in the discharge.

Data has been collected for over 30 years in support of CCNPP Units 1 and 2. Some biological entrainment data has also been collected, but there is currently no program to monitor aquatic organisms. Special Condition N of the CCNPP Units 1 and 2 NPDES permit (CCNPP, 2004) does require 24 hour notification of any impingement on the water intake apparatus of aquatic organisms substantial enough to cause modification to plant operations. In addition, several organizations monitor the aquatic ecology of the Chesapeake Bay as part of ongoing restoration programs. These programs are described in Section 2.4.2. None of these monitoring programs collect data in the vicinity of the plant and therefore are not applicable for baseline data or to augment monitoring data related to the plant intake and discharge effects.

The Clean Water Act Section 316(b) (EPA, 2007a) requires that the location, design, construction and capacity of a cooling water intake structure reflect the best technology available (BTA) (CFR, 2007d) for minimizing adverse environmental impacts. The Phase II Rule, 40 CFR 125, addresses existing sources of cooling water intake at steam electric plants. A Proposal for Information Collection (PIC) for CCNPP Units 1 and 2 was created accordance with 40 CFR Section 125.95(b)(1) of the Phase II Rule (CFR, 2007e). The PIC was prepared before the start of information collection activities and identifies a plan to address the information requirements of the Comprehensive Demonstration Study (CDS), 40 CFR 125.95(a)(2) (CFR, 2007e) to ensure that the CDS will meet the requirements of the Phase II Rule.

A separate NPDES application will be prepared and submitted for CCNPP Unit 3. The CCNPP Unit 3 cooling water intake structure is designed to meet the Clean Water Act Section 316(b) Phase I requirements for new facilities under Track 1 (closed cycle cooling and intake screen velocity less than or equal to 0.5 fps (0.15 mps)).

CCNPP Units 1 and 2 withdraw more than 50 million gallons per day (maximum 3,456 million gallons per day) from the Chesapeake Bay, thus subjecting it to the Phase II Rule. The performance standards for CCNPP Units 1 and 2 call for a minimum reduction of 80% for impingement mortality, and a minimum reduction of 60% for entrainment. These reductions are calculated from a theoretical baseline cooling water intake with no operational or design features for fish conservation. However, a recent court decision has remanded much of the Phase II rule back to EPA for reconsideration. Until this issue can be resolved, the EPA has requested permit writers to use “Best Professional Judgment” in writing NPDES permits. It is expected that the remanded Phase II rule will influence the Best Professional Judgment of the permit writers. CCNPP Units 1 and 2 are currently operating under State Discharge Permit No. 02-DP-0187, NPDES MD0002399, with a permit expiration date May 31, 2009. A new NPDES permit will be required for CCNPP Unit 3.

Impingement and impingement mortality were monitored at CCNPP Units 1 and 2 from the late 1970s through 1995. Results indicate the cooling water is withdrawn from an aquatic community that is typical of a mid-Atlantic estuary. Data from the last year sampled indicated Blue Crab and Bay Anchovy were the dominant species of all organisms collected. The highest impingement period was July through September during which 79% of all organisms for the year were collected. Implementing additional impingement and post-impingement studies is not planned at this time. Data collected during the 1990s provides an accurate baseline calculation as required by the Phase II Rule.

Entrainment data from April 1978 through September 1980 were examined for trends. Hogchoker was the dominant species, accounting for almost 75% of all organisms and life stages collected, with Bay Anchovy eggs and post larvae accounting for 19%. Entrainment survival studies during this time period have inconclusive results, with data including a range of species and life stages. Entrainment data will be collected for CCNPP Units 1 and 2 to

supplement the 20 year old data that exists to determine the calculation baseline required by the Phase II Rule.

Circulating water for both Units 1 and 2 nuclear generating units is withdrawn through a single cooling water intake structure. The existing cooling water intake structure closely resembles EPA's baseline definition with the following exceptions:

- a baffle wall sits in front of the screens to withdraw water from lower in the water column, potentially reducing impingement and entrainment rates,
- the existing traveling water screens reduce impingement mortality by returning fish and debris back to the Chesapeake Bay,
- the facility is operational at reduced flow, when necessary, with minimal losses in generation, which in turn reduces entrainment by a commensurate amount and measurably reduces impingement,
- two of the screens are dual-flow screens with a low pressure spray wash that potentially reduces impingement mortality.

While the addition of the new unit would increase water withdrawal, discharge rates, and thermal loading to the Chesapeake Bay, operation of the additional new unit would not increase withdrawal and discharge rates substantially over existing conditions. The planned new intake and discharge locations are located in the vicinity of the existing intake and discharge structures. Therefore, no additional monitoring programs are recommended in addition to those required by the NPDES permit and 40 CFR 125.80 to 40 CFR 125.89 (CFR, 2007a). The NPDES permit is required for the entire duration of plant operation. The permit is required to be renewed every five years with provisions for updating monitoring programs and parameters, as necessary. The NPDES permit builds upon the methodology and informational outputs of the previous monitoring programs and studies.

As noted in Section 5.5.1.2, the discharges to surface waters from plant operations will include cooling water blow down, permitted wastewater from auxiliary systems, and storm water runoff. Concentrations of chemicals in the cooling water discharge will be controlled by the NPDES permit. Additional sanitary wastes from CCNPP Unit 3 operations will be accommodated at a new sewage treatment plant, with effluent discharge also controlled by an NPDES permit. Note that the additional surface water discharges from the new unit are expected to be minor compared to the existing once-through cooling water discharges for CCNPP Units 1 and 2. Additional intake water requirements will also be minor compared to the existing intake flow.

Storm water discharges from impervious surfaces at the new facility will be controlled and minimized by provisions of the Storm Water Pollution Prevention Plan and the Spill Prevention, Control and Countermeasures Plan. A Stormwater Pollution Prevention Plan is required to be implemented at an industrial site under Maryland Department of the Environment regulations (MDE, 2007) The plan is submitted with an application for a general stormwater permit. The plan provides detailed descriptions of various best management practices that can be implemented on site to reduce stream channel erosion, pollution, siltation and sedimentation and local flooding. A Spill Prevention, Control and Countermeasures Plan is reguired by US EPA regulation 40 CFR 112 (EPA, 2007). The plan describes measures to prevent, contain and clean up oil, gasoline, and chemical spills All plans are certified by a Professional Engineer and kept on site available for inspection by the US EPA or the Maryland Department of the Environment

In addition, water withdrawn from the Chesapeake Bay is monitored as part of the Maryland Department of Environment Water Appropriation and Use permit program. This water will be used for makeup to plant cooling and to create potable water from the desalination plant. Flow

is monitored monthly and reported semi-annually. Groundwater diversion is also controlled under a CCNPP site Water Appropriation and Use permit. CCNPP Unit 3 operation will not require use of groundwater. Discharge effluents from CCNPP Unit 3 and the desalination plant also are monitored under the NPDES permit.

