4.2 WATER-RELATED IMPACTS

The following sections describe the hydrologic alterations and water use impacts that result from the construction of the BBNPP. 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 BBNPP Project Boundary encompasses an areas of approximately 2,055 acres (831.6 hectares) and is located on a flat upland in Salem Township, Luzerne County, Pennsylvania near U.S. Highway 11 as shown in Figure 2.1-2. Additional details on the BBNPP site location and surrounding area are provided in Section 2.1.

The topography at the BBNPP site is gently rolling with steeper slopes in the northern half of the site. Local relief ranges from approximately 485 ft (148 m) above mean sea level at the Susquehanna River to an elevation of 650 ft (198 m) along Walker Run in the southwest corner of the site up to approximately 800 ft (244 m) on the hilltop where the power block will be located. The BBNPP site is drained by Walker Run toward the southwest, while the pipeline corridor to the east of the power block drains eastward toward the North Branch Canal and Susquehanna River. Six existing surface water impoundments are present on the site.

<u>Surface Water Bodies</u>

The surface water bodies (Figure 2.3-3) within the hydrologic system that may be affected by the construction and operation of BBNPP are:

- East fork of Walker Run (labeled as Unnamed Tributary No. 1);
- Unnamed Tributary 2
- Main stem of Walker Run (labeled as Walker Run);
- Unnamed Tributary 5
- Johnson's Pond;
- Beaver Pond;
- West Building Pond;
- Unnamed Ponds 1 & 2
- Farm Pond;
- North Branch of the Pennsylvania Canal (not shown in Figure 2.3-3); and

- Susquehanna River.

Walker Run is perennial and typically fed by springs and seeps.

Four of the small onsite ponds are found in the middle of the BBNPP site while Farm Pond is located south of the power block. These man-made impoundments drain to Unnamed Tributary No. 1 and Walker Run. Water levels in Walker Run appear to be heavily influenced by surface runoff from the site and from upstream drainages to the north and northwest of the site.

A USGS gauging station is located upriver on the Susquehanna River at Wilkes-Barre 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.

<u>Groundwater Aquifers</u>

The BBNPP site lies in the northeastern end of the Ridge and Valley Province in northeastern Pennsylvania. In the vicinity of the BBNPP site, the total thickness of the Paleozoic sedimentary rocks overlying the Precambrian crystalline basement is approximately 33,000 ft (10,058 m). The sedimentary rocks include sandstone, siltstone, shale, and limestone units. In the Ridge and Valley province of Pennsylvania, groundwater is found in and produced from almost all the rock formations, including shales and clay shales. This is partly due to the fact that they have been folded, faulted, and fractured. As a result, there are no areally extensive aquitards in the vicinity of BBNPP.

In the northeastern corner of Pennsylvania, the bedrock is overlain by a variable thickness of glacial till, outwash, colluviums, kame, and kame terrace deposits of Pleistocene age. A large percentage of these surficial glacial materials were deposited during the last major glacial advance of the Wisconsin stage. The BBNPP site lies at the edge of where the Wisconsin glacier made its farthest advance and, as a result, end moraine deposits are present at the BBNPP site.

The surficial glacial outwash aquifer includes all of the glacial outwash, and other unconsolidated surficial deposits that overlie the bedrock, are saturated, and transmit groundwater. It is the main aquifer that could be impacted by project construction activities at the BBNPP site, and is more fully described in Section 2.3.1. The hydrostratigraphic column for the BBNPP site and surrounding area, identifying geologic units, confining units, and aquifers are shown in Figure 2.3-19 through Figure 2.3-22. The physical characteristics of the groundwater aquifers are provided in Section 2.3.1 and Section 2.3.2.

4.2.1.2 Construction Activities

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

<u>Clearing, Grubbing, and Grading</u>

Spoils, backfill borrow, and topsoil storage areas will be established on parts of the BBNPP 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 cooling tower areas will be brought to plant grade in preparation for foundation excavation and installation. As described in Section 4.1, approximately 633 ac (256 ha) of land will be cleared for road, facility construction, laydown and parking uses.

<u>Road Construction</u>

As described in Section 4.1.1.1, a new three-lane access road, approximately 0.8 mi (1.3 km) long, would be constructed from U.S. 11 to the construction site providing access to the construction areas without impeding traffic to the existing units. A new rail road spur will connect to the existing line on the eastern boundary of SSES and provide access to the modular laydown assembly area located north of the BBNPP power block. A site perimeter road system will be installed, including an access road from the cooling tower area to the power block area.

Bridge Construction

Seven bridges including a railroad culvert crossing will impact Walker Run, Unnamed Tributary 1 and associated wetlands. Bridges will be utilized for plant vehicular access as well as utility crossings. Bridges will span the width of any adjacent wetlands, a 50 ft (15.2 m) EV wetland buffer and the 100-year floodplain.

ESWEMS Pond (Excavation)

Dewatering is needed during excavation and fill placement for the essential service water emergency makeup system (ESWEMS) pond. This plant component is safety-related and must have a foundation placed on competent bedrock. The excavation to bedrock and placement of structural fill to design elevations must be done in a dry condition, therefore, the dewatering well, sumps, and sump pumps will be used during foundation construction, which may extend up to two years. The ESWEMS site contains a shallow glacial overburden aquifer. Actions will be taken to monitor hydrology and prevent effects to nearby wetlands and streams as a result of ESWEMS construction dewatering.

Intake Structure and Intake Structure Access)

The intake structure will be constructed to withdraw water from the NBSR. The structure will be located approximately 300 ft (91.4 m) downstream of the existing SSES intake structure along the west bank of the NBSR. A sheetpile cofferdam and dewatering system will be installed downstream of the SSES intake structure to facilitate the construction of the BBNPP Intake Structure. Pilings will also be driven to facilitate construction of new discharge system piping.

The building will be 124-feet (37.8-m) long by 90-feet (27.4-m) wide with three individual pump bays. In addition, an access drive and a parking lot are needed to access the intake structure. Dredging within the NBSR will also be required to create a forebay adjacent to the intake structure for water withdrawal.

Blowdown Discharge Structure

Dredging within the NBSR will be required to install the blowdown line and diffuser pipe. The blowdown line and submerged multi-port diffuser will be installed to discharge blowdown water into the NBSR. The pipes will extend from the bank approximately 325 ft (99.1 m) into the NBSR, downstream of the intake structure.

Switchyard Expansion

The existing SSES 500 kV Switchyard will be expanded to support the BBNPP. The northeast corner and western boundaries will be extended increasing the impervious area and affecting adjacent wetlands.

Switchyard Construction

The new SSES 500 kV Switchyard 2 will be constructed north of Beach Grove Road and the existing SSES plant. The new BBNPP 500 kV Switchyard will be constructed east of the power block.

Stormwater Discharges

Stormwater discharges during construction will be primarily from temporary sediment basins. This impact will be in compliance with existing National Pollutant Discharge Elimination System (NPDES) stormwater requirements and Pennsylvania Erosion and Sediment Control requirements.

Temporary Utilities

Temporary utilities include above-ground and underground infrastructure for power, communications, potable water, wastewater, and fire protection.

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, and sanitary piping, and electrical power and lighting duct banks, and infiltration beds will be installed and backfilled. These installations will continue as construction progresses.

Power Block Earthwork (Excavation)

The deepest excavations in the power block area are for the BBNPP reactor and auxiliary building foundations that extend to approximately 150 ft (45.7 m) below the existing ground surface. 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 an impoundment for collection and discharge. Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater pollution prevention plan, the 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

New onsite transmission corridors will be installed from the BBNPP switchyard to an expansion of the existing Susquehanna 500 kV yard and the new Susquehanna 500 kV Switchyard 2. Tower foundations will be installed as well as access roads running along, or intersecting with, the corridors. Additionally, an existing onsite 230 kV transmission line will be relocated to accommodate plant structures associated with the BBNPP site.

Offsite Areas

As stated in Section 2.2.2, BBNPP will use existing offsite transmission corridors along with the independently planned Susquehanna-Roseland 500 kV line to connect to the electrical grid. No additional transmission corridors or other offsite land use would be required to connect the BBNPP to the existing electrical grid.

4.2.1.3 Water Sources and Amounts Needed for Construction

Water demand during construction of BBNPP is estimated on work days to average from 77,800 gpd (294,000 lpd) to 138,000 gpd (522,000 lpd) during the approximately 68-month construction phase, as described in Section 5.2.1 and Table 5.2-1.

Initially, water for construction will be transported on site by trucks and stored onsite in temporary tanks. Once a potable water line is brought to the site, local municipal water will be the primary source of water for construction. Table 4.2-1 shows the estimated amounts of fresh water needed by construction year. It is currently estimated that a peak water demand of up to approximately 1,200 gpm (4,500 lpm) will be required for BBNPP construction activities (demands include those for construction personnel, concrete manufacturing, dust control, hydro testing and flushing, and filling tanks and piping). Based on the water demand figures presented in Table 4.2-1 average construction water usage would be less and is estimated at 250 gpm (950 lpm). The potential sources of water for construction include local municipal water, Susquehanna River water, and offsite water trucked to the construction site.

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

The surface water bodies within the hydrologic system at the BBNPP site that could receive effluents during BBNPP construction are listed in Section 4.2.1.1.

Infiltration beds, several temporary sedimentation basins, and a temporary sedimentation pond 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 infiltration beds and temporary sedimentation basins will be sized so as to prevent fast-flowing, sediment-laden storm water from reaching Walker Run or the Susquehanna River by allowing peak storm flows to be attenuated and sediments to be removed. The temporary sedimentation basins will comply with the requirements of the NPDES permit and Pennsylvania Erosion and Sediment Control regulations. The flow velocities will be minimized to prevent erosion of the stream banks. The allowable flow rates and physical characteristics of stormwater runoff will be specified in the State discharge permits.

4.2.1.5 Construction Impacts

Construction of BBNPP with its associated cooling towers will impact the glacial outwash aquifer, current Walker Run drainages and impoundments at the BBNPP site. In order to build the power block, the ESWEMS Pond and Pumphouse, and the CWS cooling towers on bedrock, affected portions of the glacial outwash aquifer must first be excavated and removed. Temporary dewatering will be required for groundwater management during excavation and construction of the BBNPP power block and CWS cooling tower foundations. Temporary dewatering is also required for the excavation of the ESWEMS Pond and Pumphouse.

As described in Section 2.3.2, the area of the proposed nuclear island and safety-related structures is located outside of the glacial outwash aquifer and has minimal overlying saturated glacial overburden material. The hydraulic conductivity of the glacial overburden materials is relatively low, so only minimal rates of groundwater seepage into excavations will be encountered. In contrast, the excavations for the CWS cooling towers and, in particular, the ESWEMS Pond and Pumphouse will be located in areas that are intersected by the glacial outwash aquifer and therefore feature a higher potential for groundwater inflow.

In order to excavate down to the bedrock surface and construct the subgrade for the ESWEMS Pond and Pumphouse, the sand and gravel aquifer needs first to be dewatered in the entire excavation area in order to achieve stable sidewalls and to minimize the area that is disturbed during excavation. Prior to excavation a slurry wall will be constructed around the excavation area. This step will be performed in order to minimize the amount of groundwater that flows into the excavation and minimize the potential impacts to the shallow glacial aquifer during construction activities. The relatively large saturated thickness of the outwash aquifer in this area (approximately 20 ft (6 m)) will likely require an active system of dewatering wells to keep the excavation dry during construction. Once construction of the subgrade nears completion, the dewatering wells will be turned off and converted to monitoring wells, if deemed necessary. Otherwise, they will be pressure-grouted shut and abandoned in accordance with PADEP well abandonment requirements.

In the vicinity of the CWS cooling towers, the saturated thickness of the glacial outwash aquifer is significantly lower than that of the ESWEMS Pond and Pumphouse area. As a result, a groundwater flow barrier will likely not be required for this excavation, and the rate at which groundwater will need to be pumped to keep the excavation dry will be significantly lower. Nevertheless, a flow barrier may be considered for the northwestern area of the cooling tower excavation where the outwash aquifer will be encountered to minimize groundwater seepage.

Surface drainage modifications will also affect groundwater recharge and groundwater elevations in the glacial overburden aquifer. Large sections of the site will have buildings and pavement over the land surface which will significantly reduce groundwater recharge from the surface.

While a slurry wall will be constructed to aid in containing the aerial extent and depth of groundwater depression, this measure alone will not likely prevent adverse impacts to nearby wetlands and watercourses. Therefore, PPL will implement appropriate mitigation to maintain suitable hydrologic conditions in affected wetlands during periods of intense groundwater withdrawal.

To effectively determine mitigation needs, baseline monitoring of hydrologic conditions within the zone of influence of pumping will be performed. A series of shallow piezometers and soil moisture monitoring devices will be installed in strategic locations, and data collected during a baseline monitoring period will be used to complement data from existing flow gauges and monitoring wells at BBNPP. This record of information will serve as a benchmark for comparison to determine the mitigation needs during the pumping period.

Mitigation measures will include introduction of water to affected wetlands and/or watercourses, as needed, from one or more subsurface storage reservoirs constructed on the site to store pumped groundwater. Application of stored water will be completed by a temporary irrigation system, and continued monitoring of the wetlands will be completed to allow real-time flow corrections to maintain conditions reflecting the baseline.

Post-construction evaluation of affected wetlands will be completed to determine if any additional restoration activities are required to offset any unintended impacts. The compensatory mitigation program for BBNPP includes mitigation measures provided to offset any loss of function or value of affected wetlands during the period of impact from groundwater withdrawal.

Runoff from the power block, switchyards, cooling towers, parking areas and laydown areas will be directed towards a series of infiltration beds that will be constructed around the periphery of these features. The infiltration beds will help catch surface runoff and prevent degradation of adjoining terrestrial and aquatic habitats. These beds will be important in minimizing the changes in hydrologic conditions after construction is completed. Infiltration beds serve several stormwater functions including volume reduction, groundwater recharge, control of peak runoff rates, and maintenance of water quality. Routing of runoff from the plant site through infiltration beds will help maintain the temperature of the water being discharged into wetlands and adjacent surface waterbodies and minimize sediment transport to the same. The outlet of each infiltration bed will drain to adjacent wetlands and streams with outlet protection (level spreaders, rock filters, riprap pads, etc.) being placed at the outlet of each infiltration bed.

