ENVIRONMENTAL REPORT

CHAPTER 4

IMPACTS OF CONSTRUCTION

4.0 IMPACTS OF CONSTRUCTION

4.1 LAND USE IMPACTS

This section describes the impacts of site preparation and construction to the CCNPP site and the surrounding area. Section 4.1.1 describes impacts to the site and vicinity. Section 4.1.2 describes impacts that could occur along transmission lines. Section 4.1.3 describes impacts to historic and cultural resources at the site.

4.1.1 The Site and Vicinity

The CCNPP site land use is presented in Table 2.2-1 and shown on Figure 2.2-1. The land use categories are consistent with USGS land use/cover categories. Land use/cover within the 8 mi (13 km) site vicinity is presented in Table 2.2-2 and shown on Figure 2.2-2. Highways and utility right-of-ways that cross the site and vicinity are shown on Figure 2.2-4 and Figure 2.2-5.

4.1.1.1 The Site

CCNPP Unit 3 and supporting facilities would be located on the 2,070 acre (838 hectares) CCNPP site, to the southeast of and adjacent to CCNPP Units 1 and 2. The CCNPP site use activities will not change as the result of the proposed action. The CCNPP site acreage were purchased for and used by Constellation Energy for the purpose of generating electricity. The proposed action of the construction and operation of an additional power unit does not alter the site's current use. The CCNPP site will conform to all applicable local, state, and Federal land use requirements and restrictions as they pertain to the proposed action. Figure 4.1-1 shows the current Calvert County zoning categories for the CCNPP site.

The State of Maryland and Calvert County have land use plans that attempt to limit sprawl and encourage smart growth primarily through zoning ordinances. Through regulation, the Federal, State, and County governments attempt to limit potential environmental impacts to coastal areas including the Chesapeake Bay. The CCNPP site would follow all local, state, and federal requirements that pertain to the Coastal Zone Management Program (MDE, 2004) regulations and those regulations pertaining to the Chesapeake Bay Critical Area (CALCO, 2006) (CAC, 2006). During construction, site activities are required to be authorized by the agencies and programs listed in Table 1.3-1. There are no recognized Native American Tribal Land use plan that would have jurisdiction over the CCNPP site or within the vicinity of the CCNPP site that could impact the CCNPP site.

Table 4.1-1 provides an estimate of the land areas that would be disturbed during construction of CCNPP Unit 3 and supporting facilities, including temporary features such as laydown areas, stormwater retention ponds, and borrow areas. The CoApplicants currently estimate that a total of approximately 460 acres (186 hectares) of the CCNPP site will be disturbed during the construction of CCNPP Unit 3. Of that total, approximately 320 acres (129 hectares) would be permanently dedicated to CCNPP Unit 3 and its supporting facilities. Approximately 36.4 acres (14.7 hectares) of existing open field area to the north of the proposed construction access road will be used to permanently store excavated material from the power block, CWS Cooling Tower and other construction areas that are not suitable for construction backfill. This area will be stabilized with vegetative cover after final grading. Approximately 15 acres (6 hectares) may have to have vegetation removed to accommodate large construction equipment, but it will not be necessary to disturb soil. Acreage not containing permanent structures would be reclaimed to the maximum extent possible.

From Figure 4.1-1, an estimate was made regarding the amount of land currently zoned as Forest and Farm District within the CCNPP site boundary that would be affected by the proposed construction activities. Approximately 147 acres (59 hectares) of land currently zoned Forest and Farm District will be permanently (134 acres (54 hectares)) or temporarily (13

acres (5.2 hectares)) impacted by the construction activities. Approximately 19.7 acres (8 hectares within the Intensely Developed Area (IDA) will be impacted.

As discussed in Section 4.3.1.1, an estimated 193 acres (78 hectares) of mixed deciduous forest would be lost during construction activities, approximately 28 acres (11 hectares) of which would be temporary. Additional information is provided on Table 4.3-1.

Section 2.2.1 describes the land areas that are devoted to major uses within the CCNPP site boundary and the CCNPP site vicinity. These areas are depicted on Figure 2.2-1 and Figure 2.2-2, respectively. In addition, Section 2.2.1 describes the highways and utility right-of-way that cross the CCNPP site and vicinity. The footprint for the proposed unit and supporting facilities will be partially located on land and facilities associated with Camp Conoy, a recreational facility formerly used by CCNPP employees. This area is not open to the public; thus, there would be no impact to public recreation areas as the result of the proposed action. CalvertCliffs 3 Nuclear Project and UniStar Nuclear Operating Services are not aware of any Federal action in the area that would have cumulatively significant land use impacts.

Heavy equipment and reactor components would be barged up the Chesapeake Bay to the existing barge slip. The slip area would be dredged and the existing heavy haul road from the barge slip would be modified and extended to the new construction site and lay down areas. A new access road, approximately 2 mi (3.2 km) long, would be constructed from Maryland State Road 2/4 to the construction site providing access to the construction areas without impeding traffic to the existing units. A site perimeter road system and access road around the cooling tower area to the power block would be built. Another road would be constructed to the proposed water intake structure.

The new intake, discharge, and barge facilities would be located in the 100 year coastal floodplain. With those exceptions, construction activities would be outside the 500 year floodplain in areas designated as areas of minimal flooding (FEMA, 1977).

The proposed location of CCNPP Unit 3 and supporting facilities is not farmland, and does not possess any prime farmland soils. The CCNPP site itself is predominantly forested with areas categorized as "Urban" or "Built-up" in the vicinity of the areas of current CCNPP operational facilities. In addition, the only known mineral deposits currently being extracted in Calvert Country are sand and gravel as described in Section 2.2.1.2. There are no known economic mineral deposits on the CCNPP site.

The proposed construction activities would result in the permanent loss, through filling, of approximately 11.72 acres (4.7 hectares) of non-tidal wetland habitat and approximately 30.69 acres (12.48 hectares) of non-tidal wetland buffer. Section 4.3.1.3 provides a detailed discussion of construction impacts to wetlands.

Construction would also impact 33.4 acres (13.5 hectares) within the Chesapeake Bay Critical Area including approximately 14.35 acres (5.8 hectares) within the Chesapeake Bay Critical Area Buffer area that extends 100 ft (30.5 m) landward of mean high tide. This occurs in the vicinity of the proposed intake and discharge pipelines, the heavy haul road, stormwater retention basins, sand filters, and security fencing. The intrusion into the Chesapeake Bay Critical Area (CBCA) buffer also includes the regrading of a parcel near the intake structure to accommodate construction equipment. These intrusions are within the areas designated IDA. Section 4.3.1 provides a detailed discussion of construction impacts within the Chesapeake Bay Critical Area.

In the event the construction of CCNPP Unit 3 is not completed, a Site Redress Plan describing the return of the site to preconstruction conditions willbe provided.

It is concluded that the land use impacts to the CCNPP site and vicinity of the CCNPP site from construction of the new unit would be MODERATE, primarily due to the loss of wetlands and wetland buffers, and would require mitigation. The mitigation measures associated with the wetlands and wetland buffers are described in Section 4.3.1.4.

4.1.1.2 The Vicinity

Land in the vicinity of the CCNPP site is rural with development generally occurring in town centers per current Calvert County zoning and planning requirements. Land use within 8 miles (13 km) of the site is predominantly forest as described in Figure 2.2-2.

The construction activities that would degrade the visual aesthetics of the land would be limited to those activities potentially seen from the new construction access road. Because of the forested nature of the area surrounding the proposed site, it is unlikely that construction activities for the proposed facilities could be seen directly from the adjacent highway, with the exception of the activities to build or upgrade the CCNPP site access road. Once the proposed facility construction extends above the tree line, some construction could be seen from roadways or other areas in the vicinity of the site depending on the area's topography and the immediate land cover. Construction of the new water intake and discharge structure and the upgrade to the barge pier, barge pier crane, and related roadways will be visible from the Chesapeake Bay. However, because a portion of the CCNPP site is currently zoned as industrial and already contains CCNPP Units 1 and 2, visual impacts from the proposed project would be similar to existing site conditions.

Section 4.4.2.4 provides the details on potential population impacts due to construction activities. The majority of the temporary construction workforce would probably live outside of Calvert County and St. Mary's County. These workers would commute or find temporary housing in Calvert County or St. Mary's County. No other land use changes in the vicinity would likely occur as a result of construction workforce related population changes.

Thus, it is concluded that impacts to land use in the vicinity of CCNPP Unit 3 would be SMALL, and not require mitigation.

4.1.2 Transmission Corridors and Offsite Areas

The additional electricity generated from CCNPP Unit 3 will not require the addition of new offsite right-of-way. As discussed in Section 2.2.2.2, the proposed CCNPP Unit 3 construction activities on the CCNPP site would include 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
- 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 the substation and extended 1.0 mi (1.6 km) to the CCNPP Unit 3 substation.

Numerous breaker upgrades and associated modifications would 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 (105 km) of 350 to 400 ft (100 to 125 m) wide corridors owned by Baltimore Gas and Electric. The lines cross mostly secondary-growth hardwood and pine forests, pasture, and farmland. The existing 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 transmission line work being considered to support this project would require new towers and transmission lines to connect the CCNPP Unit 3 switchyard to the existing switchyard for CCNPP Units 1 and 2. Line routing would be conducted to avoid or minimize impact on the existing Independent Spent Fuel Storage Installation (ISFSI), wetlands, and threatened and endangered species identified in the local area. No new offsite corridors or widening of existing corridors are required. The proposed onsite connector corridor would be located on land already in use to generate electric power. Some of the proposed facility locations associated with the project are located on land currently zoned and used as light industrial. The remainder is zoned as Farm and Forest District. CCNPP Unit 3 will be exempt from the Calvert County Zoning Ordinance once the CPCN for CCNPP Unit 3 is issued. However, all federal, state, and local regulations and requirements including those that deal with construction impacts, and those regulations pertaining to the Coastal Zone Management Program, the Chesapeake Bay Critical Area, and the Maryland Public Service Commission would be complied with.

There are no Federal actions that would have cumulatively significant land use impacts within the vicinity and region of the CCNPP site activity and offsite areas as described in Section 2.8.

Because there are no new offsite transmission corridors, it is concluded that there will be no additional impacts to the offsite transmission corridor lands associated with the proposed construction of CCNPP Unit 3. The proposed onsite transmission line connector corridor would be located on land already in use to generate electric power. No new access roads of modifications to existing roads are currently anticipated.

4.1.3 Historic Properties

Table 2.5-40 and Table 2.5-41 list resources within the proposed project's Area of Potential Effect (APE) that are eligible for listing on the National Register of Historic Places (NRHP) as well as resources that have been evaluated as neglible based on Phase II testing. These tables reflect the comments received from the Maryland State Historic Preservation Office (SHPO) (MHT, 2007 and MHT, 2009). As described in Section 2.5.3, the cultural resource survey of the CCNPP site identified seventeen archaeological sites, one of which is considered eligible for inclusion in the NRHP. The survey also identified five architectural resources, four of which are considered eligible for the NRHP.

The assessment of effects to the five NRHP-eligible resources from project construction activities is as follows. It is likely that archaeological site (18Cv474) would be heavily damaged by construction activities and use, thereby resulting in an adverse effect to those resources. Of the four architectural resources, two would be adversely affected. These two architectural resources are the Baltimore and Drum Point Railroad roadbed and Camp Conoy. These two architectural and historical resources are located within the 727 acre (294 hectares) APE and would be heavily damaged by construction activities and use, resulting in an adverse effect to these resources. Consultation with the SHPO and interested parties is ongoing concerning measures to avoid or mitigate adverse effects to these resources. The assessment of effects conducted for the Preston's Cliffs property, located in the northeast corner of the 727-acre

(294-hectare) project APE, concluded that proposed project impacts, consisting of tree planting within the limits of its NRHP boundary, will result in no effect to this resource. The Parran's Park property will be impacted by at-grade road construction within the resource's NRHP boundary. However, an assessment of effects concluded that because an existing roadway is located in closer proximity to the resource, because the proposed new roadway construction will not cause destruction or damage to any significant elements of the historic resource, and because the proposed construction of the Unit 3 facilities will be obscured from view by vegetation, the proposed project impacts will result in no adverse effect to the Parran's Park property.

One NRHP-eligible archaeological site has been identified within the project APE. In the event that this site cannot be avoided by project construction, a Phase III Data Recovery Plan for the site will be prepared in consultation with the SHPO. If avoidance is not feasible, Phase III Data Recovery investigations of the site will be conducted to mitigate adverse effects, per Section 106 of the National Historic Preservation Act (USC, 2007).

Consultation on the Phase I and II cultural resources investigations with Native American tribes is pending. This consultation could result in changes to the recommended National Register of Historic Places eligibility of the 22 identified resources. Phase III data recovery investigations and subsequent SHPO consultation will be conducted on NRHP-eligible archaeological resources that are located within the proposed project area and cannot be avoided, to minimize, or mitigate any adverse effects, per Section 106 of the National Historic Preservation Act (USC, 2007). A Memorandum of Agreement (MOA) will be prepared for the three NRHP-eligible resources that will be adversely affected by the proposed project.

Some areas in the Chesapeake Bay have been previously dredged for the existing discharge conduit and channel, cooling water intake channel, the barge slip and channel, and the shore protection revetment. Construction of the new intake channel and portions of the discharge conduit would occur within areas previously dredged or disturbed by construction. Cultural resource surveys were conducted in the areas of the discharge piping (PANAM, 2008). This survey identified areas to ideally avoid in piping routing. Thus, in routing the piping with consideration of this survey result, there would be no impacts to underwater historic properties from construction of these facilities.

With construction activities, there is always the possibility for inadvertent discovery of previously unknown cultural resources or human remains. Prior to initiation of land disturbing activities, procedures will be developed which include actions to protect cultural, historic, or paleontological resources or human remains in the event of discovery. These procedures will comply with applicable Federal and State laws. These laws include the National Historic Preservation Act (USC, 2007), and Code of Maryland, Criminal Law, Title 10, Subtitle 4, Sections 10-401 through 10-404 (MD, 2004a) and the Code of Maryland, Title 4, Subtitle 2, Section 4-215 (MD, 2004b).

It is concluded that there will be adverse impacts to cultural resources from construction. An assessments of effects on the National Register-eligible resources located in the APEs has been conducted and consultation has been initiated with the SHPO to identify measures for avoidance, minimization, or mitigation of any adverse effects, per Section 106 of the National Historic Preservation Act. Any identified measures would be delineated in a Memorandum of Agreement between U.S. Army Corps of Engineers, the SHPO, CalvertCliffs 3 Nuclear Project, UniStar Nuclear Operating Services, and potentially the Advisory Council on Historic Preservation.

The magnitude of the impacts and requirements for mitigation are determined to be moderate.

4.1.4 References

CAC, 2006. Critical Area Commission for the Chesapeake and Atlantic Coastal Bays, Critical Area Commission, Website: www.dnr.state.md.us/criticalarea/, Date accessed: May 7, 2006.

CALCO, 2006. Calvert County Zoning Ordinances, Calvert County, Website: Date accessed: May 16, 2006.

FEMA, 1997. Flood Hazard Boundary Map, Calvert County, Maryland, Federal Emergency Management Agency, July 15, 1997, Website: www.fema.gov/hazard/flood/index.shtm, Date accessed: December 21, 2006.

MD, 2004a. Code of Maryland, Criminal Law, Title 10, Subtitle 4, Sections 10-401 through 10-404, January 2004.

MD, 2004b. Code of Maryland, Criminal Law, Title 4, Subtitle 2, Section 4-215, January 2004.

MDE, 2004. A Guide to Maryland's Coastal Zone Management Program Federal Consistency Process, Maryland Department of the Environment, February 2004.

MHT, 2007. Letter from J. Rodney Little, Director/State Historic Preservation Officer, Maryland Historic Trust to R. M. Krich, June 7, 2007.

MHT, 2009. Letter from J. Rodney Little, Director-State Historic Preservation Officer, Maryland Historical Trust to William Seib, U.S. Army Corps of Engineers, February 13, 2009.

PANAM, 2008. Submerged Cultural Resources Survey of Proposed Outfall Pipe, Calvert Cliffs Nuclear Power Plant Unit 3 Construction, Calvert County, Maryland, Pan American Consultants, June 12, 2008.

USC, 2007. Title 16, United States Code, Part 470, National Historic Preservation Act of 1966, as amended, 2007.

Table 4.1-1— Construction Areas Acreage and Operations Acreage, Land Use and Zoning

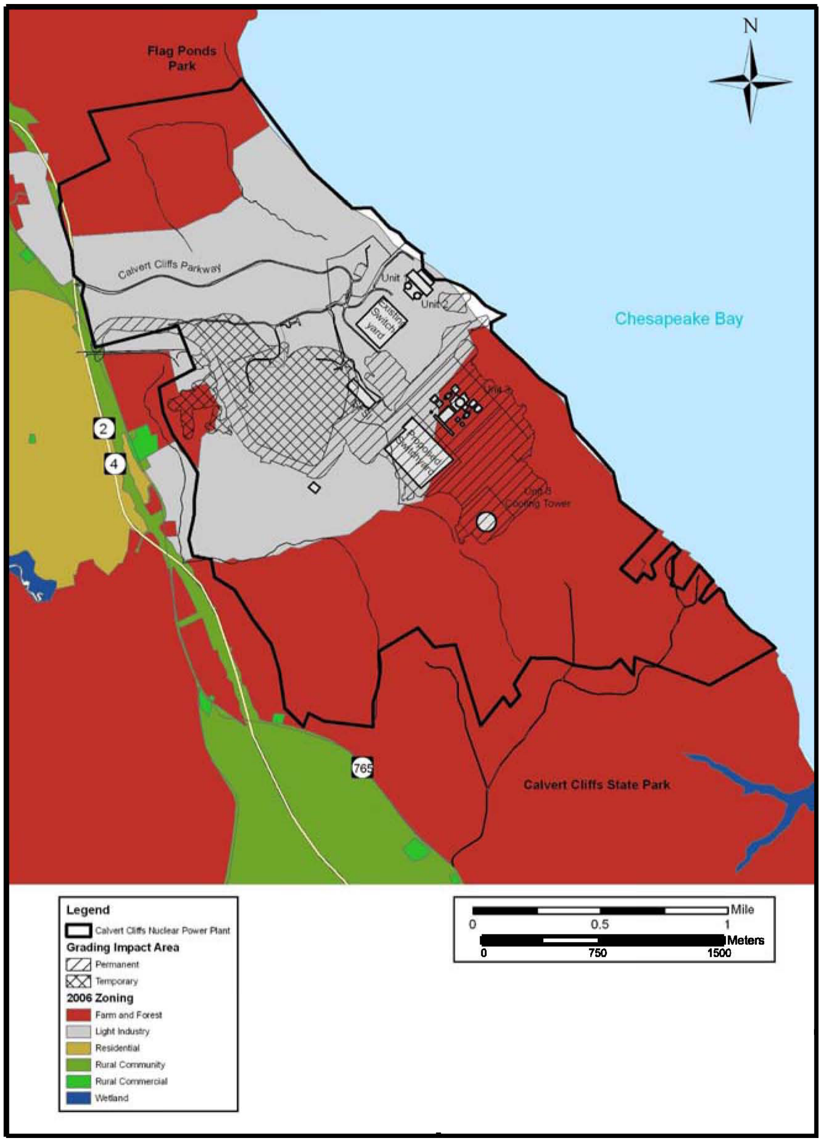
Construction Area	Construction Acreage (hectares)	Current Land Use	Current Zoning
Power Block	50 (20 ha)	Forest and Urban or Built Up	I-1 and FFD
Cooling tower	15 (6 ha)	Forest	FFD
UHS Intake Structure	5 (2 ha)	Urban or Built Up	I-1
500kV AIS Switchyard	25(10 ha)	Forest and Urban or Built Up	I-1 and FFD
Transmission Corridor	30(12 ha)	Forest and Urban or Built Up	I-1 and FFD
Desalination Plant	5 (2 ha)	Forest	FFD
Other Permanently Disturbed Area	190 (77 ha)	Forest and Urban or Built Up	I-1 and FFD
Total Acreage of Disturbed Area for Permanent Construction Features	**320 (128 ha)**	--	--
Total Acreage of Disturbed Area for Temporary Construction Features	**140 (57 ha)**	Forest and Urban or Built Up	I-1 and FFD
Total Disturbed Area (2)	**460 (186 ha)**	--	--

Notes:

I-1 = Light Industrial

FFD = Farm and Forest District

Figure 4.1-1— CCNPP Site Zoning and Grading Layout



4.2 WATER-RELATED IMPACTS

The following sections describe the hydrologic alterations and water use impacts that result from the construction of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3. Section 4.2.1 describes the hydrologic alterations resulting from construction activities including the physical effects of these alterations on other users, the best management practices to minimize any adverse impacts and how the project will comply with the applicable Federal, State and local standards and regulations. Section 4.2.2 describes the potential changes in water quality and an evaluation of the impacts resulting from construction activities on water quality, availability and use.

4.2.1 Hydrologic Alterations

This section discusses the proposed construction activities including site preparation, the resulting hydrologic alterations and physical effects of these activities on other water users, best management practices to minimize adverse impacts, and compliance with applicable Federal, State and local environmental regulations.

4.2.1.1 Description of Surface Water Bodies and Groundwater Aquifiers

The CCNPP site covers an area of approximately 2.070 acres (838 hectares) and is located on the western shore of Chesapeake Bay in Calvert County, Maryland near Maryland State Highway 2/4 as shown in Figure 2.1-2. Additional details on the CCNPP site location and surrounding area are provided in Section 2.1.

The topography at the CCNPP site is gently rolling with steeper slopes along stream courses. Local relief ranges from sea level up to an elevation of 130 ft (40 m) with an average relief of approximately 100 ft (30 m). The CCNPP site is well drained by short, intermittent, and perennial streams. Six existing surface water impoundments are present on the site. A drainage divide (ridge) runs approximately from southeast to northwest across the CCNPP site as shown in Figure 2.3-4. Approximately 20% of the existing CCNPP site surface runoff is directed to drainages discharging into Chesapeake Bay. The remaining 80% of the runoff flows into tributaries of Johns Creek.

Surface Water Bodies

The surface water bodies (Fig 2.3-4) within the hydrologic system at CCNPP that may be affected by the construction and operation of Unit 3 are:

- Two unnamed streams designated (Branch 1 and 2) on the eastern side of the drainage divide, Branch 1 being downstream of the Camp Conoy Fishing Pond
- Johns Creek, Branch 3 and Branch 4, and the unnamed headwater tributaries
- Goldstein Branch
- Laveel Branch
- Camp Conoy Fishing Pond and two downstream impoundments
- Lake Davies and two unnamed impoundments within the Lake Davies dredge spoils disposal area
- Chesapeake Bay and Patuxent River

The streams listed above are perennial and are typically fed by springs and seeps.

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 (0.3 m) over most of the lake and may exceed 3 ft (1 m) near the center. An outlet pipe conveys water from the fishing pond to a single stream channel which continues northeast toward Chesapeake Bay. Two smaller impoundments were created along this channel, and water depth in these two impoundments does not appear to exceed 1 to 2 ft (0.3 to 0.6 m) in most locations. These two impoundments are within the Chesapeake Bay Critical Area boundary.

A series of three man-made impoundments are present south of the existing dredge spoils disposal area near the center of the CCNPP site. These sequentially connected basins convey stormwater runoff from the dredge spoils disposal area to Johns Creek. Water levels in Johns Creek appear to be heavily influenced by surface runoff from the dredge spoils disposal area. The upper, pond closest to the spoils pile (Lake Davies) appears to extend to a depth below the water table and has open water of unmeasured depth at its center. The downstream impoundments do not typically contain surface water but persist as wetlands.

USGS gauging stations exist for downstream areas of the Patuxent River and these records are presented in Section 2.3.1. Additional details on the surface water drainage and hydrology are also presented in Section 2.3.1 and the Final Wetland Delineation Report (TTNUS, 2007).

Groundwater Aquifers

The local aquifer systems that could be impacted by project construction activities at the CCNPP site are, from shallow to deep, the: Surficial aquifer, Piney Point - Nanjemoy aquifer, and the Aquia aquifer. The hydrostratigraphic column for the CCNPP site and surrounding area, identifying geologic units, confining units, and aquifers is shown in Figure2.3-31. A schematic cross-section of the southern Maryland hydrostratigraphic units is shown in Figure 2.3-32. The physical characteristics of the groundwater aquifers are provided in Sections 2.3.1 and 2.3.2.

The Surficial aquifer is primarily tapped by irrigation wells, and some old farm and domestic wells. It is not widely used as a potable water supply because of its vulnerability to contamination and unreliability during droughts. The Piney Point - Nanjemoy aquifer and underlying Aquia aquifer are the chief sources of groundwater in Calvert County and St. Mary's County. The Piney Point - Nanjemoy aquifer is primarily used for domestic water supply. The Aquia aquifer is the primary source of groundwater for major groundwater appropriation in southern Maryland.

4.2.1.2 Construction Activities

The following construction activities will take place that may alter site hydrology:

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 cooling tower area will be brought to plant grade in preparation for foundation excavation and installation. As described in Section 4.1, approximately 460 acres (186 hectares) of land will be cleared for road, facility construction, laydown and parking uses.

Road Construction

A new and upgraded intersection at Nursery Road on Maryland State Highway (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 mi (3 km) of road will be upgraded and built to accommodate the 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% 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 include above-ground and underground infrastructure for power, communications, potable water, wastewater and waste treatment facilities, fire protection, and for construction gas and air systems.

Temporary Construction Facilities

Temporary construction facilities include offices, warehouses, sanitary toilets, a changing area, a training area, and personnel access facilities. The site of the concrete batch plant includes the cement storage silos, the batch plant and areas for aggregate unloading and storage.

Parking, Laydown, Fabrication, and Shop Preparation Areas

The parking, laydown, fabrication and shop areas include 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 non-safety-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 removed from the water. The slip will be widened by dredging to receive larger barge shipments that have roll-on, roll-off capability. Concurrently, crane foundations will be placed to erect a 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 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 (12 m) below plant grade. The next deepest excavations are for the turbine building foundation area which will be excavated approximately 21 ft (6.4 m) below plant grade with the circulating water piping excavation areas extending down to 33 ft (10 m) 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 would be performed as required in the stormwater pollution prevention plan, the National Pollutant 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.

4.2.1.3 Water Sources and Amounts Needed for Construction

The amounts of water needed during construction of CCNPP Unit 3 are summarized in Table 4.2-1. Amounts required are categorized as that needed for Construction Personnel, Concrete Mixing Curing and Washdown, and Dust Control/Hydrostatic Testing. Quantities are listed by construction year, one through six. The basis for these estimated requirements are also noted in Table 4.2-1.

An application for a groundwater appropriation from the Aquia aquifer has been filed with the Maryland Department of the Environment (MDE) based upon the requirements included in

Table 4.2-1. The pending permit allows withdrawals of 100,000 gpd (3.79E+5 lpd) on a yearly basis and 180,000 gpd (6.81E+5 lpd) for the month of maximum use. The source is to be new production wells to be drilled on the CCNPP site. The permit will be for a period of eight years with provision for extension.

Water requirements in excess of those authorized by MDE are expected to be satisfied by trucking water from State authorized sources to on-site storage tanks.

When completed, product water from the proposed desalinization plant will replace groundwater from the on-site construction wells. The desalinization plant will produce 1,750,000 gpd (6.62E+6 lpd) of product water from Chesapeake Bay water using the seawater reverse osmosis process.

The plant will have three portions consisting of a centralized pump center, an energy recovery center, and a reverse osmosis center. The plant will contain a pretreatment filtration system and chemical conditioning equipment to prevent fouling and mitigate corrosion in pipes and equipment. The desalinization plant is expected to reduce the salinity of the water to a level of approximately 1.67E-3 lbs/gal (200 to 300 mg/l), with the general characteristics of softened well water.

4.2.1.4 Surface Water Bodies Receiving Construction Effluents that Could Affect Water Quality

The surface water bodies as shown in Figure 2.3-4 within the hydrologic system at the CCNPP site that could receive effluents during CCNPP Unit 3 construction include:

- Two unnamed streams (Branch 1 and Branch 2) on the eastern side of the drainage divide, Branch 1 being downstream of the Camp Conoy Fishing Pond;
- Camp Conoy Fishing Pond and two downstream impoundments;
- Johns Creek, Branch 3 and Branch 4, and the unnamed headwater tributaries;
- Goldstein and Laveel Branches of Johns Creek;
- Lake Davies and two unnamed impoundments within the Lake Davies dredge spoils disposal area; and
- Chesapeake Bay and Patuxent River.

Several impoundments are planned to catch stormwater and sediment runoff from the various construction areas. Modeling of the runoff from the probable maximum flood (PMF) during plant operation bounds the possible runoff amounts, characteristics, and impacts that might occur during construction due to unpaved surfaces allowing for greater stormwater infiltration into the ground. The impoundments will be sized so as to prevent fast flowing, sediment laden stormwater from reaching the creeks or Chesapeake Bay prior to allowing the sediments to settle out. The flow velocities will be minimized to prevent erosion of creek and stream banks. The allowable flow rates and physical characteristics of stormwater runoff will be specified in the State discharge permits.

Maximum runoff for the entire western basin during the PMF is estimated at 21,790 cfs. The maximum high water level elevation in Johns Creek is 65 ft (19.8 m) NGVD 29, which is below

the approximate 84.6 ft (25.8 m) NGVD 29 elevation of the final site grade in the power block, switchyard, and cooling tower area.

4.2.1.5 Construction Impacts

Construction of CCNPP Unit 3 with its associated cooling tower will impact several of the current drainages and impoundments at the CCNPP site. Runoff from the finished grade of the CCNPP Unit 3 power block, switchyard, cooling tower, parking areas and laydown areas will be directed by sloping towards a series of sand filters around most of the periphery of these permanent features. Any excess runoff from the filters will in turn flow into stormwater impoundments. However, for large storms the infiltration capacity of the base materials will be exceeded and overflow pipes will direct the excess runoff to the stormwater impoundments. The final site grading plan is shown in Figure 4.2-1.

Grading of the dredge spoils pile for a laydown area, concrete batch plant, access road, and construction parking areas could increase runoff into the existing impoundments downstream of the dredge spoils pile and into temporary impoundments along the southern edge of the new access road as shown in Figure 4.2-1.

Construction impacts to the existing surface water bodies are summarized as follows:

- Increasing runoff from the approximately 130 acres (53 hectares) of impervious surfaces (including the power block, switchyard, cooling tower, laydown areas, critical areas, and roads)
- Infilling and eliminating the Camp Conoy Fishing Pond under the southeast portion of the laydown area south of the CCNPP Unit 3 power block foundation
- Infilling and eliminating the upper reaches of Branch 2 and Branch 3, and an unnamed tributary to Johns Creek
- Isolating portions of the upper reach of Branch 1 by construction of the laydown areas south of the CCNPP Unit 3 power block foundation
- Disruption of the drainage in the Lake Davies dredge spoils disposal area with possible impacts on the two downstream impoundments
- Wetlands removal and disruptions
- Possibly increasing the sediment loads into the proposed impoundments and downstream reaches

The overall site drainage basin areas are not directly affected by the proposed site grading plan. The 80% / 20% drainage proportion to the west and east respectively, will stay the same during and after construction. Approximately 15 to 20 acres (6 to 8 hectares) will be added to the east drainage basin and removed from the west drainage basin.

These impacts to surface water bodies are MODERATE, primarily due to the loss of wetlands and wetland buffers, and require mitigation. The mitigation measures associated with the wetlands and wetland buffers are described in Section 4.3.1.4.

4.2.1.6 Identification of Surface Water and Groundwater Users

There are no users of onsite surface water. Johns Creek flows into the Patuxent River where there is recreational boating and fishing. Branch 1 and Branch 2 flow into Chesapeake Bay

where there are also recreational boaters in addition to public beaches to the north and south of the CCNPP site. Commercial fisheries and recreational fishing also exist in Chesapeake Bay as discussed in Section 2.3.2.

Groundwater users in the vicinity of the CCNPP site are identified in Section 2.3.2. As described in Section 2.3.2, the nearest permitted Maryland Department of the Environment (MDE) groundwater well (beyond the boundary of the CCNPP property boundary and downgradient from the site), is conservatively presumed to lie adjacent to the southeastern boundary of the CCNPP site. At this location, the distance between the boundary and the center of CCNPP Unit 3 is approximately 1.1 mi (1.8 km) as shown in Figure 2.3-67. The flow direction was based on the regional direction of flow within the Aquia aquifer as shown in Figure 2.3-62.

4.2.1.7 Proposed Practices to Limit or Minimize Hydrologic Alterations

The following actions will be used to limit or minimize expected hydrologic alterations:

- Implementation of best management practices (BMPs) such as;
  - Maintaining clean working areas;
  - Removing excess debris and trash from construction areas;
  - Properly containing and cleaning up all fuel and chemical spills;
  - Installing erosion prevention devices in areas with exposed soils;
  - Installing sediment control devices at the edges of construction areas; and
  - Retaining and controlling stormwater and wash-down water onsite.
- Implementation of a Storm Water Pollution Prevention Plan (SWPPP)

The sand filter trenches are designed to allow runoff to infiltrate. They will shift, slightly, the recharge areas for the Surficial aquifer. The amount of recharge may increase since there is less opportunity for evaporation and evapotranspiration. Monitoring of construction effluents and stormwater runoff will be performed as required in the stormwater pollution prevention plan, NPDES permit, and other applicable permits obtained for the construction.

4.2.1.8 Compliance with Applicable Hydrological Standards and Regulations

The regulations guiding the implementation of Best Management Practices (BMPs) are provided by the Maryland Department of the Environment (MDE, 1994). These regulations contain BMP installation instructions and typical construction activities which require BMPs. Monitoring of construction effluents and stormwater runoff will be performed as required in the stormwater pollution prevention plan, NPDES permit, and other applicable permits obtained for the construction.

4.2.1.9 Best Management Practices

The following BMPs will be implemented:

- Implementation of a SWPPP;
- Controlling site runoff;
- Monitoring runoff, groundwater, and surface water bodies for contaminants;

- Implementing controls, such as a spill prevention program, to protect against accidental discharge of contaminants (fuel spills, other fluids and solids that could degrade groundwater.

The amount of recharge may increase since there is less opportunity for evaporation and evapotranspiration. Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater management plan, NPDES permit, and other applicable permits obtained for the construction.

In addition, CCNPP Unit 3 will comply with the requirements and conditions of the various permits issued to support construction. Environmental compliance personnel will monitor construction activities and provide direction to add, modify or replace site practices to ensure compliance with hydrological standards and regulations.

In summary, the impact to hydrology is SMALL due to design of the surface water retention systems and use of best management practices to control surface water runoff.

4.2.2 Water Use Impacts

This section discusses the proposed construction activities and resulting hydrologic alterations that could impact water use, an evaluation of potential changes in water quality resulting from construction activities and hydrologic changes, an evaluation of proposed practices to minimize adverse impacts, and compliance with applicable Federal, State and local environmental regulations.

4.2.2.1 Description of the Site and Vicinity Water Bodies

The CCNPP site covers an area of approximately 2,070 acres (8838 hectares) and is located on the western shore of Chesapeake Bay in Calvert County, Maryland near (MD) 2/4 as shown in Figure 2.1-2. Additional details on the CCNPP site location and surrounding area are provided in Section 2.1.

The surface water bodies, as shown in Figure 2.3-4, within the hydrologic system at the CCNPP site that may be affected by the construction and operation of CCNPP Unit 3 are discussed in Section 4.2.1.1.

Additional details on the surface water drainage and hydrology are presented in Section 2.3.1 and the Final Wetland Delineation Report (TTNUS, 2007).

The aquifers that could be impacted by project construction activities at the CCNPP site are the Surficial aquifer, the Chesapeake aquifer/confining unit, and the Castle Hayne-Aquia aquifer. These, and the other aquifers in the regional groundwater system, are described in Section 2.3.1 and Section 2.3.2. Site-specific hydrogeologic cross-sections are provided in Figure 2.3-60 and Figure 2.3-61.

4.2.2.2 Hydrologic Alterations and Related Construction Activities

Construction impacts to the existing surface water bodies are summarized as follows:

- Increasing runoff from the approximately 130 acres (53 hectares) of impervious surfaces (including the power block, switchyard, cooling tower, laydown areas, critical areas, and roads);
- Infilling and eliminating the Camp Conoy Fishing Pond under the southeast portion of the laydown area south of the CCNPP Unit 3 power block foundation;

- Infilling and eliminating the upper reaches of Branch 2 and Branch 3, and an unnamed tributary to Johns Creek;
- Isolating portions of the upper reach of Branch 1 by construction of the laydown areas south of the CCNPP Unit 3 power block foundation;
- Disruption of the drainage in the Lake Davies dredge spoils disposal area with possible impacts on the two downstream impoundments;
- Wetlands removal and disruptions; and
- Possibly increasing the sediment loads into the proposed impoundments and downstream reaches.

The hydrologic alterations to groundwater that could result from the project related construction activities are:

- Creation of a local and temporary depression in the Surficial aquifer potentiometric surface due to dewatering for foundation excavations
- Disruption of current Surficial aquifer recharge and discharge areas by plant construction. Hilly, vegetated areas would be cleared and graded; some streams and the Camp Conoy Fishing Pond (impoundment) would be backfilled and construction areas would be covered by less permeable materials and graded to increase runoff into sand filter trenches. The locations of, or quantity of, water produced at springs and seeps could change downgradient of the construction areas
- Stormwater runoff from the flat, non-vegetated foundation pads, switchyard and laydown areas would be directed and concentrated into sand filter trenches and new impoundments that could affect recharge to the Surficial aquifer. Since the sand filter trenches and impoundments are unlined, they could act as smaller, focused recharge areas and might increase the amount of water recharging the surficial aquifer
- Additional drawdown in the Aquia aquifer when the water needed for CCNPP Unit 3 construction is supplied by onsite wells
- Minor shifting of the Surficial aquifer recharge area(s) to the underlying Chesapeake aquifer/confining unit

A further discussion of related construction activities is provided in Section 4.2.1.2.

4.2.2.3 Physical Effects of Hydrologic Alterations

Impacts from the construction of CCNPP Unit 3 are similar to those associated with any large construction project. The construction activities that could produce hydrologic alterations to surface water bodies and groundwater aquifers are presented in Section 4.2.1.2. The potentially affected surface water bodies and groundwater aquifers are described in Section 4.2.1.4. The potential construction effects on surface water bodies and groundwater aquifers are presented in Section 4.2.1.5.

Surface Water Impacts

Because of the potential for impacting surface water resources, a number of environmental permits are needed prior to initiating construction. Table 1.3-1 in Chapter 1 provides a list of

construction-related consultations and permits that have to be obtained prior to initiating construction activities.

The construction activities expected to produce the greatest impacts on the surface water bodies occur from:

- Reducing the available infiltration area
- Grading and the subsequent covering of the 46 acre (19 hectare) CCNPP Unit 3 power block foundation
- Grading and covering of the 18 acre (7 hectare) CCNPP Unit 3 cooling tower pad
- Grading and covering of the 59 acre (24 hectare) CCNPP Unit 3 switchyard/substation
- Vegetation removal and grading of 151 acres (61 hectares) for laydown areas, concrete batch plant, offices, parking, warehouses, and shop preparation areas
- Creation of impoundments
- Elimination of an existing impoundment (i.e., Camp Conoy Fishing Pond)
- Elimination of existing branches of Johns Creek

Site grading and new building foundations will cover and reduce existing infiltration and recharge areas. Possible increases in runoff volume and velocity in the downstream creeks may cause erosion and adversely affect riparian habitat if not controlled.

Dewatering for the proposed foundation excavations could also impact surface water bodies. Effluent from the dewatering system, and any stormwater accumulating during the excavation, would be pumped to a stormwater discharge point or into onsite impoundments. If pollutants (e.g., oil, hydraulic fluid, concrete slurry) exist in these effluents from construction activities, they could enter the impoundments, downstream channel sections, or other surface water bodies. Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater management plan, NPDES permit, and other applicable permits obtained for the construction. Depending on the design of the stormwater impoundments and discharge systems, outflow rates into the surface streams could be altered.

All water bodies within the CCNPP site boundary could have the potential to indirectly receive untreated construction effluents. The water bodies listed in Section 4.2.1.1 are potentially subject to receiving untreated construction effluents directly. It will be necessary to implement proper BMPs under state regulations such as a: General NPDES Permit for Stormwater associated with Construction Activity, Erosion and Sediment Control Plan, and a stormwater pollution prevention plan. Table 1.3-1 lists and presents additional information on the Federal, State and Local Authorizations associated with this project.

If proper BMPs are implemented under these permits, treated construction effluents could be released to the site water bodies without adverse impacts. Flow rates for untreated construction effluents will depend upon the usage of water during site construction activities and the amount of precipitation contacting construction debris during construction activities. Flow rates and physical characteristics of the construction effluents are discussed in Section 4.2.1.4. A quantitative calculation and evaluation of the construction effluents and runoff will

be done as part of the state construction permit process. BMPs would be implemented to control runoff, soil erosion, and sediment transport. Good housekeeping practices and engineering controls will be implemented to prevent and contain accidental spills of fuels, lubricants, oily wastes, sanitary wastes, etc.

BMPs are implemented under a Spill Prevention Plan, a SWPPP, and an Erosion Control Plan, as described in Section 4.2.1.7 and Section 4.2.2.10. Environmental control systems installed to minimize impacts related to construction activities will comply with all Federal, state and local environmental regulations and requirements. Once the initial controls are in place, they are maintained through the completion of construction and during plant operation, as needed.

Surface water use impacts are MODERATE, primarily due to the loss of wetlands and wetland buffers, and will require mitigation. The mitigation measures associated with the wetlands and wetland buffers are described in Section 4.3.1.4.

Groundwater Impacts

Depending on the design of the stormwater impoundments and discharge systems, outflow velocity and volume in the surface streams could change, and change the volume of water available to infiltrate and recharge the Surficial aquifer.

Increasing groundwater withdrawals for construction needs from the onsite Aquia aquifer production wells, could produce a local depression of the potentiometric surface in that aquifer. These increased withdrawals could potentially induce salt water intrusion or produce land subsidence, but as discussed earlier, neither had been reported as a significant problem in Calvert County or St. Mary's County.

The hydrologic alterations that could be produced in the groundwater aquifers are expected to be localized and possibly temporary. Most of the effects are expected to occur in the uppermost or Surficial aquifer. Any effects in the deeper aquifers are expected to be minor, due to remaining within the existing permit withdrawal limits, and dependent to a large extent on groundwater travel time, thickness and physical properties of the intervening stratigraphic units, and the nature of the hydraulic connection between aquifers.

The construction activities listed in Section 4.2.1.2 that are expected to produce the greatest impacts on the Surficial aquifer are related to:

- Changing the existing recharge and discharge areas
- Possibly changing the amount of runoff available for infiltration
- Dewatering of foundation excavations during construction

Site grading and leveling for the building foundations and laydown areas will cover and possibly eliminate existing recharge areas. Runoff from the graded areas will be directed into sand filters and several proposed impoundments, possibly creating new "focused" recharge areas. Runoff velocity may be increased in the channels downstream of the impoundments, which could decrease the amount of runoff available for infiltration and recharge. Fine-grained sediments could settle out in the impoundments and channels and create less-permeable areas for infiltration and recharge. These changes affect local recharge to the Surficial aquifer. Impacts on the deeper Aquia aquifer are likely to be SMALL.

Dewatering foundation excavations also produce localized impacts on the Surficial aquifer. The deepest excavations anticipated are for the proposed reactor and auxiliary building foundations, and extend approximately 40 ft (12 m) below plant grade and approximately 60 ft (18.3 m) below pre-construction grade. The dewatering system and activities are not expected to have any significant impact on the deeper Aquia aquifer due to the main recharge area of the Aquia aquifier is to the north. Hence, it is insensitive to perturbances of the Surficial aquifier. Effluent from the dewatering system 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, NPDES permit, and other applicable permits obtained for the construction.

The locally lowered Surficial aquifer water level would be expected to eventually recover after the dewatering and other subsurface construction activities are complete. Although it would be altered by buildings and paved areas, rainwater is still allowed to infiltrate in other plant areas to recharge the aquifier.

- ♦ **Effects of Surficial aquifer changes on recharge to and users of the Piney Point-Nanjemoy aquifer**

As a result of the low vertical hydraulic conductivity, large thickness and continuity of the confining beds between the Surficial aquifer and principal aquifers in the vicinity of the CCNPP (the Piney Point-Nanjemoy and Aquia aquifers) changes at the surface that may locally affect the recharge, to discharge from or water table elevation in the Surficial aquifer are not expected to alter the groundwater potentiometric surface or water availability of these deeper aquifers. While the Surficial aquifer may provide recharge to the deeper aquifers as either leakage through the intervening confining layers or as direct infiltration where it directly contacts an underlying aquifer this recharge occurs over the entire areal extent of the Surficial aquifer where it overlies the deeper aquifers. The portion that is attributable to local recharge immediately above the Piney Point-Nanjemoy and Aquia aquifers at CCNPP is a small fraction of their total recharge.