A recent nuclear industry initiative by the Nuclear Energy Institute and NRC assessment (NRC, 2006) of existing nuclear reactors indicates that requirements related to groundwater monitoring during plant operation may change for present and future nuclear reactors. Therefore, this developing issue will continued to be followed and future requirements will be addressed, as applicable.**}**

6.5.3 REFERENCES

{Andrle, 1988. The Atlas of Breeding Birds in New York State, R. Andrle and J. Carroll, 1988.

CCNPP, 2004. State Discharge Permit No. 02-DP-0187, NPDES MD0002399, Calvert Cliffs Nuclear Power Plant, April 28, 2004.

CFR, 2007a. Title 40, Code of Federal Regulations, Sections 125.80-89, Track 1, Requirements Applicable to Cooling Water Intake Structures for New Facilities Under Section 316(b) of the Act, 2007.

CFR, 2007b. Title 40, Code of Federal Regulations, Section 122.21(r)(3), Application Requirements for Facilities with Cooling Water Intake Structures – Cooling Water Intake Structure Data, 2007.

CFR, 2007c. Title 40, Code of Federal Regulations, Section 125.84(b), Track 1 Requirements for New Facilities that Withdraw Equal to or Greater than 10 MGD, or (c)(1), Track 1 Requirements for New Facilities that Withdraw Equal to or Greater than 2 MGD and Less than 10 MGD and that Choose Not to Comply with Paragraph (b) of this Section, 2007.

CFR, 2007d. Title 40, Code of Federal Regulations, Section 125, Criteria and Standards for the National Pollutant Discharge Elimination System, 2007.

CFR, 2007e. Title 40, Code of Federal Regulations, Section 125.95(a) and (b), As an Owner of Operator of a Phase II Existing Facility, What Must I Collect and Submit When I Apply for my Reissued NPDES Permit? – Comprehensive Demonstration Study, 2007.

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USC, 2002. U.S. Code, Federal Water Pollution Control Act, Sectio 316(b), Thermal Discharges, as Amended, November 27, 2002.**}**

6.6 CHEMICAL MONITORING

Chemical monitoring of surface water is performed to control and minimize adverse impacts to the {Chesapeake Bay} and will be implemented in three phases: preapplication, construction and preoperational, and operational monitoring. The scope for each monitoring phase will be predicated by the findings for the preceding phase.

Section 6.1 discusses discharged wastewater temperature requirements and Section 6.3 discusses flow sampling requirements.

6.6.1 PREAPPLICATION MONITORING

{Preapplication monitoring provides a baseline for assessment of effects from pre-operation and operation of CCNPP Unit 3 on the aquatic environment in the vicinity of the CCNPP site. Information on past studies performed to determine thermal characteristics of Chesapeake Bay water are discussed in Section 6.1.

Surface Water

The following water quality databases, maintained by Federal agencies, State agencies, and non-profit groups, were accessed to locate available and applicable water quality data relevant to the Chesapeake Bay water in the area of the CCNPP site:

- Chesapeake Bay Program (CBP) Water Quality Database (1984 to present)
- Chesapeake Bay Institute (CBI) Water Quality Database (1949 to 1982)
- CBP Toxics Database
- Alliance Citizen Monitoring Database
- U.S. Geological Survey (USGS) River Input Monitoring Database
- USGS Monthly Stream Flow Data
- Susquehanna River Basin Commission (SRBC) Nutrient Assessment Program
- National Estuarine Research Reserve System (NERRS)
- CBP Nutrient Point Source Database

After examining these databases, the most available data was found within the CBP Water Quality Database (1984 to present). Using this database, the CBP manages water quality data recorded at monitoring stations throughout the Chesapeake Bay and its tributaries, including stations in the area of the CCNPP site. Data from three mainstream monitoring stations (identified on Figure 2.3.3-1) north of the CCNPP site (CB4.3W, CB4.3C, and CB4.3E) and three mainstream monitoring stations south of the CCNPP site (CB4.4, CB5.1, and CB5.1W) were used to characterize seasonal water quality trends for the Chesapeake Bay waters within the vicinity of the CCNPP site. Water quality data presented in this report were therefore obtained from these monitoring stations using the CBP database, unless otherwise noted (SBP, 2007).

Data reviewed for this environmental report was based on water year (WY) 2005 (i.e., the natural, annual water cycle from October 2004 through September 2005). Availability of water quality data varies by parameter and not all data were collected at the same collection events. However, where possible, trends in the available data sets were evaluated for discussion herein. Quality assurance/ quality control methodologies utilized can be found at the CBP website. Values with quality assurance/quality control issues noted by CBP were not included.

Most of the Chesapeake Bay mainstream, all of the tidal tributaries, and numerous segments of non-tidal rivers and streams are listed as Federal Water Pollution Control Act (USC, 2007)

Section 303(d) “impaired waters” largely because of low dissolved oxygen levels and other problems related to nutrient pollution (MDE, 2006a). The CCNPP site lies within the Lower Maryland Western Shore watershed, characterized by inflow from the Patuxent River, Fishing Creek, Parkers Creek, Plum Point Creek, Grays Creek and Grover Creek. According to the Maryland Department of Environment (MDE) listing of Section 303(d) waters, the Patuxent River is the only contributing water body within the watershed with Section 303(d) status. The discussion of Section 303(d) waters is limited to those in the watershed in the area of the CCNPP site. Although NUREG-1555 (NRC, 1999b) requests “State 303(d) lists of impaired waters,” there are significant portions of state waters, including waters outside of Chesapeake Bay that are well removed from the CCNPP site and could not possibly be affected by discharges from the CCNPP site.