Other stormwater management structures that will be utilized onsite include swales and berms. Swales will be used throughout the site to convey stormwater when infiltration is not required. Berms will be installed around the wetlands in the construction laydown areas to limit the potential for uncontrolled surface water runoff from entering the wetlands from disturbed areas during construction. Berms will be used in combination with silt fencing.

Stormwater from the concrete batch plant and adjacent areas will flow into a temporary sedimentation basin just south of SSES that would be constructed to capture sediment-laden runoff. The discharge from the basin will be directed to Unnamed Tributary 5. After construction, the basin would be covered and seeded.

Grading of temporary laydown areas, the concrete batch plant, access roads, and construction parking areas could increase runoff into the stormwater management structures described above.

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

- Increasing runoff from the approximately 526 ac (212.9 ha) of impervious and relatively impervious surfaces for the BBNPP power block pad, cooling tower pads, switchyard, soil disposal areas, laydown, and parking areas;
- Construction of seven bridges over the main stem of Walker Run, Unnamed Tributary 1, and wetlands. Permanent impacts from bridge construction will be limited to the footprint of the bridge foundations;
- Construction of cofferdams that will temporarily de-water a small section of the Canal;
- Abandonment of the Canal Outlet which drains the Canal into the Susquehanna River;
- Dredging within the NBSR for intake and blowdown construction may cause temporary increases in turbidity and will require the removal of benthic substrate;
- Construction of a culvert to convey Unnamed Tributary 5 under a rail line;
- Temporary wetland impacts will result from the installation of underground duct banks and the intake and blowdown line;
- Clearing of trees and vegetation for infrastructure construction, including approximately 8.4 acres (3.4 hectares) of palustrine forested wetland (PFO);
- Wetlands removal, fill and hydrologic disruptions; and

- Possibly increasing sediment loads and channel erosion rates in the downstream reaches of Walker Run and Unnamed Tributary 5.

The final site grading plan is shown in Figure 4.2-1. The site drainage basin areas are not expected to drastically change as a result of the site grading plan.

These impacts to surface water bodies are SMALL, primarily due to the loss of wetlands. The mitigation measures associated with the wetlands are described in Section 4.3.1.6 as required in the Post Construction Stormwater Management Plan. The permanent loss of affected wetlands, 1.4 ac (0.6 ha), compared to 83,797 ac (33,911 ha) of wetlands in the region is SMALL.

4.2.1.6 Identification of Surface Water and Groundwater Users

There are no users of onsite surface water. Walker Run flows into the Susquehanna River where there is recreational boating and fishing. There is no commercial fishing on the Susquehanna River in the vicinity of BBNPP.

Groundwater users in the vicinity of the BBNPP site are identified in Section 2.3.2. The nearest permitted PADEP groundwater well (beyond the boundary of the BBNPP property boundary and downgradient from the site), is permitted as Industrial Use and is located approximately 1.7 mi (2.7 km) from the center of the BBNPP site as shown in Figure 2.3-73.

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:

- Groundwater flow barriers will be installed during construction of the ESWEMS Pond and Pumphouse.
- Installation of stormwater infiltration beds
- 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 Post Construction Stormwater Management Plan.

The infiltration beds are designed to allow runoff to infiltrate into the ground, offsetting the reduction in surface due to the increased area of impervious surface, and thereby maintain post-construction hydrologic conditions as close to preconstruction conditions as possible. They will shift, slightly, the recharge areas for the glacial outwash aquifer. Level spreaders are proposed at all outfall locations. Monitoring of construction effluents and stormwater runoff will be performed as required in the stormwater pollution prevention plan, NPDES Individual

Permit for Discharge of Stormwater Associated with Construction Activities, and other applicable permits obtained for construction.

4.2.1.8 Compliance with Applicable Hydrological Standards and Regulations

The regulations guiding the implementation of BMPs for erosion and sediment control are provided in 25 PA Code, Chapter 102 (PA, 2010). 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 by the PADEP, Pennsylvania Stormwater Best Management Practices Manual (PADEP, 2006), NPDES Individual Permit for Discharge of Stormwater Associated with Construction Activities, and other applicable permits obtained for the construction.

4.2.1.9 Best Management Practices

The following BMPs will be implemented:

- 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 project involves substantial land alteration, implementation of BMPs throughout the site, and discharges of treated stormwater to on-site wetlands and the NBSR. The BBNPP plans to use appropriately designed and sited BMPs to minimize impacts that can result from stormwater discharges such as changes to watersheds, water temperatures, water chemistry or hydrologic cycles.

The combination of infiltration beds and temporary sedimentation basins is designed to remove the volume of the post-development two-year storm. The intent of the design is to replicate to the maximum extent possible preconstruction stormwater infiltration and runoff conditions so that the post construction stormwater discharges do not degrade the physical, chemical, or biological characteristics of the receiving waters.

Subsurface infiltration will be used extensively in the BBNPP design to regulate temperature, water quality, and velocity of collected stormwater prior to reintroduction to wetlands and waterways at the site. Further, project design also incorporates capture, treatment, and return of stormwater in a manner which preserves existing water budgets and prevents disruption of hydrologic cycles which may impact wetland function.

Additional BMPs will be implemented according to the Erosion and Sediment (E&S) Control Plan. The sedimentation controls proposed consist of silt barrier fence, super silt fence, sediment traps, sediment basins, slope protection, rock filter berms, and rock construction entrances. The silt barrier fence will be used along the toe of the soil stockpiles and the toe of the fill slopes at locations shown on the E&S plans to prohibit sediment from leaving the construction area. The super silt fabric fence will be placed around the designated wetlands on site. The installation of the super silt fabric fence will protect these wetland areas during construction activities.

Monitoring of construction effluents and stormwater runoff would be performed as required in the stormwater management plan, NPDES Individual Permit for Discharge of Stormwater

Associated with Construction Activities, and other applicable permits obtained for the construction.

In addition, BBNPP 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.

4.2.1.10 References

PA, 2010. 25 PA Code, Chapter 102, Erosion and Sediment Control, August, 2010.

PADEP, 2006. PA Department of Environmental Protection, Bureau of Watershed Management, Pennsylvania Stormwater Best Management Practices Manual, Document Number 363-0300-002, December 30, 2006.

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 BBNPP Project Boundary encompasses an area of approximately 2,055 ac (831.6 ha) and is located to the northwest of the Susquehanna River in Luzerne County, Pennsylvania near US Route 11 as shown in Figure 2.2-1. Additional details on the BBNPP site location and surrounding area are provided in Section 2.1.

The surface water bodies, as shown in Figure 2.3-33, within the hydrologic system at the BBNPP site that may be affected by the construction and operation of BBNPP 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.

The glacial outwash aquifer could be impacted by project construction activities at the BBNPP site. This, 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 2.3-34 through Figure 2.3-36.

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 526 ac (212.9 ha) of impervious and relatively impervious surfaces for the BBNPP power block pad, cooling tower pads, switchyards, laydown, soil disposal areas, and parking areas;
- Construction of seven bridges over the main stem of Walker Run, Unnamed Tributary 1, and wetlands. Permanent impacts from bridge construction will be limited to the footprint of the bridge foundations;
- Construction of cofferdams that will temporarily de-water a small section of the Canal;

- Abandonment of the Canal Outlet which drains the Canal into the Susquehanna River;
- Dredging within the NBSR for intake and blowdown construction may cause temporary increases in turbidity and will require the removal of benthic substrate;
- Wetlands removal, fill and hydrologic disruptions;
- Temporary wetland impacts will result from the installation of underground duct banks and the intake and blowdown line;
- Installation of a culvert to convey Unnamed Tributary 5 under the proposed rail line;
- Clearing of trees and vegetation for infrastructure construction, including 8.4 ac (3.4 ha) of PFO; and
- Possibly increasing the sediment loads and channel erosion rates in the downstream reaches of Walker Run and Unnamed Tributary 5.

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

- Creation of local and temporary depressions in the glacial outwash aquifer due to dewatering for foundation excavations;
- Disruption of current glacial outwash aquifer recharge and discharge areas by plant construction. Hilly, vegetated areas would be cleared and graded; and construction areas would be covered by less permeable materials and graded to divert runoff into infiltration beds and a temporary sedimentation pond. 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, switchyards, and parking and laydown areas would be directed to and concentrated in infiltration beds that could affect recharge of the glacial outwash aquifer. The infiltration beds would act as smaller, focused aquifer recharge areas. They would promote groundwater infiltration and reduce the amount of surface water runoff; and
- Stormwater runoff and suspended solids from the concrete batch plant and aggregate material storage areas would be directed into a temporary sedimentation pond that would discharge to Unnamed Tributary 5, potentially reducing the amount of water available for groundwater recharge.

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 BBNPP 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 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;

- Vegetation removal, grading and the placement of permanent structures, paved surfaces and other finished cover of varying permeability on 357 ac (144.6 ha), including the BBNPP power block foundation, BBNPP cooling tower pads, ESWEMS Retention Pond and Pumphouse, plant access ways, rail spur, permanent parking, BBNPP switchyard, SSES switchyard expansion, and Susquehanna Switchyard 2;

- Vegetation removal and grading of 306 ac (123.8 ha) for the concrete batch plant, temporary sedimentation pond, dredge dewatering pond, topsoil disposal areas, installation of water intake and blowdown pipelines, temporary offices, warehouses, parking and laydown areas, and other miscellaneous temporary construction features; and

- Creation of a temporary sedimentation pond.

Additional information on construction related land-use is provided in Section 4.1.1.

BBNPP site grading and new building foundations will cover and reduce existing infiltration and recharge areas and increase impervious surfaces. Runoff will be directed into infiltration beds that will be constructed on the periphery of the power block, laydown areas, cooling towers, parking areas and switchyard areas. The infiltration beds will help to capture and reduce surface runoff, increase groundwater infiltration, and minimize changes in hydrologic conditions. 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 onsite impoundments for collection and discharge. 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 E & S Control Plan, NPDES Individual Permit for Discharge of Stormwater Associated with Construction Activities, and other applicable permits obtained for construction. Depending on the design of the infiltration beds, temporary sedimentation pond and discharge systems, outflow rates into the surface streams could be altered.

Water bodies within the BBNPP Project 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 an E & S Control Plan and an NPDES Individual Permit for Discharge of Stormwater Associated with Construction Activities. 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 BBNPP 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 an E & S 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 impacts are SMALL, primarily due to the loss of wetlands and will require mitigation. The mitigation measures associated with the wetlands are described in Section 4.3.1.6.

Groundwater Impacts

Depending on the design of the infiltration beds, temporary sedimentation pond 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 glacial outwash aquifer.

The hydrologic alterations that could be produced in the groundwater aquifers are expected to be localized and temporary. Most of the effects are expected to occur in the uppermost or glacial outwash aquifer. Any effects in the deeper aquifers are expected to be minor 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 glacial outwash aquifer are related to:

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

BBNPP site grading and leveling for the building foundations and laydown areas will cover and possibly eliminate a portion of the existing recharge areas. Runoff from the graded areas will be directed into infiltration beds and a temporary sedimentation pond, possibly creating new “focused” recharge areas. Runoff velocity may be increased in the surface water bodies downstream of the outlets from the infiltration basins and temporary sedimentation pond, which could decrease the amount of runoff available for infiltration and recharge. Fine-grained sediments could settle out in downstream surface water bodies and create less-permeable areas for infiltration and recharge. These changes affect local recharge to the glacial outwash aquifer. Impacts on the deeper aquifers are likely to be small.

Dewatering foundation excavations will also produce localized impacts on the glacial outwash aquifer. However, only temporary impacts to the glacial outwash aquifer are anticipated. The deepest excavations anticipated are for the proposed reactor and auxiliary building foundations, and extend approximately 69 ft (21m) below plant grade (finished grounds surface) in order to reach bedrock. The dewatering system and activities are not expected to have any significant impact on the deeper aquifers. Effluent from the dewatering system will be pumped into on-site impoundments for collection and discharge. 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 glacial outwash 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 will still be allowed to infiltrate through the infiltration beds, which will be designed to maintain post-construction hydrologic conditions as close to preconstruction conditions as reasonably achievable, and in other plant areas with nonimpervious surfaces to recharge the aquifer.

The impact to groundwater is SMALL as changes to the glacial outwash aquifer water level will be temporary and localized and groundwater levels are expected to recover once construction is complete.

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 from the Susquehanna River are made in Luzerne County for public potable water supply. The population projection for Act 220 State Water Plan estimates a 7% decline in the Luzerne County population between 2000 and 2030 (PADEP, 2008). Thus, future additional use of surface water is projected to be extremely limited, except for the increase due to BBNPP needs.

Groundwater use and trends in the region of and at the BBNPP site are presented in Section 2.3.2.2 and in Section 2.4.12 of the Final Safety Analysis Report.

Water required for BBNPP construction is estimated at 250 gpm (946 lpm). This water is expected to come from the local public water supply once the line is brought to the site. Prior to the availability of the public water supply, water will be trucked in and stored onsite in temporary tanks.

The glacial outwash aquifer is used as a potable water source in the vicinity of the BBNPP site. The SMALL impacts expected from foundation dewatering or other construction activities will not impact any local users.

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 glacial outwash aquifer, and, potentially, any underlying 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 glacial outwash aquifer if they are of sufficient volume and concentration. The plume migration would be downgradient and, depending on location, flow either south-southwest into Walker Run or south-southeast to the Susquehanna River. As described in Section 2.3.1, the horizontal groundwater flow in the glacial outwash aquifer is generally north to south. As discussed in Section 2.3.1.2.3.2, in the southern trough (south of the BBNPP power block), ground water in the glacial outwash aquifer flows from east to west and then southwest. The glacial outwash aquifer in this area discharges as springs and seeps into the Farm Pond, the wetlands along the southern border of the BBNPP site, and into Walker Run.

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 glacial outwash aquifer.

The composition of possible construction effluents that could infiltrate into the glacial outwash 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.

A temporary sedimentation pond is planned to catch stormwater and sediment runoff from the concrete batch plant area. Infiltration beds are planned to collect runoff from the BBNPP power block, cooling towers, switchyards, parking 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.