The planned construction activities may lead to a slight reduction in recharge of the Surficial aquifer in some areas (due to construction of impermeable surfaces or temporary dewatering effects) or an increase in other areas (such as stormwater retention basins). Therefore it is difficult to determine the ultimate impact of Unit 3 to the underlying aquifers. However, it is possible to make some reasonable bounding assumptions. Considering the 2006 water table elevation of about 80 ft msl in the Surficial aquifer (Figure 2.3-41) and a potentiometric head in the Piney Point-Nanjemoy aquifer of about 0 ft msl, a vertical thickness of about 250 ft and a vertical hydraulic conductivity of .001 ft/day for the intervening Upper Confining Bed (MGS 1997) implies a vertical flux of about $3.2x10^{-5}$ ft^3/ft^2 day (about 0.14 in/yr) between the Surficial aquifer and the Piney Point-Nanjemoy aquifer. This flux is analogous to the value modeled by MGS 2007 which has a simulated flux rate north of CCNPP of 0.1 in/yr.

If one considers a 10^6 ft^2 area approximately the size of the Unit 3 power block (e.g., a square with sides 1,000 ft long) over which groundwater recharge is totally eliminated, recharge to the Piney Point-Nanjemoy aquifer would be reduced by about 40 ft^3/day or about 300 gpd. In reality the volume of recharge would be reduced less that 300 gpd because surface runoff within the power block will be directed to sand filter trenches and basins where infiltration is enhanced.

Three hundred gpd is not significant in comparison to the overall recharge to the deeper aquifers in southern Maryland. This value is also not significant in comparison to one of the

major users of the Piney Point-Nanjemoy aquifer in the vicinity of the CCNPP. The White Sands subdivision, with a Groundwater Appropriation Permit average withdrawal rate of 8,000 gpd (Table 2.3-23). Therefore, even assuming a reduced recharge from the Surficial aquifer to the Piney Point-Nanjemoy aquifer of 300 gpd the effect on the Piney Point-Nanjemoy aquifer is negligible and users of groundwater from that unit are not expected to see any effect of the reduced recharge on water level in the vicinity of the CCNPP.

- **Effects of changes to the Surficial aquifer on the level of the water table and discharge to John's Creek**

A numerical model has been developed of the Surficial aquifer at CCNPP Unit 3 (see Section 2.3.2.2.11). The model encompasses all areas affected by construction of Unit 3 and contributing discharge to John's Creek. Simulation of post-construction conditions indicates that maximum groundwater levels around the power block area will be approximately 55 ft msl. The depth to the water table in this area is estimated to be 30 ft below grade level. Groundwater levels in this area are dependent on many factors including the hydraulic conductivity of the fill material and the rate of groundwater recharge over the graded areas of the site.

The impact of the construction of Unit 3 on groundwater discharge to John's Creek will be negligible.

- **Effects of withdrawals from the Aquia aquifer on the users of the Aquia and Piney Point-Nanjemoy aquifers**

Increasing withdrawal from the Aquia aquifer from the average values withdrawn over the past 5 years by CCNPP Unit 1 & 2 (an average of about 387,000 gpd from July 2001 to June 2006) (Table 2.3-27) to the value permitted in CA69G-010 (05) of 450,000 gpd (Table 2.3-23), is expected to cause increased drawdowns in the vicinity of the CCNPP Unit 2 production wells. The effects of the increased withdrawal, even though limited to about 68 months for the duration of Unit 3 construction, may extend several thousand feet from the pumping wells. For example considering an infinite confined aquifer with no leakage (to maximize the potential drawdown), a transmissivity of about 1,000 ft^2/day a storativity of about 10^{-4} (MGS 1997) and discharge of 63,000 gpd from one well for 2,040 days would yield drawdown in the Aquia aquifer of about 4 ft at a distance of about 10,000 ft and drawdown of about 7 ft at a distance of about 1,000 ft from the pump well. This drawdown would be insignificant to other users of the Aquia aquifer in the vicinity of CCNPP Unit 2 and would have an insignificant effect on increasing leakage from the overlying Piney Point-Nanjemoy aquifer to the Aquia aquifer.

The impact to groundwater is SMALL and localized.

4.2.2.4 Water Quantities Available to Other Users

As described in Section 2.3.2.1.2, at present no surface water withdrawals are made in Calvert County for public potable water supply. Water use projection in Maryland for 2030 does not include surface water as a source for public water supply in southern Maryland counties including Calvert Country.

Groundwater use and trends in southern Maryland and at the CCNPP site are presented in Section 2.3.2.2 and in Section 2.4.12 of the Final Safety Analysis Report.

The Surficial aquifer is not used as a potable water source in the vicinity of the CCNPP site. The impacts expected from foundation dewatering or other construction activities will not impact any local users. The Camp Conoy facilities include four wells authorized under an MDE water appropriation permit. These wells draw from the Piney Point aquifer and have an appropriation limit of 500 gpd (1,900 lpd). These wells are expected to be abandoned. The impact on the local water supply resulting from any abandonment of these wells will be minor.

4.2.2.5 Water Bodies Receiving Construction Effluents

The surface water bodies directly downstream of the proposed construction activities could be impacted during clearing, grubbing, and grading. Locations of surface water and its users that could be impacted by construction activities are provided in Section 4.2.1.4.

Since most of the water for construction would be used for consumptive uses such as grading, soil compaction, dust control, and concrete mixing, little infiltration would be expected. Any effluents that might infiltrate would recharge the Surficial aquifer, and, potentially, the underlying Chesapeake aquifer/ confining unit, and the Castle Hayne-Aquia aquifer.

If contaminants enter the surface water bodies unchecked, there would be a potential for infiltration and subsequent groundwater contamination. If contaminants do enter groundwater, they may impact the quality of water withdrawn for industrial and commercial applications.

Any construction effluents infiltrating into the subsurface could potentially reach the Surficial aquifer if they are of sufficient volume and concentration. The plume migration would be downgradient and, depending on location, flow either eastward toward Chesapeake Bay or westward toward the Patuxent River. As described in Section 2.3.2, the horizontal groundwater flow in the Surficial aquifer is generally bi-directional. A northwest trending groundwater divide roughly follows a line extending through the southwestern boundary of the proposed power block area. Northeast of this divide, horizontal groundwater flow is northeast toward the Chesapeake Bay to small seeps and springs or onsite streams. Groundwater southwest of this divide flows to the southwest.

It is also possible that this groundwater could discharge locally at seeps or springs. Any possible impacts on deeper aquifers would also depend on the infiltrating volume and the hydrologic connection with the Surficial aquifer.

The composition of possible construction effluents that could infiltrate into the Surficial aquifer would depend on several factors related to the physical nature of the effluent material, i.e., solids versus liquids, solubility, vapor pressure, mobility, compound stability, reactivity in the surface and subsurface environments, dilution, and migration distance to groundwater. It is expected that proper housekeeping and spill management practices would minimize potential releases and volumes and physically contain any releases. Pesticides and herbicides are expected to be applied in limited site areas for insect and weed/brush control.

Several impoundments are planned to catch stormwater and sediment runoff from the various construction areas. Sand filter trenches are planned to drain the proposed CCNPP Unit 3 power block, cooling tower pad, switchyard, and laydown areas. Modeling of the runoff from the probable maximum flood (PMF) during plant operation bounds the possible runoff amounts, characteristics, and impacts that might occur during construction due to unpaved surfaces during construction allowing for greater stormwater infiltration to ground. The storm

water conveyance system will discharge excess runoff into impoundments. The impoundments will be sized so as to prevent fast flowing, sediment laden stormwater from reaching the creeks or Chesapeake Bay prior to allowing the sediments to settle out. The flow velocities will be minimized to prevent erosion of creek and stream banks. The allowable flow rates and physical characteristics of stormwater runoff will be specified in State discharge permits.

Maximum runoff for the entire basin during the PMF is estimated at 21,790 cfs (617 cms). The maximum high water level elevation in Johns Creek is 65 ft (19.8 m) NGVD 29, which is below the approximate 84.6 ft (25.8 m) NGVD 29 elevation of the final site grade in the power block, switchyard, and cooling tower area.

4.2.2.6 Baseline Water Quality Data

Baseline water quality data for surface water bodies is provided and discussed in Section 2.3.3. A summary of the water quality data for the onsite surface water bodies is presented in Table 2.3-29. Baseline water quality data for groundwater is provided in Section 2.3.3.

4.2.2.7 Potential Changes to Surface Water and Groundwater Quality

The following section describes the potential water quality impacts resulting from the construction of CCNPP Unit 3.

The CCNPP site is a private facility and does not have any municipal water supplies. All water currently used onsite is drawn from Chesapeake Bay or subsurface aquifers. There are 13 groundwater supply wells onsite. The wells are listed in Table 2.3-26. Figure 2.3-68 shows the locations of the onsite supply wells. Four wells supply fresh water for CCNPP Units 1 and 2 operations; eight wells supply ancillary site facilities such as the rifle range and Camp Conoy. The Old Bay Farm well, identified in Table 2.3-26, is no longer in use.

Potential Changes to Surface Water Quality

Any potential surface water quality impacts are associated with the site clearing and grading activities.

The addition of sediment and organic debris to the local streams resulting from clearing, grubbing, and grading could decrease water quality. Organic debris could dam or clog existing streams, increase sediment deposition, and increase potential for future flooding. Organic debris decomposing in streams can cause dissolved oxygen and pH imbalances and subsequent releases of other organic and inorganic compounds from the stream sediments. Sediment laden waters are prone to reduced oxygen levels, algal growth, and increases in pathogens. If heavy metals or chemical compounds spill and/or wash into surface waters, there could be a direct toxicity to aquatic organisms. These potential pollutant releases could impact aquatic species and in turn affect the recreational aspects associated with fishing, canoeing, or kayaking.

The water bodies downstream of the proposed construction areas could be directly and indirectly affected by construction activities onsite. Construction debris residing on the pads and temporary staging areas could mix with construction wash-down water or stormwater, exit the site via untreated runoff and produce chemical reactions adverse to downstream ecology. Possible contaminants include: sediment, alkaline byproducts from concrete production, concrete sealants, acidic byproducts, heavy metals, nutrients, solvents, and hydrocarbons (fuels, oils, and greases). There could be a high potential for contaminants to mix with site wash-down water or rainwater/precipitation runoff and be washed downstream

into surface water bodies existing on the CCNPP site due to the persistent nature of local precipitation. There could also be the potential for spills within the construction areas consisting of fuels, solvents, sealants, paints, or glues. Construction dusts not suppressed could drift outside of the construction zones and contaminate nearby water supplies. If these contaminants enter the surface water bodies unchecked there could be a potential for infiltration and subsequent groundwater contamination.

The proposed removal of onsite wetlands could reduce the ability of microbiotic organisms and fauna to naturally attenuate contaminants and pollutants produced onsite.

The impacts to surface water quality downstream of the construction site are SMALL due to the use of BMPs to control dust, runoff, and spills.

Potential Changes to Groundwater Quality

The spoils for CCNPP Units 1 and 2 were deposited in the dredge spoils disposal area of the site known as the Lake Davies area. Dredge spoils generated during the dredging of the barge slip area and construction of the intake/discharge structures may contain elevated levels of metals and salts. Runoff containing saline residue from the spoils could enter the impoundment just southeast of the spoils disposal pile, which is likely in direct hydraulic contact with the Surficial aquifer. Any impact on groundwater quality would probably be minor due to dilution. Little, if any, water quality impacts would be expected if this diluted water were to reach the deeper aquifers.

Dewatering for the foundation excavations may increase the oxidation of some sedimentary constituents by placing them in direct contact with the atmosphere. The oxides might have an increased solubility and could migrate down gradient when the potentiometric head is reestablished following construction completion. Possible impacts to the Surficial aquifer water quality would be SMALL and decrease with migration and dilution.

4.2.2.8 Surface Water and Groundwater Users

Surface water users downstream of the site may experience impacts from potential water quality changes if construction effluent concentrations and volumes are large enough and the release enters directly into a surface water body bypassing the overflow catch basins and retention ponds. The surface water users that could be impacted in the event of a release are those downstream of the CCNPP site along the tributaries flowing to the Patuxent River and Chesapeake Bay. Any impacts to the larger surface water bodies receiving the discharge are expected to be minor.

Groundwater users in vicinity of the CCNPP site are identified in Section 2.3.2.

4.2.2.9 Predicted Impacts on Water Users

The impact of potential increased sediment loads in site runoff during construction would result in SMALL or no impacts to surface water users and affected areas.

Because groundwater from CCNPP Units 1 and 2 onsite wells will be used for construction, there might be impacts on local users that also make withdrawals from the Aquia aquifer.

Potential construction effluent impacts on aquifer groundwater quality would first be manifested in the Surficial aquifer. Construction activities are only expected to produce limited and temporary impacts in the Surficial aquifer. As described in Section 2.3.1, the Surficial aquifer is not used as a potable water source in the vicinity of the CCNPP site. Therefore,

potential groundwater quality changes would not be expected to have any impact on possible users. Potential impacts to the deeper aquifers are dependant on the nature of the hydraulic connection between aquifers described in Section 4.2.1.1. Groundwater quality impacts on users of the deeper aquifer users are SMALL due to dilution and other contaminant attenuation effects that could occur along any effluent plume migration path.

The CCNPP site is located in U.S. EPA Region 3 (the District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, and West Virginia). Six sole-source aquifers are identified in U.S. EPA Region 3 as shown in Figure 2.3-66. These are not located in southern Maryland. Thus, the addition of CCNPP Unit 3 is a SMALL impact to any sole source aquifer.

4.2.2.10 Measures to Control Construction Related Impacts

The following measures will be taken to avoid runoff from the construction areas entering and potentially impacting downstream surface water bodies and groundwater, as applicable:

- Implementation of a SWPPP
- Controlling runoff and potential spills using dikes, earthen berms, seeded ditches, and impoundments
- Monitoring for contaminants within construction area impoundments and impoundments downstream of disturbed areas
- Implementation of BMPs to protect against accidental discharge of contaminants (fuel spills, other fluids and solids that could degrade groundwater and surface water resources)
- Performing additional onsite surface and groundwater monitoring compared to established water quality benchmarks and historical site data

Sand filter trenches are planned for the periphery of the power block, laydown, cooling tower and switchyard areas. The sand filter trenches are constructed of base materials that promote infiltration of runoff from low intensity rainfall events. However, for large storms the infiltration capacity of the base materials would be exceeded and the overflow pipes are provided to direct the runoff to the stormwater basins. The stormwater basins are unlined impoundments with simple earth-fill closure on the down stream end and include discharge piping to the adjacent watercourses.

Following the acquisition of the required permits and authorizations, site preparation activities include the installation or establishment of environmental controls to assist in controlling construction impacts to groundwater. These environmental controls include:

- Coffer Dams
- Stormwater management systems
- Spill containment controls
- Silt screens
- Settling basins
- Dust suppression systems

These controls assist in protecting the Surficial aquifer by minimizing the potential for construction effluents to infiltrate directly into the subsurface or to carry possible contaminants to aquifer recharge areas.

Mitigation measures for barge slip dredging and construction activities in the area of the new intake structure and discharge outfall include:

- Restricting dredging only during certain times of the year to minimize impacts to aquatic species
- Restricting dredging to only the areas identified for dredging
- Installing a silt curtain around each dredge or active dredge area to minimize sediment release, as far as practicable, at the seabed/silt curtain interface and at the surface water level/silt curtain interface
- Ensuring clam-shell dredges are fully closed and hoisted slowly to limit the amount of spillage
- Not filling spoils barges to levels which will cause overflowing of materials during loading and moving
- Not allowing vessel decks to be washed in such a way that allows material to be released overboard
- Installing a sheet pile cofferdam and dewatering system to facilitate construction of the CCNPP Unit 3 intake structure
- Carrying out water-quality monitoring in accordance with any permit requirements

Additional measures to minimize or contain accidental releases of contaminants will be the establishment, maintenance, and monitoring of:

- Solid waste storage areas;
- Backfill borrow, spoils, and topsoil storage areas; and
- Site drainage patterns.

Groundwater monitor wells will be installed to assess gradient changes toward the excavation dewatering areas and potential groundwater quantity and quality changes.

Construction groundwater use impacts might be expected in the Aquia aquifer and the groundwater withdrawals and potentiometric surface depression will be monitored. As mentioned in Section 4.2.1.1, salt water intrusion has not been identified as a problem in this area of Maryland.

As explained in Section 4.2.2.7, any contamination that might be introduced into the Surficial aquifer would be attenuated by the time it might reach deeper aquifers.

4.2.2.11 Consultation with Federal, State and Local Environmental Organizations

The regulations guiding the implementation of Best Management Practices (BMPs) are provided by the Maryland Department of the Environment (MDE, 1994). These regulations

contain BMP installation instructions and typical construction activities which require BMPs. Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater management plan, NPDES permit, and other applicable permits obtained for the construction. The integrated permitting process for the applicable environmental permits will proceed concurrently with NRC review of the combined license application.

4.2.2.12 Compliance with Water Quality and Water Use Standards and Regulations

The regulations guiding the implementation of water quality and water use standards and regulations are provided by the Maryland Department of the Environment (MDE, 1994). These regulations contain water quality and water use standards that must be adhered to during construction. In addition, site specific permits for various construction activities will contain conditions that must be complied with for the duration of the permitted activity.

4.2.2.13 Water Quality Requirements for Aquatic Ecosystems and Domestic Users

Section 4.3.2 discusses information pertaining to water quality requirements for aquatic ecosystems. The USEPA declared Chesapeake Bay an impaired water body in 1998 based on the Federal Water Pollution Control Act (USC, 2007) due to excess nutrients and sediments. The Chesapeake Bay water is required to meet federal regulatory water quality standards by 2010 (USC, 2007).

Domestic users of groundwater need to meet the State water quality standards for potable water systems.

4.2.2.14 References

MDE, 1994. Standards and Specifications for Soil Erosion and Sediment Control, Website: http://www.mde.state.md.us/Programs/WaterPrograms/SedimentandStormwater/erosionsedimentcontrol/standards.asp, Date accessed: March 14, 2007.

MGS, 1997. Hydrogeology, Model Simulations, and Water-Supply Potential of the Aquia and Piney Point-Nanjemoy Aquifers in Calvert and St. Mary's Counties Maryland, Maryland Geological Survey Report of Investigations No. 64, Maryland Geological Survey, G. Achmad and H. Hansen, 1997.

MGS, 2007. Water Supply Potential of the Coastal Plain Aquifers in Calvert, Charles and St. Mary's Counties, Maryland, with Emphasis on the Upper Patapsco and Lower Patapsco Aquifers, Maryland Geological Survey Report of Investigations No. 76, Maryland Geological Survey, D. Drummond, August 2007.

TTNUS, 2007. Final Wetland Delineation Report, for Proposed UniStar Nuclear Project Area, Calvert Cliffs Nuclear Power Plant Site, Calvert County, Maryland, TetraTech NUS, May 2007

USC, 2007. Title 33, United States Code, Part 1251, Federal Water Pollution Control Act, 2007.

USGS, 2007. Hydrogeology of the Piney Point-Nanjemoy, Aquia, and Upper Patapsco aquifers, Naval Air Station Patuxent River and Webster Outlying Field, St. Mary's County, Maryland, 2000-06, USGS Scientific Investigations Report 2006-5266, 26p, U.S. Geological Survey, C. Klohe and R. Kay, 2007.

Table 4.2-1— Estimated Annual Amounts of Fresh Water by Construction Year Needed for CCNPP Unit 3[f]

Construction Year	1	2	3	4	5	6
People	4,275,000[a] gal (16,183,000 L)	17,100,000[b] gal (64,730,000 L)	17,100,000[b] gal (64,730,000 L)	17,100,000[b] gal (64,730,000 L)	17,100,000 [b] gal (64,730,000 L)	
Concrete Mixing, Curing and Washdown[c]	4,700,000 gal (17,792,000 L)	4,700,000 gal (17,792,000 L)	4,700,000 gal (17,792,000 L)	4,700,000 gal (17,792,000 L)	4,700,000 gal (17,792,000 L)	
Dust Control/ Hydrostatic Testing[d]	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	11,400,000 gal (43,154,000 L)	
Subtotal	20,375,000 gal (77,128,000 L)	33,200,000 gal (125,675,000 L)	33,200,000 gal (125,675,000 L)	33,200,000 gal (125,675,000 L)	33,200,000 gal (125,675,000 L)	22,133,000 gal[e] gal (83,774,000 L)

Figure 4.2-1— Final Site Grading Plan CCNPP Unit 3

4.3 ECOLOGICAL IMPACT

4.3.1 Terrestrial Ecosystems

This section describes the impacts of construction on the terrestrial ecosystem. Construction would require the permanent or temporary disturbance of approximately 460 acres (186 hectares) of terrestrial habitat on the CCNPP site as shown in Figure 4.3-1. This area is assumed to be the maximum area of soil to be exposed at any time. Approximately 320 acres (129 hectares) of the affected terrestrial habitat would be permanently converted to structures, pavement, or other intensively-maintained exterior grounds to accommodate the proposed power block, cooling tower, switchyard, roadways, permanent construction laydown area, borrow area, retention basins, intake, forebay, and water supply structures and permanent parking lots. The remaining disturbed area of approximately 140 acres (57 hectares) would be only temporarily disturbed to accommodate the batch plant, temporary construction laydown areas, temporary construction offices and warehouses, and temporary construction parking. The temporarily disturbed habitats would be restored to a naturally vegetated condition once construction activities are complete. The permanent loss of affected terrestrial habitat of 320 acres (129 hectares) is small compared to the 1,796,718 acres (724,242 hectares) in the region as shown in Table 2.2-4. Approximately 11.72 acres (4.7 hectares) of the lost terrestrial habitat is wetlands compared to 240,288 acres (97,245 hectares) of wetlands in the region as shown in Table 2.2-4. Figure 2.2-1 shows the CCNPP site boundary and the major buildings to be constructed. Figure 4.3-2 shows the land to be cleared, the waste disposal area and the construction zone.

The construction footprint was designed to minimize impacts to terrestrial ecosystems, specifically lands within the Chesapeake Bay Critical Area (CBCA), which encompasses lands within 1,000 ft (305 m) of the mean high tide level on the shoreline; locations of federally-designated or state-designated threatened or endangered species; wetlands; wetland buffers designated by Calvert County; and forest cover, especially riparian forests, forested slopes, and large blocks of contiguous forest that provide habitat for forest dwelling species forest interior dwelling species (FIDS).

The proposed footprint of construction within the CBCA would be limited to approximately 33.39 acres (13.5 hectares), including approximately 14.35 acres (5.8 hectares) in the CBCA buffer areas, and approximately 19.04 acres (7.7 hectares) in the remainder of the CBCA. The CBCA impact is due primarily to the water intake structures and pipelines, the discharge pipelines, the heavy haul road from the barge slip, security fencing, and the security perimeter gravel path. Certain areas within the CBCA will be regraded for proposed wetland mitigation and the area to accomodate construction equipment for the intake structures. Certain of the affected land within the CBCA buffer is designated as an Intensely Developed Area (IDA) due to the presence of the existing barge slip serving CCNPP Units 1 and 2. None of the sandy cliff or beach areas on the CCNPP site that provide habitat for the puritan tiger beetle or northeastern beach tiger beetle will be disturbed because their habitat is north, south, and east of the construction footprint.

None of the sandy cliff or beach areas on the CCNPP site that provide suitable habitat for the puritan tiger beetle or northeastern beach tiger beetle will be disturbed because their habitat is primarily southeast of the construction footprint. No construction will take place within 1,500 ft of three bald eagle nests known to occur on the CCNPP site. However, a new bald eagle nest first observed within the construction footprint in 2007 may have to be mitigated after consultations and in agreement with the appropriate agencies.

It is not possible to construct the proposed facilities without adversely impacting terrestrial ecosystems, including wetlands, wetland buffers designated by Calvert County, and FIDS habitat. Construction activities will start after the State of Maryland issues the appropriate permits to start clearing and grading of the site. Activities to construct nonsafety-related systems and structures are expected to begin December 2009. Construction is expected to be complete by July 2015.

4.3.1.1 Vegetation

Plant Communities, Forest and Habitats: Clearing and grubbing would result in the vegetation losses shown in Figure 4.3-1 and summarized in Table 4.3-1. The losses would include approximately 238 acres of forest stands. This figure represents a decrease from the Co-Applicants' previous estimate that 252 acres of forest would be cleared. The decrease is the result of efforts to avoid and minimize forest clearing detailed in the Forest Conservation Plan (FCP).

Of the 238 acres of forest stands (within both the Critical Area and outside of the Critical Area), approximately 193 acres (78 hectares) are mature forest cover consisting of well developed tree canopy and understory strata and dominant trees over 12 in. (30 cm) in diameter at breast height (DBH), including:

- Approximately 183 acres (74 hectares) of mixed deciduous forest,
- Approximately 10 acres (4 hectares) of bottomland deciduous forest

The losses would also include approximately 45 acres (18 hectares) of younger, fast growing forest cover, including:

- Approximately 40 acres (16 hectares) of mixed deciduous regeneration forest, and
- Approximately 5 acres (2 hectares) of successional hardwood forest.

Of the approximately 238 acres of forest clearing proposed at this time, approximately 22 acres are in the CBCA, where forest clearing is regulated under the Maryland Chesapeake Bay Critical Areas Act.

As indicated in Table 4.3-1, each of the affected types of vegetation is common throughout the CCNPP Site.

The boundaries of vegetated areas subject to clearing and grubbing will be prominently marked prior to site preparation. Merchantable timber within marked areas may be harvested prior to site preparation. Merchantable timber occurs only in areas of mixed deciduous forest, well-drained bottomland deciduous forest, and poorly drained bottomland deciduous forest. Remaining trees will then be felled. Stumps, shrubs, and saplings will be grubbed, and groundcover and leaf litter will be cleared to prepare the land surface for grading. Felled trees, stumps, and other woody material would be disposed of by burning, chipping and spreading the wood chips, and/or sent to an offsite landfill. Opportunities to recycle woody material for use elsewhere on the CCNPP site or for sale to the public may be considered. Recycling opportunities could include cutting logs into firewood, using wood chips to mulch landscaped areas, using logs to line pathways, piling logs and brush in open fields to improve terrestrial wildlife habitat, and placing stumps (root wads) in stream channels to prevent bank erosion and enhance aquatic habitat.

Because of the need for grading broad contiguous areas of land to construct the power block, switchyard, and cooling tower, there will be no practicable opportunities to preserve individual trees within those areas. However, a biologist would examine forested areas subject to clearing for the temporary construction parking areas, construction office and warehouse area, and construction laydown areas for aesthetically outstanding trees or clusters of trees that might be capable of preservation without interfering with construction activities. Only trees where a minimum of 70% of the critical root zone can be left ungraded without interfering with construction activities would be identified for preservation. The critical root zone is defined by the Maryland Department of Natural Resources (MDNR) as a circular zone surrounding a tree trunk with a radius of 1 ft (0.3 meter) for each inch DBH (and a minimum radius of 8 ft (2.4 m) (MDNR, 1997). The critical root zone would be marked consistent with the State Forest Conservation Technical Manual (MDNR, 1997).

Sediment and erosion control BMPs including earth berms, and silt basins, will be erected around the perimeter of the construction footprint to reduce the potential for sedimentation of adjoining vegetated areas. Detailed specifications for the BMPs and vegetative stabilization will be presented in a soil erosion and sediment control plan approved by the MDE prior to site disturbance. Soil piles will be covered with plastic or bermed until removed during backfill and final grading activities. Monitoring of construction effluents and storm water runoff will be performed as required by the Storm Water Management Plan, the NPDES permit, and other applicable permits obtained for construction.

Important Habitats: The construction footprint was designed to minimize encroachment into habitats identified in Section 2.4.1 as important. Three habitats on the CCNPP Site were identified as important. Poorly drained bottomland deciduous forest and herbaceous marsh vegetation meet the definition of wetlands protected under federal and state regulations. Well-drained bottomland deciduous forest is important because of its occurrence in riparian settings. Site preparation will result in the permanent loss (filling) of approximately 11.72 acres (4.7 hectares) of wetland habitats.

Important Plant Species: The chestnut oak, tulip poplar, mountain laurel, and New York fern were identified in Section 2.4.1 as important because they are key contributors to the overall structure and ecological function of forested plant communities on the CCNPP site. Chestnut oak, which is dominant or codominant in the canopy throughout most of the mixed deciduous forest on the CCNPP site, is a slow growing tree species that is difficult to grow and transplant (Hightshoe, 1988). Similarly hard to grow species common in the mixed deciduous forest on the CCNPP site includes white oak, bitternut hickory, and pignut hickory (TTNUS, 2007a). Mountain laurel, which forms a dense understory over much of the mixed deciduous forest (TTNUS, 2007b), is also a slow growing species and is difficult to transplant (Hightshoe, 1988). Even though mixed deciduous forest can be replanted, several hundred years could be necessary to restore the oaks, hickories, and mountain laurel to their present sizes in the restored forest cover. Any losses of cover by these species, even in areas of only temporary disturbance where forest vegetation can be replanted, must therefore be considered effectively permanent.

The showy goldenrod, Shumard’s oak, and spurred butterfly pea were identified in Section 2.4.1 as important because they are listed by the State of Maryland as threatened or rare. Spurred butterfly pea was observed during a rare plant survey conducted in 2006 only in areas outside of the proposed construction footprint (TTNUS, 2007b) and therefore will not be adversely affected. Shumard’s oak was observed outside of but very close to within 50 ft (15 m) the western edge of the proposed construction area for the cooling tower. The observed

specimens of Shumard's oak do not have to be cut down to allow site preparation, but portions of their root systems could experience compaction or other physical disturbances. Careful protection of trees at the edge of the cooling tower construction area will be necessary to prevent mortality of the observed Shumard's oak specimens. Clusters of showy goldenrod (listed as threatened by Maryland) were observed in the 2006 surveys within the proposed construction footprint for the power block, at the edges of forested areas within Camp Conoy (TTNUS, 2007d). The clusters of Showy Goldenrod in Camp Conoy will be adversely impacted by construction of the power block.

In the State of Maryland, threatened and endangered plants are the property of the landowner and there are no statutory requirements for mitigation of impacts. Maryland Department of Natural Resources Natural Heritage Services (MDNR) was consulted and provided with a sample of the plant for verification. Information was also provided on the goldenrod's occurrence both within the project footprint and on the Baltimore Gas and Electric (BGE) transmission right-of-ways adjacent to the project area. MDNR advised that transplanting the goldenrod in Camp Conoy was of limited conservation value. MDNR concurred that efforts were made to minimize the impacts to the Showy Goldenrod population in Camp Conoy during facility layout and design. MDNR also acknowledged that maintenance practices on the BGE right-of-ways would likely continue to provide the early successional habitat required by the goldenrod.

4.3.1.2 Fauna

The vegetation losses will reduce the habitat available to mammals, birds, and other fauna that inhabit the CCNPP Site and surrounding region. Some smaller, less mobile fauna such as mice, shrews, and voles could be killed by heavy equipment used in clearing, grubbing, and grading. Larger, more mobile fauna will be displaced to adjoining terrestrial habitats, which could experience temporary increases in population density of certain species. If the increases exceed the carrying capacity of those habitats, the habitats could experience degradation and the displaced fauna could compete with other fauna for food and cover, resulting in a die-off of individuals until populations decline to below the carrying capacity. Potential impacts to specific fauna species identified in Section 2.4.1 as important are discussed below.

<u>White-tail Deer:</u> White-tail deer, which are identified in Section 2.4.1 as important because of their recreational value to hunters, are abundant throughout the CCNPP site (TTNUS, 2007c) and throughout Maryland. Deer populations have generally increased rather than decreased as Maryland and Virginia have become more densely developed (Fergus, 2003). When deer populations exceed the carrying capacity of forested habitats, as is common in Maryland and Virginia, shrubs and saplings can be killed or stunted by over-browsing (Fergus, 2003). Although some CCNPP personnel have noticed browse damage to understory forest vegetation on the CCNPP site, the damage is not yet severe (TTNUS, 2007c). Displaced deer can be expected to cause greater browsing and trampling of the understory of forested areas surrounding the proposed construction. The effects from increased browsing by displaced deer could be at least partially offset by increased hunting in public lands to the north and south.

<u>Scarlet Tanager and Other Forest Interior Dwelling Species (FIDS):</u> The scarlet tanager was identified as important because it represents one of several MDNR-designated FIDS (listed in "A Guide to the Conservation of Forest Interior Dwelling Birds in the Chesapeake Bay Critical Area" (CAC, 2000)) observed on the CCNPP Site in 2006 (TTNUS, 2007c). The construction footprint was designed to minimize fragmentation of forest cover to the extent possible. The proposed power block will be situated in an area where the forest cover has already been

fragmented by the lawns and playing fields of Camp Conoy. The proposed batch plant, construction laydown areas, construction office and warehouse area, and construction parking area will be situated in areas where the forest cover has already been fragmented by former agricultural fields, dredge spoil disposal, and existing roadways. Construction of CCNPP facilities will not substantially contribute to increased fragmentation of forest cover or loss of habitat for the scarlet tanager or other FIDS.

Construction of the proposed switchyard, cooling tower, and construction offices and warehouses would encroach into areas of unfragmented forest north and east of the headwaters to Johns Creek and south of Camp Conoy. The only alternative to siting the facilities in the forested areas west and south of the proposed power block location would be to site them to the east, which would encroach into the CBCA. Construction of the facilities would therefore reduce the availability of suitable habitat in the region to the scarlet tanager and other FIDS. However, the reduction would be minimized because the forest clearing would take place in blocks beginning at the edge of the forested landscapes rather than as clearings or strips that encroach deeper into the forest interior.

Bald Eagle: The bald eagle was identified as important because of its previous status as a federal protected species and state listed threatened species. Three known bald eagle nesting sites were present on the CCNPP site in 2006, although one nest was determined in 2007 to no longer be active (TTNUS, 2007c). The proposed construction footprint does not encroach within a 1,500 ft (457 meter) circular setback surrounding each of the three nesting sites. However, bald eagles established a new nest after the 2006 breeding season in a tree adjoining a ball field in Camp Conoy (Figure 2.4-2). The new nest was first observed in April 2007. Two adult bald eagles were observed circling the nest, suggesting that it was active. Because the nest is located within an area that will be impacted by construction, the Maryland Department of Natural Resources and U.S. Fish and Wildlife Service will be consulted regarding avoidance and appropriate mitigation measures.

Puritan Tiger Beetle and Northeastern Beach Tiger Beetle: The proposed construction activities would have little potential to affect the puritan tiger beetle or northeastern beach tiger beetle, which were identified as important because of their federal threatened status. Both species have highly specific habitat requirements that limit their potential occurrence on the CCNPP site to the sandy cliffs adjoining undeveloped shoreline stretches of the Chesapeake Bay (USFWS, 1993; USFWS, 1994). No major construction activities would take place on or within 500 ft (152 m) of any cliff or beach habitats which are all located south of the existing barge slip. The proposed CCNPP Unit 3 intake inlet area, associated structures, and discharge pipeline have been located, and the heavy haul road has been routed, to impact the Chesapeake Bay shoreline between the existing CCNPP Units 1 and 2 intake structure and the barge slip where the shoreline consists of armored fill soil, a habitat unsuitable for either tiger beetle species.

The results of the 2006 survey (Knisley, 2006) indicated that the work proposed at the CCNPP site will not have any effect on the puritan or northeastern beach tiger beetles or their habitats. However, since the beach south of the barge slip is favorable habitat for the puritan tiger beetle, 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.

Bird Collisions: The tallest structure constructed as part of CCNPP Unit 3 is the vent stack at 211 ft (64 m), followed by the reactor building at 204 ft (62.2 m), and the cooling tower, with a height of 164 ft (50 m). The vent stack will be the tallest structure in the vicinity, which is

predominantly rural. Assuming a tree canopy height of approximately 80 ft (24 m), the vent stack would protrude 131 ft (40 m) over the surrounding tree canopy. Because the vent stack would be constructed at a location with a ground surface elevation of 85 ft (26 m) above mean sea level (USGS, 1987), its top would be approximately 296 ft (90.2 m) above mean sea level, and hence 296 ft (90.2 m) above the water surface of the Chesapeake Bay.

Some bird mortality would likely result from collisions with the vent stack, reactor building, and cooling tower, but the expected mortality would be low and unlikely to significantly affect populations of migratory bird species. There are few published data regarding bird collision mortality with vent stacks, reactor buildings, or cooling towers. However, research was conducted in the early 1970s on the potential for bird collisions with cooling towers at the Davis-Besse Nuclear Power Station. Over 80 bird mortalities were reported in 1973 due to collisions with a 495 ft (150.8 m) tall cooling tower constructed on the southeast shore of Lake Erie as part of the Davis-Besse Nuclear Power Station (Rybak, 1973). However, the Davis-Besse tower is 495 ft (150.8 m) in height, more than 284 ft (86.5 m) taller than the proposed vent stack, the tallest proposed structure for CCNPP Unit 3, and more than 330 ft (100.5 m) taller than the CCNPP cooling tower.

Monitoring conducted at the Davis-Besse Nuclear Power Station between Fall 1972 and Fall 1979 revealed a total of 1,561 bird carcasses, of which 78.7% (approximately 1,229 carcasses) were attributed to collisions with the cooling tower. Most of the carcasses were species that migrate at night such as warblers (Family *Parulidae*), vireos (Family *Vironidae*), and kinglets (Family *Sylvidae*) (Temme, 1979). Many warbler and vireo species are suffering substantial population declines due at least in part to forest fragmentation (Askins, 2000) and have been identified as FIDS by the MDNR (CAC, 2000). Substantial numbers of warblers, vireos, and kinglets likely migrate through the extensive forested lands on and around the CCNPP site, and warblers of multiple species as well as the red-eyed vireo (*Vireo olivaceus*) were observed on the CCNPP site in 2006 (TTNUS, 2007c). Some individual warbler and vireo mortality events due to collisions with the vent stack, reactor building, and must therefore be expected. Due to the relatively low height of the proposed cooling tower, the mortality should not have an adverse effect on populations of any bird species. Measures such as reducing the lighting on the cooling tower to the minimum required by the Federal Aviation Administration and using flashing lights instead of floodlights have been shown to be effective in reducing the incidence of bird collisions (Ogden, 1996).

The construction of the onsite transmission lines could injure birds if they collide with the new conductors or towers or by electrocution if birds with large wingspans contact more than one conductor (i.e., cross phases). However, the transmission line connections will be constructed in, and adjoining other developed areas, and would not fragment natural bird habitats. Regularly occurring noise from human activity will also discourage frequent visitation by birds. The new towers would not be higher that the existing towers on the CCNPP site, and thus would be no more likely to increase bird collisions than the existing towers.

No new offsite transmission corridors and no offsite areas are impacted since no changes are required to the existing transmission lines or towers.

4.3.1.3 Wetlands

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, except to the extent that any opportunities to further reduce wetland impacts are identified during the detailed engineering process, the construction of the proposed facilities would not be

possible without permanently filling approximately 8,350 linear feet (2,545 m) of intermittent and upper perennial stream channels and approximately 11.72 acres (4.7 hectares) of the delineated wetland areas. The project would therefore require an individual permit under Section 404 of the Federal Water Pollution Act (USC, 2007) from the Baltimore District of the U.S. Army Corps of Engineers (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, fish return pipe 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 also require a permit from the Maryland Department of the Environment (MDE) under the Maryland Non-tidal Wetlands Protection Act (COMAR, 2005). The project would also disturb approximately 30.69 acres (12.48 hectares) 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 (15 m) 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 (30.5 m) 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 permits and authorizations required for the project are presented in Section 1.3.

Most of the wetland fill would take place in Wetland Assessment Areas II, IV, and IX. Minor wetland impacts are proposed for Wetland Assessment Areas I and VII. 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 nontidal wetland buffers would be disturbed in Wetland Assessment Area III, Wetland Assessment Area V, Wetland Assessment Area VI or Wetland Assessment Area VIII.

In sum, the major components of the project will have the following wetland impacts:

- Construction of the power block (reactor, turbine and safety-related structures) will impact 0.03 acres (0.01 hectares) of wetlands all of which is in Wetlands Assessment Area I.

- Construction of Laydown Area I will impact 4.90 acres (1.98 hectares) of wetlands in Wetlands Assessment Area II and 0.09 acres (0.04 hectares) of wetlands in Wetlands Assessment Area IV.

- Construction of the cooling tower will impact 0.75 acres (0.30 hectares) of wetlands in Wetlands Assessment Area IV.

- Construction of the switchyard will impact 4.13 acres (1.67 hectares) of wetlands in Wetlands Assessment Area IV.

- The Unit 3 access road will impact 0.72 acres (0.29 hectares) of wetlands in Wetlands Assessment Area VII.

- Construction of Laydown Area 2, followed by a parking lot, will impact 1.10 acres (0.45 hectares) of wetlands in Wetland Assessment Area IX.

These wetland impacts are summarized herein.

Wetland Assessment Area I: Grading to construct the power block will fill 0.03 acres (0.01 hectares) of Wetland Assessment Area I. Most of the fill would encompass approximately 729 linear feet (222 m) of intermittent and upper perennial stream channels and adjacent forested wetlands. The affected stream channels have been deeply scoured by surface runoff and are adjoined by very narrow strips of forested wetlands that are less than 5 ft (1.5 m) in width and bounded by steep, eroding banks (TTNUS, 2007d). Construction of the heavy haul road will impact approximately 111 lf (33.8 m) of perennial stream channel. Construction activities will disturb 2.09 acres (0.85 hectares) of uplands within 50 ft (15 m) of Wetland Assessment Area I designated as non-tidal wetland buffer by Calvert County. 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 (11.33 hectares). For security reasons, the protected area boundary around the nuclear and turbine islands encompasses approximately 48 acres (19.43 hectares). 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 impacted wetlands. The power block is located to limit the impact to the critical area and take advantage of Units 1 and 2 supporting facilities, such as shops, office space and parking.

Grading to construct the power block will fill approximately 0.03 acres (0.01 hectares) of an isolated wetlands within the CBCA in Wetland Assessment Area I. However, no wetland impacts will occur within 100 ft (30.5 m) of mean high tide of the Chesapeake Bay shoreline, the CBCA buffer. Approximately 1.84 acres (0.78 hectares) of uplands in the CBCA designated by Calvert County as nontidal wetland buffer would also be impacted. Construction within the CBCA, including the eastern (down-gradient) portions of Wetland Assessment Area I, is necessary to connect the proposed power block via a heavy haul road to an existing barge dock that presently serves CCNPP Units 1 and 2.

The losses of the wetland features in Wetland Assessment Area I would not represent a substantial loss in terms of wetland functions or values. 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, 1991). A functional assessment included in the wetland delineation report (TTNUS, 2007d) identified only two functions (and no values) 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 proximity to existing developed areas associated with CCNPP Units 1 and 2 (TTNUS, 2007d).

Wetland Assessment Area II: Preparation of the proposed permanent construction laydown area south of the power block will fill 4.90 acres (1.98 hectares) of Wetland Assessment Area II. Filled areas will include the Camp Conoy fishing pond which includes 2.63 acres (1.06 hectares) of open water as well as approximately 0.75 acres (0.32 hectares) of emergent wetlands and 1.47 acres (0.60 hectares) of forested wetlands fringing the pond. Stormwater Retention Basin 5 construction will total 1.74 acres (0.70 hectares). Also included are 0.05 acres of an isolated wetland. Currently, a total of 4.90 acres (1.98 hectares) of wetlands are proposed

for impact in Wetland Assessment Area II. Construction of Laydown Area 1 would also disturb 7.18 acres (2.91 hectares) of uplands within 50 ft (15 m) of Wetland Assessment Area II designated as non-tidal wetland buffer by Calvert County. The affected buffer consists mostly of undeveloped forested land. Construction of Laydown Area 1 would also impact 384 lf (117 m) of intermittent and perennial stream channel.

Impacts to Wetland Assessment Area II would be within the CBCA, but will be 0.35 acres (0.14 hectares) limited to the most landward (westernmost) 200 ft (61 m) of the CBCA. The wetland impacts will be necessary for laydown and the construction of the retention basin. Approximately 0.86 acre (0.35 hectares) of uplands, all undeveloped forest land, in the CBCA designated by Calvert County as non-tidal wetland buffer would be impacted. No areas of Wetland Assessment Area II within 800 ft (244 m) of the Chesapeake Bay will be impacted, including the two small impoundments on the wetlands complex flowing northeast from the Camp Conoy Fishing Pond to the Bay.