The Patuxent River Lower Basin was identified on the 1996 Section 303(d) list submitted to U.S. Environmental Protection Agency (EPA) by the Maryland Department of the Environment (MDE) as impaired by nutrients and sediments, with listings of bacteria for several specified tidal shellfish waters added in 1998, and listings of toxics, metals and evidence of biological impairments added in 2002 (USEPA, 2005). The Section 303(d) segments within the Patuxent River have been identified as having low priority (MDE, 2004). Only waters that may require the development of Total Maximum Daily Loads (TMDLs) or that require future monitoring need have a priority designation (MDE, 2004). Two approved TMDLs are already established within Calvert County, including TMDL of fecal coliform for restricted shellfish harvesting areas and a TMDL for mercury in Lake Lariat. While the current Section 303(d) list identifies the lower Patuxent River and greater Chesapeake Bay as low priority for TMDL development, it does not reflect the high level of effort underway to identify and document pollution loadings in the watersheds.

Pursuant to the Federal Water Pollution Control Act (USC, 2007), the water quality of effluent discharges to the Chesapeake Bay and its tributaries is regulated through the National Pollutant Discharge Elimination System (NPDES). CCNPP Units 1 and 2 maintain a current NPDES permit. When the permit required renewal in June 1999, the MDE was unaware of any major issue that would prevent the permit renewal, and it was granted at that time. At the time, the MDE noted that any new regulations promulgated by the U.S. EPA or the MDE would be included in future permits and those may include development and implementation of TMDLs (NRC, 1999a). NPDES data collected in 2005 was reviewed to determine the nature of effluent discharges from the CCNPP site. Discharge parameters including biologic oxygen demand, chlorine (total residual), chlorine (total residual, bromine), cyanuric acid, fecal coliform, oil and grease, pH, temperature, and total suspended solids, were reported. Based upon the data reviewed, all discharges were within the acceptable range and no discharge violations were reported (USEPA, 2006).

Based upon the data, the following water quality trends were evident.

- Seasonal fluctuations in ammonia concentrations were observed throughout the year; however the highest variability was observed during the summer months. A minimum concentration of 0.003 mg/l was recorded at nearly all six monitoring stations during all seasons, while a maximum concentration of 0.344 mg/l was recorded during the summer. The annual average concentration of ammonia was 0.074 mg/l.
- Nitrite concentrations reached their peaks in the fall at all six monitoring stations; the greatest absolute fluctuation was at monitoring station CB4.3C, also during the fall. The annual average concentration was 0.0134 mg/l. Nitrate concentrations fluctuated seasonally throughout the year, with peak concentrations reached in the spring at all six

monitoring stations. The highest concentration was 0.971 mg/l at CB4.3W. The annual average concentration was 0.2014 mg/l.

- Concentrations of total organic nitrogen fluctuated, but did not show a defined seasonal trend. A minimum concentration, 0.2698 mg/l, was recorded at monitoring station CB4.4 during the summer, while a maximum concentration of total organic nitrogen, 1.2507 mg/l, was recorded at monitoring station CB4.3W, also during the summer. The annual average concentration of total organic nitrogen was 0.5066 mg/l.
- Orthophosphate and total phosphorus concentrations remained relatively stable throughout the year, with no notable spatial or temporal variations. The highest concentrations for both parameters was reached at CB4.3W during the summer, with concentrations of 0.0932 mg/l and 0.1223 mg/l for orthophosphate and total phosphorus, respectively. The annual average concentration of orthophosphate was 0.0103 mg/l. The annual average concentration of total phosphorus was 0.392 mg/l.
- Concentrations of Chlorophyll A varied substantially at five of the six monitoring stations during nearly all seasonal periods. Peak concentrations were generally reached in spring or summer. Monitoring station CB5.1W had the lowest peak concentrations and the lowest variability. A minimum concentration of 0.449 µg/l was observed at monitoring station CB4.4 in the fall; while a maximum concentration 53.827 µg/l was recorded at CB4.3W during the summer. This high concentration corresponds to a rise in total available organic nitrogen and orthophosphates within the surface waters. The annual mean concentration was 9.764 µg/l.
- Total suspended solids concentrations fluctuated widely throughout the year, reaching peak concentrations at four of the six monitoring stations during the spring. Minimum concentrations of 2.4 mg/l were recorded at several monitoring stations. The maximum concentration of 53.827 mg/l was recorded during the summer at monitoring station CB4.3W. The lowest annual mean total suspended solids were 6.57 mg/l at Station CB5.1W. The average total suspended solids at Station CB4.4, nearest to CCNPP, range from 7.71 mg/l in the fall to 30.40 mg/l in the winter. The annual mean concentration for the six monitoring stations was 9.06 mg/l.
- Surface water pH fluctuated throughout the year from 7.0 to 8.6, averaging 7.764 standard units, with the lowest values generally reached during spring and summer. The average low pH across the stations was 7.7 standard units; the average maximum was 8.4 standard units. No spatial variations are noted.

In response to concerns about nutrient pollution, the U.S. EPA developed Chesapeake Bay-specific water quality criteria for dissolved oxygen, water clarity, and Chlorophyll A in 2003. Chlorophyll A is an indicator parameter used to measure the abundance and variety of microscopic plants or algae that form the base of the food chain in the Chesapeake Bay (USEPA, 2003). Excessive nutrients can stimulate algae blooms, resulting in reduced water clarity, reduced amount of good quality food, and depleted oxygen levels in deeper water. Chlorophyll A is, therefore, used to evaluate attainment of various water quality criteria including dissolved oxygen and water clarity (USEPA, 2003). Based on the 2005 water quality data as shown in Table 2.3.3-6, mesotrophic to eutrophic water conditions may have been present in the vicinity of CCNPP site during the spring and summer months, and indicated that water quality criteria for DO would not be attained for the spring months.

Beginning in February 2007, three of five planned water samples were collected at the CCNPP Units 1 and 2 cooling water intake structure. During each sampling event, water samples were collected towards the end of the incoming (flood) and the outgoing (ebb) tides. Sample results and analytical parameters are presented in Table 2.3.3-8. Because of differences in analytical

suites, not all results are directly comparable to the water quality samples collected by the CBP as shown in Table 2.3.3-6. In general, the intake analyte concentrations and measurements are similar to the values measured in CBP water samples collected at the stations closest to the CCNPP (locations CB4.3W, CB4.3C, CB4.3E, and CB4.4) indicating that there are no significant pollutants in the influent cooling water for CCNPP Units 1 and 2.