Excess runoff will be discharged to infiltration beds. The outlet of each infiltration bed will drain to adjacent wetlands and surface water bodies with outlet protection (level spreaders, rock filters, riprap pads, etc.) being placed at the outlet of each infiltration bed .The infiltration beds will be sized so as to prevent fast flowing, sediment laden stormwater from reaching Walker Run or the Susquehanna River by allowing peak storm flows to be attenuated and sediments to be removed. Level spreaders will be used to dissipate the energy from large runoff events prior to water being discharged to wetlands and streams. The allowable flow rates and physical characteristics of stormwater runoff will be specified in State discharge permits.

Maximum runoff for the Walker Run basin during the PMF is estimated at 31,208 cfs (883.7 m3/s). The maximum high water level elevation in Walker Run is 677.01 ft (206.35 m) NAVD88, which is below the approximate 719-ft (219-m) NAVD88 and 699-ft (213-m) NAVD88 final plant grade (finished ground surface) elevations in the power block and cooling tower areas, respectively.

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 2.3-45. 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 BBNPP.

The BBNPP site will be provided with water expected to come from the local public water supply once the line is brought to the site. Prior to the availability of the public water supply, water will be trucked in and stored onsite in temporary tanks.

Potential Changes to Surface Water Quality

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.

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

All aspects of the construction of BBNPP will comply with NPDES permits and minimize impacts to surface water quality. The project will also be in compliance with Section 401 of the Clean Water Act which requires that every applicant for a federal (Section 404) permit must request state certification that the proposed activities in the Section 404 permit will not violate state water quality standards.

Potential Changes to Groundwater Quality

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 glacial outwash 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 infiltration beds. The surface water users that could be impacted in the event of a release are those downstream of the BBNPP site along the tributaries flowing to the Susquehanna River. Any impacts to the Susquehanna River receiving the discharge are expected to be small.

Groundwater users in vicinity of the BBNPP 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.

Potential construction effluent impacts on aquifer groundwater quality would first be manifested in the glacial outwash aquifer. Construction activities are only expected to produce limited and temporary impacts in the Surficial aquifer. As described in Section 2.3.1, the glacial outwash aquifer is not used as a potable water source in the vicinity of the BBNPP site. Therefore, potential groundwater quality changes would not be expected to have any impact on possible users. Potential impacts to the deeper aquifers are dependent 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 are small due to dilution and other contaminant attenuation effects that could occur along any effluent plume migration path.

The BBNPP 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 (Figure 2.3-70). None of these are located in the region of BBNPP (USEPA, 1996). Thus, the addition of BBNPP is not an 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 E & S Control Plan;
- Controlling runoff and potential spills using dikes, earthen berms, seeded ditches, infiltration beds, and a temporary sedimentation pond;
- 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); and

- Performing additional onsite surface and groundwater monitoring compared to established water quality benchmarks and historical site data.

Infiltration beds are planned for the periphery of the power block, laydown, parking, cooling towers and switchyard areas. The beds are sized to promote infiltration of runoff. However, for large storms the infiltration capacity of the beds would be exceeded and outlet level spreaders will be provided to direct the runoff to adjacent wetlands and streams.

The temporary sedimentation pond for the concrete batch plant is an unlined impoundment with a simple earth-fill closure on the downstream end and includes discharge piping to the adjacent watercourses.

As discussed in Sections 2.3.2.2.9 and Section 4.2.1.5, during construction, dewatering of the glacial outwash aquifer will be required in the ESWEMS Pond and Pumphouse area and, to a much lesser extent, the CWS cooling tower area in order to excavate down to bedrock. Groundwater flow barriers will likely only be needed and installed around the ESWEMS Pond and Pumphouse excavation in order to minimize impacts to the aquifer. Because a groundwater barrier will be installed prior to excavation, the amount of groundwater that needs to be pumped and resulting impacts to the shallow aquifer will be significantly reduced. The power block excavation will not require a flow barrier, because the excavation is located outside of the outwash aquifer and groundwater inflow is therefore expected to be low. Similarly, only a portion of the excavation for the CWS cooling towers is located within the outwash aquifer, and the volume of groundwater seepage, while greater than the power block area, will be significantly less than that expected for the ESWEMS Pond and Pumphouse excavation, reducing the likelihood that a flow barrier will be needed.

During operation of the BBNPP, groundwater will not be pumped and will not be used in the plant. Therefore, the long term impacts on groundwater levels, flow direction, and resources resulting from construction and operation of the BBNPP will be localized and will be minimal.

Following the acquisition of the required permits and authorizations, BBNPP 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; and
- Dust suppression systems.

These controls assist in protecting the glacial outwash 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 construction activities in the area of the BBNPP Intake Structure and discharge outfall include:

- Installing a sheet pile cofferdam and dewatering system to facilitate construction of the BBNPP Intake Structure and discharge outfall structure; and
- 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.

As explained in Section 4.2.2.7, any contamination that might be introduced into the glacial outwash 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 Pennsylvania Department of Environmental Protection (PADEP) for water quality, and the Susquehanna River Basin Commission (SRBC) for water use. (PADEP, 2006). 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 Individual Permit for Discharge of Stormwater Associated with Construction Activities, 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 Pennsylvania Department of Environmental Protection (PADEP, 2006). 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.

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

4.2.2.14 References

PADEP, 2006. PA Department of Environmental Protection, Bureau of Watershed Management, Pennsylvania Stormwater Best Management Practices Manual, Document Number 363-0300-002, December 30, 2006.

PADEP, 2008. PA Department of Environmental Protection, Pennsylvania State Water Plan, Population Projections 2000, Website: http://www.depweb.state.pa.us/watershedmgmt/lib/watershedmgmt/stat_water_plan/data/population_projections2000/flatcounty2.pdf, Date accessed: April 27, 2008.

USEPA, 1996. The Sole Source Aquifer (SSA) Program, Section 1424(e) of Safe Drinking Water Act (SDWA), 1996, U.S. Environmental Protection Agency, Website: http://www.epa.gov/reg3wapd/presentations/ssa/index.htm, Date accessed: April 21, 2008.

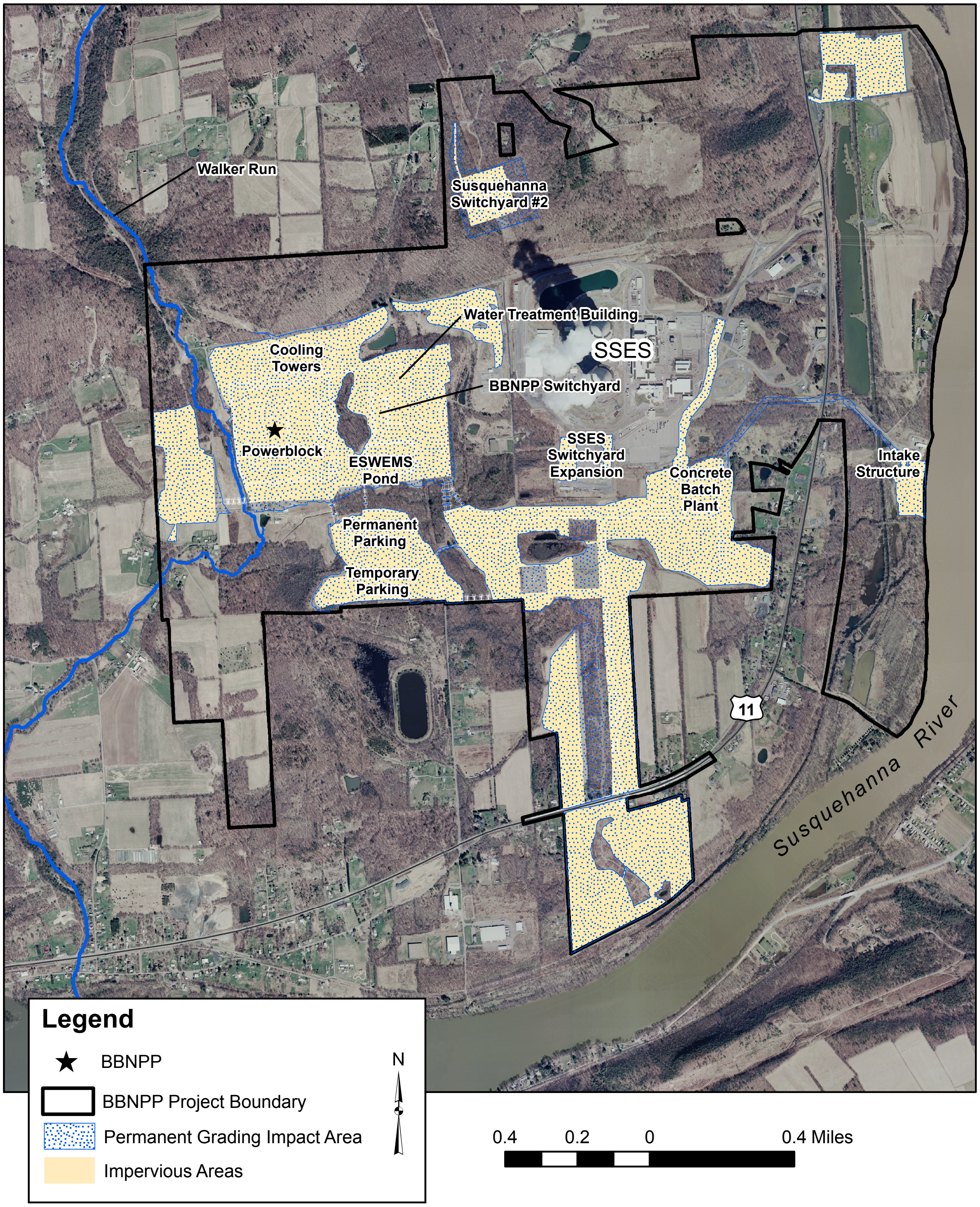
Table 4.2-1— Estimated Fresh Water Demand During BBNPP Construction

Construction Year	Year 1 gal (l)	Year 2 gal (l)	Year 3 gal (l)	Year 4 gal (l)	Year 5 gal (l)	Year 6 gal (l)
Potable and Sanitary	8,550,000[a] (32,361,750)	25,650,000[b] (97,085,250)	25,650,000[b] (97,085,250)	25,650,000[b] (97,085,250)	25,650,000[b] (97,085,250)	-
Concrete Mixing and Curing[c]	2,219,844 (8,402,110)	2,219,844 (8,402,110)	2,219,844 (8,402,110)	2,219,844 (8,402,110)	2,219,844 (8,402,110)	-
Dust Control[d]	11,400,000 (43,149,000)	11,400,000 (43,149,000)	11,400,000 (43,149,000)	11,400,000 (43,149,000)	11,400,000 (43,149,000)	-
Total	22,169,844 (83,912,860)	39,269,844 (148,636,360)	39,269,844 (148,636,360)	39,269,844 (148,636,360)	39,269,844 (148,636,360)	26,179,896[e] (99,090,906)

Notes:

(a) Estimated at 1,000 persons using 30 gallons per day for 285 days per year.
(b) Estimated at 3,000 persons using 30 gallons per day for 285 days per year.
(c) Estimated at 6,700 cubic yards per month using 27.61 gallons per cubic yard and 12 months per year.
(d) Estimated at 40,000 gallons per day for 285 days per year.
(e) Estimated at two-thirds of the amount used in years 2 through 5.

Figure 4.2-1— BBNPP Site Grading Plan



4.3 ECOLOGICAL IMPACT

4.3.1 Terrestrial Ecosystems

This section describes the impacts of construction on the terrestrial ecosystem. The potential area of disturbance within the BBNPP Project Boundary is shown in Figure 4.3-1 and represents the construction zone. An estimate of all land areas, including both developed lands and undeveloped terrestrial habitats that will be temporarily or permanently disturbed during construction of BBNPP is provided in Table 4.3-1. A comparison of pre- and post-construction land cover areas within the BBNPP Project Boundary is provided in Figure 4.3-2. Areas to be occupied by specific permanent and temporary construction features and operational facilities and their current land use classifications are detailed in Table 4.1-1. The limit of disturbance boundary associated with BBNPP encompasses 687 acres (278 ha), of which 677.4 acres (274.1 ha) will actually be disturbed by site preparation and construction. Furthermore, 457 acres (185 ha) would be permanently dedicated to BBNPP and its supporting facilities and converted to structures, pavement, or other intensively-maintained exterior grounds, or from forested land to scrub/shrub vegetation within transmission line and vehicle, rail and utility bridge corridors. Of the total acreage to be disturbed, approximately 622.8 ac (252 ha) of impacts will occur to areas that are not currently developed, and the maximum area of soil to be exposed at any one time will be 633 ac (261 ha). Existing land cover within certain areas of the construction footprint will not be altered by construction activities, including some portions of existing transmission line corridors and local roads.

Approximately 369 ac (149.5 ha) of undeveloped land would be permanently converted to structures, pavement, or other intensively-maintained exterior grounds. These facilities will include the proposed power block, switchyards, CWS and ESWS cooling towers, ESWEMS Retention Pond, Combined Waste Water Retention Pond, water treatment plant, permanent parking and laydown areas, excess soil disposal area, roads, railroad, stormwater ponds, soil stockpile and BBNPP Intake Structure.

Approximately 220.3 ac (89.2 ha) of undeveloped land would be temporarily lost, only, to accommodate the concrete batch plant, temporary sedimentation pond, dewatering basin, topsoil stockpiles and temporary offices, warehouses, and parking and laydown areas. This includes temporary wetland and regulated waterbody losses associated with the installation of water intake and discharge pipelines and wetland mitigation activities. Acreage not containing permanent structures would be restored by grading and revegetating to the extent practicable. Wetland and stream mitigation will enhance and restore the temporarily impacted areas following PPL's mitigation plan.

Approximately 33 ac (13.4 ha) of forested land would be permanently converted to accommodate transmission lines and vehicle, rail and utility pipeline bridge corridors. These areas include both forested upland and forested wetland areas that will require forest clearing for transmission line rights-of-way and bridges. Transmission line corridors and areas under and adjacent to bridges will be permanently maintained as scrub/shrub habitats following PPL vegetative management programs.