In the construction of a nuclear power station various facilities are necessary to perform safety-related construction and maintain the security of the site. Space allocation for construction activities, laydown, parking , and office space south of CCNPP Unit 3 is necessary for its proximity to the power block and turbine block construction site. This impacts the Camp Canoy fishing pond because this area would be filled to an elevation of 85 ft msl. The power block and turbine block construction site has limited accessibility on two sides. The critical area to the east and the heavy haul road and existing parking lots for CCNPP Units 1 and 2 limit access to the north. Construction congestion will be further compounded because the western perimeter will be closed off two to three years into the schedule for construction of the switchyard. Consequently, it is crucially important for mainta ining construction flow that the entire south side be available for construction activities .

A climate controlled warehouse for storage of safety-related components and sensitive electrical and electronic equipment would be located in this laydown area on the south side of the power block/turbine block construction site. 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 Units 1 and 2 and the requirement to maintain security for these facilities.

The evaluation of wetland functions and values included in the wetland delineation report (TTNUS, 2007d) 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, educational/scientific value, 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 a substantial reduction in the local availability of quality wildlife habitat. The loss of the Camp Conoy Fishing Pond would not, however constitutethe loss of an outdoor recreational facility because the property has been closed to recreational use as a result of heightened security space concerns related to CCNPP Unit 1 and 2.

Wetland Assessment Area III: No part of Wetland Assessment Area III or its associated non-tidal wetland buffer designated by Calvert County would be filled.

Wetland Assessment Area IV: Construction of the proposed switchyard will require permanently filling 4.13 acres (1.67 hectares) of wetlands and other waters of the state and U.S. in Wetland Assessment Area IV, including 4,178 lf of intermittent and perennial stream channels, forested wetlands, and forested springs associated with a generally southwest-flowing headwater of Johns Creek. Construction will also disturb 15.84 acres (6.42 hectares) of uplands within 50 ft (15 m) of Wetland Assessment Area IV designated as nontidal wetland buffer by Calvert County. The wetland and wetland buffer impacts are unavoidable because of the need to construct the switchyard adjacent to the power block. Construction of the heavy haul road will also impact 530 lf (161.5 m) of perennial stream channels.

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 causes 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 El-IV 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 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 or 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.

Construction of the proposed CWS cooling tower will require permanently filling 0.75 acres (. 304 hectares) of wetlands and approximately 1,445 lf (440.4 m) of intermittent and perennial stream channel other waters of the state and U.S. 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' diameter) circulating water pipes crossing over each other which presents significant engineering concerns.

Preparation of the proposed laydown area south of the power block (Laydown Area 1) will fill 0.09 acres (0.04 hectares) of Wetland Assessment Area IV. Filled areas will include upstream intermittent stream reaches of an unnamed tributary to Johns Creek.

Construction of Laydown Area 1 would also disturb 1.47 acres (0.59 hectares) of uplands within 50 feet (15 m) of Wetland Assessment Area IV designated nontidal wetland buffer. The affected buffer consists mostly of undeveloped forested land.

The evaluation of wetland functions and values included in the wetland delineation report (TTNUS, 2007d) 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 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.

Wetland Assessment Area V: No jurisdictional USACE or MDE wetlands or associated nontidal wetland buffer will be filled. The functional assessment included in the wetland delineation 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 nontidal wetland buffers was therefore a key objective when selecting a route for the construction access road.

<u>Wetland Assessment Area VI:</u> No jurisdictional USACE or MDE wetlands or associated nontidal wetland buffers within Wetland Assessment Area VI will be impacted by the construction of the CCNPP Unit 3. Areas resembling wetlands were determined to be non-jurisdictional by the USACE because these areas encompass former sediment basins which are man-made rather than natural features associated with the Lake Davies dredged material disposal area. In addition, these sediment basins 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.

<u>Wetland Assessment Area VII:</u> Construction of the construction access road, will require filling 0.72 acres (0.29 hectares) of wetlands and other waters of the state and U.S. in Wetlands Assessment Area VII, including 1,084 linear feet (760 m) of headwaters to Goldstein Branch and

adjacent forested wetlands. The affected area includes intermittent and perennial stream channels, forested wetlands, and forested springs associated with headwaters to Goldstein Branch, but construction will not involve disturbing the main channel of Goldstein Branch or its directlv adjoining wetlands. It is proposed to use bridges and culverts to minimize disruption of these streams. Construction will also disturb 3.41 acres (1.38 hectares) of uplands within 50 feet (15 m) of Wetland Assessment Area VII designated as nontidal wetland buffer by Calvert County. A portion of the laydown area north of Lake Davies consists of a 0.62 acre (0.25 hectare) emergent marsh that is a former storm water detention structure and is non-jurisdictional. The original locations of the construction road and concrete batch plant were relocated to minimize impacts on the wetlands associated with John Creek and the Goldstein Branch, and the preserve the maximum amount of wetlands and wetland buffer in Assessment Area VII.

The evaluation of wetland functions and values included in the wetland delineation report (TTNUS, 2007d) 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 it contains emergent vegetation in places and receives runoff from lawns on private property close to MD 2/4. Wildlife habitat was identified as principal because it 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.

Wetland Assessment Area VIII: No part of Wetland Assessment Area VII or its associated nontidal wetland buffer designated by Calvert County would be filled.

Wetland Assessment Area IX: Construction of Laydown Area 2, to be followed by use as a parking lot will require filling the entirety of Wetland Assessment Area IX (1.10 acres (0.45 hectares)), including 0.64 acres (0.26 hectares) of forested wetlands and 0.46 acres (0.19 hectares) of emergent wetlands. Wetland Assessment Area IX consists of 1,200 linear feet (366 m) of multiple springs and small fragments of intermittent stream channels and ditches within a small remnant area of forest land surrounded by existing roadways and parking lots. Construction will also disturb 2.56 acres (1.04 hectares) of uplands within 50 ft (15 m) of Wetland Assessment Area IX designated as non-tidal wetland buffer by Calvert County. The affected buffer consists of undeveloped forested land and mowed grassland adjoining existing roadways.

The affected wetlands and associated buffers are of low functional quality. The evaluation of wetland functions and values included in the wetland delineation report (TTNUS, 2007d) identified only one function (wildlife habitat) and one value (visual quality/aesthetics). Neither was identified as principal. While the isolated forest area, including its wetlands, might have some value as an ”oasis” for wildlife traversing the existing developed areas west of CCNPP Units 1 and 2, its small size and 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, hence the opportunity for the wetlands to perform water quality functions or production export to aquatic food chains is minimal. The loss of Wetland Assessment Area IX therefore represents a minimal loss of wetland functions and values.

Summary: The losses of the wetland features in Wetland Assessment Area I would not represent a substantial loss in terms of wetland functions or values. Only two wetland functions (i.e., groundwater recharge/discharge and wildlife habitat) would be affected as a result of the proposed development (impacts) with in Wetland Assessment Area I. Neither was identified as principal, i.e. of high importance to regional ecosystems or society at a local, regional, or national level. No wetland values would be affected by the proposed development within this assessment area. Space of construction activities, lavdown, and fabrication space is needed during construction in close proximity to the CCNPP Unit 3 power block. However, lands east of the power block are in the CBCA, lands to the west are needed for the switchyard, and lands north contain existing CCNPP Units 1 and 2 facilities. As a result. it is necessary to use the area immediately to the south during construction, thus permanently impacting the former Camp Conoy fishing pond in Wetland Assessment Area II. No wetlands with in Wetland Assessment Area III would be impacted through the proposed development activities. Five wetland functions (groundwater recharge/discharge, sedimen/toxicant retention, nutrient removal, production export, and wildlife habitat) and three values (recreation, educational/scientific value , and uniqueness/heritage) would be affected from proposed impacts to wetlands within Wetland Assessment Area IV. The proposed wetland impacts in this assessment area are unavoidable, however. No wetlands within Wetland Assessment Area V would be impacted through the proposed development activities. No wetland values would be affected by the proposed development within this assessment area. Six wetland functions (groundwater recharge/discharge, fish and shellfish habitat, sediment/ toxicant retention, nutrient removal, production export, and wildlife habitat) and one value (recreation) would be affected from proposed impacts to wetlands within Wetland Assessment Area VII. Of these, nutrient removal and wildlife habitat were reported to be principal. The proposed wetland impacts in this assessment area are unavoidable. No wetlands within Wetland Assessment Area VIII would be impacted through the proposed development activities. Only one wetland function (wildlife habitat) and one value (visual quality/aesthetics) would be affected as a resu lt of the proposed development (impacts) with in Wetland Assessment Area IX. Neither was identified as principal.

In general, the CCNPP Unit 3 construction facilities, including the batch plant, access road, parking, and laydown areas, have been designed to lessen the impact on wetlands. Large existing wetlands/surface waters have been avoided to the extent practicable by the planned location of construction parking and laydown areas. The power block, switchyard. and cooling tower areas require large blocks of land where little design modification can be done to avoid wetlands. The power block will be physically located to lessen the impact to the critical areas. As a result, the location will minimize the impacts to the Johns Creek watershed. Relocating the power block and the switchyard further west of the currently designed locat ion would cause a greater impact to this watershed.

4.3.1.4 Other Projects Within the Area with Potential Impacts

Although not a project, Calvert County is redirecting future residential and commercial development into existing clusters of urban development termed "town centers" away from the CBCA, including the cliffs and beaches that provide potential habitat for the two tiger beetle species and bald eagles (CCPC, 2004).

The EIS for the other large energy facility development project planned for Calvert County, the Cove Point Liquefied Natural Gas (LNG) expansion project indicates that no cliff or other naturally vegetated Chesapeake Bay habitat would be impacted by the project (FERC, 2005). The EIS also indicates that the one bald eagle nest near a proposed pipeline crossing of the Patuxent River in western Calvert County could be impacted by the construction. The

developer of the project, Dominion Cove Point LNG, LP, has committed to the U.S. Fish and Wildlife Service (USFWS) to implement appropriate mitigation measures.

Calvert County has experienced extensive fragmentation of forest cover and loss of FIDS habitat due to agricultural and suburban development. The Cove Point LNG expansion project would limit forest clearing in the county to lands directly adjacent to the LNG and ancillary facilities and areas to the side of existing pipeline right-of-way (FERC 2005) and is unlikely to diminish FIDS habitat.

4.3.1.5 Consultation

Affected Federal, State and Regional agencies will be contacted regarding the potential impacts to the terrestrial ecosystem resulting from plant construction. The Maryland Natural Heritage Program, operated by the Maryland Department of Natural Resources, 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 important species discussed above was based in part on information provided by that consultation. The U.S Fish and Wildlife Service 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 with 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 maybe reconsidered (Ratnaswamy, 2007), The consultation occurred prior identification of the eagle in the project vicinity (Section 4.3.1.2) and additional consultation is planned as stated in Section 4.3.1.2. USFWS and the Maryland Department of Natural Resources will be provided an opportunity to review the Environmental Report.

4.3.1.6 Mitigation Measures

Opportunities for mitigating unavoidable impacts to terrestrial ecosystems involve restoration of natural habitats temporarily disturbed by construction creation of new habitat types in formerly disturbed areas, as well as enhancement of undisturbed natural habitats. Mitigation plans will be developed in consultation with the applicable State and local resource agencies and will be implemented on the CCNPP site to the extent practicable. The description of mitigation measures is addressed below for upland areas (flora and fauna) and wetland areas.

Flora and Fauna: Mitigation to replace temporary and permanent impacts to upland areas (Table 4.3-1) will consist of reforestation as well as development of other appropriate naturally vegetated areas (e.g., meadows, shrub/scrub communities). Some areas on the CCNPP site may be available for mitigation, including lawns and old agricultural fields. Consideration will be given to mitigation within the CBCA as well as areas further inland. Because the areas of projected forest losses in the CBCA are already fragmented by roads and lawns in Camp Conoy and the roadways and open areas adjoining the barge dock, reforestation within the CBCA will contribute to the State of Maryland's goal of increased FIDS habitat in the CBCA (CAC, 2000). In addition, UniStar will keep the remaining unforested upland, not impacted by the construction of CCNPP Unit 3, as old field habitat to maintain site biodiversity.

The reforestation process is designed to ultimately generate a mixed deciduous forest. Mixed deciduous forest is the climax vegetation, i.e., the permanently-sustaining vegetation that would result following an extended period without disturbance, for uplands in central Maryland, including Calvert County. The process by which unvegetated land reverts to climax vegetation is termed natural succession. Left undisturbed, abandoned agricultural land in central Maryland typically passes through a series of intermediate forest stages termed seres.

The initial series consist of vegetation dominated by grasses and other herbaceous plants; then vegetation dominated by shrubs and tree saplings; then forest vegetation dominated by Virginia pines and hardwoods such as black locust and black cherry that grow rapidly in conditions of full sunlight; and finally forest dominated by oaks, tulip poplars, and other hardwoods that can regenerate under their own shade. The initial two series correspond to the old field vegetation on the CCNPP site, the intermediate series corresponds to the successional hardwood forest, and the final (climax) series corresponds to the mixed deciduous forest. The mixed deciduous regeneration forest is the result of logging mixed deciduous forest without killing the stumps and associated root systems; it therefore consists of a mixture of stump sprouts of climax tree species and fast-growing successional tree species and is intermediate in character between mixed deciduous forest and successional hardwood forest.

An optimal mix of tree species for planting includes tulip poplar, sweet gum, green ash, black locust, Virginia pine, and loblolly pine. All are relatively fast growing when properly planted, are easily transplanted and widely available as nursery stock (Hightshoe, 1988), and are components of the existing successional hardwood forest and/or mixed deciduous forest on the CCNPP site (TTNUS, 2007b). Based on reported growth rates (Hightshoe, 1988), a stand planted with bare-root or 1-gallon container-grown nursery stock of the above species would form a closed canopy forest resembling the existing successional hardwood forest or mixed deciduous regeneration forest within 20 to 30 years. At that point, the stand will provide habitat for FIDS. The Matapeake soils mapped in the subject area have a reported site index of 75 to 85 for loblolly pine (USSCS, 1971).The site index indicates the expected height for planted loblolly pine after 50 years. Site index data are not available for the other species, but the data for loblolly pine provides a general idea of growth rate for relatively fast growing tree species.

Oaks, beeches, and other shade-tolerant climax species would be expected to voluntarily establish in the shade of the stand as their nuts are dispersed naturally by squirrels and other wildlife. Mountain laurel and other understory and groundcover vegetation typical of mixed deciduous forests would also be expected to gradually become established under the shade of the closed canopy. The floristic composition of the stand will gradually approach that of the existing mixed deciduous forest on the CCNPP site, a process that could require more than 100 years.

Portions of the power plant and rights-of-way disturbed during construction will be stabilized after the cessation of construction activities within that portion of the footprint and right-of-way, followed by seed application, except in actively cultivated lands, in accordance with the best management practices presented in Maryland Standards and Specifications for Soil Erosion and Sediment Control. In wetlands and wetland buffers, seed application shall consist of the following species: annual ryegrass *(Lolium multiflorum)*, millet *(Setaria italica)*, barley *(Horedum spp.)*, oats *(Uniola spp.)*, and/or rye *(Secale cereale)*. Other non-persistent vegetation may be acceptable with appropriate approval. To minimize forest losses, cleared areas that are no longer in use and not anticipated to be in use following project construction will be replanted with tree species appropriate for the area.

<u>Wetlands:</u> Wetland mitigation in Maryland is driven primarily by conditions established by the USACE and MDE in permits issued under Section 404 of the Federal Water Pollution Control Act (USC, 2007) and the Maryland Nontidal Wetlands Protection Act (COMAR, 2005). Wetland mitigation follows a sequencing process beginning with avoidance of wetland impacts, then minimization of wetland impacts, and lastly compensatory mitigation to offset impacts. The

proposed facilities have been sited, and the proposed construction has been configured, to avoid encroaching into wetlands (and a surrounding 50 ft (15 meter) wide buffer) to the extent possible. Other factors such as minimizing encroachment into the CBCA, keeping NRC-required buffers within the CCNPP site boundaries, and situating the power block close to the existing CCNPP units were considered; hence the wetland impacts detailed above must be considered unavoidable.

Several measures will be taken to minimize the unavoidable adverse effects to wetlands. The use of berms, temporary and permanent vegetative stabilization, and other soil erosion and sediment control practices would reduce the risk of sediment runoff into intact wetlands adjoining the areas of fill. Sand filter trenches will be constructed around the periphery of the power block, construction laydown area, cooling tower and switchyard areas to help catch surface runoff and prevent degradation of adjoining terrestrial and aquatic habitats. The sand filter trenches would be constructed of base materials that promote infiltration of runoff from low intensity rainfall events. However, for large storms the infiltration capacity of the base materials would be exceeded and the overflow pipes would direct the runoff to the stormwater retention basins. The stormwater retention basins would be unlined impoundments, vegetated with regionally indigenous wetland grasses and herbs, with simple earth-fill closure on the down stream end and could include discharge piping to the adjacent watercourses.

Wetland mitigation will be required by conditions established in an individual permit to be issued by the USACE and under Section 404 of the Federal Water Pollution Control Act and in the CPCN in accordance with the requirements of the Maryland Nontidal Wetlands Protection Act. Wetland mitigation follows a sequencing process beginning with avoidance of wetland impacts, then minimization of wetland impacts, and lastly compensatory mitigation to offset impacts. The proposed facilities have been sited, and the proposed construction has been configured to avoid encroaching into wetlands(and surrounding 50 ft (15 m) wide buffer) to the extent practicable. Other factors such as minimizing encroachment into the CBCA, keeping NRC-required buffers within the CCNPP site boundaries, and situating the power block close to the existing CCNPP units were considered; hence, the wetland impacts detailed above are considered unavoidable.

The mitigation plan is divided into four categories: (1) on-site forested wetland in-kind creation; (2) onsite herbaceous wetland enhancement; (3) on-site stream restoration and (4) off-site forested wetland restoration. The details of each mitigation plan component are presented below.

The proposed compensatory "in kind" mitigation for the scheduled impacts to wetlands and surface waters of the CCNPP Unit 3 project 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. 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, nontidal stream channel, and functional losses more effectively than the other three strategies. The project is designed to adhere to the Code of Maryland Regulations (COMAR), Subsection 26.23.04.03 (COMAR, 2005).

Forested Wetland In-Kind Creation

The wetland mitigation component of the compensatory mitigation plan includes the following proposed activities:

- The creation of forested wetland habitat within the Camp Conoy area that lies within the CBCA (Mitigation Site WC-1), the creation of forested and herbaceous wetland habitat within the middle manmade, abandoned, sediment basin of the Lake Davies Disposal Area (Mitigation Site WC-2);
- The enhancement of a smaller manmade, abandoned, sediment basin within the Lake Davies Disposal Area (Mitigation Site WE-1) and the enhancement of a portion of Johns Creek and a linear drainageway extension occurring to the south of the Lake Davies Disposal Area (Mitigation Site WE-2)
- The eradication of phragmites through herbicide application (Mitigation Sites WC-2, WE-1, and WE-2)
- The use of soil material from impacted on-site wetland areas that do not contain phragmites to create mitigations sites as a supplemental growth medium (Mitigation Site WC-1 and WC-2).

Wetland Creation Mitigation Sites

Mitigation Site WC-1

Mitigation Site WC-1 is next to the northern boundary of the CCNPP Unit 3 project area within the Camp Canoy area, which lies within the CBCA. The WC-1 site is the only mitigation area of the four proposed wetland mitigation sites that occurs within the CBCA. The selection of the WC-1 site resulted from an opportunity to route stormwater from the Unit 3 facility to the proposed forested wetland creation site, thereby providing a source of hydrology for this mitigation site.

For the WC-1 site, stormwater from the proposed power block and adjacent laydown area will be used to drive the hydrology of the created wetlands. Three wetland cells in series are proposed. Discharge from the site will enter into the cell at the highest elevation. A catch basin with an overflow elevation set approximately one foot above the ground elevation and equipped with a small outlet pipe will drain water from this cell through the berm into the middle cell in approximately 24 hours. Likewise, water from the middle cell will flow into the lower cell through a catch basin set about 1 foot above base elevation. Water in the lowest cell will discharge slowly into an existing channel leading down to the Chesapeake Bay. The uppermost wetland cell will also be equipped with an overflow spillway to handle discharges up to the 25-year storm. These peaks will be reduced through temporary storage in the wetland and then released into the channel below Camp Conoy. The 24-hour drawdown time in the wetland cells was determined to reduce inundation of tree roots for excessive periods of time. Micropools and other microtopography features will be added to the wetland cells to diversify habitat for wetland flora and fauna. Finally, the WC-1 site will receive treated stormwater to drive the hydrology of the site. The WC-1 site has not been designed to provide attenuation (water quality treatment) for stormwater being routed from the constructed CCNPP Unit 3 facility.

The WC-1 site will be planted with seedlings of native hydrophytic tree species to create a wetland hardwood forest community. Approximately 4.6 acres of forested wetlands will be created in this location. At a mitigation credit ratio of 2:1, this mitigation site will yield

approximately 2.3 acres of credit. Wetland function will be increased by creating wildlife habitat for wetland dependent and wetland independent species. 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.

Mitigation Site WC-2

Mitigation Site WC-2 is located within the Lake Davies Disposal Area, near the western boundary of the CCNPP Unit 3 project area. The Lake Davies Disposal Area was created during the construction of CCNPP Units 1 and 2 as a disposal area for dredged material from the project area. The WC-2 site occurs as the middle of three sediment basins (i.e., upper, middle, and lower basins) that are separated from each other by elevated berms. The middle and lower basins are man-made, but appear to support hydrophytes within areas of hydric soils and exhibit wetland hydrology. The existing site conditions of the basins provide an opportunity for the implementation of nontidal wetland mitigation strategies.

Within the Lake Davies Disposal Area, wetland creation will be provided for the middle abandoned sediment basin through the establishment of the following vegetative zones:

- An interior open water (pond) area will be planted with floating aquatic species;
- A surrounding freshwater marsh fringe will be planted with herbaceous plant species; and
- An outer zone will be planted with woody bottomland hardwood species.

Wetland fill material will be deposited within the sediment basin to raise the ground elevation across the central portion of the basin. Soil material from impacted on-site wetland areas will be used for the WC-2 mitigation site; however, only impacted wetlands that do not contain phragmites will be considered for a source of hydric soil material. The undesirable, exotic, plant species phragmites, which is currently infesting the sediment basin, will be eradicated through the application of chemical herbicide before the 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. At a mitigation credit ratio of 1:1, this mitigation site will yield approximately 1.3 acres of credit for emergent marsh. The planting of approximately 7.2 acres of bottomland hardwood forest will provide forested wetland creation. At a mitigation credit ratio of 2:1, this mitigation site will yield approximately 3.6 acres of credit for forested wetlands. The creation of zones of open water, marsh, and bottomland hardwood forest will greatly increase wetland habitat diversity (wetland function) and wetland value within this basin and be an improvement over the existing habitat condition; i.e., a monoculture of phragmites.

Wetland Enhancement Mitigation Sites

Mitigation Site WE-1

Mitigation Site WE-1 is located within the aforementioned Lake Davies Disposal Area. The WE-1 site occurs as the lower sediment basin within the disposal area. Berms physically separate this basin from the middle sediment basin (WC-2) and a linear drainageway extension to the south (WE-2). The mitigation site is presently dominated by phragmites. Field observations indicate the presence of hydric soils and wetland hydrology within this proposed

wetland enhancement mitigation site. Culverts hydrologically connect this basin to the middle sediment basin (WC-2) and the linear drainageway extension to the south (WE-2).

The lower sediment basin within the Lake Davies Disposal Area will be enhanced through the eradication of phragmites, by application of chemical herbicide, and the planting of woody bottomland hardwood species (trees and shrubs). These mitigation activities will provide approximately 2.4 acres of wetland enhancement. At a mitigation credit ratio of 3:1, this mitigation site will yeild approximately 0.8 acre of credit for forested wetlands.

The planting of desirable woody species within the enhancement area, along with phragmites eradication, will provide suitable wildlife habitat (wetland function) and wetland values within this phragmites-infested basin. 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.

Mitigation Site WE-2

Mitigation Site WE-2 is generally located within Johns Creek. This mitigation site includes a linear drainageway extension to the south of the aforementioned lower sediment basin (WE-1), i.e., next to the southern end of the Lake Davies Disposal Area. The downstream portion of Johns Creek that is proposed for enhancement includes the portion of the reach that extends from a point approximately 1,000 feet upstream of the MD 2/4 bridge to a point near the western end of stream mitigation site SR-4. The WE-2 site lies outside the CCNPP Unit 3 boundary but within the CCNPP property boundary. Therefore, as with the other three previously described wetland mitigation sites, all mitigation activities will be implemented on site. The portions of the Johns Creek reach that are not infested with phragmites (i.e., as occurring downstream and upstream of the mitigation site) are not included within the WE-2 mitigation area.

Wetland enhancement will be provided within a significant portion of the 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:

- The eastern (upstream) and western (downstream) portions of Johns Creek near the confluence of Johns Creek and the linear drainageway extension occurring to the south of the Lake Davies Disposal Area; and
- The portion of Johns Creek that is proposed for enhancement includes the portion of the reach, which extends from a point located approximately 1,000 feet upstream of the MD 2/4 bridge to a point located near the western end of stream mitigation site SR-4. The linear drainageway extension appears as a remnant stream system that is presumed to have historically extended northward into the area that is now known as the Lake Davies Disposal Area.

The planting of desirable woody species (trees and shrubs) within the enhancement areas of Johns Creck, 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. The mitigation activities associated with the WE-2 site will provide approximately 15.7 acres of wetland enhancement. At a mitigation

credit ratio of 3:1, this mitigation site will yield approximately 5.23 acres of credit for forested wetlands.

Wetland Mitigation Planting Plan

Creation Sites

After excavation and the establishment of bottom elevations and the installation of water control structures, the WC-1 site will be planted with native hydrophytic trees species. The tree species will be planted at a density of 680 stems per acre (8-foot centers) to allow for anticipated mortality from wildlife depredation by white-tailed deer *(Odocoileus virginianus)* or other browsers and defoliation by insects during early seedling establishment. It is expected that recruited, desirable, woody species will add to the overstory stem density in the mitigation site. The plant material will be representative of the species composition of the adjacent bottomland hardwood forested wetlands within the CCNPP property 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 Calvert County Soil and Water Conservation District (CCSWCD) and the CAC. The final selection of plant stock may be determined to some extent by availability. The selected tree species will consist of containerized and/or bare root 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, but is not limited to willow oak *(Quercus phellos)*, water oak *(Quercus nigra)*, black gum, red maple, tulip tree *(Liriodendron tulipifera)*, river birch *(Betula nigra)*, and/or American sycamore *(Platanus occidentalis)*. The palette of tree species will be finalized before installation. Additional species may be added if they are determined to be highly suitable for installation in the WC-1 mitigation site.

Three planting zones are proposed for the WC-2 mitigation site; i.e., open water freshwater marsh fringe, and bottomland hardwood forest. The open water (pond) habitat will be planted with pondweed *(Potamogeton sp.)*, water lily *(Nymphaea sp.),* or other suitable floating aquatic species. The marsh fringe will be planted with native hydrophytic herbaceous species. The herbaceous species will be planted at a density of 4,800 stems per acre (3-foot centers). The plant material will be representative of the species composition of adjacent herbaceous wetlands within the CCNPP property and native to the region. 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 WC-2 mitigation site. The tree species for installation within the outer zone (bottomland hardwood forest) of the mitigation site will include, but is not limited to, willow oak, water oak, black gum, red maple, tulip tree, river birch, and/or American sycamore. Additional species may be added if they are determined to be highly suitable for installation in the WC-2 mitigation site. The tree species will be planted at a density of 680 stems per acre (8-foot centers). The installation of all plant material within the WC-2 mitigation site will be conducted following the deposition of fill material and contour shaping within the basin.

Enhancement Sites

The enhancement of the WE-1 mitigation site will entail the planting of native hydrophytic trees to establish a bottomland hardwood forest community within this basin. The tree species for installation will include, but is not limited to, willow oak, water oak, black gum, red maple, tulip tree, river birch, and/or American sycamore. The palette of tree species will be finalized

before installation and may include the addition of other desirable tree species. The plant material will be representative of the species composition of the adjacent bottomland hardwood forested wetlands within the CCNPP property and native to the region. The tree species will be planted at a density of 680 stems per acre (8-foot centers).

The enhancement of the WE-2 mitigation site will entail the planting of native hydrophytic trees and shrubs to establish a bottomland hardwood forest community within the mitigation site. The proposed mitigation site includes the bottomland hardwood forest component of the eastern (upstream) and the western (downstream) portions of Johns Creek (near the confluence of Johns Creek and linear drainageway extension) and the linear drainageway extension. The tree species for installation will include, but is not limited to, willow oak, water oak, black gum, red maple, tulip tree, river birch, and/or American sycamore. The shrub species for installation 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 and may include the addition of other desirable tree or shrub species. The plant material will be representative of the species composition within Johns Creek and native to the region. The tree and shrub species will be planted at a density of 680 stem streams per acre (8-foot centers).

Stream Mitigation

The CCNPP Unit 3 site contains five potential stream restoration reaches and five potential stream enhancement reaches (perennial and intermittent) on site. The stream reaches proposed for mitigation activities are primarily contained within the Woodland Branch and Johns Creek watershed and secondarily in the Camp Conoy area that lies within the CBCA.

The stream mitigation component of the compensatory mitigation plan includes the following proposed activities:

- The restoration of stream channel within the on-site portion of upper and lower Woodland Branch;
- The enhancement of stream channel within two un-named tributaries to and the middle reach of Woodland Branch;
- The restoration of stream channel within an un-named tributary to and a portion of the mainstem of Johns Creek;
- The enhancement of stream channel within an un-named tributary to Johns Creek; and
- The restoration and enhancement of stream channel within un-named western Bay tributaries of the Camp Conoy area.

The proposed stream restoration and stream enhancement are intended to compensate for the unavoidable, direct loss of physical, biological and/or riparian function of impacted streams. Stream restoration will take advantage of opportunities to reconnect channels to their historic flow paths and restore active access to wooded floodplains. Areas where degraded channels are abandoned will be designed to function as pockets of seasonal wetlands, ephemeral ponds, and oxbow lakes in the riparian zone. Stream enhancement activities, intended to improve existing stream physical and ecological functions within the

channel's current flow path include bank grading operations and floodplain creation at lower elevations, bank treatments, and native plantings.

The stream restoration and enhancement mitigation opportunities, 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, improve water quality, and maintain stream and riparian functions that support corresponding ecology.

Woodland Branch

Five proposed mitigation reaches within Woodland Branch have been identified as stream restoration or enhancement sites: SR-1 (Lower Woodland Branch), SE-1 (unnamed tributary to Lower Woodland Branch), SR-2 (Upper Woodland Branch), SE-2 (Middle Woodland Branch), and SE-3 (unnamed tributary to Upper Woodland Branch). Although the Woodland Branch watershed drains to a tributary stream of the Patuxent River, stream restoration efforts will be completed in consideration with CBCA requirements.

Channel Restoration Reaches

Priority 1 restoration of SR-1 and SR-2 would include relocating the main channel alignment away from the existing "F" type channels toward more stable "C" and "E" type channels, beginning at headcuts 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.

Functional lift that can be achieved by creation of complex bed features including riffles and pools to provide habitat for aquatic species, and woody planting to provide bank protection, shade, nutrient uptake, and food supply.

Channel Enhancement Reaches

The entrenchment of SE-1, SE-2, and SE-3 stream reaches have not escalated to unmanageable proportions, therefore 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 through bank sloping and/or creating inner berm features.

Functional lift that can be achieved using this approach includes creating a small floodplain at a lower elevation, creation of complex bed features including riffles and pools to provide habitat for aquatic species, and woody planting to provide bank protection, shade, nutrient uptake, and food supply. One advantage of modifying channels in place is that the hyporheic zone maintains its integrity and the benthos living in this zone experience less disruption.

Western Bay Tributaries

Two proposed mitigation reaches consist of low order streams that discharge directly into the western Chesapeake Bay, SR-3 (Branch 1), and SE-4 (Branch 2).

Channel Restoration Reach

The extreme nature of the over widening and incision of SR-3 allows for Priority 2 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. This construction effort would minimize the loss of healthy trees by stabilizing steep valley slopes using bioengineering applications.

Channel Enhancement Reach

The primary element of enhancement at this site involves providing a channel stabilization grade control feature at the confluence with the Bay. By preventing upstream migration of a single seven-foot headcut, this feature will preserve the upstream sequence of wetlands and stream channels. Additional enhancement throughout this reach includes riparian re-vegetation and minor bank grading where knickpoints have initiated. Minor bank grading plus other enhancements will be performed in preparation for bioengineering application and native plant landscaping.

Johns Creek

Channel Restoration Reaches

Priority 1 restoration is proposed for SR-4 and SR-5 whereby the existing channels will be abandoned and relocated toward the center of the valley, allowing for restored stream function. This treatment will continue for 950 lf for SR-4 and 450 lf for SR-5 until acceptable access to the active floodplain is achieved.

Channel Enhancement Reaches

Enhancement activity in the stream segment would include the grading of streambanks 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 controls in the downstream, SR-5.

Approximately 5 acres (2 hectares) of emergent freshwater herbaceous wetlands communities within the existing sediment ponds southwest of the Lake Davies Area will be enhanced through the eradication of phragmites and planting of native emergent species. The final selection of plant stock may be determ ined to some extent by availability. The selected trees and shrubs will consist of two gallon containerized stock protected by tree shelters (i.e.: TIJBEX® or Miracle Tube tree shelters). The tree shelters will provide protection from wildlife depredation, wind, or other influences. The tree materia l for installation will include bald cypress *(Taxodiwn distichum)*; willow oak *(Quercus phellos)*, water oak *(Quercus nigra)*, black gum *(Nyssa sy/vatica)*, green ash *(Fraxinus pennsy/vanica)*, red maple *(Acer rubrum)*, sweetgum *(Liquidambar styraciflua)*, and/or tulip tree *(Liriodendron tulipifera)*. The shrub material will include silky dogwood *(Comus amomum)*, inkbeny *(Ilex glabra)*, shadbush *(Amelanchier canadensis)*, highbush blueberry *(Vaccinium corymbasum)*; possum-haw *(Viburnum nudum)*, elderbeny *(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 in-kind creation areas.

Herbaceous Wetland Enhancement

The second component in the proposed compensatory wetland mitigation plan is on-site enhancement of herbaceous wetlands. The emergent freshwater marsh communities within the existing sediment basins (ponds) that occur to the south of the proposed temporary construction laydown area (Assessment Area VI) and Johns Creek (Assessment Area V) will be enhanced through the eradication of common reed (*Phragmites austra lis*) and the planting of native emergent plant species. Approximately 20 acres of herbaceous wetland enhancement will be achieved through this activity.

The 5-acre marsh area will be planted with native hydrophytic herbaceous species. The herbaceous species will be planted at a density of 2,720 stems per acre (four-foot centers). The plant material will be representative of the species composition of adjacent herbaceous wetlands and native to the region. The final selection of plant stock may be determined to some extent by availability. The herbaceous material for installation will include arrow arum *(Pelrandra virginica),* duck potato *(Saqittaria latifolia)*, water plantain *(Alisma subcordatum)*, and/or pickerelweed *(Ponrederia cordara)*. 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 common reed will be conducted through the application of approved herbicide. The eradication of common reed will be completed before the installation of plant material.

Stream Enhancement

Until refined values of existing stream lengths are developed using best available information, we can now only estimate the proposed lengths of each treatment type.

Restoration, intended to establish function where it once existed but has since been lost, will include adjustment of horizontal/vertical channel alignment and channel cross section, and will be performed on approximately 6,850 linear feet (2,082 m) as follows: Conoy Creek 250 linear feet (76 m); Lone Creek - 1,100 linear feet (334 m); Johns Creek (mainstem) - 550 linear feet (167 m); Johns Creek (unnamed tributary) - 1,200 linear feet (365 m); Woodland Branch upstream and downstream (mainstem, two locations) - 2,000 linear feet (608 m); and 1,750 linear feet (532 m), 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 will include less intense grading operations, such as minor adjustments of horizontal alignment and channel cross section only at isolated features, and include: 1) improvements to aquatic habitat, 2) bank stabilization, and 3) native riparian planting. Enhancement activities will be performed on approximately 4,550 linear feet (1,383 m) as follows: Conoy Creek - 2,000 linear feet (608 m); Johns Creek (mainstem) - 500 linear feet (152 m); Woodland Branch (main stem 500 linear feet (152 m); Woodland Branch (unnamed tributaries, two total) 500 linear feet (152 m) and 1,050 linear feet (319 m). Additional opportunities for stream mitigation may exist at the lower end of Lake Davies.

The banks of the aforementioned stream reaches will be planted with native woody species, at a planting density of 10,890 stems per acre (two-foot centers). The plant material will be representative of the species composition of adjacent stream reaches and native to the region.

The final selection of plant stock may be determined to some extent by availability. The woody material for installation will include silky dogwood, elderberry, Carolina willow *(Salix caroliniana),* and/or wax myrtle *(Myrica cerifera)*. The palette of woody species will be finalized before installation. Additional species may be added if they are determined to be highly suitable for installation in the target stream bank areas.

Offsite Forested Wetland Restoration

Up to 5 acres (2 hectares) of offsite forested wetland restoration will be provided if mitigation acreage requirements are not met through the proposed implementation of the aforementioned three mitigation plan components; i.e., onsite forested wetland in-kind creation, herbaceous wetland enhancement. And stream enhancement.

Mitigation Monitoring Program

Following the completion of the on-site wetland creation, wetland enhancement, stream restoration, and stream enhancement activities, a five-year annual monitoring plan will be implemented pursuant to the MDE, Water Management Administration (WMA) mitigation monitoring guidelines and protocols. This effort will entail the establishment of permanent cross-sections for stream restoration and enhancement reaches as well as sample plots within mitigation areas to obtain data on survivorship, growth, and vitality of planted vegetables. Additional data to be reported at the mitigation areas will include: (1) species composition of recruited, desirable plant species: (2) species composition and area cover of nuisance/exotic 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. Annual monitoring reports will be submitted to both MDE and the USACE within 60 days of data collection.

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 of USACE and the WMA. 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 WMA. Following agency review and coordination, remedial/contingency measures will be implemented, if required.

The targets for the in-kind creation and enhancement efforts will be divided into two specific areas: (1) in-kind creation and enhancement of wetland communities and enhancement of stream reaches and (2) in kind 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 U.S. ACE and/or WMA.

4.3.2 Aquatic Ecosystems

This section provides an assessment of the potential impact construction activities will have on aquatic ecosystems to impoundments and streams onsite and to the Chesapeake Bay offsite. New transmission lines and access corridors are limited to the CCNPP site. The existing transmission corridor will be used offsite.

As shown in Table 4.3-2, 2.69 acres (1.09 hectares), of the affected aquatic habitat, will be permanently converted to structures, pavement, or other intensively-maintained exterior grounds to accommodate the proposed power block, cooling tower, switchyard, roadways, permanent construction laydown area, borrow area, retention basins, and permanent parking lots. The permanent loss of affected aquatic habitat of 2.69 acres (1.09 hectares) is small compared to the 1,548,769 acres (626,787 hectares) in the region as shown in Table 2.2-4. Figure 2.1-1 shows the CCNPP site boundary and the major buildings to be constructed. Figure 4.3-2 shows the land to be cleared, the waste disposal area and the construction zone. A topographic map is provided as Figure 2.3-4, showing the important aquatic habitats. A similar analysis is discussed for wetlands in Section 4.3.1.

Section 4.2 includes a footprint of the construction area and a description of construction methods. Construction activities will start after the State of Maryland issues the appropriate permits to start clearing and grading of the CCNPP site. Activities to construct non-safety-related systems and structures will begin after that. The NRC combined license is expected by March 2011 which will allow construction of safety-related systems and structures. Construction is expected to be complete by July 2015 as discussed in Section 1.2.7.

4.3.2.1 Impacts to Impoundments and Streams

The construction footprint of CCNPP Unit 3 covers 460 acres (186 hectares) including many separate wetland and surface water areas. Construction effects to aquatic habitats in the immediate area range from temporary disturbance to complete destruction. The following surface water bodies are potentially affected by construction activities:

- Two unnamed streams (Branch 1 and Branch 2) on the eastern side of the drainage divide, Branch 1 being downstream of the Camp Conoy Fishing Pond
- Johns Creek, Branch 3 and Branch 4, and the unnamed headwater tributaries
- Goldstein Branch
- Laveel Branch
- Camp Conoy Fishing Pond and two downstream impoundments
- Lake Davies and two unnamed impoundments within the Lake Davies dredge spoils disposal area
- Chesapeake Bay and Patuxent River

As described in Section 4.2.2.2, construction of CCNPP Unit 3 will permanently destroy some of the existing surface water bodies. Construction impacts to the existing surface water bodies are summarized as follows:

- Increasing runoff from the approximately 130 acres (53 hectares) of impervious surfaces (including the power block, switchyard, cooling tower, laydown areas, critical areas, and roads)

- Infilling and eliminating the Camp Conoy Fishing Pond under the southeast portion of the laydown area south of the CCNPP Unit 3 power block foundation
- Infilling and eliminating the upper reaches of Branch 2 and Branch 3, and an unnamed tributary to Johns Creek
- Isolating portions of the upper reach of Branch 1 by construction of the laydown areas south of the CCNPP Unit 3 power block foundation
- Disruption of the drainage in the Lake Davies dredge spoils disposal area with possible impacts on the two downstream impoundments
- Wetlands removal and disruptions
- Possibly increasing the sediment loads into the proposed impoundments and downstream reaches

The overall site drainage basin areas are not directly affected by the site grading plan. The 80%/20% drainage proportion to the west and east respectively, would stay the same during and after construction. Approximately 15 to 20 acres (6 to 8 hectares) would be added to the east drainage basin and removed from the west drainage basin.

Dredging will take place at the barge slip area to accommodate delivery of large components. Dredging will also be performed for construction of the discharge line from the circulating water system. Dredged material will be disposed of in the previously used disposal area known as Lake Davies.

When a surface water body is filled by construction activities, impacts to aquatic life are expected. If the water body has an outlet, and the disturbance is gradual rather than abrupt, some fish may relocate. Oftentimes, however, construction impacts to small impoundments or stream reaches result in loss of the fish and invertebrates.

As discussed in Section 2.4.2 extensive surveys of the onsite streams and impoundments documented that no rare or unique aquatic species occur in the construction zone. 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. The most important aquatic invertebrate species in the impoundments and streams are the juvenile stages of flying insects; these species readily recolonize available surface waters, and so would not be lost to the area. No important aquatic habitats were identified in the freshwater systems in the project vicinity. The fish in the Camp Conoy pond are most likely to perish during construction activities as the overflow from the pond flows down to the Chesapeake Bay via two small impoundments. The fish in the tributaries of John’s Creek would most likely swim away from the affected areas to other parts of the creek outside the construction footprint.

Table 2.4-6 provides a list of important species and habitats found in the Chesapeake Bay. Figure 2.4-1 is a map of important species and habitats. 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. As discussed in Section 2.4.2, the American eel is abundant year round in all tributaries to the Chesapeake Bay.

Onsite streams and ponds were described in terms of the typical surface water habitats in the area. Headwater streams in general are considered important; however, there is nothing of

regional significance about these particular streams. All of the onsite aquatic species mentioned in this section are common in the area. No loss of critical habitat is anticipated.

Although the wetland areas themselves are considered a sensitive and valuable resource, the particular wetlands that will be impacted onsite are not substantively distinguishable from other wetland acreage in the vicinity. Additional details of the specific plants that will be lost in each area are presented in the final Wetland Delineation Report (TTNUS, 2007e).

Several other drainages and impoundments at the CCNPP site will be moderately to severely impacted. It is possible, and even likely, that some sediment will be deposited in wetlands, including impoundments and stream channels, with rainfall runoff during and immediately following construction. Best construction management practices will reduce the amount of erosion and sedimentation associated with construction, however, and would limit impacts to aquatic communities in down-gradient water bodies. Although unlikely, it is also possible that excavated soil placed in the proposed spoils and overflow storage area will be disturbed and move with runoff into streams onsite. Details are summarized herein:

- Increased runoff from 130 acres (53 hectares) of impervious surfaces (including the power block, switchyard, laydown areas, critical areas, cooling tower, and roads)
- Creation of a large impoundment east of the power block pad by construction of a dam, discharge structure and piping that will discharge to the impoundment down stream of the Camp Conoy fishing pond
- Creation of sand filters on the periphery of the power block, laydown, cooling tower and switchyard areas. The ditches are constructed of base materials that promote infiltration of runoff from low intensity rainfall events. However, for large storms the infiltration capacity of the base materials will be exceeded and the overflow pipes are provided to direct the runoff to the stormwater basins. The stormwater basins are unlined impoundments with simple earth-fill closure on the down stream end and may include discharge piping to the adjacent watercourses
- Creation of new impoundments southwest of the proposed switchyard and cooling tower pads for stormwater detention with associated discharge structures and outlet piping to the unnamed tributary of Johns Creek
- Disruption of the drainage in the Lake Davies dredge spoils disposal area with possible impacts on the two downstream impoundments
- Wetlands removal and associated impacts
- Increased sediment loads into the proposed impoundments and downstream reaches of Johns Creek and its associated tributaries, Branch 1 and Branch 2

Proposed construction activities that will potentially affect onsite water bodies are described in Section 4.2. During construction, effects to aquatic ecosystems may result from sedimentation (due to erosion of surface soil) and, to a lesser extent, spills of petroleum products. A report on human impacts to stream water quality listed siltation as the primary cause of stream degradation by a wide margin (Waters, 1995). In a 1982 nationwide survey by the U.S. Fish and Wildlife Service on impacts to stream fisheries, sedimentation was named the most important factor (Waters, 1995).