Groundwater

Forty (40) groundwater observation wells were installed across the CCNPP site. They were completed in the Surficial aquifer and water-bearing materials in the Chesapeake Group. The wells were located in order to provide adequate distribution with which to determine site groundwater levels, subsurface flow directions, and hydraulic gradients beneath the CCNPP site. Well pairs were installed at selected locations to determine vertical gradients. Field hydraulic conductivity tests (slug tests) were conducted in each observation well. Monthly water level measurements from the groundwater observation wells began in July 2006 and will continue until July 2007.

To evaluate vertical hydraulic gradients, several observation wells were installed as well clusters. Well clusters are a series of wells placed at the same location, with each well monitoring a distinct water bearing interval. Four well clusters were installed to evaluate the hydraulic gradient between the Surficial aquifer and the Upper Chesapeake unit, and three well clusters were installed to evaluate the gradient between the Upper Chesapeake and Lower Chesapeake units.**}**

Well water quality data are described in Section 2.3.3.2.

6.6.2 CONSTRUCTION AND PREOPERATIONAL MONITORING

{Chemical monitoring during construction will aid in controlling adverse impacts to the Chesapeake Bay and will provide additional water quality data that can be used to measure water-quality changes from operation of CCNPP Unit 3. Accordingly, chemical monitoring of surface water during construction related activities for CCNPP Unit 3 will be an extension of more than 30 years of pre-application monitoring. Construction and preoperational chemical monitoring will be performed during the planned two year and four year periods for site preparation and plant construction, respectively. Sample collection, laboratory analyses, data evaluation and reporting practices will comply with permit modifications.

Although storm water discharges will increase during construction, primarily due to water pumped from excavation sumps, disturbance to existing drainage systems will be avoided, if possible. Environmental controls (i.e., silt screens, dams, settling basins, and spill containment measures), will be implemented to reduce potential pollutants in storm water runoff and to minimize construction impacts to aquatic habitats. Prior to the start of construction, approval of storm water management and erosion/sediment control plans will be obtained in accordance with the NPDES Construction General Permit as discussed in Section 1.3. These controls will be incorporated into a Storm Water Pollution Prevention Plan (SWPPP). Similar to the existing plant's SWPPP, storm water system manholes and handholds will continue to be periodically inspected and cleaned.

Considering that the CCNPP Unit 3 footprint is in the vicinity of the former Camp Conoy site, as discussed in Section 2.2 and Section 3.1, the existing swimming pool will be demolished and Outfall 005 replaced or eliminated.

Groundwater monitoring (water level observation) of the CCNPP Unit 3 area is currently being implemented through the use of the groundwater observation wells installed in 2006 for the CCNPP Unit 3 site area subsurface investigation and through the periodic review of water levels

from selected wells within the Calvert County Groundwater Level Monitoring Network. Some of the existing CCNPP Unit 3 area observation wells will be taken out-of-service prior to construction activities due to anticipated earth moving and construction requirements. Prior to construction activities, the observation well monitoring network will be evaluated in order to determine groundwater data gaps and needs created by the abandonment of existing wells. These data needs will be met by the installation of additional observation wells, if required. Additionally, the hydrologic properties and groundwater flow regimes of the shallow water bearing units (Surficial aquifer, and to a lesser extent, the Chesapeake units) will be impacted by the proposed earthmoving, regrading, and construction of infrastructure (buildings, parking lots, etc.). Revisions to the observation well network will be implemented to ensure that the resulting changes in the local groundwater regime from construction activities will be identified. No chemical monitoring is planned at this time for groundwater.**}**

6.6.3 OPERATIONAL MONITORING

{Operational monitoring will commence from the date of the first appropriation and use of Chesapeake Bay water and first discharge and continue as long as required by the NPDES permit applicable for CCNPP Unit 3. Although operational monitoring elements will be developed in consultation with the MDE, it is anticipated that sampling locations, frequency and analyses will be similar to those for CCNPP Units 1 and 2.

Similar to the CCNPP Units 1 and 2 intake structure, the CCNPP Unit 3 intake structures will house debris screens, screen wash pumps, makeup water pumps and related equipment so that a new outfall for intake screen backwash will be likely. However, similar to CCNPP Units 1 and 2, chemical monitoring at the CCNPP Unit 3 intake and outfall will be limited by the new NPDES permit to certain chemical parameters to ensure the differences between the intake water and discharge water are within the limits specified in the permit.

Unlike the once-through cooling water system utilized by CCNPP Units 1 and 2, CCNPP Unit 3 will utilize a closed-loop cooling water system, resulting in significantly less discharge water. Fresh water for CCNPP Unit 3 will be supplied by a desalination plant, in lieu of groundwater. Prior to discharge into the Chesapeake Bay, normal cooling tower blowdown will be directed to a retention basin, provided as an intermediate discharge reservoir, and held for a period of time to reduce the concentration of solids and chlorine in the water. Essential Service Water System cooling tower blowdown, treated sanitary effluents, desalination plant discharge (brine), and other wastewater will also collect in the retention basin. Piping will transfer retention basin wastewater by gravity to the new discharge structure, which will provide a flow path for the discharge of water into the Chesapeake Bay via a submerged outfall.

The CCNPP Unit 3 Waste Water Treatment Plant (WWTP) would collect sewage and waste water generated from the portions of the plant outside the radiological control areas of the power block and would treat them using an extensive mechanical, chemical, and biological treatment processes. The treated effluent would be combined with the discharge stream from the onsite waster water retention basin and discharged to Chesapeake Bay. The discharge would be in accordance with local and state safety codes. The dewatered sludge would be hauled offsite for disposal at municipal facilities. The treated waste waster would meet all applicable health standards, regulations, and TMDLs set by the Maryland Department of the Environment and the U.S. EPA.

Table 3.6-3 lists anticipated liquid and solid effluents associated with the WWTP. Parameters are expected to include flow rates, pollutant concentrations, and the biochemical oxygen concentration at the point of release.

Non-radioactive liquid effluents that could potentially drain to the Chesapeake Bay are limited under the NPDES permit. Table 3.6-1 provides information on the various chemicals anticipated to be used for the various plant water systems. All of these chemical additives will have limiting discharge concentrations specified in the NPDES permit that will require monitoring.