Construction impacts to non-wetland terrestrial habitats, only, will entail a permanent loss of 368 ac (149 ha), and temporary disturbance of 209 ac (85 ha) as shown in Figure 4.3-2 and Table 4.3-1. Permanent terrestrial habitat losses are small compared to the 4,390,530 ac (1,776,784 ha) of terrestrial habitat in the region as shown in Table 2.2-5. Wetlands comprise approximately 1.4 ac (0.6 ha) of permanently lost terrestrial habitat, as shown in Figure 4.3-3.

Permanent wetland losses are also small compared to the 83,797 ac (33,911 ha) of wetlands in the region.

Additionally, construction of the surface water BBNPP Intake Structure and blowdown diffuser structure will involve very minor impacts of 0.6 ac (0.24 ha) and 0.4 ac (0.16 ha), respectively, within the Susquehanna River as shown in Figure 4.3-1. Approximately 0.2 ac (0.08 ha) of the river habitat will be permanently converted to a discharge structure while the intake structure will be built at the shoreline of the River. The remaining disturbed area of approximately 0.8 ac (0.32 ha) will be temporarily disturbed, only, to accommodate cofferdams, necessary excavation work and other construction activities within the river. An additional 0.2 acres (0.8 ha) will be impacted for the construction of the intake structure on land. Wherever possible, the construction footprint has been designed to minimize impacts to the river channel and terrestrial ecosystems, specifically potential habitat for species of special concern; wetlands; and forest cover, especially large blocks of contiguous forest that provide habitat for forest interior dwelling species.

Construction activities will start upon receipt of all federal, state, county and local permits necessary to start clearing and grading of the site. Start and end dates of construction activities for non safety-related systems and structures are discussed in Section 1.0.

4.3.1.1 Vegetation

Plant Communities and Habitats:

Clearing and grubbing will result in the vegetation losses shown in and summarized in Figure 4.3-2 and summarized in Table 4.3-1. The permanent and temporary losses and permanent conversions will include approximately 222 ac (90 ha) of upland deciduous forest cover and approximately 11.3 ac (4.6 ha) of palustrine forested wetland cover. Of these totals, approximately 25 ac (3.2 ha) of upland forest will be converted to scrub/shrub vegetation and 7.9 ac (3.2 ha) of palustrine forest will be converted to palustrine scrub/shrub vegetation. The majority of both the upland and wetland forest covers is composed of welldeveloped overstory and understory strata. Many canopy trees are over 12 in (30 cm) in diameter at breast height. Other vegetation losses from both permanent and temporary disturbances will include approximately:

- 63 ac (25.7 ha) of upland scrub/shrub vegetation,
- 168 ac (68.1 ha) of old field vegetation and former agricultural land including an abandoned orchard, and
- 148 ac (60 ha) of agricultural land.

Each of the affected types of vegetation is common throughout the region.

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 almost entirely in areas of upland deciduous forest and palustrine forested wetland cover. 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 will be disposed of by chipping and spreading the wood chips, and/or sent to an offsite composting facility or landfill.

Opportunities to recycle woody material for use elsewhere on the BBNPP 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.

Practicable opportunities to preserve individual trees are not available within the broad contiguous areas of land that must be graded to construct the power block, switchyard, cooling tower and other large permanent structures. However, a biologist will 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.

Silt fences will be erected around the perimeter of the construction footprint to reduce the potential for sedimentation of adjoining vegetated areas. Detailed specifications for the silt fences and vegetative stabilization will be presented in a soil erosion and sediment control plan (E&S plan) approved by the Luzerne County Conservation District prior to site disturbance. As required by state regulations, stockpiles for soil and other excavated material will be located outside of the 100-year floodplains for the Susquehanna River and other watercourses. Stockpiled materials will be covered with plastic, enclosed within a berm, or stabilized with hay mulch and a grass cover until removed during backfill and final grading activities. Monitoring of construction effluents and storm water runoff will be performed as required by the E&S plan, NPDES Individual Permit for Discharge of Stormwater Associated with Construction Activities, and other applicable permits obtained for construction.

Important Habitats:

To the extent practicable, the construction footprint has been designed to limit impacts to the river channel and terrestrial ecosystems, specifically potential habitat for species of special concern; wetlands; and forest cover, especially large blocks of contiguous forest that provide habitat for forest interior dwelling species. Site preparation will result in the permanent loss (filling) of approximately 1.4 ac (0.6 ha) of wetland habitats, including approximately 0.9 ac (0.4 ha) of palustrine emergent wetlands, and approximately 0.5 ac (0.2 ha) of palustrine forested wetlands. No impacts will occur to palustrine scrub/shrub wetlands. Wetland impacts are discussed in more detail in Section 4.3.1.3.

The 1,200-acre (486-hectare) Susquehanna Riverlands Environmental Preserve (SREP) was also identified as an important habitat as this area encompasses a wide variety of upland and wetlands habitats along both sides of the Susquehanna River, and includes a 400-acre (162-hectare) public recreation area and the Wetlands Natural Area. Site development within the SREP will consist of surface water intake and wastewater discharge related facilities and pipelines, a temporary dewatering pond for river dredging, and temporary laydown areas. Earth disturbance will be limited and will largely take place in upland cover types that are common throughout the region. Permanent loss (filling) of wetlands associated with these structures will be minimal and is included with wetland losses discussed in the above paragraph.

An estimate of all land areas within the SREP, including both developed lands and undeveloped terrestrial habitats, that will be temporarily or permanently disturbed during construction of BBNPP is provided in Table 4.3-3. A comparison of pre- and post-construction land cover areas within the SREP is provided in Table 4.3-4.

The Susquehanna River Important Bird Area (IBA #50) consists of approximately 2,111 ac (854.2 ha) and includes the Wetlands Natural Area and nearly all of the SREP. The IBA #50 is comprised of a wide variety of upland and wetland habitats along both sides of the Susquehanna River and includes Gould Island and the Susquehanna River. Approximately 957 ac (387.1 ha) of IBA #50 occurs within the BBNPP Project Boundary and a portion of this acreage will be impacted as a result of construction (Table 4.3-6). Site development within the IBA #50 includes all of the aforementioned impacts for the SREP. In addition, development within the IBA #50 includes switchyards, transmission line corridors, the ESWEMS Retention Pond, the combined wastewater retention pond, access roads, a railroad spur, and a small section of permanent parking.

An estimate of all land areas within the IBA #50, including both developed lands and undeveloped terrestrial habitats, that will be temporarily or permanently disturbed during construction of BBNPP is provided in Table 4.3-5. A comparison of pre- and post-construction land cover areas within the IBA #50 is provided in Table 4.3-6.

Important Plant Species:

As noted below in Section 4.3.1.5, the Pennsylvania Department of Conservation and Natural Resources (PDCNR) was consulted concerning plants, natural communities, terrestrial invertebrates, and geologic features of special concern within a 0.5 mi (0.8 km) radius of an area encompassing the BBNPP site, PPL Susquehanna, LLC owned lands to the east and the Susquehanna Riverlands (PDCNR, 2008a; PDCNR, 2010). PDCNR's response indicated that no state or federal rare, threatened or endangered plants are known to occur within the designated search area. (PDCNR, 2008a; PDCNR, 2010)

Important plant species were identified and discussed in Section 2.4.1, and encompass red maple, river birch, black cherry, spicebush, skunk cabbage and Canada goldenrod. These plants were designated as important species because they are key contributors to the overall structure and ecological function of vegetation communities on the BBNPP site. Red maple is a dominant tree in both upland and wetland forests throughout the project area, and river birch is a dominant overstory species in wetland forests of the Susquehanna Riverlands. Black cherry was designated as important since it is both commercially valuable and plentiful in upland forests onsite.

Spicebush is a dominant shrub in the understories of upland and wetland forests throughout the BBNPP site. Skunk cabbage is very abundant in wetland forests onsite and is the principal herbaceous groundcover in this habitat during the early part of the growing season. Canada goldenrod is a prominent herbaceous species in much of the old-field vegetation cover.

Any losses of important tree cover or other forest cover, including areas of temporary disturbance, must be considered effectively permanent. Deciduous forest can be replanted; however, at least a hundred years will be necessary to recreate forest cover of similar maturity. Shrub and herbaceous cover lost to permanent structures must also be considered permanent. However, following temporary disturbance, these cover types can generally be restored to a pre-disturbance state in a few years through a combination of replanting, reemergence from the seed bank and recolonization from similar habitats on nearby lands.

4.3.1.2 Fauna

Proposed construction will convert a portion of the forests, abandoned orchards, old fields, wetlands, agricultural and other terrestrial habitats to paved parking lots, cooling towers, power block, switchyards, roadways, and infiltration beds. These permanent habitat conversions will constitute an ecological loss and will reduce populations of and use by terrestrial fauna. However, in portions of the BBNPP site where only temporary disturbance will occur (batch plant, construction laydown areas, construction offices, warehouses, storm water pond, dredge dewatering basin and temporary parking lots), these habitats have the potential to recover, if allowed or encouraged, to be valuable again for terrestrial fauna.

Vegetation losses summarized in Table 4.3-1 will reduce the habitat available to mammals, birds, and other terrestrial fauna that inhabit the BBNPP site and surrounding regions. Some smaller, less mobile fauna such as mice, shrews, voles, frogs and toads, salamanders and snakes may be impacted 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 some individuals until populations decline to below the carrying capacity. Potential impacts to specific fauna species identified as important at the BBNPP site are discussed below in three major categories: (1) rare important species, (2) commercially or recreationally important species, and (3) ecologically important species.

Rare Important Species:

As noted in Table 2.4-1, fourteen species of terrestrial fauna were identified as potentially "important" at the BBNPP site according to rarity criteria defined in NUREG-1555 (NRC, 1999). They include four mammals (Indiana bat (*Myotis sodalis*), eastern small-footed myotis (*Myotis leibii*), northern myotis (*Myotis septentrionalis*), and Allegheny woodrat (*Neotoma magister*)); three birds, (bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and osprey (*Pandion haliaetus*)); three reptiles (redbelly turtle (*Pseudemys rubiventris*), timber rattlesnake (*Crotalus horridus*), and eastern hognose snake (*Heterodon platyrhinos*)), two amphibians (northern cricket frog (*Acris crepitans crepitans*) and eastern spadefoot (*Scaphiopus holbrookii*)); and two insects (mulberry wing (*Poanes massasoit*) and Baltimore checkerspot (*Euphydryas phoeton*). (NRC, 1999)

Five species have ranges that include Luzerne County, Pennsylvania, but have not been observed at or in the immediate area of the BBNPP site during the 2007-2008 or 2010 terrestrial faunal surveys or reported in previous studies. Further discussion will be restricted only to the 9 species that have been documented to actually occur at or near the BBNPP site.

Three rare bat species are known to occupy hibernacula within 5 mi (8 km) of the BBNPP site : the Indiana bat, which is federally and state-listed as endangered (PPL, 2006); the eastern small-footed myotis, which is state-listed as threatened; and the northern myotis, which is state-listed as candidate rare. Eastern small-footed myotis have been encountered rarely during the non-hibernating periods so very little is known about the habitat requirements or food habits of this rare bat. Unlike most other bats, the eastern small-footed myotis does not appear to hibernate in large colonies. In Pennsylvania, the largest known hibernating population consisted of less than fifty individuals and in a majority of caves where they were found, less than five individuals were found in each cave.

During non-hibernating periods (April through mid-November) the Indiana bat typically favors sites under the exfoliating bark of large, often dead, trees as roosting sites and maternity dens. Northern myotis, like the Indiana bat, also uses exfoliating bark of large trees as roosting sites and maternity dens.

No bat hibernacula of any type have been identified at the BBNPP site, nor have any of these bat species been documented to occur at the BBNPP site. However, to further document the presence or absence of bat species, especially Indiana bat, at the BBNPP site, a mist-net capture survey and habitat evaluation by an expert bat biologist was completed in the summer of 2008. No Indiana bats were captured, seen or heard, no small-footed myotis were captured, but 4 adult male northern myotis were captured. However, the capture of only adult male northern myotis, and no females or young, provides evidence for the existence of roost sites in the area surveyed, but not maternity colonies of females and young, at least for that species.

Potential suitable roosting and maternity den habitat included most of the forested areas where loose bark of shagbark hickory (*Carya ovata*), wild black cherry (*Prunus serotina*), red maple (*Acer rubrum*) and dead snags > 5 in (13 cm) diameter at breast height (dbh) were present. (PPL, 2006)

The clearing of forest habitat for construction could have a negative impact on the Indiana bat, the only federally and state- listed endangered species likely to occur at the BBNPP site. To avoid possible negative impacts on the Indiana bat, the USFWS advised that all tree cutting activities should occur only during the period November 16 through March 31, while the Indiana bat is hibernating (usually in caves or mines), so that removal of trees does not inadvertently injure or kill roosting individuals or families in maternity dens (USFWS, 2008). If cutting is necessary from April 1 through November 15, no trees > 5 in (13 cm) diameter at breast height should be cut during non-hibernating periods (USFWS, 2008). At the BBNPP site, this would be particularly true for shagbark hickory trees which are suspected to be one of the most likely to provide roosting habitat for bats. Increase of old-growth forest acreage and forest contiguity, especially within several miles of hibernation sites, is recommended to improve prospects for this species (PDCNR, 2008b).

The bald eagle, peregrine falcon, and osprey (all state threatened) have been observed with increasing frequency during migration along the Susquehanna River in recent years but no nesting or intensive use have ever been documented on the BBNPP site, so it is unlikely that construction will have any significant impact on any of these bird species. A peregrine falcon nest site is located approximately 2 mi (3.2 km) east of proposed location of the intake and discharge structures. It is unlikely that construction will have any impact on the peregrine falcons since they often nest in urban locations where considerable human presence and construction activity are common events. For example, the first recovered nesting in Pennsylvania was documented in 1987 on a bridge in Philadelphia (Brauning, 2007), and peregrine falcons have been routinely nesting at the Rachel Carson State Office Building in downtown Harrisburg and at the Gulf Tower and University of Pittsburgh Cathedral of Learning in Pittsburgh (PGC, 2008a). A possible mitigating effect for negative impacts of construction would be to erect nesting structures in suitable locations near or in the BBNPP site for bald eagles, peregrine falcon and/or osprey. (Brauning, 2007)

A total of five potentially important rare reptiles or amphibians have ranges that include Luzerne County (eastern spadefoot toad, redbelly turtle, timber rattlesnake, eastern hognose snake, and northern cricket frog). Only the northern cricket frog has been documented to occur at the BBNPP site (Section 2.4.1). A biologist surveying the BBNPP site reported hearing the call of a northern cricket frog twice in two different locations in November 2007. The species has never been visually observed or heard otherwise at the BBNPP site or at the adjacent lands associated with the Susquehanna Steam Electric Station and Riverlands Nature Preserve. The known habitat of the northern cricket frog includes a wide variety of standing water habitats within vegetated shorelines including ponds, bogs, vernal pools, and wetland edges. No ponds, bogs, or standing water bodies that could provide habitat for northern cricket frog will be affected by construction. A March 2011 letter from PFBC indicated that the proposed BBNPP project was not anticipated to cause adverse impacts to northern cricket frog (PFBC, 2011). The other four species are unlikely to occur due to lack of suitable habitat and range limitations. Accordingly, it is unlikely that the proposed construction will have any significant impact on any of these rare reptile or amphibian species.