Three major groups of aquatic organisms are typically affected by the deposition of sediment in streams: (1) aquatic plants, (2) benthic macro invertebrates, and (3) fish. The effects of

excess sediment in streams, including sediment generated by construction activities, are influenced by particle size. Finer particles may remain suspended, blocking the light needed for primary producers photosynthesis, and initiating a cascade of subsequent effects (Waters, 1995) (MDE, 2007a). Turbidity associated with suspended sediments may reduce photosynthetic activity in both periphyton and rooted aquatic plants. Suspended particles may also interfere with respiration in invertebrates and newly hatched fish, or reduce their feeding efficiency by lowering visibility. Slightly larger particles fall out of suspension to the stream bed, where they can smother eggs and developing fry, fill interstitial gaps, or degrade the quality of spawning grounds. As the gaps in the substrate are filled, habitat quality is decreased for desirable invertebrates such as Ephemeroptera, Plecoptera, and Trichoptera, and less desirable oligochaetes and chironomids become dominant (Waters, 1995). Such changes in the benthic community assemblage result in a loss of fish forage, and a subsequent reduction in fish populations.

Construction sites contribute to erosion, which can lead to sedimentation in streams. Construction-related activities such as excavation, grading for drainage during and after construction, temporary storage of soil piles, and use of heavy machinery all disturb vegetation and expose soil to erosive forces. Reducing the length of time that disturbed soil is exposed to the weather is an effective way of controlling excess erosion and sedimentation.

Preventing onsite erosion by covering disturbed areas with straw or matting is also a preferred method of controlling sedimentation. When erosion cannot be prevented entirely, intercepting and retaining sediment before it reaches a stream is a high priority.

Several measures will be taken to minimize the unavoidable adverse effects to the aquatic ecology. The use of berms, temporary and permanent vegetative stabilization, and other soil erosion and sediment control practices will reduce the risk of sediment runoff into intact wetlands adjoining the areas of fill. Sand filters will be constructed around the periphery of the power block, construction laydown area, cooling tower and switchyard areas to help catch surface runoff and prevent degradation of adjoining terrestrial and aquatic habitats. The sand filters will be constructed of base materials that promote infiltration of runoff from low intensity rainfall events. However, for large storms the infiltration capacity of the base materials will be exceeded and the overflow pipes will direct the runoff to the stormwater retention basins. The stormwater retention basins will be unlined impoundments, vegetated with regionally indigenous wetland grasses and herbs, with simple earth-fill closure on the down stream end and will include discharge piping to the adjacent watercourses.

Construction impacts to water resources will be avoided or minimized through best management practices and good construction engineering practices such as stormwater retention basins and silt screens (MDE, 2007b). The Stormwater Pollution Prevention Plan, which provides explicit specifications to control soil erosion and sediment intrusion into wetlands, streams and waterways will be followed. The Spill Prevention, Control and Countermeasure Program will also be used to clean up and contain oil spills from construction equipment to avoid or minimize the impact to wetlands and waterways.

4.3.2.2 Impacts to Chesapeake Bay

As discussed in Section 2.4.2, the Chesapeake Bay is considered important estuarine habitat to most, if not all, of the estuarine species identified in the area. However, none of the important species in the vicinity of the CCNPP site are endemic to Chesapeake Bay. All of them range widely throughout the mid-Atlantic coast, and most occur in the Gulf of Mexico, as well.

The portion of the Chesapeake Bay nearest the CCNPP site is of lower relative importance compared to other areas of the Chesapeake Bay. Estuarine species that use the Chesapeake Bay as nursery grounds need the submerged aquatic vegetation (SAV) and tidal marshes for nutrient-rich forage for the larvae and young-of-the-year, as well as for protective cover from predators. The area near the CCNPP site has no SAV, and does not provide critical habitat for any species.

The National Marine Fisheries Service designated Essential Fish Habitat (EFH) for each life stage of federally managed marine fish species in the Chesapeake Bay area; the bluefish is the only important species in the CCNPP site area that is federally managed, and for which EFH has been designated. Bluefish eggs and larvae are found only offshore, so no EFH occurs in Chesapeake Bay. For juvenile bluefish, all major estuaries between Penobscot Bay (Maine) and St. Johns River (Florida) are EFH. Generally juvenile bluefish occur in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from May through October, and South Atlantic estuaries March through December, within the "mixing" and "seawater" zones. Adult bluefish are found in North Atlantic estuaries from June through October, Mid-Atlantic estuaries from April through October, and in South Atlantic estuaries from May through January in the "mixing" and "seawater" zones. Bluefish adults are highly migratory and distribution varies seasonally and according to the size of the individuals comprising the schools. Bluefish are generally found in waters with normal shelf salinities (greater than 25 parts-per-thousand).

The threatened and endangered species known to occur in the area are two species of sturgeon and two of sea turtles. No sturgeon is known to have spawned in the Chesapeake in decades. The sea turtles that occasionally use the Chesapeake Bay spawn much further south, outside the Chesapeake Bay watershed.

Relatively minimum effects of sedimentation or runoff into the Chesapeake Bay are expected. However, construction of the CWS intake inlet area and discharge pipeline, and enlargement of the barge slip, will cause some disturbance in the Chesapeake Bay. As described in Section 4.2.1, a sheet pile cofferdam and dewatering system may be installed on the south side of the CCNPP Units 1 and 2 intake structure to facilitate the construction of the CCNPP Unit 3 CWS intake piping and trash rack structure. Pilings may also be driven into the seabed to facilitate construction of new discharge system piping. Enlargement of the barge slip is estimated to require removal of about 15,000 cubic yards (11,500 cubic meters) of sediment. Dredging of the barge slip would result in increased suspended sediment in the immediate area for a limited period. Excavation and dredging of the CWS intake piping area would have similar effects. All dredging will conform to guidance provided by the Maryland Port Authority and dredging permit conditions including mitigation measures to minimize suspended sediment and other impacts.

Dredging inevitably causes an increase in suspended sediment in the immediate area, and may result in a plume of suspended sediment some distance from the site. In a study of the effects of hopper dredging in Chesapeake Bay, near-field concentrations of suspended sediment, < 980 ft (< 300 m) from the dredge, reached 840 to 7,200 mg/L or 50 to 400 times the normal background level. Far-field concentrations (> 980 ft (> 300 m)) were enriched 5 to 8 times background concentrations and persisted 34% to 50% of the time during a dredging cycle (1.5 to 2.0 hr) (Nichols, 1990).

The ecological effect of the suspended sediment depends on a variety of factors, including the type of dredge used, the timing and duration of the dredging, the particle size of the

suspended sediment, the presence of toxins in the sediment, the success of environmental controls to contain suspended sediment, and the life stage of the species present. Both short term direct behavioral effects (such as entrainment, turbidity, fish injury, and noise) and long term cumulative effects (such as possible contaminant release and habitat alteration) on marine organisms can result from dredging (Nightingale, 2001). Although effects may be similar, concern is often greater at the disposal site than at the dredge site; controversy over the effects of disposal of dredge spoils in the Chesapeake Bay has been ongoing since the 1970s (MSG, 2000). A thorough independent scientific investigation of the effects of disposing of large volumes of sediment in a deep channel of the Chesapeake Bay concluded that, apart from possibly affecting migrating sturgeon, no significant biological effects resulted from the deposition of sediment in the channel. Although this study is not directly applicable to the small-scale dredging proposed for CCNPP Unit 3, it serves as reassurance that the Chesapeake Bay is so large, and has such an enormous volume of water flowing through it, that even extremely large disturbances, such as the deposition of dredged material from Baltimore Harbor, have a negligible long term effect on the Chesapeake Bay ecosystem (MSG, 2000).

Small-scale dredging like that required to construct CCNPP Unit 3 is not considered a significant impact to the Chesapeake Bay. A report by the NOAA Chesapeake Bay Office, developed by a Technical Advisory Panel comprised of top fisheries scientists from area universities and senior government fisheries scientists, presented a Fisheries Ecosystem Plan for the Chesapeake Bay; it is notable that the only mention of the effects of dredging in the 450 page report were the following two general statements: "Dredging and the displacement of dredge spoil to other parts of the Chesapeake Bay can affect fish and shellfish by removing or inundating slow-moving or sessile species and their prey. Dredge spoil can also reintroduce sedimentary inventories of nutrients and contaminants into the water" (Chesapeake Bay Fisheries Ecosystem Advisory Panel (NOAA, 2006)). The report also acknowledged that the effects of even widely-used methods of harvest that disturb bottom sediments, such as trawling and crab dredging, remain unknown.

Excavation and dredging of the intake structure, discharge pipe, and barge slip will continue through CCNPP site preparation into plant construction. Excavated and dredged material will be transported to the onsite Lake Davies dredge spoils area as shown in Figure 4.3-1. Figure 3.4-3 shows the location of the intake and outfall structures areas and the barge slip.

Important species in the project area that may be temporarily affected by dredging include eggs, larvae, and adults of invertebrates and fishes. Based on the monitoring of the baffle wall and intake screens for CCNPP Units 1 and 2, Bay anchovy and Atlantic menhaden are the most common mid-water fish species in the immediate area (EA, 2006). These species may be temporarily affected by high levels of suspended sediment, which can interfere with foraging and respiration, as well as cause dermal abrasion to delicate fishes. No invertebrate sampling data are available in the intake area. In a study of dredging in Chesapeake Bay, benthic communities survived the deposition of suspended sediment despite the exceedance of certain water quality standards (Nichols, 1990).

Relatively no threatened or endangered species are expected to be affected by the proposed dredging. During the license renewal review process in 1999 for CCNPP Units 1 and 2, the National Marine Fisheries Service concluded that CCNPP license renewal would not adversely affect either the shortnose sturgeon or the loggerhead turtles because the CCNPP Units 1 and 2 discharge/intake do not lie within the areas normally used by either species (NRC, 1999). Neither the shortnose sturgeon nor the loggerhead turtle has been found impinged on the CCNPP Unit 1 and 2 intake screens during the 21 years of monitoring data (NRC, 1999).

The assemblage of aquatic species present near the CCNPP site varies throughout the year, due to spawning and migration patterns of individual fish and invertebrate species, as described in Section 2.4.2. The season of the year in which dredging and construction occur would determine to a large extent the impact on specific aquatic resources within the Chesapeake Bay. However, because the area to be dredged is small and in a protected near shore area that is in close prixmity to an area already dedicated to intake and other industrial functions, the overall impact on eggs and larvae is expected to be SMALL and TEMPORARY.

4.3.2.3 Impacts on the Transmission Corridor and Offsite Areas

The new transmission lines do not cross over any onsite water bodies. At one point, the transmission corridor right-of-way is near Johns Creek. No important aquatic species and their habitat will be impacted by the transmission corridor.

Transmission line construction will be limited to onsite construction of short connections from the new switchyard to the existing 500 kV transmission line that runs from near the center of the CCNPP site northward. Construction of a 500 kV transmission line from the CCNPP Unit 3 switchyard to the existing 500 kV transmission line on the CCNPP site will require clearing trees in 0.31 acres (0.13 hectares) of additional forested wetlands in Wetland Assessment Area IV (adjoining 520 linear feet (158 m) of intermittent stream channel), as well as in 1.85 acres (0.75 hectares) of additional forested uplands designated as non-tidal wetland buffer by Calvert County. No grading will be conducted in the subject wetlands or wetland buffer; disturbance will be limited to tree and shrub removal only. Surface soils within the affected wetlands and buffer will remain undisturbed, as will the pattern of surface runoff. The vegetation impacts to the affected wetlands and buffer are necessary because trees growing close to a 500 kV electric conductor must be removed to prevent possible outages. The transmission line is needed to convey electric power generated by the CCNPP Unit 3 power block to existing transmission lines that connect to the regional power grid.

The onsite transmission corridor for CCNPP Unit 3 is within the construction area. The information provided above pertaining to control of erosion and sedimentation applies to streams and wetlands within the transmission corridor.

No incremental effect on aquatic resources beyond what currently occurs within the transmission corridor is expected for the construction of CCNPP Unit 3.

The existing offsite transmission corridor will be used for CCNPP Unit 3. No new transmission corridors and no offsite areas are impacted since no changes are required.

4.3.2.4 Summary

Construction activities that may cause erosion that could lead to harmful deposition in aquatic water bodies would be (1) of relatively short duration, (2) permitted and overseen by state and federal regulators, and (3) guided by an approved Stormwater Pollution Prevention Plan. Any small spills of construction-related hazardous fluids, such as petroleum products, would be mitigated according to a Spill Prevention, Control, and Countermeasure Plan. Some sensitive habitats occur within the area expected to be affected by construction activities; however, no important aquatic species are expected to be affected. Impacts to aquatic communities from construction would be SMALL and temporary, and would not warrant mitigation.

No incremental effect on aquatic resources beyond what currently occurs within the transmission corridor is expected.

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Table 4.3-1— Vegetation (Plant Community) Impacts in Acres (Hectares) Construction of Proposed CCNPP Unit 3

(Page 1 of 2)

Habitat (Plant Community Type)	Forest (MDNR Definition)	Wetland (Federal and MDE Definition)	Permanent Losses					Temporary Losses					Total
			CBCA IDA 0-100′ (0-30 meters)	CBCA IDA 100 -1,000′ (30 -305 meters)	CBCA RCA 0-100′ (0-30 meters)	CBCA RCA 100-1,000′ (30 -305 meters)	Rest of Site	CBCA IDA 0-100′ (0-30 meters)	CBCA IDA 100-1,000′ (30 -305 meters)	CBCA RCA 0-100′ (0-30 meters)	CBCA RCA 100-1,000′ (30 -305 meters)	Rest of Site	
Lawns/Developed Areas	No	No	1.33 (0.54)	1.76 (0.71)	-	5.21 (2.11)	19.33 (7.82)	-	-	-	-	24.30 (9.80)	51.93 (21.01)
Old Field Vegetation	No	No	0.09 (0.04)	1.13 (0.46)	-	0.23 (0.09)	27.35 (11.07)	-	-	-	-	96.00 (38.80)	124.80 (50.50)
Mixed Deciduous Forest	Yes	No	0.01 (0.004)	14.75 (5.9)	-	5.20 (2.10)	133.81 (54.15)	-	-	-	-	26.44 (10.70)	180.21 (72.92)
Mixed Deciduous Regeneration Forest	Yes	No	-	-	-	-	36.28 (14.68)	-	-	-	-	12.00 (4.90)	48.28 (19.54)
Well-Drained Bottomland Deciduous Forest	Yes	No	-	-	-	-	1.37 (0.55)	-	-	-	-	0.05 (0.02)	1.42 (0.57)
Poorly Drained Bottomland Deciduous Forest	Yes	Yes	-	0.15 (0.06)	-	0.50 (0.20)	8.87 (3.59)	-	-	-	-	0.31 (0.13)	9.83 (3.98)
Herbaceous Marsh Vegetation	No	Yes	-	0.05 (0.02)	-	0.02 (0.01)	1.74 (0.70)	-	-	-	-	1.63 (0.66)	1.81 (0.73)
Successional Hardwood Forest	Yes	No	-	-	-	1.71 (0.69)	3.50 (1.40)	-	-	-	-	7.82 (3.16)	13.03 (5.27)
Open Water	No	Yes	-	0.02 (0.01)	-	0.01- (0.01)-	2.66 (1.08)	-	-	-	-	-	2.69 (1.09)
Total			1.43 (0.57)	17.86 (7.22)	-	12.86 (5.20)	233.58 (94.53)	-	-	-	-	166.61 (67.35)	436.5 (176.64)
			Total Permanent: 265.73 (108.10)					Total Temporary: 170.77 (69.11)					

Table 4.3-1— Vegetation (Plant Community) Impacts in Acres (Hectares) Construction of Proposed CCNPP Unit 3

(Page 2 of 2)

			Permanent Losses					Temporary Losses					
Habitat (Plant Community Type)	Forest (MDNR Definition)	Wetland (Federal and MDE Definition)	CBCA IDA 0-100′ (0-30 meters)	CBCA IDA 100 -1,000′ (30 -305 meters)	CBCA RCA 0-100′ (0-30 meters)	CBCA RCA 100-1,00 0′ (30 -305 meters)	Rest of Site	CBCA IDA 0-100′ (0-30 meters)	CBCA IDA 100-1,0 00′ (30 -305 meters)	CBCA RCA 0-100′ (0-30 meters)	CBCA RCA 100-1,00 0′ (30 -305 meters)	Rest of Site	Total

Notes:
MDNR: Maryland Department of Natural Resources
MDE: Maryland Department of the Environment
CBCA: Chesapeake Bay Critical Area
IDA: Intensive Developed Area (within CBCA)
RCA: Resource Conservation Area (within CBCA)

Table 4.3-2— Non-Tidal Wetland and Non-Tidal Wetland Buffer Losses in Acres (Hectares) Construction of Proposed CCNPP Unit 3

	Permanent Grading Losses				Temporary Grading Losses				Permanent Non-Grading Losses (Forest Clearing for Transmission Line)				Total Losses	
Wetland Assessment Area	**PFO**	**PEM**	**Open Water**	**Buffer**	**PFO**	**PEM**	**Open Water**	**Buffer**	**PFO**	**PEM**	**Open Water**	**Buffer**	**Wetland**	**Buffer**
I- Total	**0.03 (0.01)**	-	-	**2.09 (0.85)**	-	-	-	-	-	-	-	-	**0.03 (0.01)**	**2.09 (0.85)**
I-Outside CBCA	-	-	-	0.37 (0.15)	-	-	-	-	-	-	-	-	-	0.37 (0.15)
I-Inside CBCA-IDA	-	-	-	0.85 (0.34)	-	-	-	-	-	-	-	-	-	0.85 (0.34)
I-Inside CBCA-RCA	0.03 (0.01)	-	-	0.87 (0.35)	-	-	-	-	-	-	-	-	0.03 (0.01)	0.87 (0.35)
II- Total	**1.52 (0.68)**	**0.75 (0.30)**	**2.63 (1.06)**	**6.79 (2.75)**	-	-	-	-	-	-	-	-	**4.90 (1.98)**	**6.79 (2.75)**
II-Outside CBCA	0.94 (0.38)	0.75 (0.30)	2.49 (1.01)	5.87 (2.38)	-	-	-	-	-	-	-	-	4.18 (1.69)	5.87 (2.38)
II-Inside CBCA-RCA	0.58 (0.24)	-	0.14 (0.06)	0.92 (0.37)	-	-	-	-	-	-	-	-	0.72 (0.29)	0.92 (0.37)
III-Total	No Impacts to Wetland Assessment Area III													
IV-Total	**4.97 (2.01)**	-	-	**15.84 (6.41)**	-	-	-	-	-	-	-	-	**4.97 (2.01)**	**15.84 (6.41)**
V-Total	No Impacts to Wetland Assessment Area V													
VI-Total	No Impacts to Wetland Assessment Area VI													
VII-Total	**0.72 (0.30)**	-	-	**3.41 (1.38)**	-	-	-	-	-	-	-	-	**0.72 (0.30)**	**3.41 (1.38)**
VIII-Total	No Impacts to Wetland Assessment Area VIII													
IX-Total	**0.64 (0.26)**	**0.46 (0.19)**	-	**2.56 (1.04)**	-	-	-	-	-	-	-	-	**1.10 (0.45)**	**2.56 (1.04)**
Total	7.88 (3.19)	1.21 (0.47)	2.63 (1.06)	30.69 (12.42)	-	-	-	-	-	-	-	-	11.72 (4.74)	30.69 (12.42)

Notes:

PFO: Palustrine Forested

PEM: Palustrine Emergent

CBCA: Chesapeake Bay Critical Area

IDA: Intensively Developed Area

RCA: Resource Conservation Area

Figure 4.3-1— CCNPP Vegetation Impacts July 2008

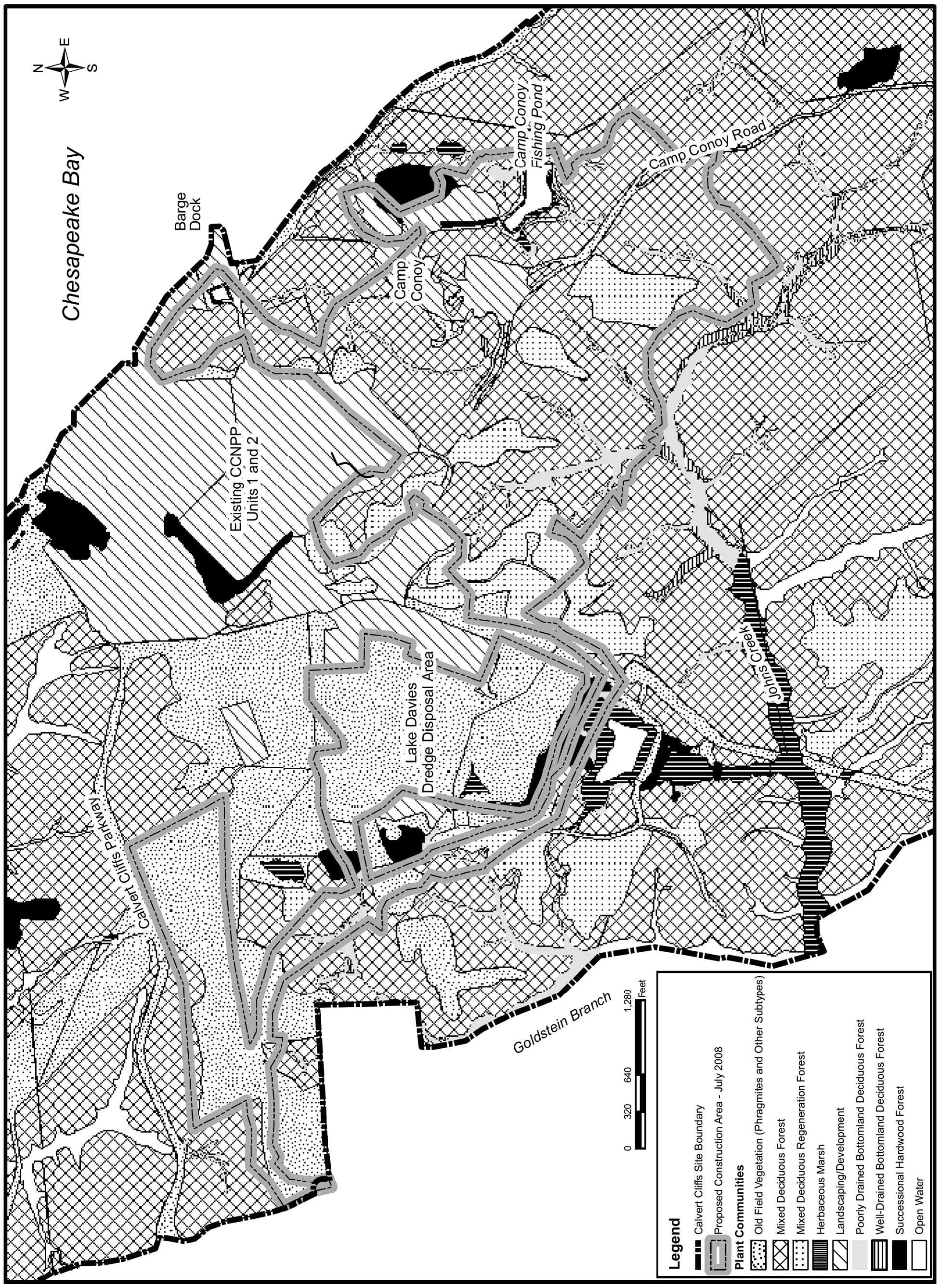
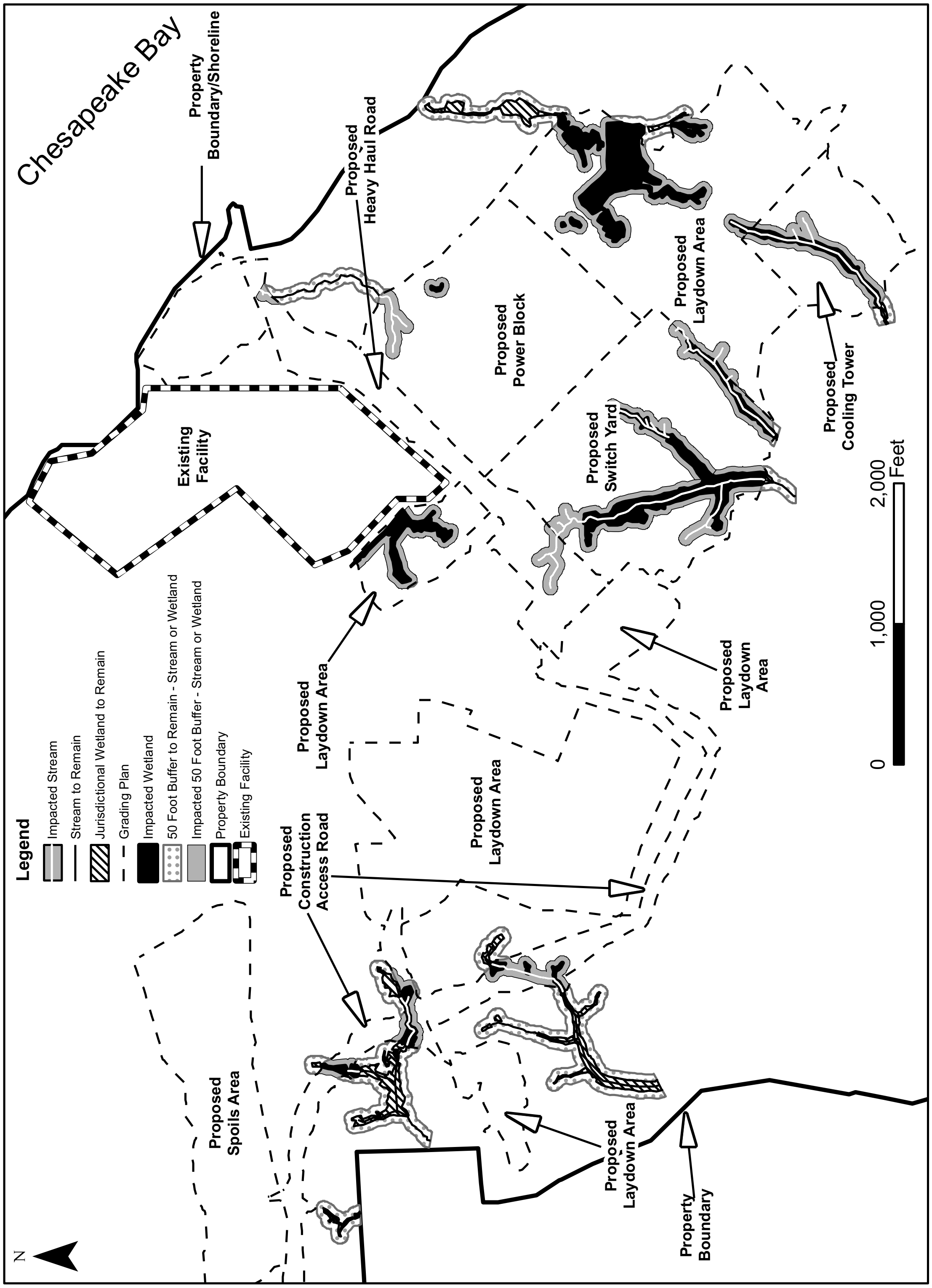


Figure 4.3-2— CCNPP Unit 3 Wetland Impacts



4.4 SOCIOECONOMIC IMPACTS

4.4.1 Physical Impacts

Construction activities at the CCNPP site will cause temporary and generally localized physical impacts such as increased noise, vehicle exhaust, and dust. This section addresses these potential impacts as they might affect people (the local public and workers), buildings, transportation routes, and the aesthetics of areas located near the plant site.

A description of the CCNPP site, location and surrounding community characteristics is provided in Sections 2.1, 2.2, and 2.5. Chapter 3 describes the proposed facility including its external appearance.

As discussed below, the potential for direct physical impacts to the surrounding communities from plant construction is expected to be SMALL.

4.4.1.1 The Public and Workers

People who work at or live near the CCNPP site will be subject to physical impacts resulting from construction activities. Onsite construction workers will be impacted the most, with workers at the existing adjacent operating units subject to slightly reduced, similar impacts. People living or working adjacent to the site will be impacted significantly less due to site access controls and distance from the construction site where most activities will occur. Transient populations and recreational visitors will be impacted the least for similar reasons and the limited exposure to any impacts of construction.

4.4.1.2 Noise

Section 2.7 provides information and data related to the background noise levels that exist at the construction site.

Noise levels in the site area will increase during construction primarily due to the operation of vehicles; earth moving, materials-handling, and impact equipment; and other tools.

Typical noise levels from equipment that is likely to be used during construction are provided in Table 4.4-1 (Beranek, 1971). Onsite noise levels that workers will be exposed to are controlled through appropriate training, personnel protective equipment, periodic health and safety monitoring, and industry good practices. Good practices such as maintenance of noise limiting devices on vehicles and equipment, and controlling access to high noise areas, duration of emission, or shielding high noise sources near their origin will limit the adverse effects of noise on workers. Non-routine activities with potential to adversely impact noise levels such as blasting will be conducted during weekday business hours and utilize good industry practices that further limit adverse effects.

The exposure of the public to adverse effects of noise from construction activities will be reduced at the source by many of the same measures described above and the additional distance, interposing terrain, and vegetation which provide noise attenuation. The noise levels at the nearest residential and other surrounding property boundary areas will be controlled to remain at or below state limits. Pile driving will occur during some construction activities. State regulations define those periods during which these activities may occur to minimize the impact of the associated noise (COMAR, 2007). The state regulations also set standards that limit the intensity of vibration that may be transmitted beyond the construction site property boundaries and that will be complied with during construction.

Traffic noise in the local area will increase as additional workers commute, and materials and waste are transported to and from the construction site. Noise impacts will occur primarily during shift changes and will not be extraordinary given the source and nature of vehicle noise and the normally varying nature of transient vehicle noise levels. Additionally, localized impacts will be reduced as distance from the construction site increases and traffic diverges outward.

In summary, good noise control practices on the construction site, and the additional attenuation provided by the distance between the public and the site, will limit noise effects to the public and workers during construction so that its impact will be small and temporary. Construction noise generation is directly linked with the conduct of construction activities which will be end as the facility enters operation.

4.4.1.3 Dust and Other Air Emissions

Construction activities will result in increased air emissions. Fugitive dust and fine particulate matter will be generated during earth moving and material handling activities. Vehicles and engine-driven equipment (e.g., generators and compressors) will generate combustion product emissions such as carbon monoxide, oxides of nitrogen, and to a lesser extent, sulfur dioxides. Painting, coating and similar operations will also generate emissions from the use of volatile organic compounds (VOCs).

To limit and mitigate releases, emission-specific strategies, plans and measures will be developed and implemented to ensure compliance within the applicable regulatory limits defined by the primary and secondary National Ambient Air Quality Standards in 40 CFR 50 (CFR, 2007c) and the National Emission Standards for Hazardous Air Pollutants in 40 CFR 61 (CFR, 2007d). Air quality and release permits and operating certificates will be secured where required.

For example, a dust control program will be incorporated into the Storm Water Pollution Prevention Plan. A routine vehicle and equipment inspection and maintenance program will be established to minimize air pollution emissions. Emissions will be monitored in locations where air emissions could exceed limits (e.g. the concrete batch plant).

The State of Maryland, Department of Labor, Licensing and Regulation, implements occupational health and safety regulations that set limits to protect workers from adverse conditions including air emissions. If localized emissions result in limits being exceeded, corrective and protective measures will be implemented to reduce emissions (or otherwise protect workers in some cases) in accordance with the applicable regulations.

Implementation of controls and limits at the source of emissions on the construction site will result in reduction of impacts offsite. For example, the dust control program will limit dust due to construction activities to the extent that it is not expected to reach site boundaries.

Transportation and other offsite activities will result in emissions due largely to use of vehicles. Activities will generally be conducted on improved surfaces and any related fugitive dust emissions will be minimized. As with noise, impacts will be reduced as distance from the site increases.

In summary, air emission impacts from construction are expected to be SMALL because emissions will be controlled at the sources where practicable, maintained within established regulatory limits that were designed to minimize impacts, and distance between the

construction site and the public will limit offsite exposures. Construction air emissions impacts are temporary because they will only occur during the actual use of the specific construction equipment or conduct of specific construction activities, and surfaces will be stabilized upon completion of construction activities.

4.4.1.4 Buildings

The primary buildings in the immediate area with potential for impact from construction are those associated with CCNPP Units 1 and 2. Some peripheral onsite buildings will be removed during construction. Related information about historic properties and the impacts of construction on them is provided in Sections 2.5.3 and 4.1.3.

Many existing onsite buildings related to safety of the existing facility were constructed to meet seismic qualification criteria which make them resistant to the effects of vibration and shock similar to that which could occur during construction. Other onsite facilities were constructed to the appropriate building codes and standards which include consideration of seismic loads. Regardless of the applicable design standard, construction activities will be planned, reviewed, and conducted in a manner that ensures no adverse effect on the operating nuclear units and that buildings are adequately protected from adverse impact.

Construction activities are not expected to affect offsite buildings due to their distance from the construction site. For example, the nearest residence is located approximately 3,000 ft (900 m) from the construction site footprint. As described above in 4.4.1.1, offsite vibrations are limited by state regulations and compliance with those regulations will further prevent mechanical interaction with offsite facilities.

The impact of construction activities on nearby buildings will be SMALL and temporary because of the design of onsite building and the administrative programs that will ensure no adverse interaction with the operating units, while offsite buildings are located at greater distances that isolate them from potential interaction.

4.4.1.5 Transportation Routes

The major transportation routes in the area are described in Section 2.5.1.

Traffic will increase substantially on Maryland State Route (MD) 2/4 during peak construction periods and will be at its highest during shift changes. Construction workers will use the public highways in the area around the site to commute to work. Additionally, public roadways will be used to transport most construction materials and equipment to the site. Impact on area transportation resources will generally decrease with increased distance from the site as varied routes are taken by individual vehicles.

As a result of the expected increase in traffic around the site, a Traffic Impact Analysis (TIA) of the area during construction and operation of the additional unit planned at the CCNPP (KLD, 2007) was conducted. The TIA study area was based on input from the state of Maryland and Calvert County. The area extended 4 miles (6.4 km) from the site access road in the north and south direction (Figure 4.4-1) and included the following intersections along Maryland State Route 2/4:

- Calvert Beach Road (intersection with signal control)
- Calvert Cliffs Parkway (intersection with signal control)
- Pardoe Road (intersection without signal control)

- Cove Point Road (intersection without signal control)

The TIA based its conclusions on the ability of the Maryland State Route 2/4 roadway network to accommodate projected construction traffic volumes generated utilizing techniques to measure capacity in the form of Critical Lane Volume (CLV) at intersections with signals (e.g., stop lights) and level of service (LOS) at intersections without signals (e.g., use of signage only such as stop or yield signs). Any signal-controlled intersection with a CLV of 1450 vehicles/ hour (vph) or less was considered acceptable, based on the state and county guidelines. LOS, on the other hand, is an ordinal scale that is defined from A to F, with "A" being the best level of service. Typically, the LOS is determined for the peak hour during the identified periods as it represents "worst case" conditions. A LOS with scale of "E" or better (delays of less than 50 seconds) at an intersection without signal control was considered acceptable.

As expected, the major concern identified in the TIA was the traffic related to the construction staff and the daily peak travel period and patterns in and around the start and end of the day shift. Since there are no major highway development or improvement projects planned within the area to influence the capacity of the roadway system (KLD, 2007), a new site access road connecting directly to Maryland State Route 2/4 at Nursery Road south of the plant will be built to reduce traffic impacts related to construction activities.

Nonetheless, the TIA concluded that the existing roadway system has insufficient capacity to handle this peak demand. Refer to Table 4.4-2. The intersections of Calvert Beach Road and Nursery Road are the most affected during the morning and afternoon peak traffic hour. The critical element in the increased traffic levels is the construction crew and not traffic delivering materials arriving to the site.

As a result, additional mitigation during the construction period is needed. For example, the TIA noted that the anticipated area future growth rate of 2.5% per year will require that signals be placed at Pardoe Road and Cove Point Road, the two intersections along Maryland State Route 2/4 without signals. Additionally, a Phase 2 TIA will be performed to determine the mitigation necessary to achieve the target value CLV of 1450 vph at intersections with signals. Examples of the type of mitigation that will be considered include both physical improvements such as traffic control signals, turning and merging lanes. Additionally, management measures, such as staggered shift changes and increasing average vehicle capacity will be considered. Thus, the potential impacts to the surrounding communities from construction traffic, although expected to be moderate, will be temporary and manageable.

Large components / equipment will be transported by barge to the site and delivered to the existing site barge unloading facility. The barge unloading facility will be refurbished and upgraded to meet the equipment delivery needs as well as to comply applicable regulatory requirements. The refurbishment will include new sheet pile, widening of the slip to receive large barge shipments, upgrading the existing onsite, heavy-haul road, and extending it to the construction area. Neither the unloading facility refurbishment nor the heavy-haul road extension is expected to have an impact to the public as each activity is confined to an access-restricted area.

4.4.1.6 Aesthetics

Construction activities generally will not be visible from points outside the CCNPP site boundary due to the heavily wooded area surrounding the site. Section 3.1 provides a detailed description of the site and figures that illustrate the appearance of the facility after completion. Construction activities will be visible on those portions of the facility visible in the

illustrations, for example construction equipment such as cranes will be visible during use. Federal regulations require that any temporary or permanent structure, including all appurtenances, that exceeds an overall height of 200 ft (61 m) above ground level be appropriately marked with FAA lighting requirements, additionally temporary cranes will be used to construct structures that are likely to require lighting during their use.

Recreational users of Chesapeake Bay to the north and east will generally be unable to view the construction site due to its elevation above the water and setback distance from the shoreline. Portions of the construction may be visible from certain locations on the Bay (see Section 3.1), including elevated activities and those conducted along the shoreline such as the barge unloading facility, and installation of intake and discharge equipment. Construction of the heavy haul road, related heavy equipment staging area, and new water intake structure requires removal of a portion of the hill area near CCNPP Units 1 and 2 causing those facilities to be exposed to a wider field of view from the Chesapeake Bay. Construction of the intake structure and pump house and associated discharge piping at the shoreline for the CCNPP Unit 3 should have minimal visual impact considering their proposed location between the CCNPP Units 1 and 2 intake structure and barge slip facility, respectively. No other visual impacts will be visible from nearby ground level vantage points.

The existing transmission line corridor will be used to provide power to the grid. No new transmission line towers are needed offsite.

Water turbidity may be present during construction and dredging activities. Measures to control water turbidity or other related activity impacts include implementation of the Storm Water Pollution Prevention Plan (SWPPP), transportation of excavated and dredged material to an onsite spoils area, and compliance with the required federal and state regulations and permit conditions (see Section 1.3).

Aesthetic impacts are expected to be small and temporary because the CCNPP Unit 3 site is set back from, and only limited portions of the construction will be visible from, publicly accessible areas. Most construction activities will be shielded from public view and construction activities are by nature temporary.

4.4.1.7 References

Beranek, 1971. Noise and Vibration Control, Leo L. Beranek, ed., 1971.

CFR, 2007a. Title 29, Code of Federal Regulations, Part 1910.95, Occupational Noise Exposure, 2007.

CFR, 2007b. Title 29, Code of Federal Regulations, Part 1926.52, Occupational Noise Exposure, 2007.

CFR, 2007c. Title 40, Code of Federal Regulations, Part 50, National Primary and Secondary Ambient Air Quality Standards, 2007.

CFR, 2007d. Title 40, Code of Federal Regulations, Part 60, Standards for Performance for New Stationary Sources, 2007.

COMAR, 2007. Code of Maryland Regulations, COMAR 26.02.03, Control of Noise Pollution, 2007.

KLD, 2007. KLD Associates, Inc., Traffic Impact Study at the Calvert Cliffs Nuclear Power Plant – Phase 1, TR-405, May 30, 2007.

4.4.2 Social and Economic Impacts

This analysis presents information about the potential impacts to key social and economic characteristics that could arise from the construction of the power plant at the CCNPP site. The analysis was conducted for the 50 mi (80 km) comparative geographic area and for the region of influence (ROI, Calvert County and St. Mary's County, Maryland), where appropriate and as described in Section 2.5.2. The discussion focuses on potential impacts to population settlement patterns, housing, employment and income, tax revenue generation, and public services and facilities.

4.4.2.1 Study Methods

Changes in regional employment can result in impacts to the region's social and economic systems. An estimate of direct full-time equivalent (FTE) personnel that would be needed to construct the new unit was determined and is provided in Table 4.4-3. "Direct" jobs are those new construction employment positions that would be located on the CCNPP site. "Indirect jobs" are positions created off of the CCNPP site as a result of the purchases of construction materials and equipment, and the new direct workers' spending patterns in the ROI. Examples of indirect jobs that could be generated include carpenters and other construction jobs, barbers, restaurant personnel, gas station and auto repairs jobs, convenience store cashiers, drying cleaning and laundry jobs, and so forth.

To estimate indirect employment that would be generated by construction of the power plant, a regional multiplier was generated by the RIMS II software provided by the Regional Economic Analysis Division of the U. S. Bureau of Economic Analysis (BEA, 1997). This model, based upon the construction industry in the ROI, generated a multiplier of 0.6855 indirect jobs created for each direct job. This multiplier was then applied to the estimated peak number of new direct FTE workers to estimate the peak number of indirect jobs that will be created in the ROI.

This analysis evaluates two potential in-migration impact scenarios for the construction workforce, an assumed 20% of the peak construction workforce moving into the ROI with their families for the duration of construction and a second scenario with 35% moving into the ROI. These scenarios were selected because they are representative of the range of in-migration levels that the NRC found in studies they conducted in 1981 of nuclear power plant construction workforces. The NRC (NRC, 1981b) conducted a study of 28 surveys of construction workforce characteristics for 13 nuclear power plants. They found that 17% to 34% of the total construction workforces at most of these nuclear power plants (the 75th percentile) had moved their families into the study areas for each power plant.

They then conducted a more detailed analysis of in-migrants and found that the most common in-migration levels (again for the 75th percentile) for the construction/labor portion of the workforce ranged from 11% to 29%. Additionally, an analysis of the craft labor portion of the workforce showed that pipefitters, electricians, iron workers, boilermakers, and operating engineers were most likely non-managerial staff to in-migrate into an area, and general laborers, carpenters, and other types of construction workers were the least likely to in-migrate (NRC, 1981b).

For managerial and clerical staff the in-migration levels ranged from 40% to 58%. Of the managerial staff alone (i.e., excluding clerical staff), most sites had in-migration rates of 58% to 76% (NRC, 1981b).

The potential demographic, housing, and public services and facilities impacts are only discussed for the two-county region of influence because those impacts are an integral part of and derive from the impacts of the in-migrating construction workforce. Impacts to employment and tax revenues are discussed for the 50 mi (80 km) comparative geographic area and the ROI because of the construction labor pool that would be drawn from and the collection and distribution of income and sales tax revenues throughout the state.

4.4.2.2 Construction Labor Force Needs, Composition and Estimates

4.4.2.2.1 Labor Force Availability and Potential Composition

There will be an estimated maximum 3,950 FTE person workforce constructing the CCNPP Unit 3 power plant between 2011 and 2015, representing a significant increase in the overall employment opportunities for construction workers. In comparison, Calvert County had 2,231 construction jobs in 2006 and St. Mary's County had 1,716 construction jobs (MDDLLR, 2007). As shown in Table 4.4-3, this peak is estimated to last for about 12 months, from about the third quarter of the fourth year of construction through about the second quarter of the fifth year. Over the course of the entire construction period, staffing needs are estimated to increase relatively steadily from the third quarter of the first year until the peak is reached. Once the peak has passed, the staff levels again will drop steadily, until the last 5 months of construction when employment levels will drop significantly.

Relatively recent studies have shown that the availability of qualified workers to construct the power plant might be an issue, particularly if several nuclear power plants are built concurrently nationwide. Competition for this labor could increase the size of the geographic area, beyond the middle eastern seaboard, from which the direct construction labor force would have to be drawn for CCNPP Unit 3. In its study of the construction labor pool for nuclear power plants, the U.S. Department of Energy (DOE, 2004) stated that, "A shortage of qualified labor appears to be a looming problem…The availability of labor for new nuclear power plant construction in the U.S. is a significant concern."