Chemical monitoring will be performed at the new outfall to assess the effectiveness of retention methods and effluent treatment systems, as well as to detect changes in water quality associated with plant operations. Similar to CCNPP Units 1 and 2, chemical monitoring will also be performed at storm water runoff outfalls and at internal monitoring points (i.e., sanitary waste effluents, wastewater retention basin influent and/or effluent). Effluent water chemistry will meet applicable federal and state environmental regulatory requirements.

The following discussion provides a basis for the type of data and information that is expected to be required by the NPDES permit for CCNPP Unit 3. The CCNPP Units 1 and 2 NPDES permit specifies the monitoring conditions that the existing plant must meet to protect water quality. It is expected that NPDES permit requirements for CCNPP Unit 3 will be similar. Table 6.6-1 summarizes the required water sampling protocol for the existing monitoring stations. A map showing the monitoring station locations is provided in Section 6.1. Although the sampling station for Outfall 001 is located onshore, its discharge point is offshore (Special Condition A.1 of NPDES, 2004). Past and present chemical characteristics of monitoring station discharges are provided in Section 2.3.3. Well water not consumed by various plant systems discharges into the Chesapeake Bay via authorized Outfall 001 or Outfall 005.

Sampling for CCNPP Unit 3 NPDES permit requirements will be performed in accordance with the quality standards outlined in a Chemical Quality Assurance (QA) and Quality Control (QC)**}** Program. This Chemical QA and QC Program will provide performance instructions for chemical/reagent control, instrumentation control, program control (e.g., sampling methodologies, analysis), minimum quantifiable concentration control, use and evaluation of charts, and data reporting.

Samples representative of the system or stream will be collected and preserved as necessary to prevent contamination or deterioration. Treated sewage effluent samples will be collected with an automatic compositor. Sampling and analytical methods will conform to procedures for the analysis of pollutants as identified in 40 CFR Part 136, “Guidelines Establishing Test Procedures for the Analysis of Pollutants.” Toxicity testing will be conducted in accordance with procedures described in EPA/600/4-90/027F (USEPA, 1993). To ensure accuracy of measurements, monitoring and analytical instrumentation is maintained and periodically calibrated in accordance with manufacturer specifications or those per the Chemical QA and QC Program, whichever are more restrictive. The Chemical QA and QC Program will also provide instructions for calibration standards, prepared or purchased, used for preparing calibration curves and performing calibration checks. Statistical reliability will be achieved by calculating the mean and standard deviation of the data at a 95% confidence level. Data quality objectives include producing accurate, reliable and cost effective measurements and data, adequate for their intended use.

Monthly monitoring results will be summarized on Discharge Monitoring Reports and submitted to the MDE. Sampling data collected during pre-application monitoring serve to document existing water quality conditions.

There are currently no plans to monitor groundwater for chemicals during the operational phase of CCNPP Unit 3.**}**

6.6.4 REFERENCES

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USEPA, 2005. Decision Rationale - Total Maximum Daily Loads of Fecal Coliform for Restricted Shellfish Harvesting Areas in the Patuxent River Lower and Eastern Bay Basins in Calvert, St. Mary's and Queen Anne's Counties, Maryland, U.S. Environmental Protection Agency, September 27, 2005.

USEPA, 2006. Water Discharge Permits - Detailed Reports, U.S. Environmental Protection Agency, Website: http://oaspub.epa.gov/enviro/pcs_det_reports.detail_report?npdesid=MD000239, Date accessed: November 2006.**}**

Table 6.6-1 {NPDES Required Water Sampling Protocol for CCNPP Units 1 and 2

(Page 1 of 3)

Monitoring Station[a]	Monitoring Location[b]	System(s) Sampled[b]	Parameter Sampled	Sample Type[i]	Sampling Frequency
Outfall 001[c]	Surge pit at end of Discharge Road near the northeast corner of the plant	• Once-through Cooling Water • Sewage Treatment • Low Volume Waste, Sump Water and Storm Water Runoff • Auxiliary Boiler Blowdown • Reverse Osmosis Reject Water • Secondary Cooling Blowdown	TRC[d]	Grab	1/Week
Monitoring Point 101A	Discharge for the de-chlorination chamber	Sewage Treatment	BOD	8 hour Composite	1/Week
			TSS	8 hour Composite	1/Week
			Fecal Coliform[e]	Grab	1/Week
			TRC	Grab	1/Week
Monitoring Point 102A[f]	Pipe outlet beside the Sewage Treatment Plant access road	• Low Volume Waste, • Sump Water • Storm Water Runoff	TSS	Grab	1/Month
			Oil and Grease	Grab	1/Month
			pH	Grab	1/Month
Monitoring Point 103A[g]	Auxiliary Boiler Room	Auxiliary Boiler Blowdown	TSS	Grab	1/Year
			Oil and Grease	Grab	1/Year
			pH	Grab	1/Year

Table 6.6-1 {NPDES Required Water Sampling Protocol for CCNPP Units 1 and 2

(Page 2 of 3)

Monitoring Station[a]	Monitoring Location[b]	System(s) Sampled[b]	Parameter Sampled	Sample Type[i]	Sampling Frequency
Monitoring Point 104A	Discharge from the neutralization tank	Reverse Osmosis Reject Water (Demineralizer Backwash)	TSS	Grab	1/Month
			Oil and Grease	Grab	1/Month
			pH	Grab	1/Discharge
Monitoring Point 106A[g]	Plant sample sink	Secondary Cooling Blowdown	TSS	Grab	1/Year
			Oil and Grease	Grab	1/Year
			pH	Grab	1/Year
Outfall 003[h]	Intake Structure	Intake Screen Backwash	N/A	N/A	N/A
Outfall 004[h]	Intake Structure	Intake Screen Backwash	N/A	N/A	N/A
Outfall 005[j]	Plastic pipe across road north of pool	Swimming Pool Filter Backwash	TRC	Grab	1/Month
			TRB	Grab	1/Month
			Cyanuric Acid	Grab	1/Month

Notes:

a. Refer to Section 6.1 for a map showing the location of the monitoring stations. The sampling location for Outfall 001 is onshore, but its discharge point is offshore.

b. Monitoring station locations and systems sampled are specified in the NPDES permit.

c. Includes discharges from internal Monitoring Points 101A, 102A, 103A, 104A and 106A.

d. The monthly Discharge Monitoring Reports indicate when chlorine compounds are not in use. Discharge of residual chlorine from any unit is limited to two hours per day.

e. Average limitations are calculated as Geometric Mean.