Correspondence with the Pennsylvania Department of Conservation and Natural Resources (PDCNR) indicated that two species of butterflies (mulberry wing and Baltimore checkerspot), each state-listed as species of special concern, were known to occur in the immediate area of BBNPP site (PDCNR, 2010).

A butterfly survey was conducted by an experienced entomologist as part of the terrestrial fauna studies during June and July of 2008. No mulberry wing or Baltimore checkerspot butterflies were located during the butterfly survey.

The project area potentially provides suitable habitat for these butterflies based on habitat descriptions provided by PDCNR and information collected concerning life histories and breeding/foraging preferences of these species. Table 2.4-32 provides information on the occurrence of host plant species on the BBNPP site for each of the butterfly species listed. PDCNR requested that attempts be made to minimize impacts to potential habitat for these butterflies within the project area. Accordingly, care will be taken to prevent loss of plant species listed in Table 2.4-32.

<u>Commercially or Recreationally Important Species:</u>

White-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*) and wild turkey (*Meleagris gallopovo*) are identified as commercially or recreationally important species on the BBNPP site. Hundreds of thousands of hunters hunt for these game animals each year throughout Pennsylvania, generating large economic impacts, particularly in rural areas like Luzerne County.

White-tailed deer are currently abundant on the BBNPP site based on terrestrial vertebrate surveys of 2007-2008 and 2010. With the proposed construction and development of the power plant facility portions of the suitable upland forest habitat will be lost and resident deer will be forced to emigrate to adjacent suitable habitat which is similar to the BBNPP site. This may temporarily increase competition for limited resources in adjacent areas.

However, the long-term impact of this construction project on the deer herd is unlikely to be significant on a larger landscape scale. For example, in Pennsylvania deer populations average about 25 deer per 1 mi^2 (2.6 km^2). At this density, Luzerne County, which is 907 mi^2 (2,322 km^2) should support approximately 2,250 deer, of which only about 50 (less than 0.3%) would live in the BBNPP site. The lack of impact significance is particularly true because in the absence of major natural predators, a decline in the numbers of hunters, and land use changes that create abundant browse (abandonment of farmland and forest fragmentation due to development), deer populations in much of Pennsylvania have increased dramatically. Because none of these conditions is likely to change in the near future, white-tailed deer populations are expected to remain high in the region, even if deer leave the BBNPP site.

Black bear sign (tracks and scat) have been located on the BBNPP site and several bears have been observed but the 234 ac (94.5 ha) of forest habitat expected to be lost is very small when compared to the average home range of even a single bear. In northeastern Pennsylvania, male home ranges averaged 63 mi^2 (173 km^2) and were 8 to 16 mi (13 to 26 km) across, while female home ranges averaged 15 mi^2 (41 km^2) and were 3 to 8 mi (5 to 13 km) wide (Alt, 1980) and rivers and developed areas of several square miles, such as the BBNPP site, are not much of a barrier for bears. They will simply swim across rivers or walk around highly developed areas. Due to the very large area requirements of bears and their preferential selection for larger blocks of forest habitat than is found in the BBNPP site, the impacts of construction on the local black bear population should be minimal. In addition, black bear populations throughout Pennsylvania, including the Luzerne County area, have increased dramatically in the past few decades (PGC, 2008b).

Wild turkeys were frequently observed on the BBNPP site during terrestrial vertebrate surveys of 2007-2008 and 2010. The current mix of forested, actively farmed and reverting farmland habitat types found at the BBNPP site is ideal for wild turkeys (PGC, 2008) but the carrying capacity will decline considerably with the loss of much of this habitat to construction. Like the white-tailed deer, the resident wild turkey population will likely emigrate to adjacent suitable habitat after construction begins. Also, like the deer, wild turkey populations have increased dramatically in recent decades throughout Pennsylvania and the impacts of construction will likely be minimal at the landscape level. (PGC, 2008b)

<u>Ecologically Important Species:</u>

The meadow vole (*Microtus pennsylvanicus*), deer mouse (*Peromyscus maniculatus*) and white-footed mouse (*Peromyscus leucopus*) are three mammalian species identified as being ecologically important due to their value as a major prey base for predators at the BBNPP site. Because of their ubiquitous distribution across nearly all habitats, these species form an essential link in the complex food web. They represent the major herbivore component bridging the gap between plants (producers) and carnivorous animals (consumers). (Merritt, 1987)

Proposed construction at the BBNPP site will convert a significant portion of the forests, abandoned orchards, old fields, agricultural and other terrestrial habitats heavily used by these prey species to paved parking lots, cooling towers, power block, switchyards, roadways, and infiltration beds. These permanent habitat conversions will constitute an ecological loss and will significantly reduce populations of prey species and utilization of their predators. However, in portions of the BBNPP site where only temporary disturbance will occur, these habitats have the potential to recover, if allowed or encouraged, to be valuable again for small mammal prey species and their predators.

The scarlet tanager (*Piranga olivacea*) was also identified as an ecologically important species at the BBNPP site as a forest interior bird and biological indicator of effects related to forest fragmentation. The loss of nearly 234 ac (94.5 ha) of forested habitat is expected, primarily in the western portion of the project area, which will negatively impact scarlet tanagers and other forest interior birds. However, extensive forested regions remain in adjacent and nearby areas, (especially directly north and south) of the BBNPP site, that scarlet tanagers and other forest interior birds could use, though this may temporarily increase competition with resident populations for limited habitat resources.

<u>Bird Collisions:</u> The proposed cooling towers are not expected to cause substantial bird mortality due to collisions. Although infrequent bird collisions with the proposed cooling towers are likely, the overall mortality potentially resulting from bird collisions with cooling towers is reported to have only minor impacts on bird species populations (NRC, 1996).

In a review of the literature for avian collision mortality associated with all types of man-made objects as well as the monitoring studies conducted at six nuclear power plants, (including the Susquehanna Steam Electric Station (SSES) Units 1 and 2 adjacent to the proposed BBNPP (Ecology III, 1995), it was concluded that (1) avian mortality associated with cooling towers is a very small part of the total mortality and (2) local bird populations are not being significantly reduced (NRC, 1996). A majority of the avian mortality caused by collision with cooling towers occurred during nocturnal periods of spring and fall migration by songbirds. (Ecology III, 1995)

The proposed cooling towers for the BBNPP site are similar to the 540 ft (165 m) tall natural draft towers already existing on the adjacent property at SSES. Accordingly, expected bird-collision impacts should be comparable. At SSES, surveys conducted on weekdays during spring and fall migration from 1978 through 1986 yielded an average of about 170 dead birds per survey year, consisting primarily of songbirds (NRC, 1996). Songbird population studies done in the vicinity of SSES prior to and after operation of the plant did not detect population declines associated with the plant operation (Ecology III, 1995).

The scarlet tanager and other forest interior bird species should be even less impacted by collisions with the cooling towers, at least during non-migrating periods, because they would not find suitable habitat close to the cooling towers, which will be constructed on a cleared, treeless pad. 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). No other mitigation appears to be necessary to prevent substantial adverse impacts to bird species populations caused by collisions with the cooling towers. (Ogden, 1996)

Noise Impacts:

Section 2.7 provides information and data related to the background noise levels that exist at the construction site. Locations where noise measurements were taken are provided in Figure 2.7-97. Ambient environmental community baseline noise levels at the BBNPP site were determined to be between 57 and 59 dBA (excluding location 5 which was within 200 feet of US 11 and impacted by load traffic noise) throughout a survey conducted during the leaf-off season in February and March 2008. This study concluded that the major sources of environmental noise (pre-construction) in the BBNPP proposed project area are primarily from traffic, high wind, and rain and not related to the existing adjacent SSES Units 1and 2.

Additional noise measurement studies were completed during the leaf-on season in the summers of 2008 and 2010. The general results of these studies were consistent with the aforementioned study performed during the leaf-off season in 2008. A detailed discussion of the results for these studies is provided in Section 2.7.

Noises during active construction periods at the BBNPP site will likely result in at least temporary displacement of some of the more mobile wildlife species at the site. Noises that are loud, sudden, and unpredictable have the greatest impacts. Sound levels above about 90 dBA are often associated with wildlife behaviors such as retreat from the sound source, freezing, or a strong startle response while lower sound levels usually cause much less adverse behavior (USFWS, 1988).

Typical noise levels of construction equipment, such as loaders, dozers, graders, dump trucks, cranes, generators, pile drivers, and jack hammers are provided in Table 4.4-1 and range from

73 to 102 dBA at 50 feet (Beranek, 1971). However, construction noise is expected to attenuate, within several hundred feet of its origin, below the 90 dBA threshold at which wildlife is most affected. The construction of BBNPP should produce the same magnitude of noise, and no greater effects to wildlife than were previously experienced when the SSES was constructed on the adjacent property. In summary, the effects of construction noise on wildlife at the BBNPP site are expected to be temporary and SMALL and would not require mitigation, however, efforts will be made in order to minimize noise impacts as practicable, especially noises that are loud, sudden, and unpredictable.

4.3.1.3 Wetlands

The construction footprint for the proposed facilities has been designed, wherever possible, to minimize encroachment into state and federally regulated wetlands, other waters of the U.S., and "Regulated Waters of the Commonwealth of Pennsylvania." However, construction of the proposed facilities will not be possible without permanently filling approximately 1.4 ac (0.6 ha) of wetlands, permanently converting approximately 7.9 ac (3.2 ha) of forested wetlands to scrub/shrub wetlands, and permanently filling approximately 742 linear feet (226.2 m) of stream channel outside of the wetlands areas. Temporary wetland losses of 9.3 ac (3.7 ha) will occur as a result of the installation of water intake and discharge pipelines and for wetland and stream mitigation activities. The project will therefore require an Individual Permit from the Baltimore District of the U.S. Army Corps of Engineers (USACE) under Section 404 of the Federal Water Pollution Control Act, and Section 10 of the Rivers and Harbors Act. The project does not qualify for approval under the USACE's Pennsylvania State Programmatic General Permit-4 (PASPGP-4) due to the extent of impacts to federally regulated areas.

At the state level, the project will require the following permits from the Pennsylvania Department of Environmental Protection (PADEP) under its Chapter 105 Dam Safety and Waterway Management Regulations (Chapter 105) for proposed development activities in "Regulated Waters of the Commonwealth":

- Water Obstruction and Encroachment Permit,
- CWA Section 401 Water Quality Certification,
- Submerged Lands License Agreement,

Both the USACE and PADEP permitting processes include a detailed analysis of environmental impacts and alternative measures for avoiding and/or minimizing impacts. All impacts to wetlands and other regulated waters must be unavoidable, and will require mitigation through techniques such as the construction of new wetlands habitat as discussed below in Section 4.3.1.6. Permits and other regulatory authorizations required for the project are presented in Section 1.3.

4.3.1.4 Other Projects Within the Area with Potential Impacts

Preliminary siting studies have been conducted for an electric power transmission line extending from the vicinity of Berwick, Pennsylvania to Roseland, New Jersey. In addition, the U.S Department of Energy has tentatively designated a corridor in Pennsylvania, including Luzerne County, as part of the Mid-Atlantic Area National Corridor that will serve as potential routes for future electric power transmission lines (DOE, 2008a) (DOE, 2008b). BBNPP contributes to two previously identified transmission system upgrades for electrical overloads, initially caused by prior Queue position generation additions (PJM, 2008). The upgrades include rebuilding a 16.1 mile stretch of a single circuit 230 kV transmission line to a double circuit line in Harford County, MD, and a bus reconfiguration with circuit breaker additions at an existing substation near Meshoppen, PA. The transmission line rebuild will make use of the existing right-of-way corridor. The only other known project that may impact natural resources in the region is a new 42 in (107 cm) natural gas pipeline, part of which is located in Luzerne County (FERC, 2006). Transco proposes to expand its existing Leidy gas pipeline to allow additional transport of gas to southern New York. (DOE, 2008) (USFWS, 2008).

4.3.1.5 Regulatory Consultation

Affected federal, state and Regional agencies will be contacted regarding the potential impacts to the terrestrial ecosystem resulting from plant construction. The U. S. Fish and Wildlife Service was consulted for information on known occurrences of federally-listed threatened, endangered, or special status species and critical habitats (USFWS, 2008). For state-listed threatened, endangered, or special status species and critical habitats, the Pennsylvania Game Commission was consulted concerning mammals and birds (PGC, 2008; PGC, 2010); the Pennsylvania Fish and Boat Commission was consulted concerning reptiles and amphibians (PFBC, 2008; PFBC, 2011; PFBC, 2010), and the Pennsylvania Department of Conservation and Natural Resources (PDCNR) was consulted concerning plants, natural communities, terrestrial invertebrates, and geologic features (PDCNR, 2008a; PDCNR, 2010). Wetlands regulatory officials with the USACE and PADEP were consulted regarding wetlands issues. Identification of the important species discussed above was based in part on information provided by consultation with the state and federal agencies listed above.

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 BBNPP site to the extent practicable. The description of mitigation measures is addressed below for upland areas (flora and fauna) and wetland areas.