These workforce restrictions are most likely to occur with "managers, who tend to be older and close to retirement, and skilled workers in high-demand, high-tech jobs." The DOE (2005) anticipates that qualified boilermakers, pipefitters, electricians, and ironworkers might be in short supply in some local labor markets. Labor force restrictions can be exacerbated by the fact that portions of the labor force might have to have special certifications for the type of work that they are doing, and because they might have to pass NRC background checks. (DOE, 2004) DOE also found that, "recruiting for some nuclear specialists (e.g., health physicists, radiation protection technicians, nuclear QA engineers/technicians, welders with nuclear certification, etc.) may be more difficult due to the limited number of qualified people within these fields" (DOE, 2004b). However, meeting these needs can be accomplished by hiring traveling crafts workers from other jurisdictions or regions of the country, which is a typical practice in the construction industry.

Estimates about the composition of the CCNPP Unit 3 construction workforce (i.e., types of personnel needed) have not been developed for the power plant. However, existing studies of other nuclear power plant construction sites provide an indication about the potential composition of the CCNPP Unit 3 construction workforce. As shown in Table 4.4-4 (DOE, 2005), during the peak construction period an estimated 67% (2,635) of the construction workforce

could be craft labor. Other less prevalent construction personnel could include about 8% (330) of UniStar's operation and maintenance staff, 7% (265) site indirect labor, and 6% (230) Nuclear Steam Supply System vendor and subcontractor personnel.

In more specifically reviewing only the potential craft labor force component of the entire construction workforce (see Table 4.4-5, DOE, 2005), the greatest levels of employment during the peak of construction could be about 18% (475) electricians and instrument fitters, 18% (475) iron workers, 17% (450) pipefitters, 10% (265) carpenters, and 10% (265) of general laborers. Table 4.4-6 shows the percentage of each of these craft labor categories that would be needed during seven phases of construction. Carpenters, general laborers, and iron workers would comprise the greatest proportions of the workforce during the concrete formwork, rebar installation, and concrete pouring phase of construction. Iron workers would continue to be the greatest portion of the workforce during the installation of structural steel and miscellaneous iron work. General laborers and operating engineers would be most needed during the earthwork and clearing of the site, including excavation and backfilling. The installation of mechanical equipment would primarily require pipefitters and millwrights. Pipefitters would also be the primary craft labor category working during installation of piping. Electricians would be the most prevalent during installation of the power plant instrumentation and the electrical systems (GIF, 2005).

4.4.2.3 Demography

As stated above, it is estimated that a peak of 3,950 FTE employees would be required to construct CCNPP Unit 3. As shown in Table 4.4-8A, the total maximum potential number of workers on site at any one time is approximately 5,783 personnel. This total represents the sum of the CCNPP Unit 3 construction workforce. Units 1 and 2 operations staff (833), and CCNPP Units 1 or 2 outage personnel (1,000), assuming only one unit is in outage at a time. The total influx of workers to the area would include approximately 562 indirect workers assuming a 35% emigration of construction workers to Calvert and St. Mary's Counties.

The number of workers potentially entering and leaving the site on a daily basis would be mitigated by shift rotation of the operations, outage and construction staff. In addition, the construction workforce is expected to ramp up gradually to its peak and then diminish as construction nears completion.

The number of construction and indirect workers potentially residing in the ROI is shown in 4.4-7 and 4.4-8. Under the 20% in-migration scenario an estimated peak of 720 construction workers would migrate into the ROI along with about 1,160 family members, for a total of 1,880. Of these, the total estimated direct in-migration would be about 1,400 people (68%) into Calvert County and 475 people (23%) into St. Mary's County. Under the 35% in-migration scenario an estimated peak of 1,260 direct workers would migrate into the ROI along with about 2,025 family members, for a total of 3,285 people. Of these, the total estimated peak in-migration would be about 2,455 people (68%) into Calvert County and 830 people (23%) into St. Mary's County.

In addition, it is estimated that a maximum of 493 indirect jobs would be created within the ROI under the 20% scenario and 860 indirect workforce jobs would be created under the 35% scenario (multiplying 3,595 ROI peak direct workers by the BEA indirect employment/economic multiplier of 0.6855 (BEA, 1997)). Under both scenarios, all of these indirect jobs located within the ROI could be filled by the spouses of the direct workforce, because the number of in-migrating family members would exceed the number of indirect jobs created by the in-migrating direct workforce.

An in-migration of up to 1,880 people into the ROI under the 20% scenario or up to 3,285 people under the 35% scenario would only represent a 1.2% to 2.0% increase in the total ROI population of 160,774 people. Because these percentage changes are small, it is concluded that the impacts to population levels in the ROI would be small, and would not require mitigation.

Figure 4.4-2, shows the overlapping 50 mile (80 km) zones for four nuclear power plant sites surrounding the CCNPP site. The other power plants include Salem Units 1 & 2 and Hope Creek Unit 1 to the northeast, Peach Bottom Units 2 and 3 to the north, North Anna Units 1 and 2 to the southwest, and Surry Units 1 and 2 to the south/southwest. As can be seen in the figure, the CCNPP site's 50 mi (80 km) radius overlaps slightly with the 50 mi (80 km) zones of each of these facilities. The cumulative effect of a portion of the construction workforce originating from within 50 mi (80 km) of Calvert Cliffs and potentially drawing employees from these other four power plants, or significantly adding to the total employment levels for these types of facilities in these areas, would be SMALL because of the distances and intervening political and geographical features, and would not require mitigation.

4.4.2.4 Housing

The in-migrating construction workforce would likely either rent or purchase existing homes, or would rent apartments and townhouses. Non-migrating (i.e., weekly or monthly) workers would likely stay in area hotels, motels, bed and breakfasts (B&Bs), or at area campgrounds and recreational vehicle (RV) parks. Of the estimated 720 households migrating into the ROI to construct CCNPP Unit 3 under the 20% scenario and the 1,260 households in the 35% scenario, it is estimated that 535 to 940 households (75 percent) would reside in Calvert County and 180 to 320 (25 percent) would reside in St. Mary's County. This would represent a maximum of 12.9% to 22.6% of the 5,568 total housing units vacant in the ROI in 2000 (see Section 2.5.2). Thus, the ROI and each county within it have enough housing units available to meet the needs of the workforce, based upon 2000 housing information.

However, since 2000, discussions with the Calvert County Department of Economic Development indicated that the housing market in Calvert County might be tight. Despite this indication, as shown in Section 2.5.2 the county issued a low of 488 authorizations for construction of single family and multifamily units in 2005 to a high of 928 permits in 2002 (MDDP, 2006). Unlike Calvert County, discussions with the St. Mary's County Government indicated that the housing market might still remain open in St. Mary's County (see Section 2.5.2 for more details). Thus, the housing market is not likely to be quite as open as indicated by the 2000 data, but there still appears to be adequate housing available based upon the fact that less than 25% of the 2000 levels of vacant units would be used.

Also, the Calvert County Department of Economic development has indicated that because housing prices have increased significantly in Calvert County over the past few years, particularly in the northern part of the county, some of the units that might be available for purchase or rent in that location might be outside of the construction workers' budget. This might result in a greater percentage of the in-migrating construction workforce seeking housing in St. Mary's County than is estimated in these projections.

In addition to the above housing units, there are a total of 33 apartments and townhouse complexes providing one to three bedroom rental units in the ROI. Most of these facilities are located in St. Mary's County, including 28 apartment and townhouse complexes. These rental complexes could be used to house part of the in-migrating workforce and might be a viable option to purchasing more costly single-family homes. In addition, the St. Mary's County

Government has indicated that some apartment units currently used by a major employer in the county to house staff in training, might become available in the future because of potential relocation of training activities to areas outside of Maryland. These units could provide an additional housing option for the in-migrating construction workforce.

Weekly or monthly commuters might elect to stay at one of the 28 hotels/motels/B&Bs facilities, providing about 1,950 rooms for rent, in the ROI. Most of the 28 hotels/motels/B&Bs facilities are located in St. Mary's County, with 16 hotel/motel facilities having 737 rooms. Because the hotels and motels are operating at or near capacity during the summer vacation season, from about April through August (see Section 2.5.2), the portions of the workforce that might want to stay on a weekly or monthly basis and then commute home might compete with existing users. During the remainder of the year, enough units would likely be available to meet the needs of the weekly or monthly commuters.

Because significantly more housing units are available than would be needed, the in-migrating workforce alone should not result in an increase in the demand for housing, or in increases in housing prices or rental rates. Also, construction is not scheduled to begin until 2011, providing adequate time for private developers to construct additional new homes and apartment complexes if the economy in the ROI expands, in general, and demand warrants it. In addition, for about seven months out of the year there are noticeable quantities of vacant motel and hotel units that could be used by weekly and monthly commuters. Thus, because of the available housing, it is concluded that the impacts to area housing would be SMALL, and would not require mitigation.

4.4.2.5 Employment and Income

4.4.2.5.1 50 mi (80 km) Comparative Geographic Area

As stated above, it is estimated that a peak of 3,950 direct construction employees would build CCNPP Unit 3. Under the 20% peak in-migration scenario described above, it is implicit that the remaining 80% (3,160) either would be commuting from a reasonable distance on a daily basis or would stay at area hotels/motels and would be weekly/monthly commuters to the job site. Under the 35% in-migration scenario, an estimated 65% (2,570) of the peak direct construction workers would be daily or weekly/monthly commuters. The greatest proportion of these workers would likely commute from within or near the Washington DC; Alexandria, Virginia; Annapolis, Maryland; and the Baltimore, Maryland, metropolitan areas. However, a portion of these workers also would likely originate from outside of this 50 mi (80 km) radius, from throughout the middle eastern seaboard and the remainder of the U.S. The greater the distance that they would commute and the longer that they are employed on the construction site, the more likely they would be to commute from home on a weekly or monthly basis and stay in area motels, or to become in-migrants into the ROI, as described in the housing section above. Because the employment opportunities and income would be spread over the 50 mi (80 km) radius, and an even larger geographic area and basis of comparison outside of the region, the beneficial impacts would be SMALL and would not require mitigation.

4.4.2.5.2 Two-County Region of Influence

Direct construction workforce employment is already discussed in the demography section above. In addition to the 3,950 direct workforce, a peak of 495 indirect workforce jobs would be created in the ROI under the 20% scenario and 860 indirect jobs would be created under the 35% scenario (see Tables 4.4-7 and 4.4-8). This would result in a peak increase of 1,212 to 2,120 employed people in the ROI, depending upon the scenario selected. The peak increase in employment would range from 905 to 1,585 people in Calvert County and 310 to 535 people in St. Mary's County. Unemployed or underemployed members of the labor force could benefit from these increased employment opportunities, to the extent that they have the craft skills required (e.g., laborers, carpenters, electricians, plumbers, welders) and are hired as part of the construction workforce. These increases would result in a noticeable but small impact to the area economy, representing a maximum 4.0% increase in the 39,341 total labor force in Calvert County in 2000 and 1.2% in the 46,032 total labor force in St. Mary's County (USCB, 2000).

It is estimated that the direct construction workforce will receive average salaries of $34.00/hour/worker (two-thirds of the estimated $50 per hour, including benefits), or about $70,720 annually. This would result in an annual salary expenditure, for the peak construction workforce of 3,950 people, of $279.3 million. The average annual salary for the direct workforce would be moderately less than the $84,388 median income for an entire household in Calvert County in 2005, but larger than $62,939 median household income in St. Mary's County. Based upon the peak 35% scenario in-migration levels, Calvert County would experience an estimated $66.5 million increase in annual income during peak construction and St. Mary's County would receive an estimated $22.5 million annually. In addition, the working spouses of the direct construction workers, who filled indirect jobs created by the power plant, would contribute substantially to individual household incomes. The additional direct and indirect workforce income would result in additional expenditures and economic activity in the ROI. However, it would represent a small percentage of overall total income and economic activity in the ROI. It is concluded that the beneficial impacts to employment and income would be SMALL, relative to the overall labor force and ROI-wide income, and would not require mitigation.

4.4.2.6 Tax Revenue Generation

4.4.2.6.1 50 mi (80 km) Comparative Geographic Area

State income taxes would be generated by the in-migrating residents, although the amount cannot be estimated because of the variability of investment income, retirement contributions, tax deductions taken, applicable tax brackets, and other factors. It is estimated that the 50 mi (80 km) radius and the state, excluding the two-county ROI, would experience a $223.5 million increase in annual wages from the direct workforce under the 20% scenario (i.e., 80% of the construction workforce in the 50 mi (80 km) area) and $181.6 million under the 35% scenario (i.e., 65% of the construction workforce in the 50 mi (80 km) area). Relative to the existing total wages for the region and the 50 mi (80 km) radius, it is concluded that the potential increase in state income taxes represent a small economic benefit.

Additional sales taxes also would be generated by the power plant and the in-migrating residents. CalvertCliffs 3 Nuclear Project and UniStar Nuclear Operating Services would directly purchase materials, equipment, and outside services, which would generate additional state sales taxes. Also, in-migrating residents would generate additional sales tax revenues form their daily purchases. The amount of increased sales tax revenues generated by the

in-migrating residents would depend upon their retail purchasing patterns, but would only represent a small benefit to this revenue stream for the region and the 50 mi (80 km) radius.

Overall, although all tax revenues generated by the CCNPP Unit 3 and the related workforce would be substantial in absolute dollars, as described above, they would be relatively small compared to the overall tax base in the region and the state of Maryland. Thus, it is concluded that the overall beneficial impacts to state tax revenues would be SMALL.

4.4.2.6.2 Two-County Region of Influence

In 2006, Constellation Energy paid about $15.8 million in Calvert County property taxes (including $10.3 million in personal property and $5.5 million in operating real property taxes) for Units 1 and 2, and in 2007 it paid about $16.2 million in property taxes (including $10.6 million in personal property and $5.6 million in operating real property taxes). As a basis for comparison, these payments may be considered to be representative for CCNPP Unit 3.

The total project capital cost estimated for CCNPP Unit 3 is [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] million. Investments in planning, engineering, and an assumed limited work authorization from 2008 through 2010 would result in UniStar paying increased county total property taxes, from about [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] million in 2009, to [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] in 2010. Even more substantial increases in total property tax payments would occur in subsequent years once major construction activities commence, including [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] million in 2011, [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] million in 2012, [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] million in 2013, [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] million in 2014, and [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] million in 2015. The maximum of [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] million would represent a significant [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] percent increase in Calvert County's $78.8 million in annual property (real and personal) tax revenues for fiscal year 2005, and a [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] percent increase in total county revenues of [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] million (see Section 2.5.2).

These increased property tax revenues would either provide additional revenues for existing public facility and service needs or for new needs generated by the power plant and associated workforce. The increased revenues could also help to maintain or reduce future taxes paid by existing non-project related businesses and residents, to the extent that project-related payments provide tax revenues that exceed the public facility and service needs created by CCNPP Unit 3. However, the payment of those taxes often lags behind the actual impacts to public facilities and services, or the time needed to plan for and provide the additional facilities or services. Thus, it is concluded that these increased power plant property tax revenues would be a LARGE economic benefit to Calvert County.

Additional county income taxes would be generated by the in-migrating residents, although the amount cannot be estimated because of the variability of investment income, retirement contributions, tax deductions taken, applicable tax brackets, and other factors. It is estimated that Calvert County would experience a $66.5 million increase in annual wages from the direct

workforce. St. Mary's County would experience an estimated annual increase of $22.5 million from the direct workforce. Relative to the existing total wages for the ROI, it is concluded that the potential increase in county income taxes represent a small economic benefit to the jurisdictions.

As with the 50 mi (80 km) comparative geographic area, additional sales taxes also would be generated within the ROI by the power plant and the in-migrating residents. However, these purchases would be much smaller within the ROI. The amount of increased sales tax revenues generated by the in-migrating residents would depend upon their retail purchasing patterns, but would only represent a small benefit to this revenue stream for Calvert and St. Mary's Counties.

Overall, although all tax revenues generated by the CCNPP Unit 3 and the related workforce would be substantial, as described above, they would be relatively small compared to the overall tax base in the ROI. Thus, it is concluded that the overall beneficial impacts to tax revenues would be SMALL.

4.4.2.7 Land Values

The Maryland Department of Natural Resources evaluated three industrial facilities to determine how their presence might affect area property values. The three industrial facilities included CCNPP Units 1 and 2, the Alcoa Eastalco Works in Frederick County, and the Dickerson Generating Plant in Montgomery County. The study showed that residential property values were not adversely affected by their proximity to the CCNPP site. Overall, Maryland power plants have not been observed to have negative impacts on surrounding property values. This

lack of impact is partially attributed to impact mitigation fees imposed in Maryland Power Plant Research Program (PPRP) conditions stipulated in Certificates of Public Convenience and Necessity (CPCNs). It is concluded that the impacts to land values would be SMALL, and would not require mitigation.

4.4.2.8 Public Services

Although an increase in population levels from the CCNPP operational workforces would likely place additional demands on area doctors and hospitals, as indicated in Section 2.5.2 discussions with Calvert Memorial Hospital have indicated that these services have enough capacity to accommodate the increased demand and impacts would likely be small. However, the increased population levels could place some additional daily demands on constrained police services, fire suppression and EMS services, and schools. Impacts to these services are provided below.

<u>Police</u>

The Calvert County Sheriffs Department previously has expressed concern about whether they have sufficient staff levels to simultaneously respond to a potential emergency and offsite evacuation in the event of an emergency. The department has identified ongoing current needs for additional funding, staff, facilities, and equipment. However, the department does not feel that construction of CCNPP Unit 3 and the potential additional in-migrating construction workforce, daily commuters, and weekly/monthly commuters would not create additional needs beyond the existing ones.

Similarly, representatives from St. Mary's County Government have stated that the Sheriff's Department currently has the typical ongoing need for additional staff. They felt that the peak

in-migrating workforce and their families into the county would minimally increase their needs from their current levels, but not enough to warrant taking action.

EMS and Fire Suppression Services

The Calvert County and St. Mary's County have large volunteer fire departments that appear to be doing an excellent job of meeting the needs of their residents. The Calvert County Public Safety office has indicated that they have ongoing needs for some staff, renovation or construction of facilities for three departments, new vehicles, and new equipment. However, representatives of both departments felt that construction of the power plant generally would not create additional needs beyond those that already exist. Calvert County did state that the Emergency Management office staff would be affected by having to conduct emergency planning activities for the new power plant.

The incremental number of emergency calls due to in-migrating direct and indirect workers can be estimated by comparing the existing inventory of calls to the relative percentage increase in population that may occur. Table 2.5-3 provides the 2010 population estimates for Calvert County (94,450) and St. Mary's County (107,700). The percentage increase in population attributed to the influx of construction workers and operators in these counties was estimated to be approximately 2,466 people in Calvert County and 834 people in St. Mary's County for the 20% immigation scenario. The relative increase is approximately 3% for Calvert County and less than 1% for St. Mary's.

Table 2.5-35 provides a listing of the fire/EMS calls that were experienced in Calvert County during 2005. There were a total of 16, 797 calls during that period or about 0.2/person. Applying an increase in population size on the order of 3%, and assuming that the rate of calling is proportionate to population size, number of calls would increase by approximately 500 annually. Comparable data were not available for St. Mary's County.

These fire and emergency response departments are supplemented by the CCNPP's onsite emergency response team, which includes a fire brigade. The CCNPP Unit 3 staff will include an onsite emergency response team staff, a fire brigade and emergency medical technician (EMT) responders. A new emergency management plan will be developed for CCNPP Unit 3, similar to that already existing for CCNPP Units 1 and 2, that would address CalvertCliffs 3 Nuclear Project and UniStar Nuclear Operating Services and agency responsibilities, reporting procedures, actions to be taken, and other items should an emergency occur at CCNPP Unit 3.

Existing fire and law enforcement services in Calvert County and St. Mary's County appear to be adequate to meet current daily needs within their jurisdictions. As described in Section 4.4.2.6 above, the significant new tax revenues generated in Calvert County by operation of CCNPP Unit 3 would provide additional funding to expand or improve services and equipment to meet the additional daily demands created by the plant. St. Mary's County would also experience increased revenues from operation of the power plant, but to a much lesser extent. However, some departments still might not have enough staff and equipment to respond to an emergency situation, including offsite evacuation. Because the relevant departments did not feel that the new power plant would increase the needs on their services to the point of having to take action, it is concluded that there would be a SMALL impact on the fire and law enforcement departments and no mitigation would be required.

Educational System

There were 17,431 students enrolled in Calvert County public schools in 2006. St. Mary's had 16,552 students enrolled (ER Section 2.5.2.5.1) (Table 2.5-24). The number of students in

Calverty County represents about 20% of the county population and in St. Mary's, about 17%. If we apply these percentages to the estimated increase in population due to construction worker in-migration, approximately 490 new students would enroll in Calvert County (an increase of 2.8%) and about 140 in St. Mary's (an increase about about 0.8%).

Assuming that of the 2.6 household members, 0.6 are students and a 20% in-migration during CCNPP Unit 3 construction, there would be a total of about 720 new households in the ROI (ER Section 4.4.2.4). This results in approximately 432 new students in the ROI. Approximately 68% of these, or 294, would reside in Calvert County and 23% in St. Mary's, or about 99 students.

The estimated [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] to [Proprietary Information - Withheld Under 10 CFR 2.390 - See Part 9 of the COL Application] million in increased annual property taxes that would be paid to Calvert County by UniStar during construction of CCNPP Unit 3, which include levies for the Calvert County Public School System, would provide additional funds to meet the educational needs of children for the in-migrating operational workforce. Calvert County Public Schools indicated that some of these current needs include providing additional special services (i.e., special education) for its students. If enrollment levels were to increase as a result of constructing the power plant, the district might seek assistance in recruiting additional teachers and would install modular classrooms. However, in general, the district did not feel that the in-migrating workforce would have an impact on the system. Thus, it is concluded that the impacts to the Calvert County Public School System would be SMALL, and would not require mitigation.

The St. Mary's County Government stated that the educational facilities in St. Mary's County Public School System already are operating about at capacity. However, representatives of the county stated that school enrollment has been relatively stable for the last few years, they are completing construction of a new elementary school, and don't anticipate building a new high school until about 2012. Because they are generally able to meet existing needs, they are now focused more on improving students' performance. The in-migration of an estimated 182 to 318 new households into the county from construction of the CCNPP Unit 3 could place greater demands on the system. Although the school district could receive some additional funding from property taxes generated by these new households (likely to be minimal because adequate housing units are already available in the county and those units are already being taxed), it would not receive additional funding directly from the power plant because CCNPP Unit 3 does not pay property taxes to St. Mary's County. Because the St. Mary's County Public School System is at capacity and would not receive additional funding, the impacts of the power plant would be SMALL and no mitigation would be required.

4.4.2.9 Public Facilities

As discussed above, there is a sufficient quantity of vacant housing units in Calvert and St. Mary's Counties to meet the housing needs of the in-migrating direct construction workforce for CCNPP Unit 3, so no new housing units would likely be required. The excess capacity in the water and sewage services and the lack of new construction resulting from the power plant would result in no effects to those services. Although an increase in the population would likely place additional demands on area transportation and recreational facilities, the facilities appear to have enough capacity to accommodate the increased demand and impacts would likely be small. Area highways and roads would have increased traffic levels, particularly during shift changes at the CCNPP, resulting in a SMALL traffic impact. These impacts are described in Section 4.4.1.

4.4.2.10 References

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4.4.3 Environmental Justice Impacts

This section describes the potential disproportionate adverse socioeconomic, cultural, environmental, and other impacts that construction of CCNPP Unit 3 could have on low income and minority populations within two geographic areas. The first geographic areas is a 50 mi (80 km) radius of the CCNPP Unit 3 power plant, where there is a potential for disproportionate employment, income, and radiological impacts, compared to the general population (NRC, 1999). This analysis also evaluates potential impacts within the region of influence (ROI), most of which is encompassed within a 20 mi (32 km) radius of the power plant site, where more localized potential additional impacts could occur to transportation/traffic, aesthetics, recreation, and other resources, compared to the general population. It also highlights the degree to which each of these populations would disproportionately benefit

from construction of the proposed power plant, again compared to the entire population is also discussed.

Section 2.5.1 provides details about the general population characteristics of the study area. Section 2.5.4 provides details about the number and locations of minority and low income populations within a 50 mi (80 km) radius of the CCNPP site, and their related reliance on subsistence sources. Calvert County contains 41 census blocks, among which there are no minority census blocks. St. Mary's County contains 55 identified census blocks, two of which are minority census blocks. Maryland has a total of 1,116 census blocks with 463 of these classified as minority census blocks.

In Maryland, 27 census blocks are classified as low income. Calvert County has no low income census blocks and St. Mary's County has one. The incidence of low income households within the 50 mi zone is also low, being 4.11% in Calvert County and 6.75% in St. Mary's County compared to 8.32% in Maryland as a whole.

4.4.3.1 Minority and Low Income Populations and Activities

As discussed in Section 2.5, about 90% of the residential population that lives within a 50 mi (80 km) radius lives farther than 30 mi (48 km) from the site. Calvert County and St. Mary's County have been defined as the ROI because 91% of the current CCNPP Units 1 and 2 operational workforce resides there, and it is assumed that the in-migrating construction workforce for CCNPP Unit 3 would also primarily reside in and impact this geographic area.

Because the power plant site is already developed and access is restricted, no minority or low income residences would be removed or relocated within the ROI. Additionally, the distance of the plant from area residents, in general, is great enough that none of these populations would be directly affected by construction of the power plant (i.e., noise, air quality, and other disturbances from the footprint of the facility). Construction and operation of CCNPP Unit 3 are expected to have no disproportionate effect on minority and low income populations.

4.4.3.1.1 50 Mile (80 km) Comparative Geographic Area

Employment and Income

There would be an estimated maximum 3,950-person workforce constructing the CCNPP Unit 3 power plant from 2011 to 2015, representing a significant increase in the overall employment opportunities for construction workers. Unemployed or underemployed members of minority and low income groups could benefit from increased employment opportunities, to the extent that they have the craft skills required (e.g., laborers, carpenters, electricians, plumbers, welders), are hired as part of the construction workforce, and have adequate transportation to access the construction site. These low income and minority populations primarily reside in the Washington/Arlington/Alexandria Metropolitan Statistical Area (MSA) and Prince Georges County, Maryland, and in Fairfax County, Virginia. The beneficial impacts of these potential new employment opportunities likely would be SMALL.

In addition, because of the demand for such skills, the proportion of low income and minority construction workers from the comparative geographic area that are currently employed could realize increased income levels, to the extent that they leave lower paying jobs to work on CCNPP Unit 3. The beneficial impacts of these increased income levels for low income and minority populations likely would be SMALL.

There are no unique minority or low income populations within the comparative geographic area that would likely be disproportionately adversely impacted by construction of the

proposed power plant because they are located more than 30 mi (48 km, or outside of the ROI) from the CCNPP Unit 3 site where no environmental impacts (e.g., noise, air quality, water quality, changes in habitat, aesthetic, etc.) would likely occur.

4.4.3.1.2 Two-County Region of Influence

Employment and Income

Unemployed or underemployed members of minority and low income groups within the ROI also could benefit from increased employment opportunities, to the extent that they have the craft skills required (e.g., laborers, carpenters, electricians, plumbers, welders) and are hired as part of the construction workforce. The beneficial impacts of increased employment opportunities are likely to be more noticeable for minority and low-income populations within the 20 mi (32 km) radius that includes most of the ROI because of the potential hiring levels relative to the smaller existing workforce base. As shown in Table 4.4-8A, minority and low income populations within a 20 mi (32 km) radius that comprises the ROI are located at least 11 mi (18 km) to the south in St. Mary's County and over 19 mi (30.6 km) away in Dorchester County. Because of their limited geographic extent and the level of impacts, the beneficial impacts of these potential new employment opportunities likely would be SMALL.

In addition, impacts on area businesses, and potentially related increased opportunities to obtain higher paying indirect jobs, could be realized from increased economic activity resulting from CCNPPs purchase of materials from businesses within the ROI. The beneficial impacts of these potential new employment opportunities likely would be SMALL.

In addition, because of the demand for such skills, the proportion of low income and minority construction workers from the ROI that are currently employed could realize increased income levels, to the extent that they leave lower paying jobs to work on CCNPP Unit 3. These benefits might be even greater for the low income populations within the 20 mi (32 km) radius of the ROI, relative to the benefits realized in the 50 mi (80 km) comparative geographic area, if construction related income currently is lower within the ROI. The beneficial impacts of these increased income levels for low income and minority populations likely would be SMALL.

4.4.3.2 Subsistence Activities

The types and levels of subsistence activities occurring in the two-county region of influence (i.e., Calvert and St. Mary's Counties) are described in Section 2.5.4. As discussed there, fish and shellfish harvesting are important parts of the food gathering activities for minority and low income residents. Chesapeake Bay sediments would be disturbed and turbidity would likely increase during construction of the water intakes and outfall for the CCNPP Unit 3. These activities could disturb current subsistence catch rates of shellfish and finfish, to the extent that they are occurring near the CCNPP site. Construction of the CCNPP Unit 3 intakes within the existing intake embayment should limit siltation effects outside of the curtain wall and are not likely to alter fishing habits or harvest. Construction of the discharge multi-port diffuser would result in temporary disturbance of the substrate and a localized increase in turbidity during the work activities, thus resulting in a small impact. Although these activities could disturb traditional subsistence catch rates of shellfish and finfish, to the extent that they are occurring near the CCNPP site, the impacts likely be SMALL for all members of the general public and, thus, would not represent a disproportionate impact to minority or low income populations.

As stated in ER Section 2.4.1, white-tail deer and waterfowl populations are abundant throughout Maryland and on or near the CCNPP site. These populations represent a valuable resource for hunters.

In addition, it is assumed that collection of plants for ceremonial purposes and as a food source (i.e., culturally significant plants, berries, or other vegetation) could be occurring in the two-county region of influence. Again, minority and low-income populations might be conducting these collection activities, off of the CCNPP site, more often than the general population. In addition, when conducting their collection activities, they also could be harvesting greater quantities of plants, than the general population. For safety and security reasons the general public is not allowed uncontrolled access to the CCNPP site. Thus, no ceremonial or subsistence gathering of culturally significant plants, berries, or other vegetation occurs on the site and no impacts will occur.

Table 4.4-1— Typical Noise Levels of Construction Equipment

Equipment Type	Noise Level, db(A)		
	Peak	at 50 ft (15.2 m)	at 3000 ft (914.4 m)
Earthmoving			
Loaders	104	73-86	38-51
Dozer	107	87-102	52-67
Scraper	93	80-89	45-54
Graders	108	88-91	53-56
Dump trucks	108	88	53
Heavy trucks	95	84-89	49-54
Materials Handling			
Concrete mixer	105	85	50
Crane	104	75-88	40-53
Forklift	100	95	60
Stationary			
Generator	96	76	41
Impact			
Pile driver	105	95	60
Jack hammer	108	88	53

Table 4.4-2— Projected Traffic Conditions During Construction

	Morning Peak 6:30-7:30 AM		Afternoon Peak 4:00-5:00 PM	
Intersection at MD 2/4	LOS[1]	CLV (vph)	LOS	CLV (vph)
Calvert Beach Road	F	1796	F	1986
Calvert Cliffs Parkway	B	1005	E	1558
Pardoe Road	C	1293	E	1471
Cove Point Road	D	1371	E	1577
Nursery Road	F	2303	F	2525

LOS: Level of Service

CLV: Critical Lane Volume

1. Note:

LOS Ratings

A: Best Serivce

F: Worst Service

E or better indicates a wait of <50 seconds at an intersection without signal control.

Table 4.4-3— Estimated Average FTE Construction Workers, by Construction Year/Quarter at the CCNPP

Year / Quarter of Construction	Average FTE Construction Workforce
Year 1:	
1	350
2	800
3	1,250
4	1,600
Year 2:	
1	1,900
2	2,200
3	2,500
4	2,800
Year 3:	
1	3,050
2	3,200
3	3,350
4	3,500
Year 4:	
1	3,683
2	3,867
3	3,950
4	3,950
Year 5:	
1	3,950
2	3,917
3	3,700
4	3,400
Year 6:	
1	3,050
2	1,967
3*	768*

Note: The third "quarter" of construction year 6 has only two months; the length of the total construction period is estimated to be 68 months.

Table 4.4-4— Total Peak On-Site Nuclear Power Plant Construction Labor Force Requirements (based on an average of single power plants)

Personnel Description	DOE Percent of Total Peak Personnel, Average Single Unit	DOE Peak Total Personnel, Average Single Unit	Estimated CCNPP Unit 3 Total Peak Workforce Composition
Craft Labor	66.7%	1,600	2,635
Craft Supervision	3.3	80	130
Site Indirect Labor	6.7	160	265
Quality Control Inspectors	1.7	40	67
NSSS Vendor and Subcontractor Staffs	5.8	140	229
EPC Contractor's Managers, Engineers, and Schedulers	4.2	100	166
Owner's O&M Staff	8.3	200	328
Start-Up Personnel	2.5	60	99
NRC Inspectors	0.8	20	32
Total Peak Construction Labor Force	100.0 %	2,400	3,950

Notes:
EPC = Engineering, Procurement, and Construction
O&M = operation and maintenance
NRC = Nuclear Regulatory Commission
NSSS = Nuclear Steam Supply System
Percentages and numbers may total slightly more or less than the total due to rounding.

Table 4.4-5— Peak On-Site Nuclear Power Plant Construction Craft Labor Force Requirement (based on an average of single power plants)

Craft Personnel Description	DOE Percent of Peak Craft Labor Personnel, Average Single Unit	DOE Peak Craft Labor Personnel, Average Single Unit	Estimated CCNPP Unit 3 Peak Craft Workforce Composition
Boilermakers	4.0 %	60	105
Carpenters	10.0	160	264
Electricians/Instrument Fitters	18.0	290	474
Iron Workers	18.0	290	474
Insulators	2.0	30	53
Laborers	10.0	160	264
Masons	2.0	30	53
Millwrights	3.0	50	79
Operating Engineers	8.0	130	211
Painters	2.0	30	53
Pipefitters	17.0	270	448
Sheetmetal Workers	3.0	50	79
Teamsters	3.0	50	79
Total Craft Labor Force	100.0 %	1,600	2,635

Notes: Percentages and numbers may total slightly more or less than the total due to rounding.

Table 4.4-6— Nuclear Power Plant Craft Labor Force Composition by Phases of Construction (in percent)

Craft Labor	Percentage of Craft Labor Force by Construction Phase						
	Concrete Formwork, Rebar, Embeds, Concrete	Structural Strength Steel, Misc. Iron & Architectural	Earthwork Clearing, Excavation, Backfill	Mechanical Equipment Installation	Piping Installation	Instrument Installation	Electrical Installation
Boilermakers				15			
Carpenters	40	5					2
Electricians/ Instrument Fitters						70	96
Iron Workers	20	75		10			
Laborers	30	5	60				1
Millwrights				25			
Operating Engineers	5	15	35	12	15	2	1
Pipefitters				35	80	28	
Teamsters			5	3	5		
Others	5						
Total Percentage of Craft Labor Force	100	100	100	100	100	100	100

Table 4.4-7— Estimates of In-Migrating Construction Workforce in Calvert County and St. Mary's County, 20% In-Migration Scenario, 2011-2015

In-migration Characteristics	Calvert County	St. Mary's County	Total ROI
Direct Workforce:			
Maximum Direct Workforce			3,950
Percent of Current CCNPP Units 1 & 2 Workforce Distribution	68%	23%	
Estimated In-migrating Direct Workforce (@20% assumption)	537	182	719
In-migrating Direct Workforce Population (@2.61 people/household)	1,402	474	1,876
Indirect Workforce:			
Estimated Distribution of Peak Direct Workforce	2,686	909	3,595
Peak Indirect Workforce (@0.6855, BEA multiplier)	368	125	493
Indirect Workforce Needs That Could Met by Direct Workforce Spouses (@59.5% working spouses)	515	175	689
Remaining, Unmet Indirect Workforce Need*	-148	-50	-196

Notes:

It is assumed that 100% of the construction workforce in-migrating into the ROI will move their families with them.

U.S. Census Bureau 2000 census data indicates that the state of Maryland had 2.61 people per household.

U.S. Census Bureau 2000 census data indicates that, within the state of Maryland, 59.5% of households had a working spouse.

* - A negative value for the remaining, unmet indirect workforce needs means that working spouses of the in-migrating direct workforce will exceed the estimated number of indirect workforce jobs generated by the power plant.

Table 4.4-8— Estimates of In-Migrating Construction Workforce in Calvert County and St. Mary's County, 35% In-Migration Scenario, 2011-2015

In-migration Characteristics	Calvert County	St. Mary's County	Total ROI
Direct Workforce:			
Maximum Direct Workforce			3,950
Percent of Current CCNPP Units 1 & 2 Workforce Distribution	68%	23%	
Estimated In-migrating Direct Workforce (@35% assumption)	940	318	1,258
In-migrating Direct Workforce Population (@2.61 people/household)	2,454	830	3,284
Indirect Workforce:			
Estimated Distribution of Peak Direct Workforce	2,686	909	3,595
Peak Indirect Workforce (@0.6855, BEA multiplier)	644	218	862
Indirect Workforce Needs Met by Direct Workforce Spouses (@59.5% working spouses)	901	305	1.205
Remaining, Unmet Indirect Workforce Need*	-256	-87	-434

Notes:

It is assumed that 100% of the construction workforce in-migrating into the ROI will move their families with them.

U.S. Census Bureau 2000 census data indicates that the state of Maryland had 2.61 people per household.

U.S. Census Bureau 2000 census data indicates that, within the state of Maryland, 59.5% of households had a working spouse.

* - A negative value for the remaining, unmet indirect workforce needs means that working spouses of the in-migrating direct workforce will exceed the estimated number of indirect workforce jobs generated by the power plant.

Table 4.4-8A— Total Work Force Potential During CCNPP Unit 3, Units 1 and 2 Operations (and outage) and Buildup of Unit 3 Operations Staff

Workforce Groups	Workforce Potential	Total
Units 1 and 2 Operations and Outage		
Units 1 & 2 Operations	833[1]	
Units 1 & 2 Outage Workers	1,000[2]	
Maximum Existing Operational Workforce		1,833
Unit 3 Construction		
Peak Unit 3 Direct Construction Workforce	3.950[3]	
Cumulative Units 1 & 2, Outage plus Peak Direct Construction Workforce		5,783
Indirect In-Migration	862	
Cumulative Peak Operations, Construction & Outage Workforce		6,645
Unit 3 Operations		
Peak Unit 3 Direct Operations Workforce	363[4]	
Cumulative Units 1 & 2 with Outage and Peak Direct Workforce	1,833	
Unit 3 Operations and Unit 1 & 2 with Outage		2,196
Indirect In-Migrations Workforce	562	
Cumulative Peak Operation & Outage		2,758

Notes:
[1]Table 2.5-1
[2]Section 5.8.2.1.2
[3]Section 4.4.2.3
[4]Section 5.8.2.3

Table 4.4-9— Minority and Low Income Populations Within About 20 Linear Miles (32 km) of the CCNPP Site

County	Type of Population	Number of Census Block Groups	Estimated Linear Distance from CCNPP mi (km)	Direction from CCNPP
Region of Influence:				
Calvert	Minority	0	n/a	n/a
	Low Income	0	n/a	n/a
St. Mary’s	Minority	2	11 (17.7)	South
	Low Income	1	11 (17.7)	South
Other Counties:				
Dorchester	Minority	4	>19 (30.6)	northeast
	Low Income	2	21 (33.8)	northeast
Charles	Minority	0	n/a	n/a
	Low Income	0	n/a	n/a
Prince George’s	Minority	0	n/a	n/a
	Low Income	0	n/a	n/a
TOTAL	Minority	6		
	Low Income	3		

Notes:

n/a = not applicable

A 20-mi (32 km) radius was selected because it includes most of Calvert County and St. Mary’s County, the ROI, but also includes portions of other counties.

Figure 4.4-1— CCNPP Traffic Impact Assessment Study Area

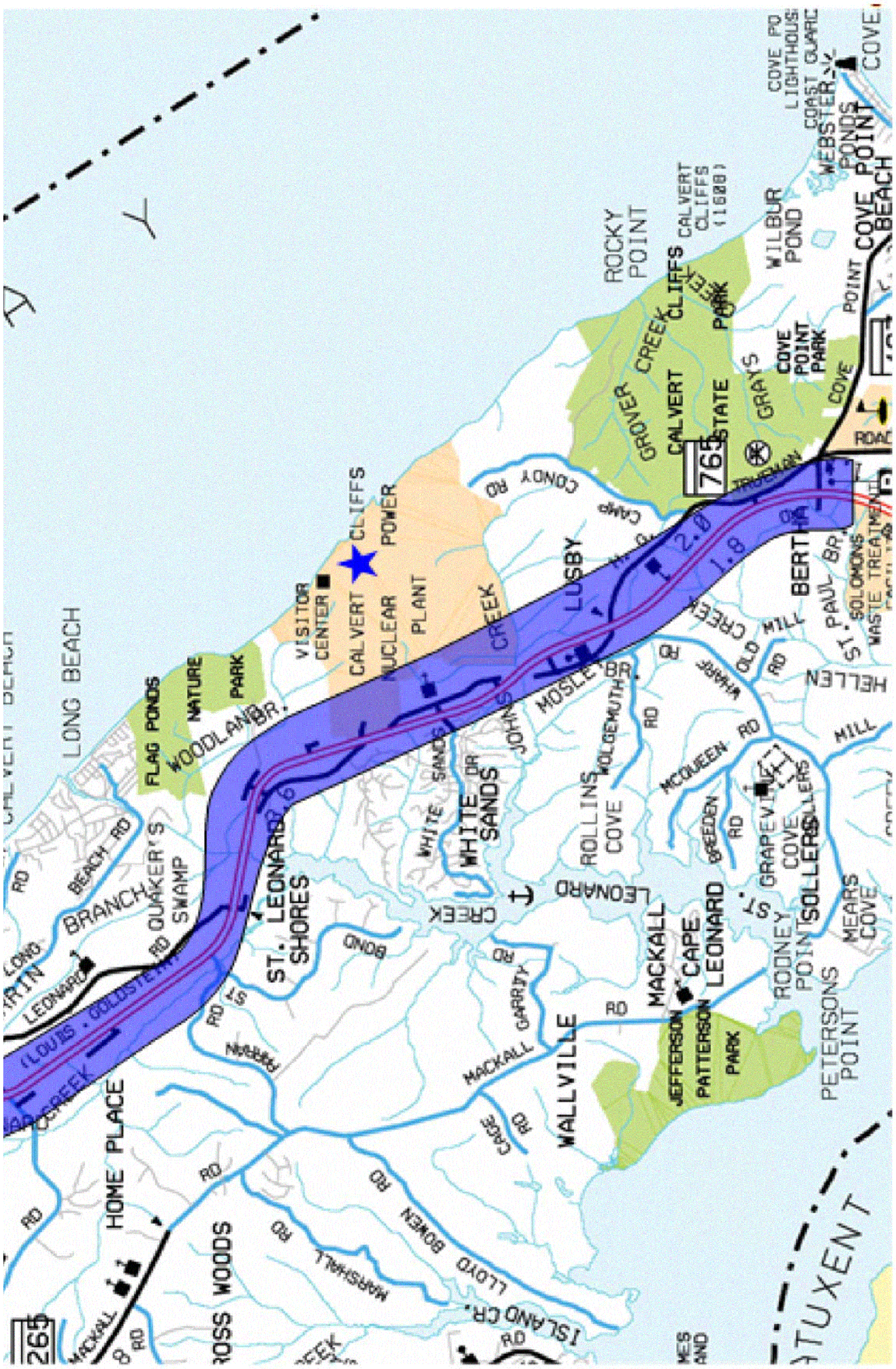
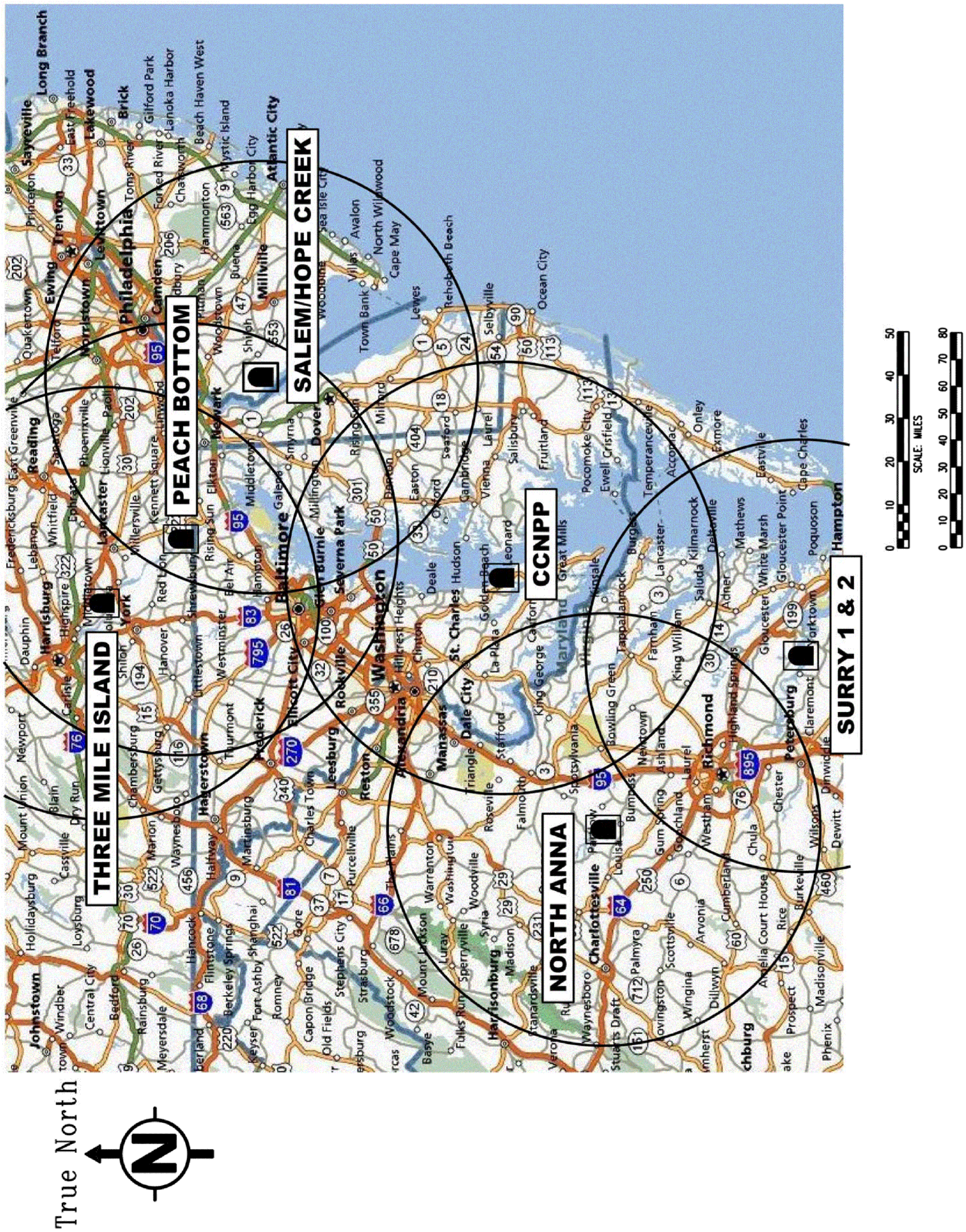


Figure 4.4-2— Cumulative Overlapping 50 mi (80 km) Zones for Nuclear Power Plants Surrounding CCNPP Unit 3



4.5 RADIATION EXPOSURE TO CONSTRUCTION WORKERS

This section discusses the exposure of construction workers building Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 to radiation from the normal operation of CCNPP Units 1 and 2.