Table 6.6-1 {NPDES Required Water Sampling Protocol for CCNPP Units 1 and 2

(Page 3 of 3)

f. Limitations and monitoring requirements are applicable during periods of no storm water runoff.

g. Closed loop system. Makeup water is supplied by the reverse osmosis system. Monitoring is performed annually since the discharged water is essentially pure.

h. Since the water is not changed by the screen backwash process, it is not limited by the NPDES permit.

i. "Grab sample" means an individual sample collected in less than 15 minutes. Grab samples collected for pH and TRC are analyzed within 15 minutes of time of sample collection. "Composite sample" means a combination of individual samples obtained at least at hourly intervals over a time period. Although 'time periods' as noted above and in Note 'j' below are specified for sample collection in the NPDES permit, the 'time of day' that samples are collected, is not mandated.

j. Discharge is to an unnamed tributary (a small swale) which flows into the Chesapeake Bay.**}**

6.7 SUMMARY OF MONITORING PROGRAMS

This section summarizes the monitoring environmental programs described in Chapter 6. The summary is divided into three sections:

- Pre-application monitoring
- Construction and Pre-Operational monitoring
- Operational monitoring

6.7.1 PREAPPLICATION MONITORING

Pre-Application monitoring for **{**CCNPP Unit 3**}** will be fulfilled by the ongoing thermal, radiological, hydrological, meteorological, and chemical monitoring programs (Sections 6.1 through 6.6) for the existing **{**CCNPP Units 1 and 2**}**. This represents **{**30**}** years of monitoring for the site. Pre-application ecological monitoring was provided through field studies. Summaries of the pre-application monitoring activities are included in Tables 6.7-1 through 6.7-7.

6.7.2 CONSTRUCTION AND PREOPERATIONAL MONITORING

The current thermal, radiological, hydrological, meteorological, and chemical monitoring programs will be continued through the construction and preoperational phases of **{**CCNPP Unit 3**}**. Construction and pre-operational ecological monitoring will be provided by follow-up field studies and monitoring of intake structure impingement and entrainment, and quality monitoring for water withdrawn from the Chesapeake bay. Summaries are included in Tables 6.7-1 through 6.7-7.

6.7.3 OPERATING MONITORING

While specific operational monitoring requirements and programs for **{**CCNPP Unit 3**}** have not yet been fully established, they will be similar to and tiered from or added to those monitoring programs described in the previous sections which currently monitor the impacts of **{**CCNPP Units 1 and 2**}** on the surrounding environment. Summaries are included in Tables 6.7-1 through 6.7-7.

The existing and future operational monitoring programs could be modified as a result of future consultations with state regulatory agencies. The need for modifications to established monitoring locations, parameters, collection techniques, or analytical procedures will be assessed prior to and during the course of operation, as is done now for **{**CCNPP Units 1 and 2**}**.

6.7.4 REFERENCES

None

Table 6.7-1 Thermal Monitoring
(Page 1 of 1)

Phase	Summary	Permit
Pre-Application	**{**The National Pollutant Discharge Elimination System (NPDES) permit for CCNPP Units 1 and 2 requires thermal monitoring of plant discharges via Outfall 001, and provides a cooling water temperature increase limit of 12 °F (6.7 °C). Once-through cooling water for CCNPP Units 1 and 2 is discharged through tunnels approximately 400 yards (365.8 meters) offshore.**}**	NPDES Permit issued for **{**CCNPP Units 1 and 2**}**
Construction and Pre-Operation	Construction and pre-operational thermal monitoring will be a continuation of the pre-application program. Construction related discharges will mainly consist of surface drainage that collects in sumps at the bottom of excavations, which will be pumped to a storm water discharge point. Consequently, no changes in thermal discharges are expected to the construction and preoperational monitoring program from those provided during the pre-application phase. **{**The Maryland Department of Environment (MDE) will be notified of pending construction activities and approval of storm water management and erosion/sediment control plans will be obtained in accordance with the NPDES Construction General Permit.**}**	General NPDES Construction Permit
Operation	**{**CCNPP Unit 3 will utilize a closed-loop cooling systems. Thermal monitoring will be performed at the discharge structure outfall for CCNPP Unit 3, and will conform to the requirements of the NPDES permit issued for CCNPP Unit 3. It is anticipated that the location of the thermal monitoring station for the new outfall structure will be similar to the existing monitoring stations (i.e., near the intake screens and discharge structure).**}**	NPDES Permit issued for **{**CCNPP Unit 3**}** Operation

Table 6.7-2 Radiological Monitoring
(Page 1 of 1)

Pre-application monitoring for {CCNPP Unit 3} site location will be provided by the existing Radiological Environmental Monitoring Program (REMP) for {CCNPP Units 1 and 2}. Annual reporting of these REMP activities, detected radioactivity, trends, and plant related impacts will continue through the construction and operation of {CCNPP Unit 3}. Existing sampler locations, sampling frequency, and type of analysis are described further in Tables 6.2-2 through 6.2-7.

Construction and pre-operational radiological monitoring will be a continuation of the pre-application monitoring program. {Prior to commencing construction, an existing REMP air particulate and iodine sampler (A1) and a Thermoluminescence Dosimetry location (DR7) will be relocated to an area that is outside the construction footprint for CCNPP Unit 3 (see Figure 6.2-4 for monitoring locations). Also, three vegetation species sample locations (lb4, lb5, lb6) that are located within the construction footprint for CCNPP Unit 3 (see Figure 6.2-1) will be relocated near the new location for sampler A1.}

For the operational phase, an additional air particulate and iodine sampler and Thermoluminescence Dosimetry location will be provided at the SSW site boundary area to satisfy REMP siting criteria. A surface water sampler will also be provided near the {CCNPP Unit 3 discharge point}.