<u>Flora and Fauna:</u>

Emphasis is on a two-prong approach that includes reforestation and the conservation and management of existing habitat. Reforestation includes acreage both within and outside the site boundary to compensate for approximately 234 acres (94.5 hectares) of proposed forest clearing which includes less than 10 acres (4.1 hectares) of palustrine forested (PFO) wetland. Conservation and habitat management involves maintaining riparian buffers, existing wetlands, and forest habitats for roosting, nesting, and foraging. The reforestation, and the conservation and habitat management plans will be developed in conjunction with an Indiana Bat Management Plan to compensate for the loss of potential Indiana bat habitat resulting from the tree clearing needed to support facility construction and grading. The management plan will focus on ways to create, improve, and protect on- and off- site Indiana bat habitat such as planting shagbark hickory and other tree species with exfoliating bark or crevices listed by USFWS for Indiana bat habitat restoration.

PPL has identified priority areas for reforestation. The priorities include a corridor along Walker Run corresponding with a wetland mitigation project, crop fields north and east of Lake Took-A-While and west of the North Branch Susquehanna River (NBSR), and parcels on the east side of the NBSR. The reforestation goal is to provide north/south flyways on both sides of the project boundary, along Walker Run, and on the east bank of the NBSR between the river and the existing railroad tracks as well as to create and enhance Indiana bat habitat. The

USFWS will provide input and ensure the reforestation process will meet specific pre-determined criteria to create suitable Indiana bat habitat.

Surface Water Withdrawal and Consumptive Water Use

Physical impacts of cooling system water withdrawal from the NBSR could include alteration of site hydrology at, and in areas downstream of the intake structure. Studies have been completed to determine if BBNPP water withdrawals will have a negative effect on aquatic habitat, vulnerable aquatic species, and water quality, especially during drought or low flow conditions. Mitigation of potential aquatic impacts during low flow periods is a requirement of the Susquehanna River Basin Commission and is being separately addressed as part of the Commission's regulatory review.

Groundwater Withdrawal

Construction dewatering necessary to support excavation to bedrock for safety-related structures is needed for the power block, cooling towers, and Essential Service Water Emergency Makeup System (ESWEMS) pond. Construction dewatering for the power block and cooling towers is anticipated to be minor and will be accomplished with a series of gravity drains and sump pumps. Dewatering required for the construction of the ESWEMS pond will be more extensive. Mitigation measures such as the installation of a slurry wall will reduce the extent of drawdown and the depth of the groundwater depression. Collection and appropriate ground surface application of the pumped groundwater will maintain groundwater at or near preexcavation levels and prevent impacts to nearby wetland and stream hydrology.

The BBNPP design meets Section 404(b)(1) guidelines regarding avoidance and/or minimization of wetland impacts. Adjustments to the design were made to decrease the size of the required temporary and permanent facilities and to maximize the amount of undisturbed vegetation. Substantial measures taken to minimize impacts after avoidance planning was completed resulted in the impacts currently proposed, in which direct, permanent impacts have been further reduced from approximately 11.3 acres (4.6 hectares) to less than 2 acres (0.8 hectares), the majority of which is associated with the BBNPP Intake Structure. This process included the following avoidance minimization measures:

Wetlands:

Wetland mitigation in Pennsylvania is driven primarily by conditions established by the USACE and PADEP in permits issued under Section 404 of the Federal Water Pollution Control Act and Chapter 105 Dam Safety and Waterway Management Regulations. 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 to the extent possible. Therefore, the wetland impacts detailed in 4.3.1.3 must be considered unavoidable.

Several measures will be taken to minimize the unavoidable adverse effects to wetlands. The use of silt fences, 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, as well as wetlands located downstream of the project area.

The BBNPP design meets Section 404(b)(1) guidelines regarding avoidance and/or minimization of wetland impacts. Adjustments to the design were made to decrease the size of the required temporary and permanent facilities and to maximize the amount of undisturbed vegetation. Substantial measures taken to minimize impacts after avoidance planning was completed resulted in the impacts currently proposed, in which direct, permanent impacts have been further reduced from approximately 11.3 acres (4.6 hectares) to less than 2 acres (0.8 hectares), the majority of which is associated with the BBNPP Intake Structure. This process included the following avoidance minimization measures:

- Preservation of a 50 ft (15 m) buffer zone around wetlands and streams within the Walker Run watershed to preserve the existing riparian zone and undeveloped lands adjacent to wetlands. This measure is expected to significantly reduce indirect impacts to wetland and streams on the BBNPP Site.

- Fencing of EV wetlands with a silt fence/fiber log barrier and an orange high visibility snow fence installed around the perimeter. Should the use of a siltation and erosion control barrier along with snow fencing be inadequate to provide suitable protection in a high traffic area, wood chips will be used to create a protective berm around the wetland.

- Construction of several bridges accessing the BBNPP site with lengths greater than the minimum requirement to achieve the necessary span. This extension of bridge length allows for the landings of the bridges to avoid EV wetlands, 50 ft (15 m) forested wetland buffers and stream impacts (including the 100-year floodplain) altogether, reducing total impacts to only those associated with support pilings.

- Alignment of structures and features associated with the CWIS to the smallest acceptable size to reduce impacts in this area.

- Location of laydown areas on previously disturbed sites.

- Fencing wetlands located within temporary laydown areas during construction activities.

- Co-location of buildings and reconfiguration of roadways of minimal acceptable width.

- Adoption of low impact development (LID) practices, including siting stormwater discharges outside of wetlands and within heavily vegetated buffer areas, and reduction in impervious surfaces.

- Use of numerous retaining walls to reduce side slope areas and create “useable” uplands.

- Use of gas-insulated switchgear, rather than air-insulated switchgear in the switchyard to take advantage of a much smaller (60% size reduction) footprint at substantially higher cost to PPL.

- Use of a coffer dam to dewater the area impacted by intake and discharge structures during construction reducing sedimentation and turbidity in the Susquehanna River.

- Erosion and sediment control plans that meet 25 Pa Code Chapter 102 requirements and that will reduce water quality impacts to surface waters.

- Use of subsurface infiltration beds to reduce the area required for surface stormwater basins and to regulate temperature and water quality entering wetlands and streams; this measure is also expected to reduce degradation of wetlands at BBNPP.

Additional Information: Remaining unavoidable impacts are categorized as permanent loss, temporary loss, or permanent conversion. Permanent losses involve the placement of fill or grading in a wetland or watercourse. Temporary loss results from disturbances necessary to perform work where the disturbed area will be restored to its original condition. Wetland replacement acreage is not required for temporary impacts. Permanent conversion impacts result when there is no physical obstruction or encroachment, but changes to vegetation associated with vegetation management activities.

Provision of compensatory mitigation for unavoidable impacts to wetland and stream systems resulting from BBNPP construction is proposed as part of the overall BBNPP project. Determination of the most appropriate mitigation measures for BBNPP will be made following the processes outlined under the Federal Clean Water Act and Pennsylvania 25 PA Code §105 which require avoidance and minimization of impacts to aquatic habitat prior to provision of suitable compensatory mitigation for unavoidable impacts to wetlands and aquatic resources.

The ACOE and EPA 2008 Final Compensatory Mitigation Rule will be employed as the primary mechanism guiding the evaluation of and commitment to suitable mitigation for BBNPP. Mitigation measures will also be designed to conform to applicable Pennsylvania law and PADEP guidance on compensatory mitigation.

Compensatory wetland and waterbody mitigation for BBNPP will be:

- Primarily in-kind, providing for the same type of habitats to be created as are lost (emergent wetland will be replaced with forested wetland due to site-specific habitat creation goals),

- In the same watershed as the permanently affected wetlands and aquatic features disturbed by BBNPP construction and in most cases in the same subwatershed,

- Designed to replace lost functions and values. Selection and design of mitigation measure for BBNPP relies upon a site-specific functions and values analysis, which identifies the important characteristics provided by those wetlands to be altered or lost as a result of BBNPP construction.

- Provided at a ratio of wetlands replaced to wetlands lost that is greater than 1:1, which is meant to mitigate for temporal losses of functions and values during the period of maturation of the mitigation areas.

- Designed to enhance the physical integrity and provision of functions and values of riparian buffer zone and wetland buffer zones through enhancement of existing unaffected habitats on the BNNPP property.

Commonly used forms of compensatory wetland mitigation include restoration or enhancement of degraded wetlands, creating (constructing) wetlands in areas that are not wetland, and preserving areas of intact wetlands. The proposed wetland impacts requiring mitigation are permanent impacts or indirect impacts (affecting wetland functions and values). Restoring permanently impacted wetlands after completion of construction activities would not be possible.

Compensatory wetland and waterbody mitigation for the BBNPP site will include:

- Re-creating the same type of habitats as are lost.
- Creating wetlands in the same watershed as the permanently affected wetlands and aquatic features disturbed by BBNPP construction, and in most cases in the same sub-watershed.
- Replacing lost wetland habitat functions and values; selection and design of mitigation measures for BBNPP will rely upon a site-specific functions and values analysis, which identifies the important characteristics provided by those wetlands to be altered or lost as a result of BBNPP construction.

Compensatory mitigation for BBNPP is designed to meet these guiding principles, the ultimate determination of the areal requirements for mitigation will be based upon the project's unavoidable impacts. Construction of the BBNPP project will permanently impact approximately 1.4 ac (0.6 ha) of wetlands, and 7.9 ac (3.2 ha) of forested wetlands located within proposed transmission line rights-of-way and vehicle, rail and utility pipeline bridge corridors will be permanently affected by long-term vegetation management activities. Additionally, the installation of water intake and discharge pipelines will result in temporary wetland impacts. The total mitigation provided for BBNPP will result in a substantially greater area of compensatory wetlands than that lost from construction.

Numerous potential mitigation sites were evaluated for compensatory stream and wetland mitigation for the BBNPP project impacts. PPL selected three wetland mitigation projects based on their ability to satisfy the wetland mitigation acreage needed for the proposed impacts, to replace functions and values affected by the proposed impacts, and to provide the greatest environmental benefits relative to the expected cost of the mitigation measure. The chosen mitigation projects are also intended to address site specific concerns such as replacement of forested wetland habitat and habitat quality improvements for reproducing brown trout populations in Walker Run. The following projects will be implemented as part of the BBNPP mitigation strategy for impacts to jurisdictional waters.

<u>Walker Run Mitigation Project</u>

A stream and floodplain restoration project will be implemented on two reaches of Walker Run creating and enhancing wetlands and wild trout habitat as well as mitigating for permanent stream impacts. This proposed project will use natural stream channel design techniques to improve channel stability, water quality, and aquatic habitat along Walker Run and to restore the functionality of the floodplain. The proposed project will greatly improve Walker Run's habitat, especially for reproducing brown trout populations. Sedimentation and stream bank erosion will also be reduced, improving availability of trout spawning substrate. Varying in-stream conditions including riffles, runs, and pools, as well as fish habitat structures will be established, and eventually a mature PFO wetland will exist along the length of the restored reach improving canopy cover and reducing stream temperatures.

The Walker Run stream and floodplain restoration will account for all of the required wetland mitigation for the BBNPP impacts. The project will create approximately 8 ac (3.2 ha) of wetlands and enhance an additional 5 ac (2.0 ha) through invasive species removal and the planting of native herbaceous vegetation, shrubs, and trees. The project will also restore the Walker Run floodplain by reconnecting the hydrologic link between the stream channel and floodplain.

The planting plan for this project was designed with the goal of eventually establishing mature PFO wetlands to mitigate for losses to forested wetland habitat, including Indiana bat habitat, resulting from permanent and indirect impacts. The functions provided by the created wetlands will exceed the functions lost by BBNPP project impacts and will include; enhanced fish habitat, stream stabilization, groundwater recharge, sediment reduction, flood flow alteration, and water quality improvements.

The Walker Run mitigation project will also account for all of the required stream mitigation for BBNPP impacts. The existing straightened and channelized stream will be realigned, creating and enhancing approximately 2,200 LF (671 m) of channel. Stream channel is created where the existing channel is moved and lengthened. Approximately 1,400 LF (423 m) of created stream channel and 800 LF (244 m) of enhanced channel will result from the Walker Run mitigation project. Stream enhancements occur where the stream remains in its existing location but channel improvements are made such as bank grading or planting native vegetation.

PPL Riverlands Mitigation Project

The PPL Riverlands project will restore the North Branch Canal (NBC), enhance wetlands at the PPL Riverlands near the proposed intake structure, and extend the existing recreational trail system. The Riverlands Mitigation Project is two-fold. First, the NBC will be reconnected in its historical alignment. Second, 1.24 acres (0.50 hectares) of wetlands will be enhanced near the proposed intake structure.

The reconnection of the NBC has been identified as the preferred solution to address the proposed filling of the existing manmade NBC outfall channel in conjunction with the intake structure construction. The NBC outfall channel was installed to provide an outfall to the canal weir which is intended to maintain water surface elevation in the canal. The reconnection also includes plans for a walking trail along the old tow path for the length of the restored canal. The reconnection of the canal will mitigate for the wetland values lost such as recreation, educational opportunities, uniqueness, and visual quality.

This project will also enhance over one acre of wetlands near the proposed intake structure. The planned enhancement will include removing invasive species and planting native herbaceous species, shrubs, and trees to compensate for reduced PFO habitat.

Confers Lane Mitigation Project

This project will include removing a section of Confers Lane, which is to be abandoned, creating additional wetlands and restoring a hydrologic connection between two exceptional value (EV) wetlands. Existing wetlands on either side of Confers Lane are hydrologically similar and were likely connected prior to road construction. The abandonment of Confers Lane presents an opportunity to remove the road bed, re-establish a connection between existing EV wetlands, and create 0.36 ac (0.15 ha) of additional forested wetland habitat. This small area will be enhanced with native herbaceous plants, shrubs and trees to restore the PFO wetland post construction.

Conclusion

Approximately 8 acres (3.2 hectares) of wetlands will be created, 7 acres (2.8 hectares) of wetlands will be enhanced, and 2,200 feet (671 m) of stream channel restored resulting in a significant net gain of wetlands and stream channel within the BBNPP property boundary. All impacted functions and values will be replaced. Additional wetland functions and values will be created exceeding those currently existing on the BBNPP site. The mitigation projects will create forested wetland habitat and improve habitat for reproducing wild trout populations within Walker Run. The proposed mitigation project will exceed both PADEP and ACOE mitigation requirements. PPL will satisfy additional Federal and State mitigation requirements by addressing impacts to endangered and protected species habitat.