4.5.1 Site Layout

The physical location of CCNPP Unit 3 relative to the existing CCNPP Units 1 and 2 on the CCNPP site is presented on Figure 4.5-1. As shown, except for the CCNPP Unit 3 Intake Structure, CCNPP Unit 3 would be located southeast of the protected area from CCNPP Units 1 and 2. Hence, the majority of construction activity would take place outside the protected area for the existing units, but inside the Owner Controlled Area for the CCNPP site.

4.5.2 Radiation Sources at CCNPP Units

During the construction of CCNPP Unit 3, the construction workers will be exposed to radiation sources from the routine operation of CCNPP Units 1 and 2. Sources that have the potential to expose CCNPP Unit 3 workers are listed in Table 4.5-1. They are characterized as to location, inventory, shielding, and typical local dose rates. Interior, shielded sources are not included. Figure 4.5-2 and Figure 4.5-3 show the locations of these sources. These sources are discussed in the Offsite Dose Calculation Manual (ODCM) (CCNPP, 2005), the annual Radiological Effluent Release Report (CCNPP, 2007a), and the Radiological Environmental Operating Report (CCNPP, 2007b) for CCNPP Units 1 and 2. The four main sources of radiation to CCNPP Unit 3 workers are gaseous effluents, liquid effluents, the Independent Spent Fuel Storage Installation (ISFSI) and the Interim Resin Storage Area. These are discussed below.

All gaseous effluents flow out the CCNPP Units 1 and 2 plant stacks. The releases are reported annually to the NRC. For example, the annual gaseous releases from CCNPP Units 1 and 2 for 2006 were reported as 876 Ci (3.24E+13 Bq) of fission and activation gases, 3.28E-2 Ci (1.21E +9 Bq) of I-131, 1.62E-5 Ci (6E+5 Bq) of particulates with half-lives greater than eight days, and 4.79 Ci (1.77E+ 11 Bq) of tritium (CCNPP, 2007a). Doses to the general population are also reported annually.

Effluents from the liquid waste disposal system produce small amounts of radioactivity in the discharge to the Chesapeake Bay. The annual liquid radioactivity releases for 2006 were reported as 4.87E-2 Ci (1.80E+09 Bq) of fission and activation products, 1560 Ci (5.75E+13 Bq) of tritium, and 1.71 Ci (6.31E+10 Bq) of dissolved and entrained gases (CCNPP, 2007a).

There are two main direct radiation sources, the ISFSI and the Interim Resin Storage Area. This is because they are closer to CCNPP Unit 3 than all the other direct sources. There are radiation monitors at the perimeter of each. Radiation from minor direct sources from CCNPP Units 1 and 2 would be picked up by the ISFSI and Resin Storage Area monitoring programs, and thus, would be included in the dose estimates below.

4.5.3 Historical Dose Rates

The historical measured and calculated dose rates that were used to estimate worker dose are presented below.

4.5.3.1 Gaseous and Liquid Effluent Historical Measurements

The doses listed in Table 4.5-2 are to the maximally exposed member of the public due to the release of gaseous and liquid effluents from CCNPP Units 1 and 2 and are calculated in accordance with the existing units' ODCM (CCNPP, 2005). The maximum individual doses are from historical CCNPP Units 1 and 2 Annual Radiological Environmental Operating Reports

and, prior to that, the Radiological Environmental Monitoring Program Annual Reports. While these off-site doses provide perspective on the variation of effluent releases through the history of the operation of Units 1 and 2, on-site workers will be exposed to fewer pathways. For example, construction workers will not ingest food (edible plants or fish) grown in effluent streams as part of their work activity. Therefore, only inhalation and external pathways will be considered in the calculation of dose to workers.

4.5.3.2 ISFSI Historical Measurements

Figure 4.5-4 provides thermoluminescent dosimeter (TLD) measurements made adjacent to the ISFSI in 2005 as well as a conservative extrapolation of dose over distance. Table 4.5-3 contains the average monthly ISFSI TLD dose and the average monthly control location dose from 1990 to 2005. The locations used to determine the background are locations DR 1, 7, 8, 20, 21, 22, and 23 as described in the 2005 Radiological Environmental Monitoring Program (REMP) report (CCNPP, 2006b). Table 4.5-4 provides the time trend for the ISFSI net annual dose since spent fuel was initially placed into storage at the ISFSI in 1993.

4.5.3.3 Resin Storage Area Historical Measurements

Table 4.5-5 provides historical Resin Storage Area TLD readings from 2001 through 2005.

Figure 4.5-5 provides the ISFSI and Resin Storage Area TLD readings, averaged over all detectors and over each year of data. Figure 4.5-6 extrapolates the 2005 dose rate over distance from the center of the Resin Area.

4.5.4 Projected Dose Rates at CCNPP Unit 3

Dose rates from all sources combined were calculated for each 100 x 100 foot square on the plant grid. These dose rates were in terms of mrem/year. For purposes of dose rate calculations a 100% occupancy is assumed. (For purposes of collective dose calculations the occupancy for construction workers is 2,200 hours per year.) The dose rates were the sum of the dose rate from the four main sources; gases, liquids (only on the shoreline), ISFSI, and Resin Storage Area. They are shown in Figure 4.5-7 for the year 2015, the estimated last year of construction. It is this year that the dose rate will be greatest, primarily because the ISFSI will have the largest number of spent fuel storage casks. In the calculations, no credit is taken for any additional shielding other than that present in measured doses.

The collective dose is the sum of all doses received by all workers. It is a measure of population risk. The number of workers (in terms of Full Time Equivalents) and their location by zone are given in Table 4.5-13. The zone locations are shown by 100 x 100 foot squares in Figure 4.5-7. The details of the collective dose calculations are given in the following discussion.

The equation for dose rate during year t at location x,y on the plant grid is:

$$\dot{D}_{x,y} = \dot{D}_{gas} + \dot{D}_{liq} + \dot{D}_{N,2005} + \dot{D}_{S,t} + \dot{D}_{resin}$$

where the terms are explained in the ER subsections.

The equation for the average dose rate in a zone is:

$$\bar{\dot{D}}_z = \frac{1}{N_z} \sum_{(\text{all } x,y \text{ in } Z)} \dot{D}_{x,y}$$

where N_z is the number of squares in the zone.

The equation for collective dose for the construction period is:

$$D = \frac{2200}{8760} \sum_t \sum_z \overline{\dot{D}}_z FTE_{z,t}$$

where

$$\frac{2200}{8760} = \text{fraction of work hours per year}$$

$\overline{\dot{D}}_z$ = average dose rate in zone, Z.

$FTE_{Z,t}$ = Full Time Equivalents in zone Z during year t.

The equation for FTE is:

$$FTE_{Z,t} = P_Z \, Census_t$$

where P_Z = probability of worker in zone, Z

$Census_t$ = FTE of workers on site in year t.

The probability of a worker in each zone, P_Z, reflects the average construction worker and is based on a rough idea of how much time the average worker spends in each zone. For example, the time in the parking lot and road is low, in the construction area is high, in the offices is less. These are best estimates based on construction experience.

The spatial distribution of zones on the site is shown (red letters indicating a zone code in each square) in Figure 4.5-7. There are many locations where construction workers are not expected to be, so they are not marked in the Figure. Those squares that are marked were chosen because of planned activities at those locations, for example, the parking lots are marked on site drawings, as are roads, and most importantly, the construction area.

4.5.4.1 Gaseous Dose Rates

The annual TEDE (Total Effective Dose Equivalent) dose rate from gaseous effluents to construction workers on the CCNPP Unit 3 site is bounded by the following equation:

$$\dot{D}_{gas} = 220256 \, r^{-1.8} \text{ (mrem/year)}$$

where r = distance from stack to worker location in feet

The skin dose rate equation bounds organ doses from iodines and particulates.

$$\dot{D}_{skin} = 1066039 \, r^{-1.8} \text{ (mrem/year)}$$

where r = distance from stack to worker location in feet

This parametric equation is based on annual average, undepleted, ground level χ/Qs that are based on CCNPP site specific meteorology for the years 2000 to 2006. Note that only those wind directions which could carry gaseous effluents from the stacks to the CCNPP Unit 3 workers were included in the present analysis. Thus, the ENE through W sectors (clockwise) are included. The χ/Q data used are provided in Table 4.5-6. A bounding curve was then fitted to a power equation as shown in Figure 4.5-8.

The equation is:

$$\frac{\chi}{Q}(r) = 60r^{-1.8}$$

where r is the stack to target distance in feet.

The dose rates were calculated for an onsite location with a known χ/Q for the years 2001 through 2006 according to the Regulatory Guide 1.109 (NRC, 1977) method with Total Effective Dose Equivalent (TEDE) calculations according to Federal Guidance Reports 11 (EPA, 1988) and 12 (EPA, 1993). The gaseous releases are shown in Table 4.5-7. The 2006 releases gave the highest dose rates. This data was then used to establish the dose rate to χ/Q ratio which was used to derive a parametric equation to bound the dose rate from the 2006 releases. These equations generate "TEDE" doses suitable for 10 CFR 20.1301 calculations.

4.5.4.2 Liquid Dose Rates

The dose from liquid effluents is conservatively calculated assuming all the exposure is from deposition on the shoreline. The historical liquid effluents and dilution rates for the years 2001 through 2006 are given in Table 4.5-8. The maximum calculated dose at the shoreline during this interval is 0.32 mrem/yr (3.2 µSv/yr). Thus,

$$\dot{D}_{liq} = 0.32 \text{ (mrem/year) on shoreline}$$

$$= 0 \text{ not near the water}$$

The actual discharge from CCNPP Units 1 and 2 is 850 ft (259 m) away from shore. The dilution factor at the shore would provide a significant reduction but is conservatively ignored. The LADTAPII computer code (NRC, 1986) was used to make these calculations. LADTAPII assumes a 12 hours/year occupancy rate which had to be scaled up to by the factor 8760/12 for annual dose rate calculations.

4.5.4.3 ISFSI Dose Rates

The dose rate had to be calculated at various distances and directions from the ISFSI. The dose rate also had to be projected into the future as more spent fuel was loaded into storage canisters and stored at the ISFSI from CCNPP Units 1 and 2. TLD readings around the ISFSI as shown in Figure 4.5-4 were used to develop the following equation for 2005 dose rate as a function of location:

$$\dot{D}_{N,2005} = 76\,\omega\, e^{-0.00195r} \text{ (mrem/year)}$$

r = source surface to target distance

ω = solid angle of ISFSI source and equivalent air scattering volume above

The equation for solid angle is derived empirically from dosimetry and distance measurements at the ISFSI site. The height, H, and radius, R, are effective values derived from the fit. They are 400 and 124 feet respectively. The equation is:

$$\omega = 2\arcsin\left(\left(\frac{H}{\sqrt{H^2 + r^2}}\right)\left(\frac{R}{\sqrt{R^2 + r^2}}\right)\right)$$

This is a reasonable approximation for the North end, i.e., ISFSI-N, which was about 72% loaded with spent fuel at the end of 2005. The exterior perimeter distance, x, to ISFSI-N is calculated assuming a source center at N9703, E7936. Then, it was assumed that all post-2005 spent fuel loading went into ISFSI-S whose source center was N9403, E7936. The source term for ISFSI-S was an extrapolation of the historic dose rate increase from ISFSI-N as shown in Figure 4.5-10. The dose rate from ISFSI-S as a function of calendar year after 2005 is:

$$\dot{D}_{s,t} = (-170.8456 + 0.08521\ t)\ \dot{D}_{N,2005}$$

where t is the absolute year (such as 2010).

Note that these provide annual average dose rates. There are significant temporal variations, for example, during ISFSI loading operations the dose rate will go up. These variations are included in the annual average.

4.5.4.4 Resin Area Dose Rates

The resin dose rate equation is given below where, r, the distance in feet from the effective center of the Resin Area, i.e., N 10100 E 7600 on the plant grid is given in feet

$$\dot{D}_{resin} = \frac{2.23E6\ e^{-0.000951r}}{r^2}\ (\text{mrem/year})$$

This is independent of direction. The Cobalt-60 photon energy spectrum is assumed because it typically dominates or bounds the exterior distance dose rate from resin beds. In reality there is expected to be significant variation in the sources and their strengths from quarter to quarter. There is also expected to be some azimuthal variation in dose rate. However, this is a best estimate, which is suitable for the purpose of ALARA calculations.

This equation was fitted to TLDs located as shown in Figure 4.5-11. The data for 2005 was used. All the data for the years 2001 through 2005 are in Table 4.5-5. There has been one year in which the dose rate was higher than is predicted by this equation. For this reason, future TLD dose rates will be monitored to assure that this equation and associated results remain valid.

4.5.4.5 Example Dose Rate Calculation

As an example the dose rate to the location N8050, E9150 is calculated. This location is at the center of the square that is nearest to the center of the containment of the new plant. The ISFSI will be at its maximum load for the construction period, i.e. as projected in 2015. The distances between the sources and the receptor are shown in the following table. Note that the first grid coordinate on the map is shown as N8050, but, mathematically is -8050. The distance between the gas stack and the receptor is

$$r = \sqrt{(-10474 - -8050)^2 + (9996 - 9150)^2} = 2567$$

The other distances are similarly calculated

Location	N	E	r (ft)
Receptor	-8050	9150	
Gas Stack	-10474	9996	2567
ISFSI North Half	-9703	7936	1927
ISFSI South Half	-9403	7936	1694
Resin Area	-10100	7600	2570

The dose rate from gases released from the stack are

$$\dot{D}_{gas} = 220256 \cdot 2567^{-1.8} = 0.16064$$

The dose rate from liquids is zero because the receptor is not near the shoreline nor any effluent liquids. The dose rate from the ISFSI is calculated assuming the 2005 load at both the North and South halves. Both dose calculations depend upon the solid angles in streradians (sr) which are calculated as follows:

$$\omega_N = 2\arcsin\left(\left(\frac{400}{\sqrt{400^2 + 1927^2}}\right)\left(\frac{124}{\sqrt{124^2 + 1927^2}}\right)\right) = 0.02611\,\text{sr}$$

Similarly for the south half:

$$\omega_S = 2\arcsin(\left(\frac{400}{\sqrt{400^2 + 1694^2}}\right)\left(\frac{124}{\sqrt{124^2 + 1694^2}}\right)) = 0.03356\text{sr}$$

Note, that arcsin() calculates planar angle in degrees or radians. Units of degrees are converted by θ(radians) = θ(degrees) 180/π(radians). The dose rate from the North half of the ISFSI is

$$\dot{D}_{N,2005} = 76 \cdot 0.02611 \cdot e^{-0.00195 \times 1927} = 0.04$$

From the south half the dose rate is calculated assuming it is loaded like the north half in 2005:

$$\dot{D}_{S,2005} = 76 \cdot 0.03356 \cdot e^{-0.00195 \times 1694} = 0.09381$$

Correcting for ISFSI loading out to the year 2015:

$$\dot{D}_{S,2015} = (-170.8456 + 0.08521 \cdot 2015)\ 0.09381 = 0.07998$$

The dose rate from resins is:

$$\dot{D}_{resin} = \frac{2.23E6\ e^{-0.000951 \times 2570}}{2570^2} = 0.02931$$

Thus, the dose rate near the center of the containment in 2015 is:

$$\dot{D} = 0.16064 + 0 + 0.04631 + 0.07998 + 0.02931 = 0.316(\text{mrem/y})$$

4.5.5 Compliance with Dose Rate Regulations

CCNPP Unit 3 construction workers are, for the purposes of radiation protection, members of the general public. The construction workers (with the exception of certain specialty contractors loading fuel or using industrial radiation sources for radiography) do not deal with radiation sources.

Dose limits to members of the public are provided in 10 CFR 20.1301 (CFR, 2007a) and 10 CFR 20.1302 (CFR, 2007b). Note that 10 CFR 20.1201 through 20.1204 do not apply to the construction workers as they are considered members of the public and not radiation workers.

4.5.5.1 10 CFR 20.1301

10 CFR 20.1301 (CFR, 2007a) limits annual doses from licensed operations to individual members of the public to 0.1 rem (1 mSv) TEDE (total effective dose equivalent.) In addition, the dose from external sources to unrestricted areas must be less than 0.002 rem (0.02 mSv) in any one hour. This applies to the public both outside of and within controlled areas. The maximum dose rates by zone are given in Table 4.5-9. For an occupational year, i.e., 2,200 hours onsite, the maximum dose would be on the road by the ISFSI or the Resin Storage Area where the dose would be 0.0389 rem (0.389 mSv) and less than 0.002 rem (0.02 mSv) in any one hour. This assumes the worker stood on the road for all working hours in one year. This value is less than the limits specified above for members of the public.

4.5.5.2 10 CFR 20.1302

10 CFR 20.1302 (CFR, 2007b) requires surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits for individual members of the public in 10 CFR 20.1301 (CFR, 2007a). The Technical Specifications for Calvert Cliffs Units 1 and 2 limit radioactivity release rates to values that ensure the requirements of Appendix I to 10 CFR 50 are met and therefore ensure compliance with 10 CFR 20.1301 (CFR, 2007a). Furthermore, the Radiological Environmental Monitoring Program for Units 1 and 2 will place dosimetry devices on the fence of the construction area for Unit 3; these devices will also verify the dose is below the 10 CFR 20.1301 (CFR, 2007a) limits.

4.5.5.3 10 CFR 50, Appendix I

The 10 CFR 50, Appendix I criteria (CFR, 2007c) apply only to effluents. The purpose of the criteria are to assure adequate design of effluent controls. The annual limits for liquid effluents are 3 mrems (30 µSv) to the total body and 10 mrems (100 µSv) to any organ. For gaseous effluents, the pertinent limits are 5 mrems (50 µSv) to the total body and 15 mrems (150 µSv) to organs including skin. Table 4.5-10 shows that there is no dose rate to workers in a construction zone from effluents that exceeds these limits. Therefore, the criteria have been met.

4.5.6 Collective Doses to CCNPP Unit 3 Workers

The collective dose is the sum of all doses received by all workers. It is a measure of population risk. The total worker collective dose for the combined years of construction is 4.6 person-rem (0.046 person-Sieverts). This is a best estimate and is based upon the worker census and occupancy projections shown in Table 4.5-11 and Table 4.5-12. The breakdown of FTE, average

dose and collective dose by construction year and occupancy zone is given in Tables 4.5-13, 4.5-14 and Table 4.5-15. These assume 2,200 hours per year occupancy for each worker and are based on effluent release and meteorological data through 2006.

4.5.7 References

CFR, 2007a. Title 10, Code of Federal Regulations, Part 20.1301, Dose Limits for Individual Members of the Public, 2007.

CFR, 2007b. Title 10, Code of Federal Regulations, Part 20.1302, Compliance with Dose Limits for Individual Members of the Public, 2007.

CFR, 2007c. Code of Federal Regulations, Title 10 CFR 50, Appendix I, Numerical Guides for Design Objectives and Limiting Condition for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light Water Cooled Nuclear Power Reactor Effluents, 2007.

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CCNPP, 2007a. 2006 Radioactive Effluent Release Report, for the year 2006. Calvert Cliffs Nuclear Power Plant, July 11, 2007.

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EPA, 1988. Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion, Federal Guidance Report No. 11, Document Number EPA-52011-88-020, U.S. Environmental Protection Agency, September 1988.

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NRC, 1978. Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations will be as Low As is Reasonably Achievable, Regulatory Guide 8.8, Revision 3, Nuclear Regulatory Commission, June 1978.

NRC, 1977. Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I, Regulatory Guide 1.109, Revision 1, Nuclear Regulatory Commission, October 1977.

NRC, 1986. LADTAP II – Technical Reference and User Guide, NUREG/CR-4013, Nuclear Regulatory Commission, April 1986.

Table 4.5-1— Source List for CCNPP Units 1 and 2

Source	Location	Radioactive Inventory	Shielding	Typical Dose Rates
CCNPP Unit 1 Stack	Side of CCNPP Unit 1 containment	There are two elevated vents, one for each of CCNPP Units 1 and 2. Their joint effluents are characterized in the annual RETS/ REMP reports[(a)]	N.A., airborne effluent	Offsite doses generally less than few mrem/year (few hundredths msievert/ year)
CCNPP Unit 2 Stack	Side of CCNPP Unit 2 containment		N.A., airborne effluent	Offsite doses generally less than few mrem/year (few hundredths msievert/ year)
Circulating Water System Discharge	850 ft (259.1 m) from shore	Liquid effluents discharged to bay are characterized in annual RETS/ REMP reports[(b)]	N.A., waterborne effluent	Offsite doses generally less than few mrem/year (few hundredths msievert/ year)
ISFSI	ISFSI Pad	Spent fuel characterized by TLD measurements listed in annual ISFSI REMP report	Vented concrete bunkers	Contact dose rates <20 mrem/hr (<0.2 msievert/ hr)
Auxiliary Building	West of Turbine Building	Radwaste tanks and storage	Shielded building walls	Exterior contact <2.5 mrem/hr (<0.025 msievert/hr)
Refueling Water Tanks (RWT)	Adjacent to Auxiliary Building on 45 ft (13.7 m) elevation	Maximum inventory occurs when tanks have reactor water	None	<5.0 mrem/hr (<0.05 msievert/hr) at 15 ft (4.6 m) distance
Interim Resin Storage Area, Lake Davies	300 ft (91.4 m) west of ISFSI	Interim storage of spent resin and filters	None	<0.5 mrem/hr (<0.005 msievert/hr) at the storage area fence
Materials Processing Facility (MPF)	South of Turbine Building	Interim storage of dry active waste, and liquids being processed for shipment	Variety of shields built into structure	Exterior contact <0.5 mrem/hr (<0.005 msievert/hr)
Original Steam Generator Storage Facility	100 ft (30.5 m) north of north end of ISFSI	Lower assemblies of four original steam generators	Heavily shielded building	Exterior contact <0.5 mrem/hr (<0.005 msievert/hr)
West Road Cage	On 45 ft (13.7 m) Elevation ~120 ft (~36.6 m) Auxiliary Building rollup doors	Interim storage of spent resins and filters	None	< 5.0 mrem/hr (<0.05 msievert/hr) at the cage fence

Notes:

a. The gaseous releases reported for 2006 were 876 Ci (3.24E+13 Bq) of fission and activation gases, 3.28E-2 Ci (1.21E+9 Bq) of I-131, Ci (6E+ 5 Bq) of particulates with half-lives greater than eight days, and 4.79 Ci (1.77E+ 11 Bq) of tritium. These are typical compared to recent years.

b. Liquid effluents from the liquid waste disposal produce small amounts of radioactivity in the discharge to the Chesapeake Bay. The annual liquid radioactivity releases for 2006 were reported as 4.87E-2 Ci (1.80E+09 Bq) of fission and activation products, 1560 Ci (5.75E+13 Bq)of tritium, and 1.71 Ci (6.31E+10 Bq) of dissolved and entrained gases. These are typical compared to recent years.

Table 4.5-2— Historical All-Source Compliance for Offsite General Public

(Historically the receptors have been offsite; therefore the dose is dominated by gaseous and liquid effluents.)

	Historical Site Boundary Doses Reported to NRC (mrem/ year)/(msievert/year)		
Limits	**75**	**25**	**25**
Year	**Thyroid**	**WB**	**Other Organs**
2006	0.052/0.00052	0.004/0.00004	0.010/0.00010
2005	0.006/0.00006	0.005/0.00005	0.095/0.00095
2004	0.007/0.00007	0.002/0.00002	0.006/0.00006
2003	0.006/0.00006	0.004/0.00004	0.023/0.00023
2002	0.003/0.00003	0.007/0.00007	0.174/0.00174
2001	0.005/0.00005	0.010/0.0001	0.351/0.00351
2000	0.018/0.00018	0.018/0.00018	0.211/0.00211
1999	0.011/0.00011	0.013/0.00013	0.686/0.00686
1998	0.005/0.00005	0.005/0.00005	0.302/0.00302
1997	0.005/0.00005	0.009/0.00009	0.235/0.00235
1996	0.005/0.00005	0.012/0.00012	0.245/0.00245
1995	0.007/0.00007	0.017/0.00017	0.132/0.00132
1994	0.024/0.00024	0.039/0.00039	0.473/0.00473
1993	0.099/0.00099	0.125/0.00125	0.466/0.00466
1992	0.125/0.00125	0.114/0.00114	0.420/0.00420
1991	0.167/0.00167	0.045/0.00045	0.292/0.00292
1990	0.070/0.00070	0.070/0.00070	0.370/0.00370
1989	0.526/0.00526	0.113/0.00113	0.674/0.00674
1988	1.130/0.01130	0.120/0.00120	0.500/0.00500
1987	0.381/0.00381	0.250/0.00250	1.360/0.01360
1986	0.685/0.00685	0.093/0.00093	0.643/0.00643
1985	0.800/0.00800	0.010/0.00010	0.030/0.00030
1984	0.710/0.00710	0.110/0.00110	0.020/0.00020
1983	0.150/0.00150	0.060/0.00060	0.030/0.00030
1982	0.220/0.00220	0.034/0.00034	0.080/0.00080
1981	0.100/0.00100	0.002/0.00002	0.080/0.00080
1980	0.170/0.00170	0.009/0.00009	N/A/N/A

Table 4.5-3— Historical ISFSI Exposures by Year

Average TLD Exposures by Year Digitized from Figure 7 of 2005 REMP Report (mRoentgen/30 days) (These are historical values and are listed as reported, in English units)		
Year	**ISFSI**	**Control**
1990	3.96	N/A
1991	3.95	4.11
1992	4.28	4.40
1993	3.99	4.19
1994	4.73	4.63
1995	5.14	4.69
1996	5.01	4.20
1997	5.56	4.31
1998	6.20	4.56
1999	6.07	4.47
2000	5.72	3.88
2001	6.88	4.15
2002	7.23	4.48
2003	8.46	4.60
2004	8.27	4.51
2005	8.14	4.02

Notes:

1990 through 1992 provide baseline data before spent fuel stored at ISFSI in 1993

Table 4.5-4— Historical ISFSI Net Trend

Annual Gamma Dose Rate based on ISFSI TLDs						
Year	ISFSI	Control[(a)]	Net ISFSI	ISFSI	Control[(a)]	Net ISFSI
	mrem/y	mrem/y	mrem/y	µSv/y	µSv/y	µSv/y
1991	48.06	47.54	[(b)]	480.6	475.4	[(b)]
1992	52.10	51.11	[(b)]	521.0	511.1	[(b)]
1993	48.53	48.54	0.00	485.3	485.4	0.0
1994	57.55	53.93	3.62	575.5	539.3	36.2
1995	62.59	54.67	7.92	625.9	546.7	79.2
1996	61.00	48.61	12.39	610.0	486.1	123.9
1997	67.69	50.02	17.68	676.9	500.2	176.8
1998	75.38	53.08	22.30	753.8	530.8	223.0
1999	73.80	52.00	21.79	738.0	520.0	217.9
2000	69.56	44.78	24.77	695.6	447.8	247.7
2001	83.71	48.02	35.69	837.1	480.2	356.9
2002	87.92	52.08	35.84	879.2	520.8	358.4
2003	102.90	53.49	49.41	1029.0	534.9	494.1
2004	100.65	52.41	48.24	1006.5	524.1	482.4
2005	99.07	46.52	52.55	990.7	465.2	525.5

Notes:

a. Slightly adjusted such that 1993 net TLD dose is zero.

b. 1991 and 1992 provide baseline before first spent fuel stored at ISFSI in 1993.

Table 4.5-5— Historical Resin Area TLD Readings for 2001 through 2005

Quarter	RPDR05	RPDR06	RPDR07	RPDR08	RPDR09	RPDR10	RPDR11	RPDR12
1st Qtr 2001	16.07	16.88	27.94	16.66	32.02	29.56	11.82	21.36
2nd Qtr 2001	51.86	129.45	166.45	124.63	113.28	48.70	17.39	29.98
3rd Qtr 2001	38.54	50.32	154.74	146.91	122.34	52.91	16.91	32.08
4th Qtr 2001	17.54	20.19	23.16	19.72	19.62	21.49	12.68	21.98
1st Qtr 2002	20.91	23.04	38.04	37.08	28.29	28.45	13.96	24.30
2nd Qtr 2002	19.07	18.71	15.78	17.54	19.28	20.96	13.43	21.78
3rd Qtr 2002	15.83	16.20	19.20	18.68	21.08	23.75	16.27	27.98
4th Qtr 2002	16.87	17.04	23.38	18.94	18.91	21.48	17.89	29.63
1st Qtr 2003	16.48	17.21	23.87	18.31	18.11	22.52	18.06	19.73
2nd Qtr 2003	17.75	17.74	31.33	18.73	16.34	25.52	21.06	21.49
3rd Qtr 2003	15.44	15.87	20.96	20.52	16.98	19.31	17.58	24.81
4th Qtr 2003	18.01	16.93	18.63	17.39	19.97	21.78	17.29	26.26
1st Qtr 2004	16.32	16.75	17.88	17.64	18.75	20.89	17.38	25.82
2nd Qtr 2004	36.25	33.89	18.85	36.51	24.17	22.40	16.14	23.34
3rd Qtr 2004	30.26	30.32	24.27	50.34	28.67	30.49	14.84	32.10
4th Qtr 2004	59.47	72.37	74.41	77.07	43.09	46.48	21.50	48.46
1st Qtr 2005	33.37	42.40	34.46	37.28	31.26	33.52	17.03	52.83
2nd Qtr 2005	57.76	53.64	35.03	44.53	45.42	33.16	18.67	60.40
3rd Qtr 2005	30.16	33.09	23.84	42.11	25.38	24.47	15.03	46.03
4th Qtr 2005	17.97	16.71	20.91	38.71	20.81	18.56	14.62	39.27

Note:

(Exposure Rates to TLDs are expressed in mRoentgen/90 days. Note that for photons, a Roentgen is approximately equal to a rem.)

Table 4.5-6— Historical Annual Average χ/Q (sec/m³) In CCNPP Unit 3 Directions

Normal Effluent Annual Average, Undecayed, Undepleted χ/Q Values for Ground Level Release Without Building Wake Using CCNPP Meteorological Data for Directions that Could Affect CCNPP Unit 3 Workers

Downwind Direction	Distance from Stacks to CCNPP Unit 3 Location							
	328 ft (100 m)	656 ft (200 m)	1640 ft (0.5 km)	0.5 mi (0.8 km)	0.62 mi (1.0 km)	0.75 mi (1.2 km)	0.93 mi (1.5 km)	1.24 mi (2.0 km)
ENE	1.43E-03	4.03E-04	7.76E-05	3.32E-05	2.24E-05	1.62E-05	9.19E-06	4.48E-06
E	1.08E-03	3.04E-04	5.86E-05	2.51E-05	1.69E-05	1.23E-05	6.95E-06	3.39E-06
ESE	9.72E-04	2.73E-04	5.26E-05	2.26E-05	1.53E-05	1.11E-05	6.27E-06	3.05E-06
SE	7.12E-04	1.96E-04	3.77E-05	1.63E-05	1.11E-05	8.07E-06	4.56E-06	2.21E-06
SSE	4.63E-04	1.27E-04	2.43E-05	1.05E-05	7.17E-06	5.21E-06	2.94E-06	1.42E-06
S	5.27E-04	1.43E-04	2.70E-05	1.16E-05	7.87E-06	5.71E-06	3.22E-06	1.55E-06
SSW	4.80E-04	1.30E-04	2.45E-05	1.05E-05	7.13E-06	5.17E-06	2.92E-06	1.40E-06
SW	4.63E-04	1.26E-04	2.38E-05	1.02E-05	6.92E-06	5.03E-06	2.84E-06	1.37E-06
WSW	4.03E-04	1.10E-04	2.08E-05	8.90E-06	6.06E-06	4.40E-06	2.49E-06	1.20E-06
W	3.64E-04	9.90E-05	1.88E-05	8.09E-06	5.52E-06	4.01E-06	2.27E-06	1.09E-06

Downwind Direction	Distance from Stacks to CCNPP Unit 3 Location						
	1.5 mi (2.4 km)	1.55 mi (2.5 km)	1.86 mi (3.0 km)	2.49 mi (4.00 km)	2.50 mi (4.02 km)	3.5 mi (5.6 km)	4.5 mi (7.2 km)
ENE	2.85E-06	2.61E-06	1.74E-06	9.29E-07	9.19E-07	4.85E-07	3.11E-07
E	2.15E-06	1.97E-06	1.32E-06	7.02E-07	6.94E-07	3.67E-07	2.35E-07
ESE	1.94E-06	1.78E-06	1.18E-06	6.29E-07	6.22E-07	3.27E-07	2.09E-07
SE	1.39E-06	1.28E-06	8.44E-07	4.44E-07	4.39E-07	2.28E-07	1.44E-07
SSE	8.96E-07	8.20E-07	5.41E-07	2.83E-07	2.80E-07	1.44E-07	9.07E-08
S	9.75E-07	8.93E-07	5.87E-07	3.06E-07	3.03E-07	1.55E-07	9.71E-08
SSW	8.81E-07	8.06E-07	5.30E-07	2.76E-07	2.72E-07	1.39E-07	8.70E-08
SW	8.60E-07	7.87E-07	5.17E-07	2.70E-07	2.67E-07	1.37E-07	8.55E-08
WSW	7.53E-07	6.89E-07	4.53E-07	2.36E-07	2.33E-07	1.19E-07	7.46E-08
W	6.86E-07	6.28E-07	4.13E-07	2.15E-07	2.13E-07	1.09E-07	6.82E-08

Table 4.5-7— Historical Gaseous Releases for 2002 through 2006

Nuclide	2002 Release Ci (Bq)	2003 Release Ci (Bq)	2004 Release Ci (Bq)	2005 Release Ci (Bq)	2006 Release Ci (Bq)
1 H-3	7.33E+00 (2.71E+11)	1.20E+01 (4.44E+11)	5.86E+00 (2.17E+11)	6.48E+00 (2.40E+11)	4.79E+00 (1.77E+11)
18 Ar-41	1.06E-02 (3.92E+08)	1.68E-02 (6.21E+08)	4.32E-01 (1.60E+10)	2.87E-03 (1.06E+08)	2.72E-03 (1.01E+08)
26 Fe-55	None Detected	None Detected	2.52E-04 (9.33E+06)	None Detected	None Detected
27 Co-58	None Detected	None Detected	1.24E-05 (4.59E+05)	7.09E-06 (2.62E+05)	8.99E-06 (3.33E+05)
27 Co-60	None Detected	None Detected	None Detected	None Detected	7.19E-06 (2.66E+05)
35 Br-82	None Detected	None Detected	1.10E-05 (4.07E+05)	None Detected	None Detected
36 Kr-85 m	1.78E-02 (6.60E+08)	6.67E-02 (2.47E+09)	5.48E-02 (2.03E+09)	2.18E-02 (8.06E+08)	8.60E-02 (3.18E+09)
36 Kr-85	3.33E+01 (1.23E+12)	2.99E+01 (1.11E+12)	2.31E+01 (8.54E+11)	2.22E+01 (8.23E+11)	1.88E+02 (6.94E+12)
36 Kr-87	3.09E-04 (1.14E+07)	2.87E-03 (1.06E+08)	7.08E-05 (2.62E+06)	None Detected	None Detected
36 Kr-88	6.65E-04 (2.46E+07)	9.07E-03 (3.36E+08)	4.90E-03 (1.81E+08)	9.06E-03 (3.35E+08)	2.33E-02 (8.61E+08)
38 Sr-89	None Detected	None Detected	None Detected	1.24E-07 (4.59E+03)	9.08E-09 (3.36E+02)
38 Sr-90	None Detected	None Detected	4.48E-10 (1.66E+01)	9.43E-07 (3.49E+04)	None Detected
53 I-131	5.75E-04 (2.13E+07)	1.82E-03 (6.72E+07)	1.54E-03 (5.71E+07)	1.36E-03 (5.03E+07)	3.28E-02 (1.21E+09)
52 I-132	None Detected	None Detected	None Detected	None Detected	4.28E-03 (1.58E+08)
53 I-133	2.96E-03 (1.10E+08)	3.80E-03 (1.41E+08)	1.42E-03 (5.25E+07)	3.06E-03 (1.13E+08)	2.32E-02 (8.57E+08)
53 I-135	None Detected	None Detected	None Detected	None Detected	3.87E-03 (1.43E+08)
54 Xe-131 m	1.00E-01 (3.71E+09)	9.53E-01 (3.53E+10)	8.35E-01 (3.09E+10)	6.57E-01 (2.43E+10)	1.51E+01 (5.60E+11)
54 Xe-133 m	2.84E-01 (1.05E+10)	1.83E+00 (6.78E+10)	1.75E+00 (6.49E+10)	6.11E-01 (2.26E+10)	6.49E+00 (2.40E+11)
54 Xe-133	6.03E+01 (2.23E+12)	1.12E+02 (4.15E+12)	1.22E+02 (4.52E+12)	1.55E+02 (5.72E+12)	2.58E+02 (9.53E+12)
54 Xe-135 m	6.12E-04 (2.26E+07)	5.29E-03 (1.96E+08)	1.29E-04 (4.77E+06)	None Detected	None Detected
54 Xe-135	2.75E+00 (1.02E+11)	5.77E+00 (2.13E+11)	9.23E+00 (3.41E+11)	1.29E+01 (4.77E+11)	2.67E+01 (9.87E+11)
54 Xe-138	1.34E-04 (4.96E+06)	3.71E-04 (1.37E+07)	7.15E-09 (2.64E+02)	None Detected	None Detected

Table 4.5-8— Historical Liquid Releases 2001 through 2006
(Page 1 of 2)

Isotope	2001 Release Ci (Bq)	2002 Release Ci (Bq)	2003 Release Ci (Bq)	2004 Release Ci (Bq)	2005 Release Ci (Bq)	2006 Release Ci (Bq)
Ag-110M	3.45E-02 (1.28E+09)	2.03E-02 (7.49E+08)	2.22E-03 (8.22E+07)	2.65E-04 (9.81E+06)	9.78E-06 (3.62E+05)	1.77E-04 (6.55e+06)
Ba-140	None Detected	2.88E-05 (1.07E+06)	None Detected	None Detected	None Detected	None Detected
Be-7	None Detected	3.94E-04 (1.46E+07)	None Detected	None Detected	None Detected	None Detected
Ce-144	1.19E-03 (4.40E+07)	None Detected	2.25E-04 (8.33E+06)	None Detected	None Detected	None Detected
Co-57	1.19E-03 (4.39E+07)	3.50E-04 (1.30E+07)	7.61E-05 (2.82E+06)	1.62E-05 (5.99E+05)	1.39E-06 (5.14E+04)	1.79E-05 (6.64E+05)
Co-58	3.04E-01 (1.13E+10)	4.29E-02 (1.59E+09)	1.44E-02 (5.33E+08)	5.90E-03 (2.18E+08)	2.39E-03 (8.85E+07)	3.23E-03 (1.19E+08)
Co-60	1.95E-02 (7.22E+08)	1.94E-02 (7.19E+08)	3.64E-03 (1.34E+08)	1.77E-03 (6.53E+07)	5.94E-04 (2.20E+07)	1.43E-03 (5.31E+07)
Cr-51	5.64E-02 (2.09E+09)	1.09E-02 (4.03E+08)	1.54E-03 (5.71E+07)	6.88E-04 (2.55E+07)	3.89E-04 (1.44E+07)	5.01E-04 (1.85E+07)
Cs-134	3.30E-03 (1.22E+08)	2.35E-04 (8.68E+06)	7.95E-05 (2.94E+06)	2.78E-04 (1.03E+07)	7.55E-05 (2.79E+06)	4.48E-04 (1.66E+07)
CS-136	None Detected	None Detected	None Detected	None Detected	None Detected	1.09E-05 (4.03E+05)
Cs-137	9.39E-03 (3.48E+08)	4.44E-04 (1.64E+07)	3.17E-04 (1.17E+07)	7.34E-04 (2.71E+07)	1.32E-04 (4.89E+06)	5.60E-04 (2.07E+07)
Eu-154	6.99E-04 (2.59E+07)	3.32E-04 (1.23E+07)	2.03E-04 (7.51E+06)	None Detected	None Detected	None Detected
Eu-155	2.23E-04 (8.25E+06)	3.63E-04 (1.34E+07)	1.47E-04 (5.44E+06)	None Detected	None Detected	None Detected
Fe-55	1.07E-01 (3.96E+09)	1.19E-01 (4.41E+09)	2.71E-02 (1.00E+09)	1.51E-02 (5.59E+08)	8.67E-02 (3.21E+09)	2.27E-02 (8.39E+08)
Fe-59	5.02E-03 (1.86E+08)	2.25E-03 (8.33E+07)	5.80E-05 (2.14E+06)	5.35E-06 (1.98E+05)	1.66E-05 (6.13E+05)	5.15E-05 (1.90E+06)
I -131	1.42E-03 (5.26E+07)	3.51E-04 (1.30E+07)	6.04E-04 (2.24E+07)	2.93E-04 (1.08E+07)	1.58E-04 (5.86E+06)	4.10E-03 (1.52E+08)
I -132	None Detected	2.40E-04 (8.88E+06)	None Detected	None Detected	None Detected	None Detected
I -133	8.97E-05 (3.32E+06)	4.95E-05 (1.83E+06)	1.57E-05 (5.80E+05)	3.55E-05 (1.31E+06)	1.59E-05 (5.86E+05)	8.91E-05 (3.30E+06)
La-140	None Detected	9.69E-05 (3.59E+06)	None Detected	None Detected	None Detected	None Detected
Mn-54	5.75E-03 (2.13E+08)	4.66E-03 (1.72E+08)	7.45E-04 (2.76E+07)	1.81E-04 (6.68E+06)	4.11E-05 (1.52E+06)	2.21E-04 (8.18E+06)
Na-24	4.66E-03 (1.72E+08)	None Detected	2.49E-06 (9.21E+04)	None Detected	None Detected	None Detected
Nb-95	5.96E-02 (2.20E+09)	2.16E-02 (7.98E+08)	2.65E-03 (9.82E+07)	3.06E-04 (1.13E+07)	1.60E-04 (5.93E+06)	2.89E-04 (1.07E+07)
Nb-97	3.54E-05 (1.31E+06)	None Detected	None Detected	None Detected	None Detected	None Detected
Ni-63	None Detected	None Detected	None Detected	2.17E-03 (8.03E+07)	6.16E-03 (2.28E+08)	7.47E-04 (2.76E+07)
Ru-103	5.42E-04 (2.01E+07)	7.10E-05 (2.63E+06)	None Detected	None Detected	None Detected	None Detected
Sb-124	3.42E-03 (1.26E+08)	6.43E-05 (2.38E+06)	5.50E-04 (2.04E+07)	None Detected	None Detected	None Detected