Effluent Exposure Pathways	REMP Sampling Media	Frequency	Phase
Liquid Effluents			
{Ingestion Fish	Commercial & Recreational Fish Species	In season, or semiannually if not seasonal	All Phases
Ingestion Invertebrates	Commercial & Recreational Fish Species	In season, or semiannually if not seasonal	All Phases
Shoreline Exposure (External Direct)	Sediments from Shoreline	Semiannually	All Phases
Swimming & Boating (External Direct)	Surface Waters	Composite sample over one month period	All Phases}
Gaseous Effluents			
{Cloud Immersion (External Direct)	Thermoluminescence Dosimetry (TLD)	At least quarterly	All Phases
Ground Plane (External Direct)	Thermoluminescence Dosimetry (TLD)	At least quarterly	All Phases
Inhalation	Air Particulate Sampling, Iodine Sampling	Continuous sampler with weekly sample collection	All Phases
Ingestion of Agricultural Products	Broadleaf Vegetation	Monthly during growing season	All Phases}

Notes:

1. No milk ingestion pathway. No milk animals within 5 mi (8 km) of the site. Meat ingestion is not a significant pathway contributor.
2. The REMP for CCNPP Unit 1 and 2 does not include groundwater monitoring. By design, there are no liquid effluent releases to groundwater or structures that discharge to groundwater. Therefore there is no human ingestion pathway associated with groundwater for CCNPP Unit 3.

Table 6.7-3 Hydrological Monitoring
(Page 1 of 1)

Phase	Surface Water	Groundwater
Pre-Application	**{**Hydrological Monitoring of surface water is in accordance with the NPDES program. Table 6.3-1 lists monitoring locations and frequencies. Water from the Chesapeake Bay is used for plant system cooling in accordance with a water appropriation and use (WAU) permit.**}**	**{**Groundwater monitoring is conducted of five production wells that supply process and domestic water in the CCNPP Unit 1 and 2 protected area. Nine additional wells supply water for domestic and industrial use in the outlying areas. These are monitored in accordance with a WAU permit.**}**
Construction and Pre-Operation	**{**Surface water on site will be monitored as part of the NPDES Construction General Permit. Erosion/sediment control and storm water management will be monitored by the Storm Water Pollution Prevention Plan (SWPPP). Chesapeake Bay surface water will be monitored during construction of the CCNPP Unit 3 intake and discharge structures as part of the U.S. Army Corps of Engineers 404 permit.**}**	**{**Groundwater monitoring during construction of CCNPP Unit 3 will be conducted with groundwater observation wells installed across the CCNPP site as part of the COL pre-application studies. This is to monitor for potential dewatering of perched water levels. Generally, temporary dewatering is exempt from a WAU permit unless pre-established limits are exceeded.**}**
Operation	**{**During CCNPP Unit 3 operation, plant water supply will be from two sources. Makeup water for plant cooling will be withdrawn from the Chesapeake Bay at a new intake structure. Potable (fresh water) will be provided from a desalination plant using Chesapeake Bay water. Operation of the new intake structure and desalination plant, as well as discharge to the Chesapeake Bay, will require monitoring via WAU and NPDES permits. **}**	**{**The desalination plant will provide all fresh water needs for CCNPP Unit 3 under a WAU permit. CCNPP Unit 3 will not require use of groundwater. **}**

Table 6.7-4 Meteorological Monitoring
(Page 1 of 1)

Phase	Primary Tower	Backup Tower	Additional Sensors	Detailed Descriptions
Pre-Application	Wind Speed Sensor, Wind Direction Sensor, Temperature Sensors, Precipitation Sensor	Wind Speed Sensor, Wind Direction Sensor, Temperature Sensors	**{**A tipping bucket rain gauge is located about 30 ft (9.1 m) from the primary tower in an open field and a barometric pressure instrument is located in the Meteorology Building.**}**	Table 6.4-1 Table 6.4-2
Construction and Pre-Operation	Wind Speed Sensor, Wind Direction Sensor, Temperature Sensors, Precipitation Sensor	Wind Speed Sensor, Wind Direction Sensor, Temperature Sensors	**{**A tipping bucket rain gauge is located about 30 ft (9.1 m) from the primary tower in an open field and a barometric pressure instrument is located in the Meteorology Building.**}**	Table 6.4-1 Table 6.4-2
Operation	Wind Speed Sensor, Wind Direction Sensor, Temperature Sensors, Relative Humidity Sensor (Added for CCNPP Unit 3), Precipitation Sensor	Wind Speed Sensor, Wind Direction Sensor, Temperature Sensors	**{**A tipping bucket rain gauge is located about 30 ft (9.1 m) from the primary tower in an open field and a barometric pressure instrument is located in the Meteorology Building.**}**	Table 6.4-3 Table 6.4-4

Notes:

1 Pre-Application, and Construction and Pre-Operation, meteorological monitoring to be performed as an extension of the existing meteorological monitoring program for {CCNPP Units 1 and 2}

2 Primary tower – **{**197 ft [60 m] and 33 ft [10 m] elevations above ground level**}**

3 Backup Tower – **{**33 ft [10 m] elevation above ground level**}**

Table 6.7-5 Terrestrial Ecology Monitoring

(Page 1 of 3)

Phase	Summary	Permits
Pre-Application	**[{**There are currently no program or regulatory requirements to monitor terrestrial ecology. Extensive terrestrial ecology field studies were performed during the pre-application phase, including studies for rare plants, flora, fauna, wetlands, and two federally threatened tiger beetles. These studies included baseline surveys of the scarlet tanager and other forest-interior birds, and the bald eagle within 1,000 ft of the construction area. Aerial photographic records of the project area have been performed to establish baseline conditions for vegetation types and moisture regimes, and to identify suitable habitats for Federal and State protected species of plant and animals. Mitigation of unavoidable wetland impacts due to construction activities for CCNPP Unit 3 will be guided by permit requirements of the US Army Corps of Engineers and Maryland Department of the Environment. Wetlands likely to be affected by construction will be evaluated to determine their functions and values by methodology accepted by the US Army Corps of Engineers and Maryland Department of the Natural Resources.**}**	**{**US Army Corps of Engineers Maryland Department of the Environment Maryland Department of the Natural Resources**}**

Table 6.7-5 Terrestrial Ecology Monitoring

(Page 2 of 3)

Phase	Summary	Permits
Construction and Pre-Operation	**{**There are no continuous monitoring program requirements for terrestrial ecology during this phase. Mitigation of wetlands lost to development will commence concurrently with project construction. Monitoring will follow guidelines developed by the US Army Corps of Engineers, State of Maryland permit requirements, the CCNPP Stormwater Pollution Prevention Plan, and the CCNPP Spill Prevention, Control and Countermeasures Program. The Showy Goldenrod population at Camp Conoy will be relocated to avoid destruction during site preparation and construction of CCNPP Unit 3. Power line right-of-ways require periodic vegetable management and the resulting open old-field herbaceous plant community matches the Showy Goldenrod's requirements for transplantation. Relocation followed by annual monitoring for the first three years will be performed and will be documented as field surveys. Aerial photographic records will be obtained every five years, including some field observations, to verify the information gathered from photo interpretation. This will serve as a record of forest growth in restored areas following construction, identify areas of erosion, and indicate changes in vegetation that require corrective action. Bald eagle surveys will be performed annually during the construction and pre-operation phase.**}**	**{**US Army Corps of Engineers Maryland Department of the Environment Maryland Department of the Natural Resources**}**