A comprehensive monitoring and corrective action plan is proposed to be implemented following BBNPP mitigation area construction to ensure the original design goals are met, to provide an active feedback mechanism allowing for identification and correction of areas of concern within the mitigation areas, and to meet applicable regulatory agencies' requirements for annual reporting of the condition of the mitigation areas. The monitoring and corrective action plan will be followed for a minimum of 5 years. Mitigation plans will be developed in consultation with the State, Federal, and local resource agencies.

4.3.2 Aquatic Ecosystems

This section provides an assessment of the potential impact construction activities will have on aquatic ecosystems in the onsite ponds, Walker Run, Unnamed Tributary 5, North Branch Canal and adjacent waterbodies, and offsite in the Susquehanna River and Unnamed Tributaries 3 and 4, as shown on Figure 2.3-3. Any new transmission lines and access corridors associated with the project are limited to the BBNPP site.

Approximately 1.4 acres (0.6 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 towers, switchyard, roadways, permanent construction laydown area, and permanent parking lots. The permanent loss of affected aquatic habitat of approximately 1.4 acres (0.6 hectares) is SMALL compared to the 83,797 ac (33,911 ha) in the region as shown in Table 2.2-5. Figure 4.3-1 shows the BBNPP site boundary, the major buildings to be constructed, the land to be cleared, the waste disposal area and the construction zone. The location of biological assessment stations for the water bodies is given in Figure 2.4-3 to Figure 2.4-6. A topographic map is provided as Figure 2.4-1 showing the aquatic habitats. A similar analysis is discussed for wetlands in Section 4.3.1.

Section 4.2 includes a description of the footprint of the construction area and construction methods. Activities to construct non-safety-related systems and structures will begin after the Commonwealth of Pennsylvania issue applicable permits to start clearing and grading the BBNPP site. Other permits may be required from other regulatory agencies. The expected date for the NRC combined license, which will allow construction of safety-related systems and structures is discussed in Section 1.2. The expected date for completion of construction is also available in Section 1.2.

4.3.2.1 Impacts to Impoundments and Streams

The construction footprint of BBNPP covers approximately 687 ac (278 ha) including many separate wetland and surface water areas. The effects of construction to onsite wetlands are described in Section 4.3.1. Construction effects to aquatic habitats in the immediate area range from temporary disturbance to permanent loss of small portions of the affected aquatic habitats. The following surface water bodies may be affected by construction activities:

- East fork of Walker Run (Unnamed Tributary 1);
- Unnamed Tributary 2,
- Main stem Walker Run (Walker Run);

- Unnamed Tributary 5,
- Johnson's Pond;
- Beaver Pond;
- West Building Pond;
- Unnamed Pond;
- Farm Pond; and
- North Branch of the Pennsylvania Canal and adjacent water bodies.

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

- Increasing runoff from the approximately 87 ac (35 ha) of impervious and relatively impervious surfaces for the BBNPP power block pad, cooling tower pad, switchyard, laydown, and parking areas;
- Construction of seven bridges over the main stem of Walker Run, East Fork Walker Run, Unnamed Tributary 1, and wetlands. Permanent impacts from bridge construction will be limited to the footprint of the bridge foundations;
- Construction of a culvert to convey Unnamed Tributary 5 under the proposed rail line;
- Creating a new stream channel and abandoning the section of the main stem of Walker Run at the western boundary of the site along Market Street;
- Construction of cofferdams that will temporarily de-water a section of the canal;
- Abandonment of the Canal Outlet which drains the Canal into the River; and
- Reconnection of the North Branch Canal in the Susquehanna Riverlands
- Possibly increasing the sediment loads and channel erosion rates in the downstream reaches of Walker Run and Unnamed Tributary 5.

The site drainage basin areas are not expected to change substantially as a result of the site grading plan.

As discussed in Section 2.4.2, 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 on site are ubiquitous, common, and easily located in nearby waters. Typical and abundant fish species in the onsite ponds include green sunfish, bluegill, and brown bullhead. Common and abundant fish species on site in Walker Run include creek chub, white sucker, and blacknose dace.

For the Canal and Canal Outlet the common and abundant fish species included bluegill, green sunfish, and golden shiner. One unusual species occurrence in the Canal Outlet was the collection of a single brook stickleback (*Culaea inconstans*). The species is currently considered a candidate species in Pennsylvania. No previous occurrences of the brook stickleback are known from water bodies in the vicinity of BBNPP, and this observation likely represents an introduction through human action. A more detailed discussion of brook stickleback is provided in Section 2.4.2.1.3.

The most important aquatic organisms in the onsite water bodies are benthic macroinvertebrates. In particular, the larval stages of aquatic insects are important indicators of water quality and are an important food source for insectivorous fishes. These macroinvertebrate species readily recolonize available surface waters and would not be permanently impacted as a result of construction related activities.

No important aquatic habitats were identified in Walker Run within the project vicinity. However, headwaters streams, such as Walker Run, are important components of lotic ecosystems and support important ecological functions. Recent scientific literature promotes the protection of headwaters streams and the role they play in determining downstream water quality (Lowe, 2005). Both Walker Run and Unnamed Tributary 5 are important in this respect. The ponds, Canal, and Canal Outlet are all man-made water bodies in which no unique habitat exists.

The direct impacts to Walker Run from construction activities will be from construction of bridges at several locations across the stream. A total of six bridges will be constructed across the main stem of Walker Run and Unnamed Tributary 1. Bridge construction will result in permanent impact to areas in the footprint of the bridge pilings, which will be built adjacent to the stream channel. Construction of the bridge pilings will likely cause temporary impact to riparian habitats. Temporary impacts will likely include disturbance or removal of vegetation, compaction of soil, and an increase in sediment loads to the stream. Likewise, one bridge will be constructed across a wetland. The bridge will span the wetland and permanent impact will be limited to the footprint of the bridge pilings.

Impacts will also occur to Walker Run as a result of stream and floodplain restoration activities. The section of Walker Run from the Beach Grove Rd bridge to the confluence with Unnamed Tributary 1 will be impacted. A new section of stream channel will be constructed adjacent to the existing channel and the former steam channel will be abandoned. Restoration activities will result in disruption of both benthic and fish community habitat in this section. Fish in the affected stream section could be rescued and transported downstream into unaffected sections of the stream during the channel dewatering process. Macroinvertebrates and other aquatic organisms within the affected stream section would perish. After construction it is expected that the former community will recolonize the created stream section within a fairly short time frame.

The direct impacts to Unnamed Tributary 5 will be construction of a culvert to convey the stream under the proposed rail line. Approximately 125 ft (38 m) of stream will be permanently impacted. The permanent impact will result in the loss of benthic habitat within the 125 ft (38 m) length of culvert that will replace the existing stream channel. The culvert will be constructed as to not impede fish or other aquatic organism movement within the stream.

A 50-ft (15.2 m) buffer zone will be maintained adjacent to each of the aquatic habitats within the Walker Run watershed during construction. No permanent grading will occur within 50 ft (15.2 m) of these wetlands or streams. Buffer zones will remain undisturbed as much as possible, although minor work may occur in these areas. All areas disturbed within the buffer zones will be restored and re-vegetated to their original condition. Adhering to a strict erosion and sedimentation control plan will help minimize the amount of sediment being transported into onsite water bodies.

The main impact to the Canal will be construction of cofferdams that will be used to temporarily de-water a section of it for placement of the intake and discharge lines. Fish in the Canal would probably swim away from the affected area to other parts of the Canal, outside of the area being disturbed by construction activities. It is possible additional sediments would be transported by runoff into the Canal during and after construction. Cofferdam construction would be a temporary disturbance with no long term impacts anticipated.

The Canal Outlet will be abandoned as a part of construction of the BBNPP intake structure. The Canal Outlet is a man-made channel that drains the Canal to the Susquehanna River. The North Branch Canal is currently dammed at the Canal Outlet and disconnected from the original Canal system to the south of the Outlet. During construction of the intake structure the Canal to the north of the Canal Outlet will be reconnected to the old Canal south of the Canal Outlet. Some fish within the Canal Outlet will be able to move downstream into the River once the channel is dewatered. Those that do not move from the Canal Outlet could be rescued and transported into the River or Canal during the channel dewatering process. Other aquatic organisms living in the Canal Outlet will perish as result of channel abandonment.

Long-term impact to streams and other water bodies with watersheds that will be developed on the BBNPP site relates to impervious surfaces. Impervious surfaces (e.g. parking lots, sidewalks, buildings) prevent precipitation from infiltrating the soil. Increases in the amount of impervious surface in a watershed can lead to increases in the rate of channel erosion, changes in stream flow (larger and more frequent flood events, decrease in base flow), and changes in water quality. The affect of increasing impervious surface can potentially alter aquatic biota habitat and alter fish (Wang, 2003) and macroinvertebrate communities (Lieb, 2000). These impacts may be evaluated using the United States Environmental Protection Agency Rapid Bioassessment Protocols for habitat assessment. (Barbour, 1999) (Lieb, 2000) (Wang, 2003)

Onsite streams and ponds were described as typical surface water habitats in the area. Headwater streams in general are considered important; however, there is nothing of regional significance about Walker Run. 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 on site are not substantively distinguishable from other wetland acreage in the vicinity. Discussion of wetlands impacts are treated extensively in Section 4.3.1. Additional details of the specific plants that will be lost in each area are presented in Section 4.3.1. The impact to the wetlands that remain at the BBNPP site may be MODERATE.

Proposed construction activities that will potentially affect onsite water bodies are described in Section 4.2. Due to 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 anthropogenic 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).

Several groups of aquatic organisms are typically affected by the deposition of sediment in streams: (1) aquatic plants, (2) benthic macroinvertebrates, (3) fish, and (4) periphyton. The effects of excess sediment in streams and rivers, including sediment generated by construction activities, are influenced by particle size. Finer particles may remain suspended, blocking the light needed for primary producer photosynthesis, which could initiate a cascade of subsequent effects (Waters, 1995). Turbidity associated with suspended sediments may reduce photosynthetic activity in both periphyton and rooted aquatic plants. Suspended particles may also interfere with respiration in macroinvertebrates and newly hatched fish, or reduce their feeding efficiency by lowering visibility. Suspended particles may also clog feeding structures for filter-feeding macroinvertebrates (Newcombe, 1991). 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. Larger particles in combination with high flow events can also scour periphyton from substrate and thereby reduce peripyton biomass (Newcombe, 1991). As the interstitial spaces in the substrate are filled, habitat quality is decreased for intolerant benthic macroinvertebrates forms such as Ephemeroptera, Plecoptera, and Trichoptera, and more tolerant forms such as oligochaetes and chironomids become dominant (Waters, 1995) (Lemly, 1982). Such changes in the benthic community assemblage result in a loss of fish forage, and a subsequent change in fish community functional feeding groups and reduction in fish populations. (Lemly, 1982) (Newcombe, 1991) (Rabeni, 1995) (Waters, 1995)

Construction sites contribute to erosion, which can lead to sedimentation in streams and rivers. 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 silt fences, 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.

Infiltration beds will be constructed on the periphery of the power block, laydown, cooling tower, parking areas and switchyard areas to help catch surface runoff and prevent degradation of adjoining terrestrial and aquatic habitats. These beds will be important in minimizing the changes in hydrologic conditions after construction is completed. Infiltration beds serve several stormwater functions including volume reduction, groundwater recharge, control of peak runoff rates, and maintenance of water quality. Routing of runoff from the plant site through infiltration beds will help maintain water temperatures of the water being discharged into the wetlands and minimize sediment transport to the wetlands. The infiltration beds will be constructed of 2 to 4 in (51 to 102 mm) diameter washed rocks that promote infiltration of runoff and the tops and sides of the rock layer would be covered with a non-woven geotextile fabric to limit sediment entry. The outlet of each infiltration bed will drain to adjacent wetlands with outlet protection (level spreaders, rock filters, riprap pads, etc.) being placed at the outlet of each infiltration bed.

Other stormwater management structures that will be utilized onsite include swales and berms. Swales will be used throughout the site to convey stormwater when infiltration is not required. Berms will be installed around the wetlands in the construction laydown areas to limit the potential for uncontrolled surface water runoff from entering the wetlands from disturbed areas during construction. Berms will be used in combination with silt fencing.

Construction impacts to water resources will be avoided or minimized through best management practices and compliance with NPDES Individual Permit for Discharge of Stormwater Associated with Construction Activities requirements. An Erosion and Sedimentation Control (E&S) Plan which provides explicit specifications to control soil erosion and sediment intrusion into wetlands, streams and waterways will be followed (Pa Code Chapter 102). Applicable Pennsylvania state regulations found at 25 Pa. Code include Chapter 92, National Pollutant Discharge Elimination System; Chapter 93, Water Quality Standards; and Chapter 102, Erosion and Sediment Control. These chapters provide the primary regulatory authority for implementing the federal NPDES requirements within the Commonwealth. Chapter 92 regulations provide for the development and use of individual and general NPDES permits, applications, and Notice of Intent (NOI), and describes the public participation and other requirements. Chapter 93 regulations identify the water quality standards that must be met, including those for special protection waters. Chapter 102 regulations provide the requirements for the development and implementation of Erosion and Sedimentation Control (E&S) Plans for earth disturbance activities. A Preparedness, Prevention, and Contingency (PPC) Plan will be developed to reduce the potential for causing accidental pollution of air, land, and water through accidental release of toxic, hazardous, or other polluting materials.

4.3.2.2 Impacts to the Susquehanna River and Offsite Streams

The construction footprint in the Susquehanna River will be limited to construction of the BBNPP Intake Structure and discharge structure, located as shown on Figure 4.3-1. These construction activities are expected to have limited impact to the river. Temporary disturbance to both the river bank and bottom substrate will occur due to construction. Construction may lead to sediment additions to the river from bank disturbance and soil erosion. Other indirect impacts may result from increased sediment loads from Walker Run and Unnamed Tributaries 3, 4, and 5. The impacts of sediment on aquatic communities were discussed in detail in Section 4.3.2.1.