Table 4.5-8— Historical Liquid Releases 2001 through 2006
(Page 2 of 2)

Isotope	2001 Release Ci (Bq)	2002 Release Ci (Bq)	2003 Release Ci (Bq)	2004 Release Ci (Bq)	2005 Release Ci (Bq)	2006 Release Ci (Bq)
Sb-125	2.15E-02 (7.96E+08)	1.70E-02 (6.30E+08)	8.85E-03 (3.27E+08)	1.44E-04 (5.33E+06)	8.57E-06 (3.17E+05)	6.83E-05 (2.53E+06)
Sn-113	5.45E-03 (2.02E+08)	2.18E-03 (8.06E+07)	5.27E-05 (1.95E+06)	None Detected	None Detected	None Detected
Sn-117M	3.77E-04 (1.40E+07)	3.86E-04 (1.43E+07)	1.08E-03 (3.98E+07)	3.20E-05 (1.18E+06)	1.28E-04 (4.74E+06)	None Detected
Sr-89	7.63E-04 (2.82E+07)	9.51E-06 (3.52E+05)	4.84E-04 (1.79E+07)	None Detected	3.83E-04 (1.42E+07)	None Detected
Sr-90	2.12E-05 (7.84E+05)	None Detected	1.89E-06 (7.00E+04)	None Detected	None Detected	None Detected
Te-125M	None Detected	None Detected	None Detected	None Detected	1.27E-02 (4.70E+08)	1.38E-02 (5.11E+08)
Te-132	None Detected	1.44E-04 (5.33E+06)	None Detected	None Detected	None Detected	None Detected
W -187	None Detected	7.15E-06 (2.65E+05)	None Detected	None Detected	None Detected	None Detected
Zn-65	1.54E-06 (5.70E+04)	None Detected	None Detected	None Detected	None Detected	None Detected
Zr-95	3.59E-02 (1.33E+09)	1.12E-02 (4.15E+08)	1.46E-03 (5.41E+07)	1.59E-04 (5.88E+06)	1.17E-04 (4.34E+06)	1.58E-04 (5.84E+06)
Zr-97	5.61E-05 (2.08E+06)	None Detected	None Detected	None Detected	None Detected	None Detected
Total	6.82E-01 (2.52E+10)	2.75E-01 (1.02E+10)	6.65E-02 (2.46E+09)	2.81E-02 (1.04E+09)	1.10E-01 (4.08E+09)	4.86E-02 (1.80E+09)
Dilution Flow ft^3/sec (L/sec)	3705.3 (104922)	2738.4 (77543)	4924.0 (139431)	5147.8 (145769)	5147.8 (145769)	5003.4 (141681)

Table 4.5-9— Projected Dose Rates from all Sources by Construction Zone

Maximum Construction Zone Dose Rates (mrem/year) Assuming 2,200 Hours per Year Occupancy			
Zone	**Zone Description**	**Dose Rate mrem/2200 hours (mSv/2200 hours)**	**Effluents Only mrem/2200 hours (mSv/2200 hours)**
B	Batch Plant	0.02 (0.0002)	0.01 (0.0001)
C	Construction on main structures	1.35 (0.0135)	0.08 (0.0008)
L	Laydown/Spoils	21.67 (0.2167)	0.12 (0.0012)
O	Office/Trailer	2.42 (0.0242)	0.03 (0.0003)
P	Parking	19.65 (0.1965)	0.04 (0.0004)
R	Roads	38.89 (0.3889)	0.13 (0.0013)
S	Shoreline, tunnel, barge, in/out flow	0.47 (0.0047)	0.47 (0.0047)
T	Tower/Basin/Desalinization	0.02 (0.0002)	0.01 (0.0001)
W	Warehouse	0.65 (0.0065)	0.03 (0.0003)
	Maximum, not roads	21.67 (0.2167)	0.47 (0.0047)
	Maximum, all zones	38.89 (0.3889)	0.47 (0.0047)

Note: The 39 mrem assumes worker occupancy of 2200 hours per year on the highest dose location on the road, converted assuming 8760 hours per year. The ALARA program will prevent this. In fact, workers will spend very little time at that location. Occupancy is expected to be 2%, or 44 hours per year at any road location. Taking credit for 2% occupancy the road dose drops to 0.78 mrem. This and all other doses meet the criterion

Table 4.5-10— Projected Dose Rates from Effluents by Construction Zone

		Maximum Dose Rate Assuming Full Time Occupancy mrem/year (mSievert/year)				
Zone	Zone Description	Gaseous Effluents TEDE	Bounding App. I Total Body (Noble Gas)	Bounding App. I Skin (Noble Gas)	Bounding App I Organ (Iodines & Particulates)	Liquid Effluents TEDE
B	Batch Plant	0.06 (0.0006)	0.12 (0.0012)	0.23 (0.0023)	0.29 (0.0029)	0.00 (0.0000)
C	Construction on main structures	0.32 (0.0032)	0.63 (0.0063)	1.27 (0.0127)	1.59 (0.0159)	0.00 (0.0000)
L	Laydown/Spoils	0.48 (0.0048)	0.97 (0.0097)	1.93 (0.0193)	2.41 (0.0241)	0.00 (0.0000)
O	Office/Trailer	0.12 (0.0012)	0.24 (0.0024)	0.48 (0.0048)	0.60 (0.0060)	0.00 (0.0000)
P	Parking	0.17 (0.0017)	0.33 (0.0033)	0.66 (0.0066)	0.83 (0.0083)	0.00 (0.0000)
R	Roads	0.53 (0.0053)	1.06 (0.0106)	2.11 (0.0211)	2.64 (0.0264)	0.00 (0.0000)
S	Shoreline, tunnel, barge, in/out flow	1.55 (0.0155)	3.09 (0.0309)	6.18 (0.0618)	7.73 (0.0773)	0.32 (0.0032)
T	Tower/Basin/Desalinization	0.06 (0.0006)	0.12 (0.0012)	0.24 (0.0024)	0.30 (0.0030)	0.00 (0.0000)
W	Warehouse	0.10 (0.0010)	0.20 (0.0020)	0.41 (0.0041)	0.51 (0.0051)	0.00 (0.0000)
	Maximum	1.55 (0.0155)	3.09 (0.0309)	6.18 (0.0618)	7.73 (0.0773)	0.32 (0.0032)
	10CFR50 Appendix I Limit		5 (0.05)	15 (0.15)	15 (0.15)	3 (0.03)

Table 4.5-11— Projected Construction Worker Census 2010 to 2015

Year	Construction Workers on Site
2010	531
2011	2,281
2012	4,000
2013	4,000
2014	4,000
2015	3,215

Table 4.5-12— Projected Construction Worker Occupancy by Zone

Zone Description	Zone Code	Occupancy Fraction
Batch Plant	B	0.001
Construction on Main Structures	C	0.665
Laydown/Spoils	L	0.020
Office/Trailer	O	0.160
Parking	P	0.020
Roads	R	0.020
Shoreline, Tunnel, Barge, In/Out Flow	S	0.066
Tower/Basin/Desalinization	T	0.066
Warehouse	W	0.003
	Total	1.021

Note: Total occupancy fractions is greater than 1 because the "Laydown/Spoils" zone fraction was conservatively increased to match the occupancy fraction for parking and roads.

Table 4.5-13— FTE for CCNPP Unit 3 Construction Workers

		FTE (Number of Workers by Zone)					
Zone	Count	2010	2011	2012	2013	2014	2015
B	41	0.5	2.3	4.0	4.0	4.0	3.2
C	232	353.1	1516.9	2660.0	2660.0	2660.0	2138.0
L	451	10.6	45.6	80.0	80.0	80.0	64.3
O	87	85.0	365.0	640.0	640.0	640.0	514.4
P	172	10.6	45.6	80.0	80.0	80.0	64.3
R	170	10.6	45.6	80.0	80.0	80.0	64.3
S	69	35.0	150.5	264.0	264.0	264.0	212.2
T	65	35.0	150.5	264.0	264.0	264.0	212.2
W	38	1.6	6.8	12.0	12.0	12.0	9.6
	By YEAR	542.2	2328.9	4084.0	4084.0	4084.0	3282.5

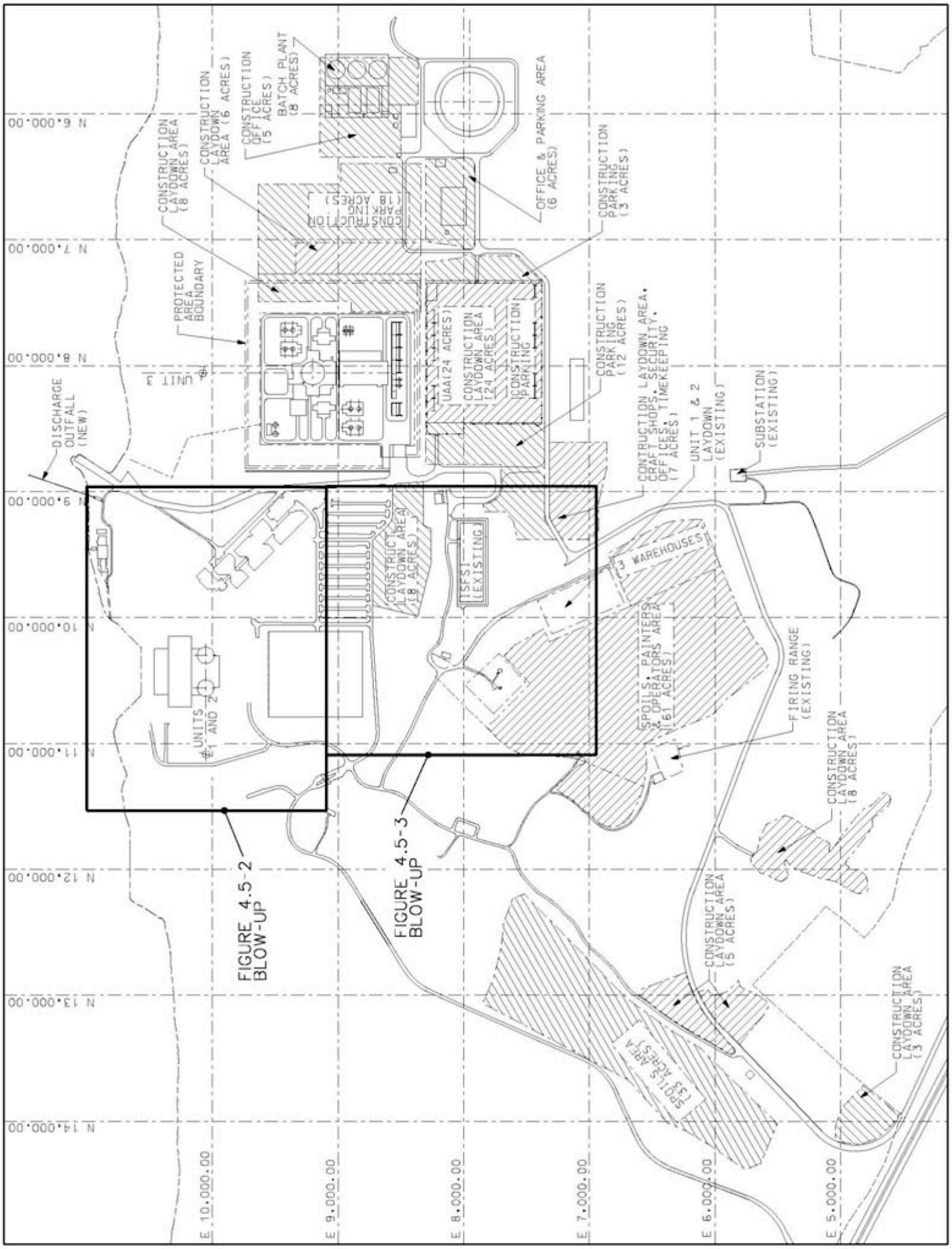
Table 4.5-14— Average Dose Rates to CCNPP Unit 3 Construction Workers

		Average Dose Rate (mrem/year (mSv/year)) by Zone					
Zone	**Count**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
B	41	0.054 (0.00054)	0.054 (0.00054)	0.054 (0.00054)	0.054 (0.00054)	0.054 (0.00054)	.054 (0.00054)
C	232	0.493 (0.00493)	0.523 (0.00523)	0.553 (0.00553)	0.582 (0.00582)	0.612 (0.00612)	0.642 (0.00642)
L	451	3.218 (0.03218)	3.311 (0.03311)	3.404 (0.03404)	3.496 (0.03496)	3.589 (0.03589)	3.682 (0.03682)
O	87	1.059 (0.01059)	1.128 (0.01128)	1.196 (0.01196)	1.264 (0.01264)	1.332 (0.01332)	1.400 (0.01400)
P	172	2.383 (0.02383)	2.632 (0.02632)	2.881 (0.02881)	3.130 (0.03130)	3.379 (0.03379)	3.628 (0.03628)
R	170	10.757 (0.10757)	11.262 (0.11262)	11.767 (0.11767)	12.273 (0.12273)	12.778 (0.12778)	13.283 (0.13283)
S	69	0.731 (0.00731)	0.732 (0.00732)	0.732 (0.00732)	0.732 (0.00732)	0.732 (0.00732)	0.733 (0.00733)
T	65	0.054 (0.00054)	0.054 (0.00054)	0.054 (0.00054)	0.054 (0.00054)	0.055 (0.00055)	0.055 (0.00055)
W	38	0.929 (0.00929)	0.952 (0.00952)	0.975 (0.00975)	0.999 (0.00999)	1.022 (0.01022)	1.045 (0.01045)

Table 4.5-15— CCNPP Unit 3 Collective Dose to Construction Workers

		Collective Dose (person-rem) (person-sievert) by Zone						
Zone	**Zone Description**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**By Zone**
B	Batch Plant	0.0000 (0.0000)	0.0000 (0.0000)	0.0001 (0.000001)	0.0001 (0.000001)	0.0001 (0.000001)	0.0000 (0.0000)	0.0002 (0.000002)
C	Construction on Main Structures	0.0437 (0.000437)	0.1992 (0.001992)	0.3691 (0.003691)	0.3889 (0.003889)	0.4087 (0.004087)	0.3445 (0.003445)	1.7541 (0.017541)
L	Laydown/Spills	0.0086 (0.000086)	0.0379 (0.000379)	0.0684 (0.000684)	0.0702 (0.000702)	0.0721 (0.000721)	0.0595 (0.000595)	0.3167 (0.003167)
O	Office/Trailer	0.0226 (0.000226)	0.1033 (0.001033)	0.1922 (0.001922)	0.2031 (0.002031)	0.2141 (0.002141)	0.1809 (0.001809)	0.9162 (0.009162)
P	Parking	0.0064 (0.000064)	0.0302 (0.000302)	0.0579 (0.000579)	0.0629 (0.000629)	0.0679 (0.000679)	0.0586 (0.000586)	0.2837 (0.002837)
R	Roads	0.0287 (0.000287)	0.1290 (0.001290)	0.2364 (0.002364)	0.2466 (0.002466)	0.2567 (0.002567)	0.2145 (0.002145)	1.1119 (0.011119)
S	Shoreline, Tunnel, barge, In/Out Flow	0.0064 (0.000064)	0.0277 (0.000277)	0.0485 (0.000485)	0.0485 (0.000485)	0.0486 (0.000486)	0.0390 (0.000390)	0.2188 (0.002188)
T	Tower/Basin/ Desalinization	0.0005 (0.000005)	0.0021 (0.000021)	0.0036 (0.000036)	0.0036 (0.000036)	0.0036 (0.000036)	0.0029 (0.000029)	0.0163 (0.000163)
W	Warehouse	0.0004 (0.000004)	0.0016 (0.000016)	0.0029 (0.000029)	0.0030 (0.000030)	0.0031 (0.000031)	0.0025 (0.000025)	0.0136 (0.000136)
	By YEAR	0.1173 (0.001173)	0.5310 (0.005310)	0.9791 (0.009791)	1.0270 (0.010270)	1.0749 (0.010749)	0.9024 (0.009024)	**4.6316** (0.046316)

Figure 4.5-1— Site Layout of CCNPP Units 1, 2, and 3



See Figure 2.1-1 and Figure 3.1-2 for Site and Powerblock layout

Figure 4.5-2— Sources on CCNPP Units 1 and 2 (Part 1 and 2)

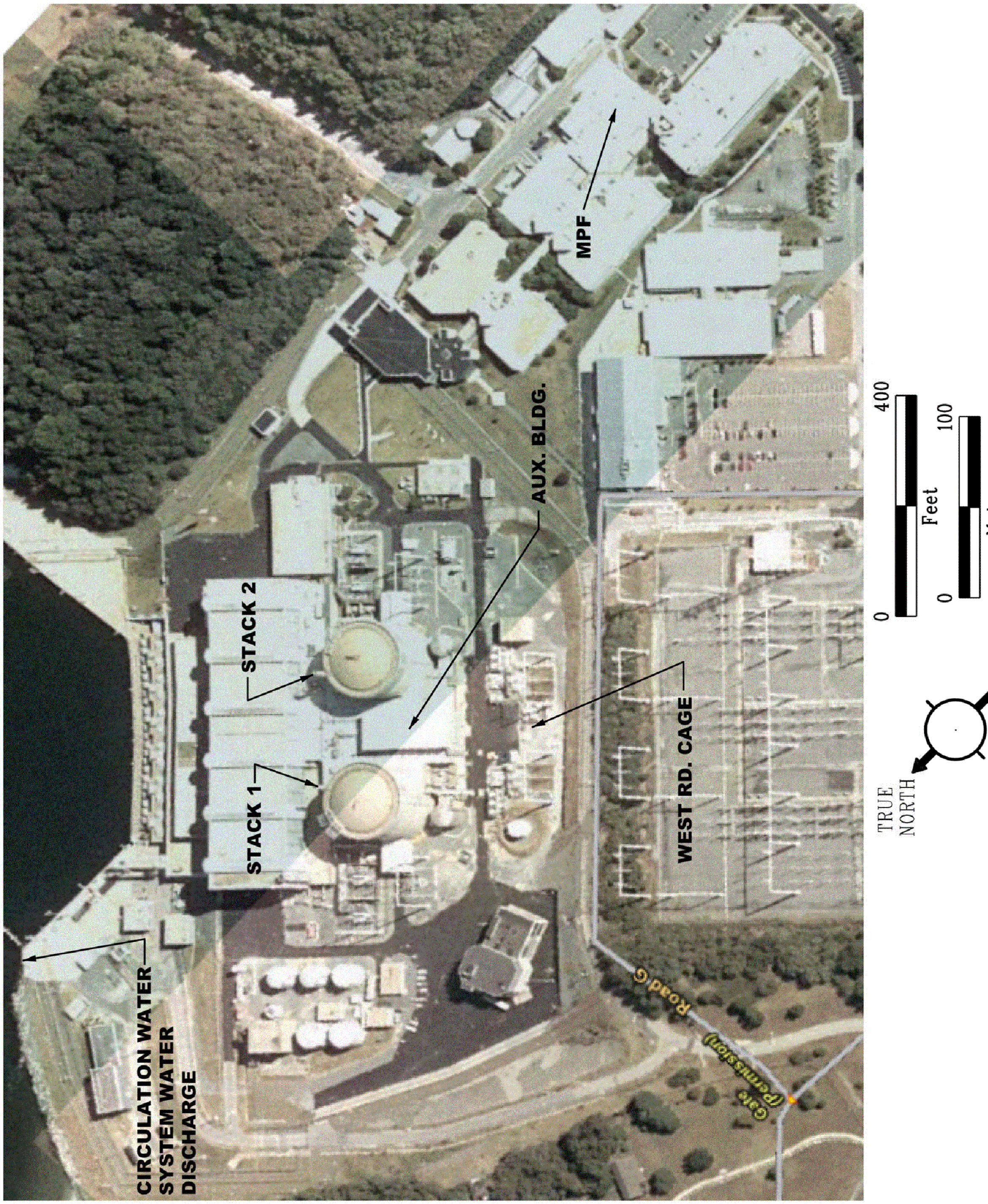


Figure 4.5-3— Sources on CCNPP Units 1 and 2 (Part 2 of 2)

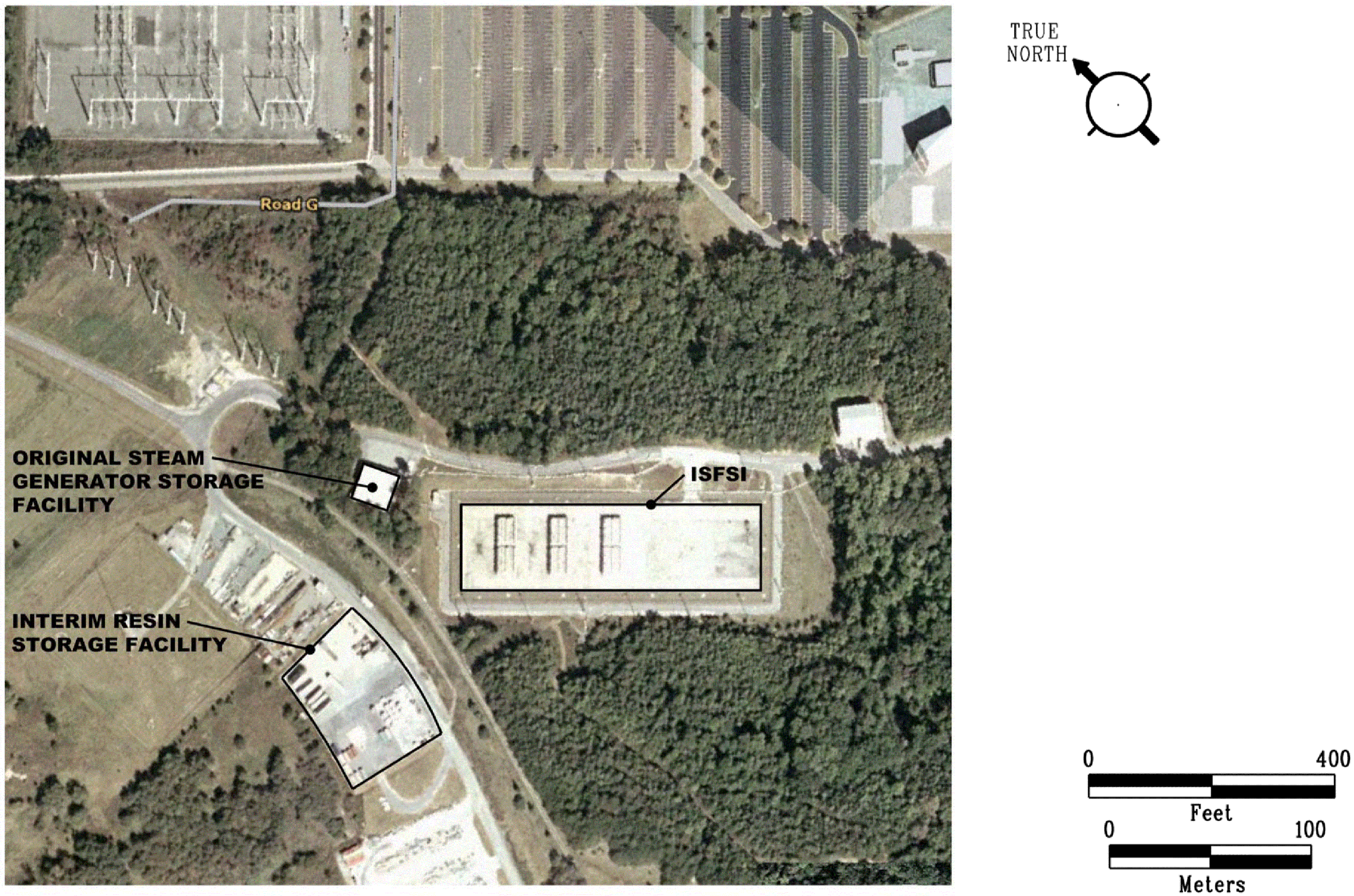


Figure 4.5-4— Historical ISFSI 2005 TLD Doses Versus Distance

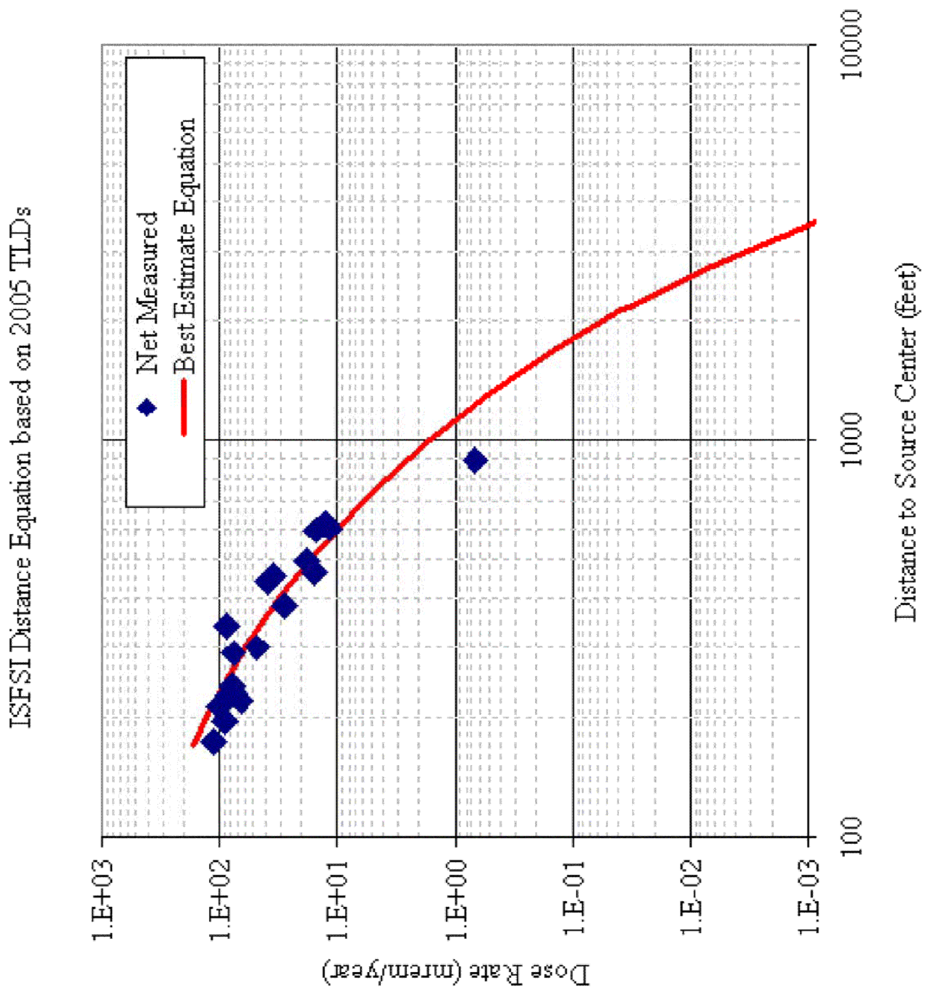


Figure 4.5-5— Resin Area and ISFSI Historical TLD Readings

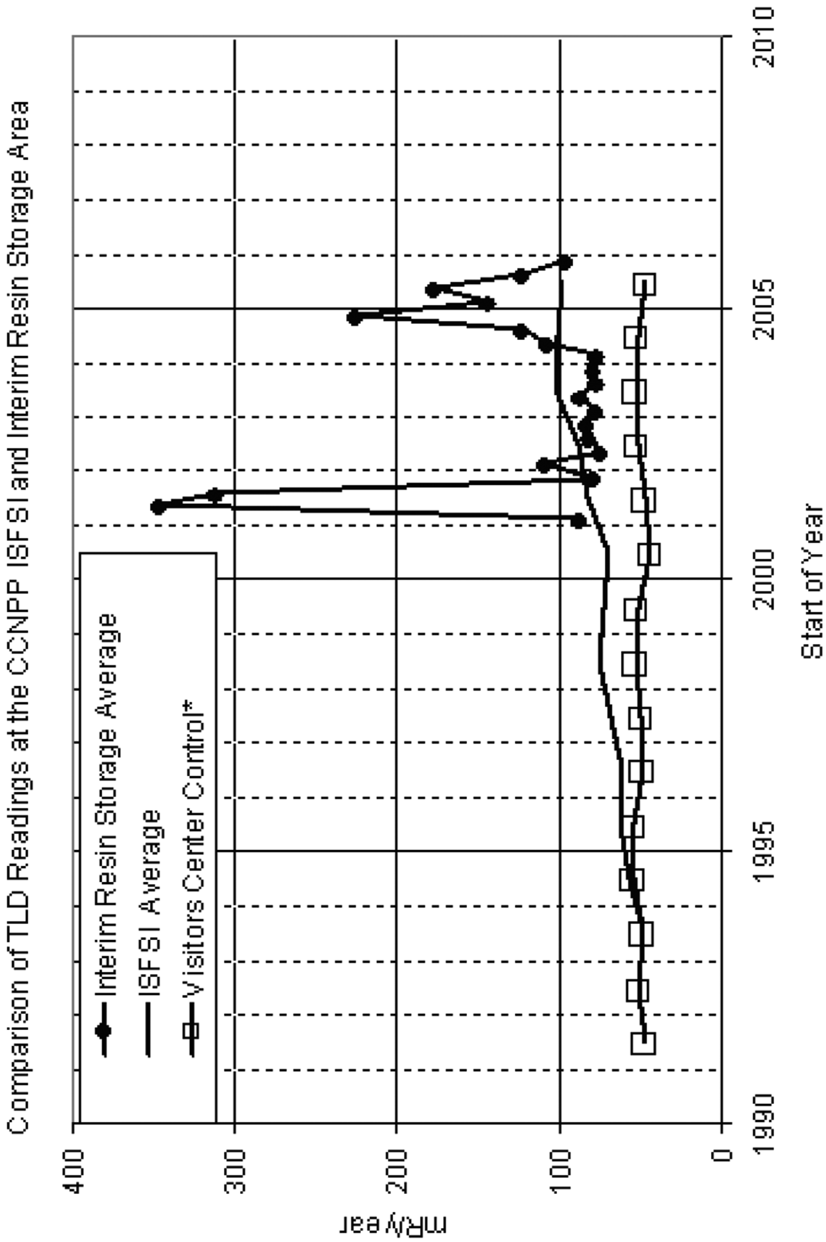


Figure 4.5-6— Resin Area Dose Rate for 2005

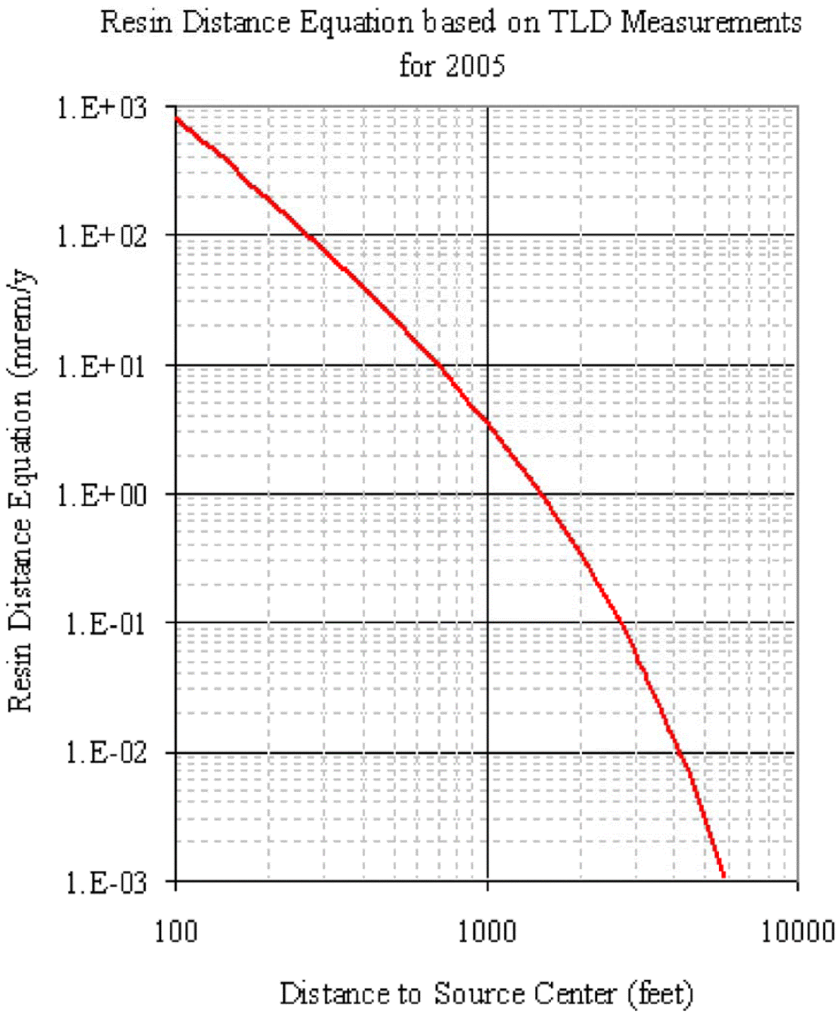


Figure 4.5-7— Dose Rate Estimated in 2015 in Units of mrem per 8760 Hours

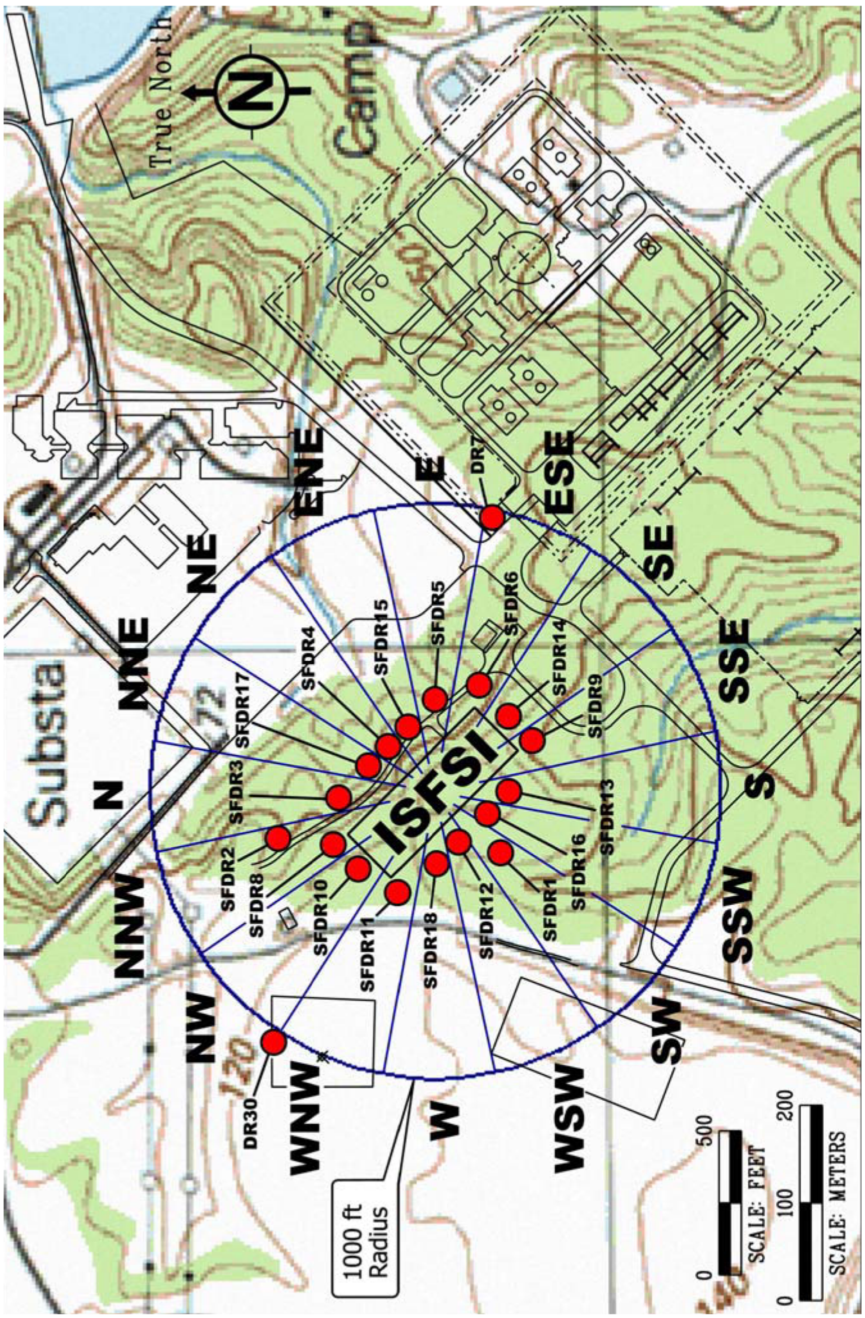


Figure 4.5-8— Bounding Annual Average X/Q in CCNPP Unit 3 Direction

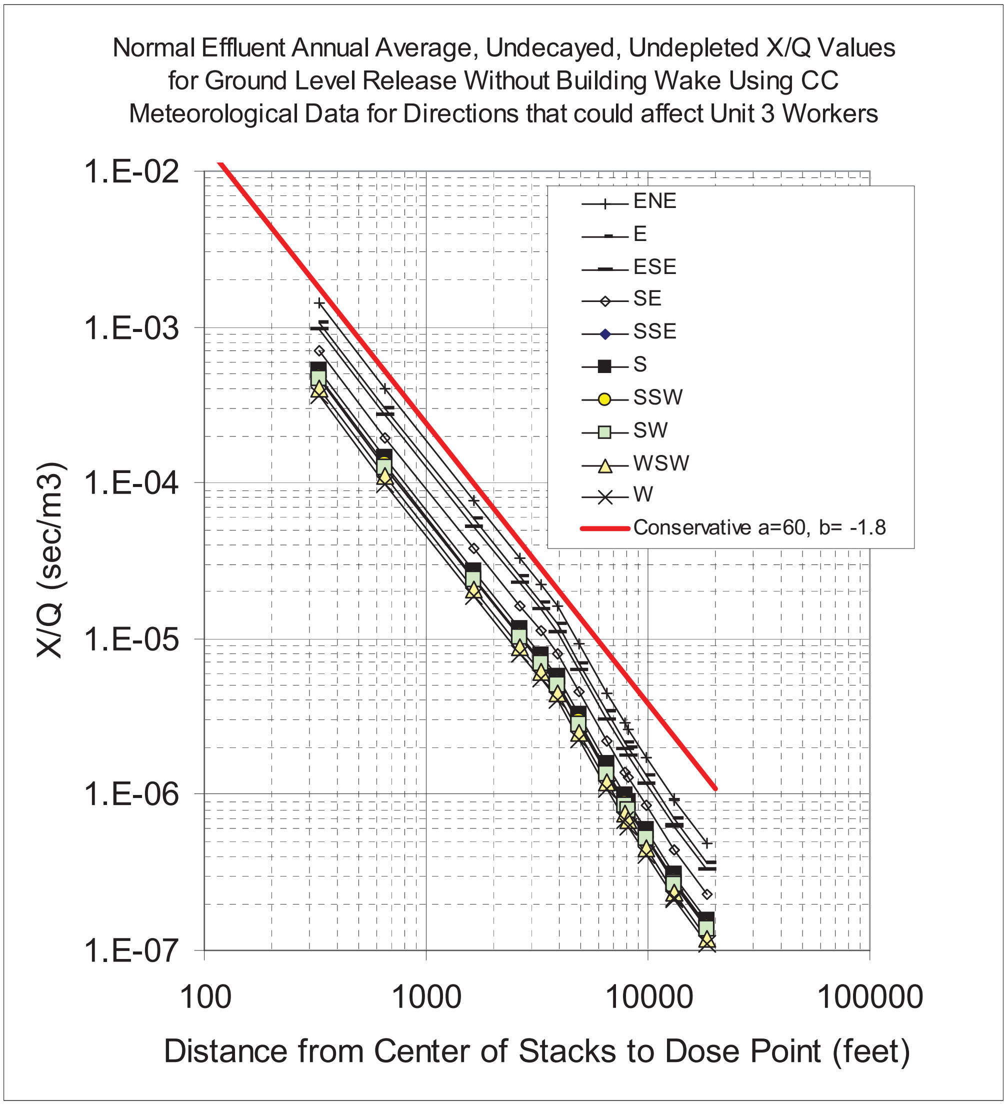
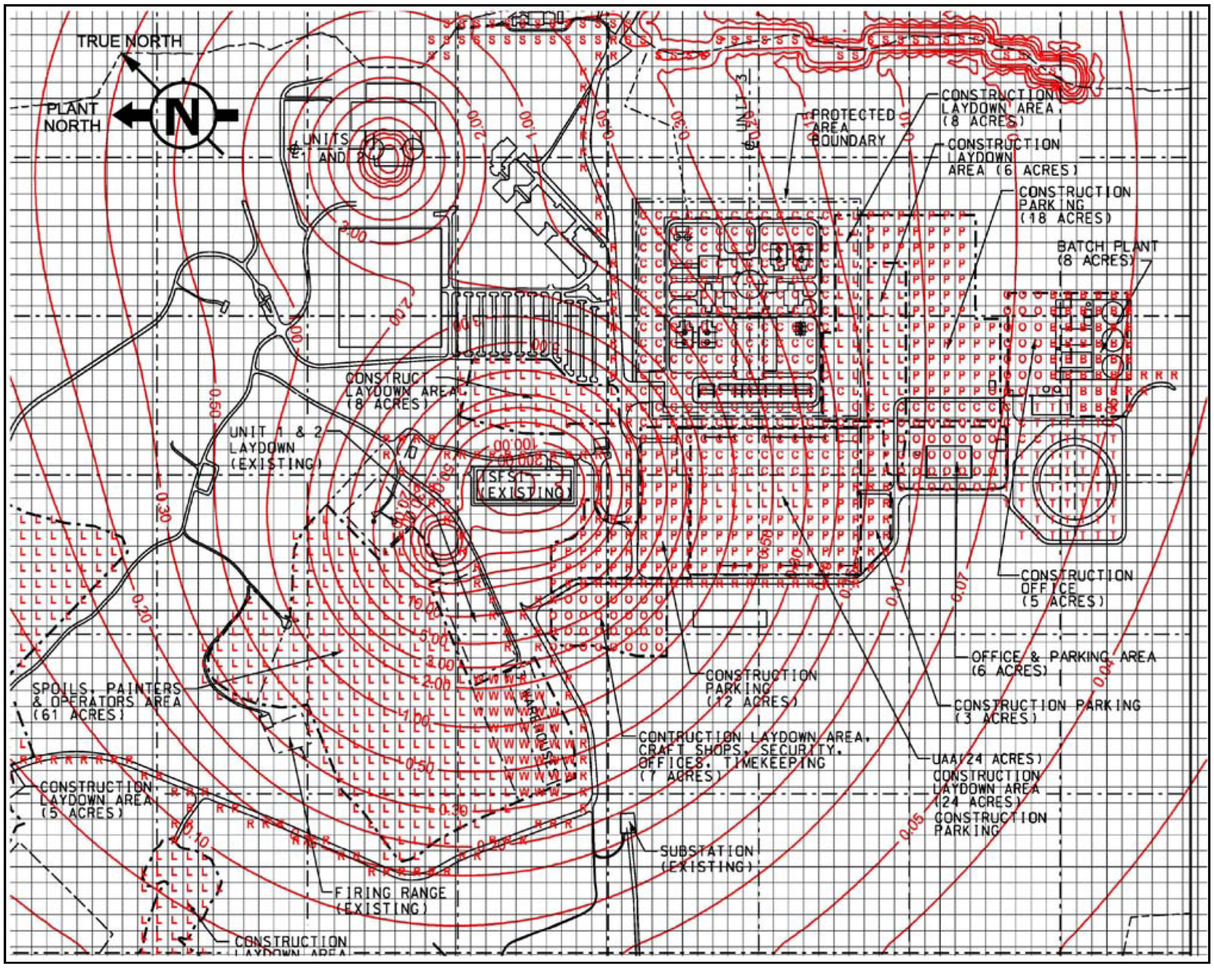


Figure 4.5-9— ISFSI TLD Locations



Notes for figure on next page.

Note 1 — the plant grid on this figure is shown in 100-foot by 100-foot squares.

Note 2 — the following provides a key to the zones indicated in the figure.