Table 6.7-5 Terrestrial Ecology Monitoring
(Page 3 of 3)

Phase	Summary	Permits
Operation	**{**There are no continuous monitoring program requirements for terrestrial ecology during this phase. The transplanted Showy Goldenrod population will be monitored annually for the first three years following relocation, and every five or ten years thereafter, based on perceived need. A refined version of the Maryland Natural Heritage Program's Rare Species Reporting Form will serve as the core protocol for data collection. Aerial photographic monitoring, backed by field observations, will continue to be performed every five years during operations to serve as a record of forest growth, and to identify erosion or changes in vegetation requiring corrective action. Bald eagle surveys will be performed every five years during the operational phase.**}**	**{**US Army Corps of Engineers Maryland Department of the Environment Maryland Department of the Natural Resources Maryland Natural Heritage Program**}**

Table 6.7-6 Aquatic Ecology Monitoring

(Page 1 of 2)

Phase	Summary	Permit
Pre-Application Monitoring	**{**There are currently no program or regulatory requirements to monitor aquatic ecology. Extensive aquatic ecology field studies were performed during the pre-application phase. These studies evaluated submerged aquatic vegetation, sediment quality and benthic macroinvertebrates, and oysters. Other pre-application monitoring included review of historical data for CCNPP Units 1 and 2, and the CCNPP Unit 1 and 2 icthyplankton in-plant entrainment and baffle wall study Surveys performed to establish baseline conditions follow the guidelines published by the Maryland Department of Natural Protection and US Department of Environmental Protection, as referenced in the aquatic field study report.**}**	**{**None applicable**}**
Pre-Operation and Construction Monitoring	**{**Construction and pre-operation monitoring programs are proposed for resources that may affect aquatic ecology, including thermal monitoring (Section 6.1), hydrological monitoring (Section 6.3), and chemical monitoring (Section 6.6). The existing monitoring locations for Outfall 001 are expected to remain the same as those for pre-application monitoring (see Table 6.6-1 for location). Engineered controls minimizing silt runoff from impervious surfaces on the CCNPP Unit 3 construction site will be periodically monitored for effectiveness. The monitoring requirements of the Army Corps of Engineers 404 permit and the Spill Prevention, Control and Countermeasures Plan will be implemented as they relate to spills and spill controls, as required. Biological monitoring for fish impingement and entrainment of the commercial, recreational, and forage base fish and shellfish identified in the Source Water Baseline Characterization data will be performed to meet 40CFR122..21(r)(3), Tier I requirements. • Impingment samples will be taken over a 24 hour period no less than once per month when the cooling water intake structure is in operation. • Entrainment samples will be taken over a 24 hour period no less than bi-weekly during the identified period of primary reproduction, larval recruitment, and peak abundance when the cooling water intake structure is in operation.}	**{**General NPDES Construction Permit Army Corps of Engineers 404 Permit Spill Prevention, Control and Countermeasures Plan**}**

Table 6.7-6 Aquatic Ecology Monitoring
(Page 2 of 2)

Phase	Summary	Permit
Operational Monitoring	**{**Operational monitoring will be part of compliance with the new NPDES permit and the Clean Water Act 316(b) Phase II rule. The Phase II rule addresses existing sources of cooling water intake at steam electric plants. Entrainment data will be collected for CCNPP Units 1 and 2 to supplement older data that exists to determine the calculation baseline required by the Phase II Rule. A year long seasonally stratified entrainment sampling program that includes monitoring inside and outside of the baffle wall has been proposed. This will provide a baseline for implementation of the Phase II rule. Biological monitoring for fish impingement and entrainment of the commercial, recreational, and forage base fish and shellfish identified in the Source Water Baseline Characterization data will be performed to meet 40CFR122..21(r)(3), Tier I requirements. • Impingment samples will be taken over a 24 hour period no less than once per month when the cooling water intake structure is in operation. • Entrainment samples will be taken over a 24 hour period no less than bi-weekly during the identified period of primary reproduction, larval recruitment, and peak abundance when the cooling water intake structure is in operation. • Velocity monitoring will be performed for surface intake screens that correlate the measure value with the design intake velocity at the minimum source water elevation. Monitoring will be performed during initial startup, and thereafter at the frequency specified in the NPDES permit, but no less than once per quarter Water withdrawn from the Chesapeake Bay will be monitored monthly in accordance with a Maryland Department of Environment Water Appropriation and Use (WAU) permit **}**	**{**NPDES issued for CCNPP Unit 3 Operations**}**

Table 6.7-7 Chemical Monitoring

(Page 1 of 1)

Phase	Summary	Permit
Pre-Application	**{**Pre-application chemical monitoring will be performed in accordance with the existing NPDES permit for CCNPP Units 1 and 2. Details of the existing chemical monitoring program are shown in Table 6.6-1. This includes the monitoring locations, systems sampled, parameter sampled, sample type, and sampling frequency.**}**	**{**Existing NPDES permit for CCNPP Units 1 and 2**}**
Construction and Pre-Operation	**{**Construction and Pre-Operational chemical monitoring will be performed in accordance with the existing NPDES permit for CCNPP Units 1 and 2. Sample collection, laboratory analyses, data evaluation and reporting practices will comply, as needed, the General NPDES Construction Permit. A Storm Water Pollution Prevention Plan will be implemented for construction of CCNPP Unit 3. **}**	**{**General NPDES Construction Permit**}**
Operation	**{**Operational chemical monitoring of the new CCNPP Unit 3 outfall, stormwater runoff outfalls, and internal monitoring points (i.e., sanitary waste effluents, wastewater retention basin influent/effluent) will be conducted in accordance with the new NPDES permit for CCNPP Unit 3 to determine the effectiveness of the retention methods and effluent treatment systems and to detect changes in water quality associated with Unit 3 operations.**}**	**{**NPDES permit issued for Unit 3 Operations**}**