Zone	Description
B	Batch Plant
C	Construction on main structures
L	Laydown/Spoils
O	Office/Trailer
P	Parking
R	Roads
S	Shoreline, tunnel, barge, in/out flow
T	Tower/Basin/Desalinization
W	Warehouse

Note 3 — See Figure 2.1-1 and Figure 3.1-2 for Site and Powerblock layout

Figure 4.5-10— Annual Gamma Net ISFSI Dose Rate

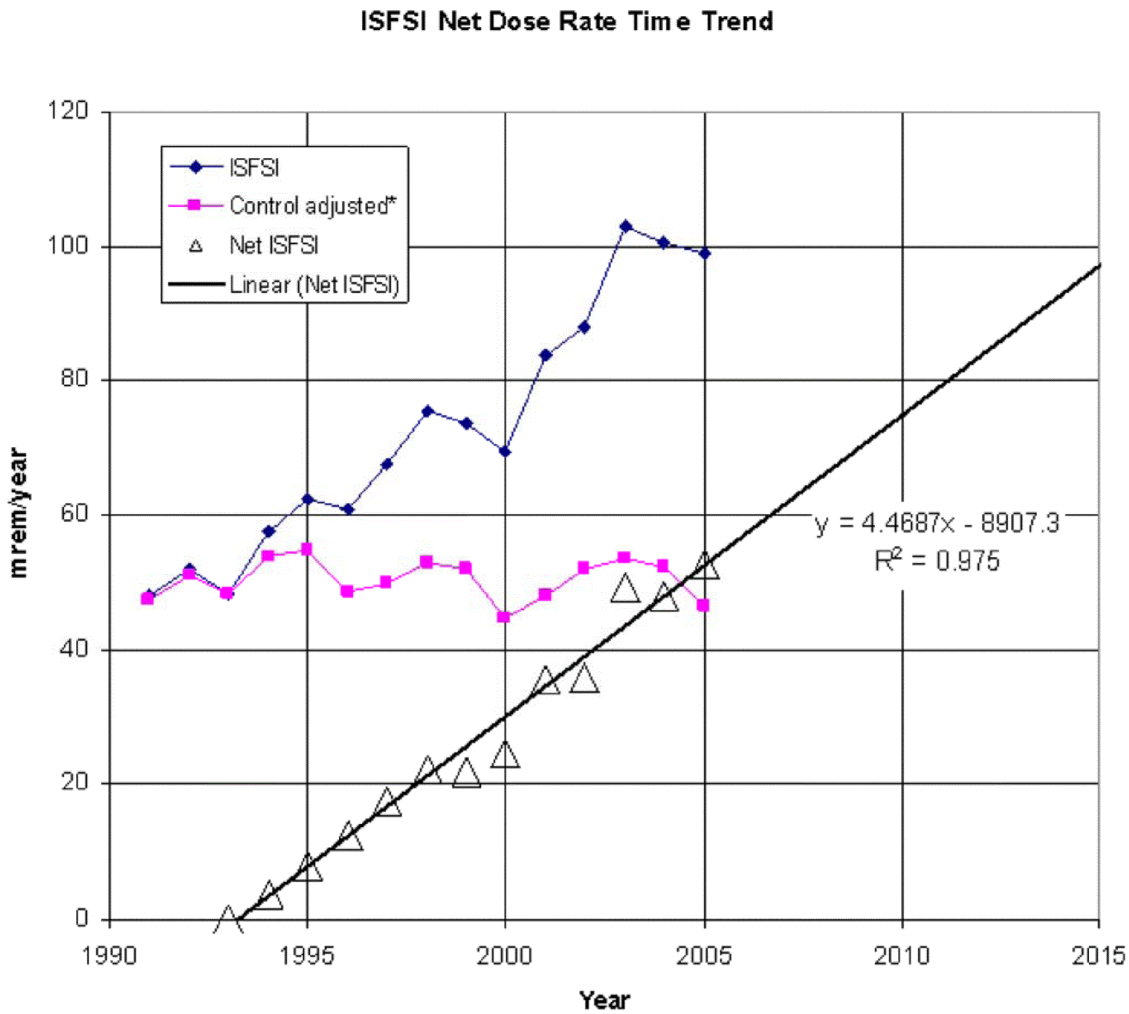
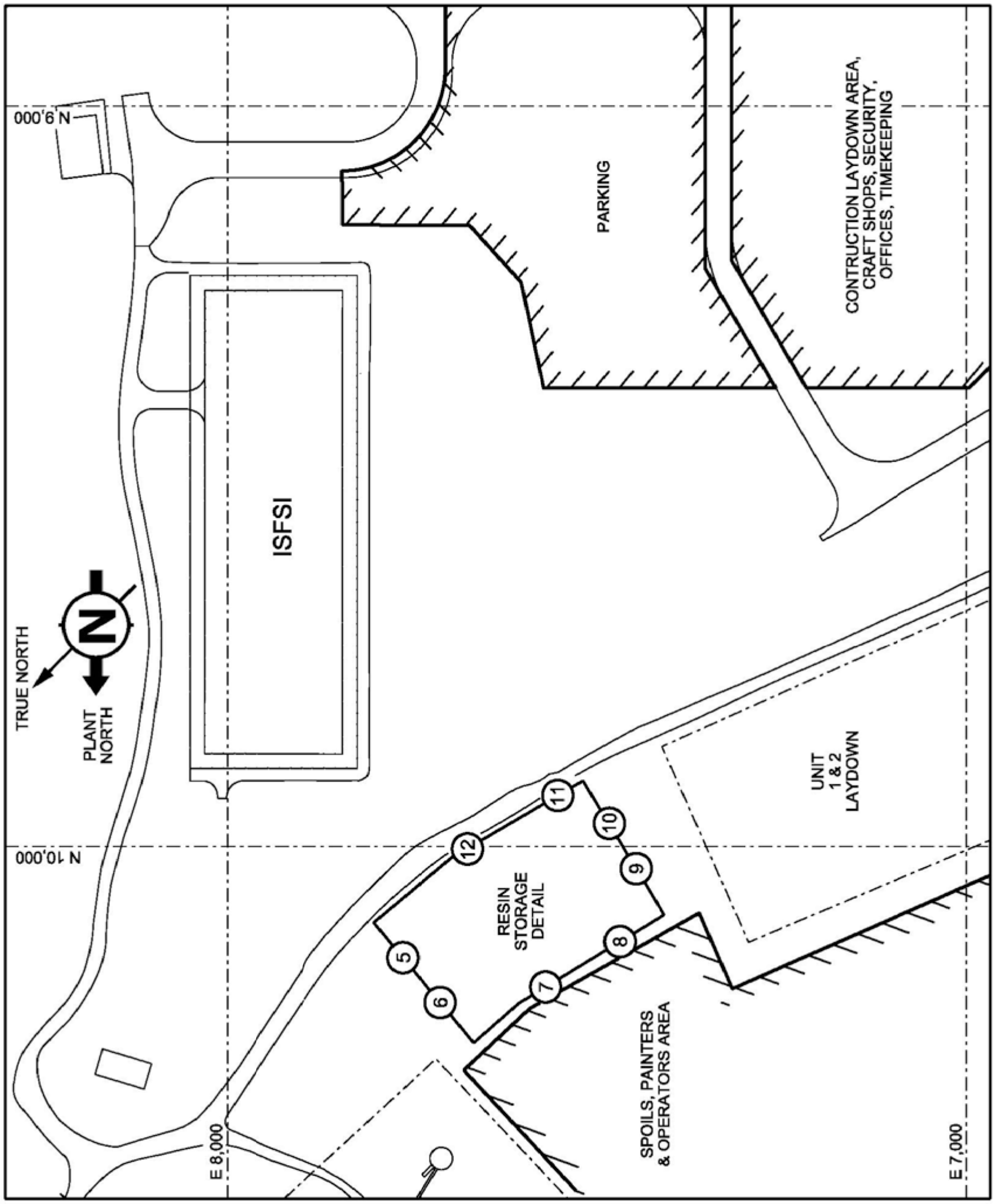


Figure 4.5-11— Resin Area TLD Locations



4.6 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

In general, potential impacts will be minimized through compliance with applicable Federal, Maryland, and local laws and regulations enacted to prevent or minimize adverse environmental impacts that may be encountered such as air emissions, noise, storm water pollutants, and spills. Principal among these will be the National Pollutant Discharge Elimination System (NPDES) Construction General Permit and the Corps of Engineers 404 Permit to minimize sediment erosion and protect water quality. The Site Resource Management Plan will address affected site lands and waters. Also included will be required plans such as a Storm Water Pollution Prevention Plan (SWPPP) and associated Best Management Practices (BMPs) as well as administrative actions such as a Traffic Management Plan.

Table 4.6-1 lists the potential impacts associated with the construction activities described in Sections 4.1 through 4.5 and 4.7. The table identifies, from the categories listed below, which adverse impact may occur as a result of construction activities and its relative significance rating (i.e., [S]mall, [M]oderate, or [L]arge) following implementation of associated measures and controls. Table 4.6-1 also includes a brief description, by ER Section, of each potential impact and the measures and controls to minimize the impact, if needed.

- Erosion and Sedimentation
- Air Quality (dust, air pollutants)
- Wastes (effluents, spills, material handling)
- Surface Water
- Groundwater
- Land Use
- Water Use and Quality
- Terrestrial Ecosystems
- Aquatic Ecosystems
- Socioeconomic
- Aesthetics
- Noise
- Traffic
- Radiation Exposure
- Other (site specific (i.e., non-radiological health impacts))

Based on existing site conditions, in-place CCNPP Units 1 and 2 programs and procedures, as well as the measures and controls proposed, the potential adverse impacts identified from the construction of CCNPP Unit 3 are anticipated to be SMALL, if any, for all categories evaluated except: (1) surface waters, which is expected to be MODERATE and require mitigation due to

the impact of wetlands and wetland buffers; (2) traffic, which is expected to be MODERATE but manageable with the implementation of a Traffic Management Plan.

Table 4.6-2 provides estimates of the percentage of impacts attributable to "construction" and to "preconstruction" as well as a summary of the basis for the estimates. The estimated construction related impacts presented in the table were based primarily on two factors, namely the area associated with the construction of safety-related structures, systems, or components (SSCs) and the labor hours associated with the construction of SSCs. Information related to these two factors is provided as follows:

- Construction Area - The area that will be developed for CCNPP Unit 3 is estimated to be approximately 460 ac (186 ha). Of this developed area, approximately 130 ac (53 ha) will be occupied by SSCs. This includes 5 ac (2 ha) for the UHS Intake Structure, 25 ac (10 ha) for the 500 kV AIS Switchyard, 30 ac (12 ha) for the Transmission Corridor, 50 ac (20 ha) for the Power Block, 15 ac (6 ha) for the Cooling Tower and 5 ac (2 ha) for the Desalination Plant. It is assumed that preconstruction activities of clearing, grubbing and site preparation will impact land area to be occupied by both SSCs and non SSCs structures/activities. All site development will be done concurrently.

- Labor Hours - Based on construction estimates for all phases of development of the CCNPP Unit 3, the estimated labor hours associated with the construction of SSCs is approximately 90% of the total labor hours associated with the development of the entire CCNPP Unit 3 plant site.

"Other factors that were considered where applicable include the following:

- Construction Duration - Estimates of impacts generally associated with construction activities were estimated to be related to construction of SSCs 77% of the time and to preconstruction activities 23% of the time.

- Water Usage - The quantity of water to be used for preconstruction is estimated to be 10% of the total water requirements in Table 4.2-1. Preconstruction activities were assumed to begin at the start of Year 1 and extend eight months into Year 2 to align with the assumption that preconstruction activities comprise 23% of time of construction. The water usage predicted for the first 20 months of the 86 month CCNPP Unit 3 construction period is allocated to preconstruction activities. That usage totals 10% of the total volume in Table 4.2-1.

Table 4.6-1— Summary of Measures and Controls to Limit Adverse Impacts During Construction
(Page 1 of 7)

ER Reference Section	Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	Erosion/Sediment (ES)	Proposed Measures and Controls or Mitigating Circumstances
4.1Land Use Impacts	S	S	S	M	-	S	-	S	S	-	-	-	-	-	-	S	

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.1.1The Site and Vicinity	Clearing, grading, excavation, and re-contouring. (ES)(AQ)(L)(TE)	Comply with NPDES Construction General Permit, including EPA effluent limitations.
	Disturbance (temporary and permanent) of wetlands and streams in vicinity. (SW)(AE)	Use site Resource Management Plan and BMPs to protect resources such as wetlands and streams in vicinity.
		Comply with individual Corps of Engineers 404 Permit.
		Comply with Maryland Non-Tidal Wetlands Protection Act permit.
		Restore wetlands and wetland buffers temporarily disturbed during construction.
		Construct new wetlands.
	Soil stockpiling and disturbance to natural drainage channels. (L)(ES)	Implement Storm Water Pollution Prevention Plan (SWPPP), including sediment and erosion control.
	Removal of existing trees and vegetation. (WS)(TE)	Use site Resource Management Plan and comply with BMP requirements; on-site land is not used for farmland nor is it considered prime or unique.
		Unmerchantable trees and slash will be chipped and spread as wood chips, or disposed of at an offsite landfill.
		Acreage will be restored following construction to the extent possible.
	Construction of temporary and permanent structures. (AQ)(L)(TE)	Construction footprint would be wholly contained on an existing dedicated nuclear power plant site.
	Release of fuels, oils, or other chemicals. (WS)(TE)(AE)	Implement Spill Prevention Control and Countermeasures (SPCC) Plan.
4.1.2Transmission Corridors and Off-site Areas	The existing transmission lines have sufficient capacity to carry the total output of existing CCNPP Units 1 and 2, as well as CCNPP Unit 3; as a result, there will be no new off-site transmission lines or rights-of-way disturbance. (L)(TE)	Use existing transmission corridor maintenance policies and practices to protect terrestrial and aquatic ecosystems.

Table 4.6-1— Summary of Measures and Controls to Limit Adverse Impacts During Construction
(Page 2 of 7)

<table>
<tr><th>ER Reference Section</th><th colspan="16">Potential Impact Category and Description</th><th>Proposed Measures and Controls or Mitigating Circumstances</th></tr>
<tr><td rowspan="3">4.1.3Historic Properties (and Cultural Resources)</td><td colspan="16" rowspan="3">Disturbance of archaeological resources. (L)</td><td>Perform Phase II Cultural Resource Survey.</td></tr>
<tr><td>In consultation with the SHPO, develop plan and procedures to manage identified/ unidentified historic/cultural resource.</td></tr>
<tr><td>Take appropriate actions (e.g., stop work) following discovery of potential historic/cultural resource.</td></tr>
<tr><td rowspan="2">4.2Water-Related Impacts</td><td>Erosion/Sediment (ES)</td><td>Air Quality (AQ)</td><td>Wastes (WS)</td><td>Surface Water (SW)</td><td>Groundwater (GW)</td><td>Land Use (L)</td><td>Water Use & Quality (W)</td><td>Terrestrial Ecosystems (TE)</td><td>Aquatic Ecosystems (AE)</td><td>Socioeconomic (S)</td><td>Aesthetics (A)</td><td>Noise (N)</td><td>Traffic (T)</td><td>Radiation Exposure (R)</td><td>Other (site specific) (O)</td><td>Erosion/Sediment (ES)</td><td></td></tr>
<tr><td>S</td><td>-</td><td>S</td><td>M</td><td>S</td><td>S</td><td>S</td><td>-</td><td>S</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>S</td><td></td></tr>
<tr><td rowspan="5">4.2.1Hydrologic Alterations</td><td colspan="16">Erosion, sediment, and storm water runoff (from on-site building, utilities, and road construction activities). (ES)(SW)(GW)(W)</td><td>Implement Storm Water Pollution Prevention Plan (SWPPP), including sediment and erosion control, as part of the NPDES Construction General Permit requirements.</td></tr>
<tr><td colspan="16">Chesapeake Bay turbidity/sediment effects (from dredging, refurbishment of the shoreline unloading facility, and installation of the Intake and Discharge Structures). (WS)(SW)(W)(AE)</td><td>Comply with Corps of Engineers 404 Permit requirements.</td></tr>
<tr><td colspan="16" rowspan="3">Temporary increase in groundwater withdrawal. (GW)(W)</td><td>Comply with existing Groundwater Water Appropriations and Use Permit Withdrawal Limit.</td></tr>
<tr><td>Use off-site water supply.</td></tr>
<tr><td>Install Desalinization Plant.</td></tr>
</table>

Table 4.6-1— Summary of Measures and Controls to Limit Adverse Impacts During Construction
(Page 3 of 7)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.2.1Hydrologic Alterations (Cont.)	Temporary dewatering activities. (GW)(W)	Comply with COMAR 26.17.06 for dewatering activities or obtain Water Appropriation and Use Permit, as needed.
		Comply with individual Corps of Engineers 404 Permit.
		Comply with BMP requirements.
		Monitor perched water levels.
	Disturbance of wetlands and streams in vicinity. (SW)(AE)	Use site Resource Management Plan and BMPs to protect resources such as wetlands and streams in vicinity.
		Comply with Maryland Non-Tidal Wetlands Protection Act permit.
		Comply with individual Corps of Engineers 404 Permit.
		Restore wetlands and wetland buffers temporarily disturbed during construction.
		Construct new wetlands.
	Shift of the Surficial aquifer recharge area(s). (GW)	Monitor perched water levels.
4.2.2Water Use Impacts	Temporary increase in groundwater withdrawal. (GW)(W)	Comply with existing Groundwater Water Appropriations and Use Permit Withdrawal Limit.
		Use off-site water supply.
		Install Desalinization Plant.
	Reduction in available pervious (infiltration) areas. (GW)(W)	Install sand filter trenches to allow runoff to infiltrate.

Table 4.6-1— Summary of Measures and Controls to Limit Adverse Impacts During Construction

(Page 4 of 7)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.2.2Water Use Impacts (Cont.)	Temporary dewatering activities. (GW)	Comply with COMAR 26.17.06 for dewatering activities or obtain Water Appropriation and Use Permit, as needed.
		Comply with individual Corps of Engineers 404 Permit.
		Comply with BMP requirements.
	Disturbance of wetlands and streams in vicinity. (SW)(AE)	Use site Resource Management Plan and BMPs to protect resources such as wetlands and streams in vicinity.
		Comply with Maryland Non-Tidal Wetlands Protection Act permit.
		Comply with individual Corps of Engineers 404 Permit.
		Comply with BMP requirements
		Restore wetlands and wetland buffers temporarily disturbed during construction.
		Construct new wetlands.
	Construction of new impoundments and modification of existing impoundments. (L)(AE)	Use site Resource Management Plan and BMPs to protect resources such as wetlands and streams in vicinity.
	Release of fuel, oils, or other chemicals. (WS)(AE)	Implement Spill Prevention, Control, and Countermeasures (SPCC) Plan.
	Temporary increase in sediment and silt. (ES)(W)	Implement Storm Water Pollution Prevention Plan (SWPPP), including sediment and erosion control, as part of the NPDES Construction General Permit requirements.
	Temporary increase in turbidity. (ES)(W)	Comply with Corps of Engineers 404 Permit requirements.

ER Reference Section	Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	Erosion/Sediment (ES)	Proposed Measures and Controls or Mitigating Circumstances
4.3Ecological Impacts	S	-	-	-	-	-	S	S	S	-	S	-	-	-	-	S	

Table 4.6-1— Summary of Measures and Controls to Limit Adverse Impacts During Construction
(Page 5 of 7)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.3.1Terrestrial Ecosystems	Loss of vegetation (i.e., oaks, hickories, mountain laurel and showy goldenrod) and existing habitat for important fauna (i.e., white-tailed deer and scarlet tanager and other forest-interior dwelling species (FIDS)), as well as forest cover. (TE)	Use site Resource Management Plan and BMPs to protect resources.
		To the extent practicable, design construction footprint to account for CBCA and other important habitat, including bald eagles nests.
		If any bald eagles' nest is located within the construction area, the Maryland Department of Natural Resources and U.S. Fish and Wildlife service will be contacted to obtainapproval of the required mitigating actions.
		Minimize cooling tower lighting, as practicable and allowed by regulation.
		Create new habitats (i.e., unforested uplands to ultimately generate a mixed deciduous forest).
		Maintain remaining unforested upland as old field habitat.
		Acreage will be restored following construction to the maximum extent possible.
	Disturbance (temporary and permanent) of wetlands and streams in vicinity. (ES)(AE)(A)	Use site Resource Management Plan and BMPs to protect resources such as wetlands and streams in vicinity.
		Comply with Maryland Non-Tidal Wetlands Protection Act Permit.
		Comply with BMP requirements.
		Comply with individual Corps of Engineers 404 Permit.
	Temporary disturbance of Chesapeake Bay Critical Area (CBCA). (AE)(A)	Preserve aesthetically outstanding tree clusters, as practical; harvest merchantable timber; use or recycle other woody material, as appropriate; develop reforestation plan.
	Limited mortality of wildlife (e.g., avian collisions with man-made structures.) (TE)(AE)	Use site Resource Management Plan and BMPs to protect resources.

Table 4.6-1— Summary of Measures and Controls to Limit Adverse Impacts During Construction

(Page 6 of 7)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.3.2Aquatic Ecosystems	Disturbance (temporary and permanent) of wetlands and streams in vicinity; however, on-site wetlands are not substantively distinguishable from other wetlands in the site vicinity and streams within the construction zone contain no rare or unique aquatic species. (SW)(ES)(AE)(A)	Use site Resource Management Plan and BMPs to protect resources.
		Implement Spill Prevention, Control, and Countermeasures (SPCC) Plan.
		Comply with Maryland Non-Tidal Wetlands Protection Act Permit.
		Comply with individual Corps of Engineers 404 Permit.
		Comply with BMP requirements.
		Restore wetlands and wetland buffers temporarily disturbed during construction.
		Construct new wetlands.
	Temporary sediment and silt buildup. (ES)(AE)	Implement Storm Water Pollution Prevention Plan (SWPPP), including sediment and erosion control and the construction of new impoundments, as appropriate.
	Temporary turbidity increase. (ES)(AE)(W)	Comply with Corps of Engineers 404 Permit requirements.
	Limited mortality of fish (i.e., resulting from sedimentation). (AE)	Comply with BMPs, including intercepting and retaining sediment before it reaches streams.

ER Reference Section	Erosion/Sediment (ES)	Air Quality (AQ)	Wastes (WS)	Surface Water (SW)	Groundwater (GW)	Land Use (L)	Water Use & Quality (W)	Terrestrial Ecosystems (TE)	Aquatic Ecosystems (AE)	Socioeconomic (S)	Aesthetics (A)	Noise (N)	Traffic (T)	Radiation Exposure (R)	Other (site specific) (O)	Air Quality (AQ)	
4.4Socioeconomic Impacts		S	S	-	-	-	-	-	-	S	S	S	M	-	-	S	

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.4.1Physical Impacts	Equipment and non-routine noise. (N)	Comply with applicable MDE noise limits.
		Comply with applicable OSHA noise-exposure limits.
	Air emissions (fugitive emissions and exhaust emissions) increase. (AQ)(WS)	Comply with applicable EPA and MDE air quality regulations.
		Implement routine vehicle/equipment inspection and maintenance program.
	Local and regional traffic increase. (AQ)(T)	Install new site perimeter and access road.
		Conduct Phase 2 Traffic Impact Analysis (TIA).
		Develop Traffic Management Plan using Phase 2 TIA results.
	The site is aesthetically altered due to CCNPP Units 1 and 2. Additional temporary impacts due to the visibility of construction activities. (A)	No mitigating measures required, because local residences and road traffic have limited visibility of site due to heavily wooded area.

Table 4.6-1— Summary of Measures and Controls to Limit Adverse Impacts During Construction

(Page 7 of 7)

ER Reference Section	Potential Impact Category and Description	Proposed Measures and Controls or Mitigating Circumstances
4.4.2Social and Economic Impacts	Influx of large construction work force. (S)	Small aggregate socioeconomic impacts anticipated, mitigation not required.
	Public services need (housing, schools, land use) increase. (S)	Small aggregate socioeconomic impacts anticipated; mitigation not required.
	Spending and tax revenue increase. (S)	Large beneficial impact to county property tax revenues; small beneficial impact for other types of tax revenues. No mitigating measures or controls required.
4.4.3 Environmental Justice Impacts	No disproportionate adverse impacts to minority or low-income populations. (S)	No mitigating measures or controls required
4.5Radiation Exposure to Construction Workers	Erosion/Sediment (ES): -; Air Quality (AQ): -; Wastes (WS): -; Surface Water (SW): -; Groundwater (GW): -; Land Use (L): -; Water Use & Quality (W): -; Terrestrial Ecosystems (TE): -; Aquatic Ecosystems (AE): -; Socioeconomic (S): -; Aesthetics (A): -; Noise (N): -; Traffic (T): -; Radiation Exposure (R): S; Other (site specific) (O): -; Erosion/Sediment (ES): -	
	ISFSI and Interim Resin Storage Area direct radiation exposure. (R)	Total Effective Dose Equivalent (TEDE) from all exposures has been determined to be below limits set in 10 CFR 20.1301.
		Implement ALARA practices at construction site.
	CCNPP Units 1 and 2 gaseous effluents exposure. (R)	Implement ALARA practices at construction site.
	CCNPP Units 1 and 2 liquid effluents exposure. (R)	Implement ALARA practices at construction site.
4.7Non-Radiological Health Impacts	Erosion/Sediment (ES): -; Air Quality (AQ): -; Wastes (WS): -; Surface Water (SW): -; Groundwater (GW): -; Land Use (L): -; Water Use & Quality (W): -; Terrestrial Ecosystems (TE): -; Aquatic Ecosystems (AE): -; Socioeconomic (S): -; Aesthetics (A): -; Noise (N): -; Traffic (T): -; Radiation Exposure (R): -; Other (site specific) (O): S; Erosion/Sediment (ES): -	
	Risk to workers from accidents and occupational illnesses. (O)	Implement site-wide Safety and Medical Program, including safety policies, safe work practices, as well as general and topic-specific training.

Table 4.6-2— Summary of Construction and Preconstruction Related Impacts
(Page 1 of 8)

Section Reference	Potential Impact and Significance[a]	Estimated Impacts (%)		Basis of Estimate
		Construction[b]	Preconstruction	
4.1 Land Use Impacts				
4.1.1 The Site and Vicinity				
4.1.1.1 The Site	S - Land Use	0	100	The percentage of the construction area impacted during preconstruction is estimated to be 100%, as described previously.
4.1.1.2 The Vicinity	S - Land Use	95	5	Estimates are based on the activities for the construction of CCNPP Unit 3 and supporting facilities that will take place during the construction of the new construction access road and above the tree line and will thus be visible from nearby roads.
4.1.2 Transmission Corridors and Off-Site Areas	S - Land Use	0	100	Transmission corridors are not included in the definition of construction of SSC's. There are no off-site areas associated with the project that are included in the definition of construction of SSC's.
4.1.3 Historic Properties	S - Land Use	0	100	The impact of historic properties will apply primarily to preconstruction activities since they will be identified and mitigation plans established prior to land clearing, grading, installation of drainage, erosion and other environmental mitigation measures, construction of temporary roads and laydown areas, etc. There is some small potential for discovery of historic properties during the construction-related excavations.
Section 4.2 Water Related Impacts				
Section 4.2.1 Hydrologic Alterations				
Section 4.2.1.1 Description of Surface Water Bodies and Groundwater Aquifers	S - Erosion and Sediment M - Surface Water S - Groundwater	0	100	The percentage of the construction area impacted during preconstruction is estimated to be 100%, as described previously.
Section 4.2.1.3 Water Sources and Amounts Needed for Construction	M - Surface Water	90	10	Estimates are based on a planned 86 months of construction, of which 23% is preconstruction. Estimates are based on the quantity of water to be used during the initial 23% time (assumed for preconstruction) and the remaining years for construction as shown in Table 4.2-1.
Section 4.2.1.4 Surface Water Bodies Receiving Construction Effluents that Could Affect Water Quality	S - Erosion and Sediment M - Surface Water	0	100	The percentage of the construction area impacted during preconstruction is estimated to be 100%, as described previously.

Table 4.6-2— Summary of Construction and Preconstruction Related Impacts
(Page 2 of 8)

Section Reference	Potential Impact and Significance[(a)]	Estimated Impacts (%)		Basis of Estimate
		Construction[(b)]	Preconstruction	
Section 4.2.1.5 Construction Impacts	S - Erosion and Sediment M - Surface Water S - Groundwater	0	100	These estimates are based on the land area that will be impacted by the construction of CCNPP Unit 3 and related facilities and on water usage over the time period of construction. A significant contributor to construction impacts will be de-watering of the deep excavations, with water routed in accordance with a required NPDES permit.
Section 4.2.1.6 Identification of Surface Water and Groundwater Users	N/A	N/A	N/A	N/A
Section 4.2.1.7 Proposed Practices to Limit or Minimize Hydrologic Alterations	N/A	N/A	N/A	N/A
Section 4.2.1.8 Compliance with Applicable Hydrological Standards and Regulations	N/A	N/A	N/A	N/A
Section 4.2.1.9 Best Management Practices	N/A	N/A	N/A	N/A
Section 4.2.2 Water Use Impacts				
Section 4.2.2.1 Description of the Site and Vicinity Water Bodies	N/A	N/A	N/A	N/A
Section 4.2.2.2 Hydrologic Alterations and Related Construction Activities	S - Erosion and Sediment M - Surface Water S - Groundwater	0	100	These estimates are based on the land area that will be impacted by the construction of CCNPP Unit 3 and related facilities and on water usage over the time period of construction. A significant contributor to construction impacts will be de-watering of the deep excavations, with water routed in accordance with a required NPDES permit.
Section 4.2.2.3 Physical Effects of Hydrologic Alterations	S - Erosion and Sediment M - Surface Water S - Groundwater	0	100	These estimates are based on the land area that will be impacted by the construction of CCNPP Unit 3 and related facilities and on water usage over the time period of construction. A significant contributor to construction impacts will be de-watering of the deep excavations, with water routed in accordance with a required NPDES permit.

Table 4.6-2— Summary of Construction and Preconstruction Related Impacts
(Page 3 of 8)

Section Reference	Potential Impact and Significance[(a)]	Estimated Impacts (%)		Basis of Estimate
		Construction[(b)]	Preconstruction	
Section 4.2.2.4 Water Quantities Available to Other Users	M - Surface Water S - Water Use S - Groundwater	90	10	Estimates are based on a planned 86 months of construction, of which 23% is preconstruction. Estimates are based on the quantity of water to be used during the initial 23% time (assumed for preconstruction) and the remaining years for construction as shown in Table 4.2-1.
Section 4.2.2.5 Water Bodies Receiving Construction Effluents	M - Surface Water S - Groundwater	90	10	Estimates are based on a planned 86 months of construction, of which 23% is preconstruction. Estimates are based on the quantity of water to be used during the initial 23% time (assumed for preconstruction) and the remaining years for construction as shown in Table 4.2-1.
Section 4.2.2.6 Baseline Water Quality Data	N/A	N/A	N/A	N/A
Section 4.2.2.7 Potential Changes to Surface Water and Groundwater Quality	M - Surface Water S - Groundwater	90	10	These estimates are based on the water usage over the time period of construction. The assumption is made that the disturbed land will be stabilized so as to prevent erosion and that potential changes to water quality will be associated with water usage and consequent runoff potential during active preconstruction and construction. A significant contributor to construction impacts will be de-watering of the deep excavations, with water routed in accordance with a required NPDES permit.
Section 4.2.2.8 Surface water and Groundwater Users	N/A	N/A	N/A	N/A
Section 4.2.2.9 Predicted Impacts on Water Users	S - Water Use M - Surface Water S - Groundwater	90	10	Estimates are based on a planned 86 months of construction, of which 23% is preconstruction. Estimates are based on the quantity of water to be used during the initial 23% time (assumed for preconstruction) and the remaining years for construction as shown in Table 4.2-1.
Section 4.2.2.10 Measures to Control Construction Related Impacts	S - Erosion and Sediment M - Surface Water S - Groundwater	0	100	The percentage of the construction area impacted during preconstruction is estimated to be 100%, as described previously.
Section 4.2.2.11 Consultation with federal, state, and local environmental organizations	N/A	N/A	N/A	N/A

Table 4.6-2— Summary of Construction and Preconstruction Related Impacts
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Section Reference	Potential Impact and Significance[a]	Estimated Impacts (%)		Basis of Estimate
		Construction[b]	Preconstruction	
Section 4.2.2.12 Compliance with Water Quality and Water Use Standards and Regulations	N/A	N/A	N/A	N/A
Section 4.2.2.13 Water Quality Requirements for Aquatic Ecosystems and Domestic users	N/A	N/A	N/A	N/A
Section 4.3 Ecological Impact				
Section 4.3.1 Terrestrial Ecosystems				
Section 4.3.1.1 Vegetation	S - Terrestrial Ecosystems	0	100	The percentage of the construction area impacted during preconstruction is estimated to be 100%, as described previously.
Section 4.3.1.2 Fauna	S - Terrestrial Ecosystems	0	100	The percentage of the construction area impacted during preconstruction is estimated to be 100%, as described previously.
Section 4.3.1.3 Wetlands	S - Aquatic Ecosystem	5	95	Estimates are based on the land area of wetlands that will be permanently filled (11.7 acres (4.7 ha) of non-tidal wetland habitat of a total of 57.5 acres (23.3 ha) of wetlands, or 20%) due to the construction of the CCNPP Unit 3 site. Most wetlands work is preconstruction; minor wetlands work may be required during construction.
Section 4.3.1.4 Other Projects Within the Area with Potential Impacts	N/A	N/A	N/A	N/A
Section 4.3.1.5 Consultation	N/A	N/A	N/A	N/A
Section 4.3.1.6 Mitigation Measures	N/A	N/A	N/A	N/A
Section 4.3.2 Aquatic Ecosystems				
Section 4.3.2.1 Impacts to Impoundments and Streams	S - Surface Water S - Aquatic Ecosystem	0	100	The percentage of the construction area impacted during preconstruction is estimated to be 100%, as described previously.

Table 4.6-2— Summary of Construction and Preconstruction Related Impacts
(Page 5 of 8)

Section Reference	Potential Impact and Significance[a]	Estimated Impacts (%)		Basis of Estimate
		Construction[b]	Preconstruction	
Section 4.3.2.2 Impacts to Chesapeake Bay	S - Aquatic Ecosystem	0	100	These estimates are based on the land area that will be impacted by the construction of CCNPP Unit 3 and related facilities and on water usage over the time period of construction. A significant contributor to construction impacts will be de-watering of the deep excavations, with water routed in accordance with a required NPDES permit. The majority of these construction impacts (sediments disturbed during the enlargement of the barge slip and the intake structure) are temporary. The portion of the Chesapeake Bay nearest the CCNPP site is of lower relative importance, none of the important species in the vicinity of the CCNPP site are endemic to Chesapeake Bay, and the area near the CCNPP site does not provide critical habitat for any species; therefore the affects of the construction of CCNPP will be small and temporary.
Section 4.3.2.3 Impacts on the Transmission Corridor and Off-Site Areas	S - Aquatic Ecosystem	0	100	Transmission corridors are not included in the definition of construction of SSCs. There are no off-site areas associated with the project that are included in the and definition of construction of SSCs.
Section 4.3.2.4 Summary	N/A	N/A	N/A	N/A
Section 4.4 Socioeconomic Impacts				
Section 4.4.1 Physical Impacts				
Section 4.4.1.1 The Public and Workers	N/A	N/A	N/A	N/A
Section 4.4.1.2 Noise	S - Noise	77	23	Estimates are based on a planned 86 months of construction, of which 23% is preconstruction.
Section 4.4.1.3 Dust and Other Air Emissions	S - Air Quality	77	23	Estimates are based on a planned 86 months of construction, of which 23% is preconstruction.
Section 4.4.1.4 Buildings	S - Other (Site Specific)	77	23	Estimates are based on a planned 86 months of construction, of which 23% is preconstruction.
Section 4.4.1.5 Transportation Routes	M - Transportation and Roads	77	23	Estimates are based on a planned 86 months of construction, of which 23% is preconstruction.

Table 4.6-2— Summary of Construction and Preconstruction Related Impacts
(Page 6 of 8)

Section Reference	Potential Impact and Significance[a]	Estimated Impacts (%)		Basis of Estimate
		Construction[b]	Preconstruction	
Section 4.4.1.6 Aesthetics	S - Other (Site Specific)	77	23	Estimates are based on the visual aesthetic impact from construction of CCNPP Unit 3. The reactor building, turbine hall, and two natural draft cooling towers are expected to affect the aesthetics around the site. CCNPP Unit 3 is set back from, and only limited portions of the construction will be visible from, publicly accessible areas. Most construction activities will be shielded from public view and construction activities are by nature temporary.
Section 4.4.2 Social and Economic Impacts				
Section 4.4.2.1 Study Methods	N/A	N/A	N/A	N/A
Section 4.4.2.2 Construction Labor Force Needs, Composition and Estimates	N/A	N/A	N/A	N/A
Section 4.4.2.3 Demography	N/A	N/A	N/A	N/A
Section 4.4.2.4 Housing	S - Socioeconomic	77	23	Estimates are based on the workforce estimated to be necessary for each phase of construction as shown in Table 4.4-3. Estimates are based on a planned 86 months of construction, of which 23% is preconstruction.
Section 4.4.2.5 Employment and Income	S - Socioeconomic	77	23	Estimates are based on the workforce estimated to be necessary for each phase of construction as shown in Table 4.4-3. Estimates are based on a planned 86 months of construction, of which 23% is preconstruction.
Section 4.4.2.6 Tax Revenue Generation	S - Socioeconomic	77	23	Estimates are based on the workforce estimated to be necessary for each phase of construction as shown in Table 4.4-3.
Section 4.4.2.7 Land Values	S - Socioeconomic	100	0	Estimates are based on the presumption that preconstruction activities have no impact on land values; only permanent structures as will be developed during construction may be perceived to impact land values.

Table 4.6-2— Summary of Construction and Preconstruction Related Impacts
(Page 7 of 8)

Section Reference	Potential Impact and Significance[a]	Estimated Impacts (%)		Basis of Estimate
		Construction[b]	Preconstruction	
Section 4.4.2.8 Public Services	S - Socioeconomic	77	23	Public services availability is based on the ability of the emergency services to respond simultaneously to an emergency as well as off-site evacuation. For the educational system, estimates are based on the workforce estimated to be necessary for each phase of construction. Estimates are based on the workforce estimated to be necessary for each phase of construction as shown in Table 4.4-3.
Section 4.4.2.9 Public Facilities	S - Socioeconomic	77	23	Estimates are based on the workforce estimated to be necessary for each phase of construction as shown in Table 4.4-3.
Section 4.4.3 Environmental Justice Impacts				
Section 4.4.3.1 Minority and Low Income Populations and Activities	S - Socioeconomic	77	23	Estimates are based on the workforce estimated to be necessary for each phase of construction as shown in Table 4.4-3. Estimates are based on a planned 86 months of construction, of which 23% is preconstruction.
Section 4.4.3.2 Subsistence Activities	S - Socioeconomic	0	100	The percentage of the construction area impacted during preconstruction is estimated to be 100% as described previously.
Section 4.5 Radiation Exposure to Construction Workers				
Section 4.5.1 Site Layout	N/A	N/A	N/A	N/A
Section 4.5.2 Radiation Sources at CCNPP Units	S - Radiation Exposure to Construction Workers	77	23	Estimates are based on the workforce estimated to be necessary for each phase of construction as shown in Table 4.4-3. Estimates are based on a planned 86 months of construction, of which 23% is preconstruction.
Section 4.5.3 Historical Dose Rates	N/A	N/A	N/A	N/A
Section 4.5.4 Projected Dose Rates at CCNPP Unit 3	N/A	N/A	N/A	N/A
Section 4.5.5 Compliance with Dose Rate Regulations	N/A	N/A	N/A	N/A

Table 4.6-2— Summary of Construction and Preconstruction Related Impacts
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Section Reference	Potential Impact and Significance[(a)]	Estimated Impacts (%)		Basis of Estimate
		Construction[(b)]	Preconstruction	
Section 4.5.6 Collective Doses to CCNPP Unit 3 Workers	S - Effluent and Wastes S - Radiation Exposure to Construction Workers	77	23	Estimates are based on the workforce estimated to be necessary for each phase of construction as shown in Table 4.4-3. Estimates are based on a planned 86 months of construction, of which 23% is preconstruction.
Section 4.5.7 Radiation Protection and ALARA Program	N/A	N/A	N/A	N/A

Notes:

a) The qualitative significance levels of [S]MALL, [M]ODERATE, or [L]ARGE have been assigned based on deployment and effective implementation of mitigation measures and controls required by local, state and federal regulations.

b) "Construction," as defined in 10 CFR 50.2 "Definitions" refers to the construction of "safety-related structures, systems, or components (SSCs) of a facility".

4.7 NONRADIOLOGICAL HEALTH IMPACTS

4.7.1 Public Health

Members of the public can potentially be put at risk by construction of a new power generation unit and associated new transmission lines. Nonradiological air emissions and dust can migrate offsite through the atmosphere to nearby residences or businesses. Noise can also propagate offsite. The increase in traffic from commuting construction workers and deliveries can result in additional air emissions and traffic accidents. Section 4.4.1, "Physical Impacts", addresses these potential impacts to the public from construction activities.

4.7.2 Occupational Health

Construction of a new power generation unit and associated transmission lines would involve risk to workers from accidents or occupational illnesses. These risks could result from construction accidents (e.g., falls and burns), exposure to toxic or oxygen-replacing gases, and other causes.

During construction of CCNPP Unit 3, CalvertCliffs 3 Nuclear Project and UniStar Nuclear Operating Services will provide a safety and medical program with associated personnel to promote safe work practices and respond to occupational injuries and illnesses. The safety and medical program will utilize an industrial safety manual providing a set of work practices with the objective of preventing accidents due to unsafe conditions and unsafe acts. These safe work practices address hearing protection, confined space entry, personal protective equipment, respiratory protection, heat stress, electrical safety, excavation and trenching, scaffolds and ladders, fall protection, chemical handling, storage, and use, and other industrial hazards. The safety and medical program provides for employee training on safety procedures. Site safety and medical personnel are provided to handle construction accidents and occupational illnesses.

Contractors, including construction contractors, will be required to review all safety policies/ safe work practices applicable to their work with site personnel. The contractors will be required to comply with site safety, fire, radiation, security polices, procedures, safe work practices, and federal and state regulations.

The Bureau of Labor Statistics maintains records of a statistic known as total recordable cases (TRC), which are a measure of annual work-related injuries or illnesses that include death, days away from work, restricted work activity, medical treatment beyond first aid, and other criteria. The 2005 nationwide TRC rate published by the Bureau of Labor Statistics for utility system construction is 5.6 per 100 workers (BLS, 2005a). The same statistic for the State of Maryland is 6.3 per 100 workers (BLS, 2005b). CalvertCliffs 3 Nuclear Project and UniStar Nuclear Operating Services have calculated the TRC incidence for the proposed construction site. Using the monthly employment numbers and the national and Maryland TRC rates, monthly TRCs were estimated from which an average monthly rate was developed. The average monthly rate was then used to calculate the annual average TRCs over the 68 months of construction activities, the estimates are as follows:

	TRC Incidence	**TRC Incidence**
	Based on US Rate	Based on MD Rate
Average Annual	154	174

The Bureau of Labor Statistics published 2005 statistics for fatal occupational injuries (BLS, 2005c) and average employment (BLS, 2005a) that were used to calculate the nationwide

annual rate of fatal occupational injuries for utility system construction. Using monthly construction employment predictions and the calculated rate 0.027%, it is estimated that 4 construction deaths could occur over the construction period of 68 months. CalvertCliffs 3 Nuclear Project and UniStar Nuclear Operating Services will require all construction contractors and subcontractors working at the construction site to comply with all safety procedures in order to prevent and/or minimize the number of deaths, injuries, and illness during the construction of CCNPP Unit 3. Even with effective safety procedures, construction work carries the risk or injury, illness, and death. However, it is not expected that the construction of a new nuclear power generation facility will result in more construction deaths than other similarly sized non-nuclear heavy construction projects.

4.7.3 References

BLS, 2005a. Table 1, Incidence rates of nonfatal occupational injuries and illnesses by industry and case types, 2005, Bureau of Labor Statistics, Website: http://www.bls.gov.iif/oshwc/osh/os/ostb1619.pdf, Date accessed: February 27, 2007.

BLS, 2005b. Table 6, Incidence rates of nonfatal occupational injuries and illnesses by industry and case types, 2005, Maryland, Bureau of Labor Statistics, Website: http://www.bls.gov.iif/oshwc/osh/os/pr056md.pdf, Date accessed: February 27, 2007.

BLS, 2005c. Table A-1, Fatal occupational injuries and even or exposure, All United States, 2005, Bureau of Labor Statistics, Website: http://www.bls.gov.iif/oshwc/cfoi/cftb0205.pdf, Date accessed: March 5, 2007.