Extensive surveys of the Susquehanna River did not document any important fish species (Section 2.4.2). Fish species observed in the river are year-round residents and common in Pennsylvania. Recreationally important fishes that are abundant in the river include smallmouth bass, walleye, and channel catfish. Construction impacts to recreational fish species will be minimal based on the fact that the areas of impact are not unique to this segment of the river. That is, the areas do not serve a special ecological purpose for fish within this river segment. Two important species of mussels classified as species of special concern by the Pennsylvania Fish and Boat Commission (PFBC) , green floater (*Lasmigona subviridis*) and yellow lampmussel (*Lampsilis cariosa*), were collected within the vicinity of the proposed location of the BBNPP intake/discharge structures.

Freshwater mussels, in general, are sensitive to sedimentation effects and proper erosion controls should be employed when working in and along the river. Similar to other filter-feeding macroinvertebrates, excess sediments can lead to disrupted feeding and subsequent decline in health. Large amounts of sediment can also lead to deposition and alteration of the bottom substrate. Mussels within the footprint of disturbance for the intake structure and the diffuser pipe will also be impacted by the physical disturbance of bottom substrate. The exact location of the intake and discharge structures was not surveyed because their locations were not known at the time that the surveys were completed. Instead, sampling was completed in the vicinity (both upstream and downstream) of the approximate BBNPP intake and discharge structures. Renewed coordination with the PFBC will be undertaken prior to initiation of construction of the intake and discharge structures. No unique habitats were identified in the Susquehanna River (Section 2.4.2.2), thus no loss of important habitat will occur as a result of construction of the intake/discharge structures.

Turbidity and sedimentation in the river will be minimized during construction of the intake structure by placement of a cofferdam around the work area. Bedrock excavation should not be necessary within the river limits. Bedrock at the east edge of the intake structure is at about Elevation 470' and slopes upward to approximately El. 480' at the west end of the intake structure. The rock elevation decreases eastward into the river. The top of the concrete mat for the intake structure is at Elevation 474'. Considering a 2' thick concrete mat, the bottom of the excavation is at Elevation 472'. Therefore, no rock excavation is required beneath the forebay area within the river limits; however, some rock excavation is required for the intake structure itself on land adjacent to the river. A seepage cutoff structure will be built to allow the construction of the intake structure to occur in dry conditions. The cutoff wall will consist of a circular cofferdam consisting of interlocking sheetpile sections. The cofferdam will be anchored into the bedrock to minimize any under seepage into the excavation and to provide stability against sliding. The diameter of the cofferdams will be designed to provide adequate stability from overturning due to the water load from the river.

The area of the river disturbed by the installation of the cofferdam at the intake structure will be approximately 200 ft (61 m) into the river channel, by 100 ft (30 m) parallel to the shoreline, for a total area of 20,000 ft^2 (1,858 m^2). When the cofferdam is removed some additional area will be disturbed. Some dredging is required in the river in front of the structure to remove the material from within the cofferdam and to shape the slope on all three sides to the design elevation of the forebay area to minimize sedimentation in the structure. This total area after construction will be approximately 120 ft (37 m) into the river channel, by 220 ft (67 m) for a total disturbed area of 26,400 ft^2 (2,453 m^2).

After completion of the intake structure, the cofferdams and fill material will be removed to allow the river to flow into the structure. After removal of the cofferdams a temporary increase in sediment in the water column is expected. The area of disturbance due to the cofferdams would be approximately 400 ft (122 m) in length (the length of the cellular cofferdam in the river) by the diameter of the cofferdam (consider 16 ft (4.9 m) in diameter). This area of disturbance would be approximately 6400 ft^2 (595 m^2).The cofferdams will not inhibit aquatic organism movement within the river due to the small area affected by construction activity (see Figure 3.4-11).

A similar process will be employed during diffuser pipe installation. The diffuser begins 203 ft (62 m) perpendicularly from the shoreline, and is 119.5 ft (36 m) in length. The plan distance along the discharge pipeline to the diffuser is approximately 258 ft (79 m). Thus the trench for the pipeline and the diffuser will extend approximately 377.5 ft (115 m), i.e., 258 ft (79 m) plus (+) 119.5 ft (36 m), into the river, and will be approximately 50 ft (15 m) wide. The discharge pipe is slightly below the river bottom and the diffuser is situated at the bottom of the river as shown in Figures Figure 3.4-6 and Figure 3.4-12. Since the pipe elevation is above the elevation of the rock, no rock excavation will be necessary for the discharge pipeline and diffuser within the river limits.

The total disturbed area during construction will be approximately 18,900 ft^2 (1,760 m^2). After installation of the pipe and the riprap protection, the final disturbed area will be slightly narrower, with a disturbed area of approximately 377.5 ft (115 m) by 20 ft (6 m) for a total of 7,600 ft^2 (706 m^2). Construction will result in removal and disruption of river substrate in the immediate vicinity of the diffuser pipe. Temporary increases in suspended sediments in the water column will result during cofferdam installation. After completion of the pipe installation, the cofferdam will be removed. If no material is placed within the cofferdam cells, then no additional dredging will be required in the river after sheet pile removal because the river bottom should be basically at its original level. However, after removal of the cofferdams a temporary increase in sediment in the water column is also expected. The cofferdams will not inhibit migration of aquatic organisms within the river due to the small area affected by construction activity.

The river bed in the vicinity of BBNPP site is composed of a coarse sand and gravel mixture which is not expected to produce any significant turbidity during removal of the cofferdams. Blasting should not be necessary since both the intake and discharge structures will be constructed in locations in which only the river bed overburden, not the bedrock, will need to be penetrated. Any disturbed material should settle within a short distance downstream of the intake structure or diffuser pipe.

4.3.2.3 Impacts on the Transmission Corridor and Offsite Areas

There are no new offsite transmission corridors associated with the construction and operation of BBNPP. The new on-site transmission lines will cross over Beaver Pond, West Building Pond, Unnamed Tributary 1, and associated wetlands. No new transmission towers will be constructed in any on-site waterbodies. No important aquatic species or habitat will be impacted by the new on-site transmission corridors.

Transmission line construction will be limited to the onsite construction area. The BBNPP plant switchyard will be electrically interconnected to the 500 kV transmission system via two independent 500 kV, 4,260 MVA circuits. One circuit, approximately 0.50 mi (0.80 km) in length, will connect the BBNPP plant Switchyard to the existing Susquehanna 500 kV Switchyard, and a separate circuit, approximately 0.75 mi (1.21 km) in length to a new 500 kV Switchyard (Susquehanna Yard 2). The transmission lines are needed to convey electric power generated by the BBNPP power block to existing or proposed transmission lines that connect to the regional power grid. Additionally, an existing 230 kV transmission line will be relocated on the site to make way for other plant structures.

The onsite transmission corridors for the BBNPP are 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 BBNPP.

Only existing or proposed offsite transmission corridors that are unrelated to the project's construction will be used for BBNPP. No existing or proposed transmission corridors in offsite areas will be impacted, since no changes are required that would be related to the project.

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 NPDES Individual Permit for Discharge of Stormwater Associated with Construction Activities. Any small spills of construction-related hazardous fluids, such as petroleum products, would be mitigated according to a Preparedness, Prevention, and Contingency Plan. Wetland and stream 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 within the stream, canal, and river from construction will be limited and temporary.

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

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Table 4.3-1— Impacts to Plant Communities and Other Habitats in Acres (Hectares) for Construction of BBNPP

Land Cover Type	Permanent Losses[1]		Temporary Losses[2,3]		Permanent Conversions[4]		Impacts to Previously Developed Land[5]		Total Impacts[6]	
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
Upland Forest	148.0	59.9	49.0	19.8	25.2	10.2	n/a	n/a	222.2	89.9
Upland Scrub/Shrub	17.9	7.3	45.5	18.4	0.0	0.0	n/a	n/a	63.4	25.7
Old Field/Former Agricultural	119.2	48.2	49.0	19.8	0.0	0.0	n/a	n/a	168.2	68.1
Agricultural	82.8	33.5	65.4	26.5	0.0	0.0	n/a	n/a	148.2	60
Palustrine Forested Wetlands	0.5	0.2	3.0	1.2	7.9	3.2	n/a	n/a	11.3	4.6
Palustrine Scrub/Shrub Wetlands	0.0	0.0	0.0	0	0.0	0.0	n/a	n/a	0.0	0.0
Palustrine Emergent Wetlands	0.9	0.4	6.3	2.5	0.0	0.0	n/a	n/a	7.1	2.9
Waterbodies	0.0	0.0	0.2	0.1	0.0	0.0	n/a	n/a	0.2	0.1
Streams	0.1	0.1	2.0	0.8	0.0	0.0	n/a	n/a	2.1	0.9
Total for Plant Communities and Other Habitats	**369.4**	**149.5**	**220.3**	**89.2**	**33.0**	**13.4**	**0.0**	**0.0**	**622.8**	**252.0**
Developed	n/a	n/a	n/a	n/a	n/a	n/a	54.6	22.1	54.6	22.1
Total for all Land Cover Types									**677.4**[7]	**274.1**

Notes:

[1] Areas categorized as permanent losses will be occupied by permanent structures, pavement or intensively-managed exterior grounds once construction is completed.

[2] Temporary impacts from construction activities will occur in areas that include laydown, construction parking, warehouses, the concrete batch plant, and other construction-related facilities. These areas will be graded and revegetated following construction and allowed to revert to a natural state.

[3] Temporary losses to wetlands and other regulated waters are related to wetland and stream mitigation activities, and for construction of electrical ducts, raw water, blowdown, and deicing lines.

[4] Areas categorized as permanent conversions are forested areas (wetland and upland) that will be cleared and permanently converted to scrub/shrub vegetation because of vegetation management practices and include areas within and adjacent to transmission line corridors and bridges.

[5] Includes all land currently classified as "developed" or "quarry" that will be impacted by construction activities.

[6] Total impacts do not include areas within the Susquehanna River that will be affected temporarily or permanently by construction activities.

[7] Includes all areas within the 687 ac (278 ha) limit of disturbance (LOD) that will be impacted by construction activities. Approximately 9.6 ac (3.9 ha) of land within the LOD will not be impacted as a result of construction activities.

n/a = not applicable

Table 4.3-2— Pre- and Post-Construction Land Cover within the BBNPP Project Boundary

Land Cover Type	Pre-Construction[1]		Total Impacts[2]		Total Additions[3]		Post-Construction[4]	
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
Upland Forest	772.3	312.5	222.2	89.9	0.0	0.0	550.1	222.6
Upland Scrub/Shrub	106.8	43.2	63.4	25.7	25.2	10.2	68.6	27.7
Old Field/Former Agricultural	242.5	98.1	168.2	68.1	0.0	0.0	74.3	30.1
Agricultural	332.7	134.6	148.2	60	0.0	0.0	184.5	74.7
Palustrine Forested Wetlands	112.8	45.6	11.3	4.6	0.0	0.0	104.4	42.3
Wetlands Palustrine Scrub/ Shrub	9.4	3.8	0.0	0.0	7.9	3.2	17.3	7.0
Palustrine Emergent Wetlands	36.8	14.9	7.1	2.9	0.0	0.0	35.9	14.5
Developed	382.7	154.9	54.6	22.1	632.9	256.1	961	388.9
Waterbodies	43.3	17.5	0.2	0.1	0.0	0.0	43.3	17.5
Streams	15.6	6.3	2.1	0.9	0.0	0.0	15.5	6.3
Total	2054.9	831.6	677.4	274.1	666	269.5	2054.9	831.6

Notes:

[1] Acreage for land cover types is based on a combination of plant community and wetlands surveys and aerial photographs.

[2] Includes permanent and temporary losses, permanent conversions, and previously developed areas impacted by construction.

[3] Includes post-construction additions to developed areas, permanent conversions of forested land cover to scrub/shrub, and restoration of wetlands subject to temporary losses.

[4] Temporary losses to upland habitat have been included in the post-construction total for the "developed" land cover category. Although it is assumed that these areas would be revegetated and allowed to revert to a natural state following construction with certain portions designated for wetland or other habitat mitigation. Post-construction acreages for wetlands, streams, and waterbodies are based on permanent losses only (see Table 4.3-1, Permanent Losses)

Table 4.3-3— Construction Impacts to Plant Communities and Other Habitats within the Susquehanna Riverlands Environmental Preserve

Land Cover Type	Permanent Losses[1]		Losses[2, 3] Temporary		Conversions [4] Permanent		Impacts to Previously Developed Land[5]		Total Impacts[6]	
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
Upland Forest	0.3	0.1	6.2	2.5	0.0	0.0	n/a	n/a	6.5	2.6
Upland Scrub/Shrub	0.0	0.0	0.1	0.0	0.0	0.0	n/a	n/a	0.1	0.0
Old Field/Former Agricultural	0.5	0.2	4.4	1.8	0.0	0.0	n/a	n/a	4.9	2.0
Agricultural	0.0	0.0	16.5	6.7	0.0	0.0	n/a	n/a	16.5	6.7
Palustrine Forested Wetlands	0.3	0.1	0.9	0.4	0.0	0.0	n/a	n/a	1.2	0.5
Palustrine Scrub/Shrub Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	n/a	n/a	0.0	0.0
Palustrine Emergent Wetlands	0.7	0.3	2.3	0.9	0.0	0.0	n/a	n/a	3.0	1.2
Waterbodies	0.0	0.0	0.2	0.1	0.0	0.0	n/a	n/a	0.2	0.1
Streams	0.1	0.0	0.6	0.2	0.0	0.0	n/a	n/a	0.6	0.3
Total for Plant Communities and Other Habitats	**1.8**	**0.7**	**31.1**	**12.6**	**0.0**	**0.0**	**0.0**	**0.0**	**32.9**	13.3
Developed	n/a	n/a	n/a	n/a	n/a	n/a	2.0	0.8	2.0	0.8
Total for all Land Cover Types									**34.9**	**14.1**

Notes:

1 Areas categorized as permanent losses will be occupied by permanent structures, pavement or intensively-managed exterior grounds once construction is completed.

2 Temporary impacts from construction activities will occur in areas that include laydown, construction parking, warehouses, the concrete batch plant, and other construction-related facilities. These areas will be graded and revegetated following construction and allowed to revert to a natural state.

3 Temporary losses to wetlands and other regulated waters are related to wetland and stream mitigation activities, and for the construction of electrical ducts, raw water, blowdown and deicing lines.

4 Areas categorized as permanent conversions are forested areas (wetland and upland) that will be cleared and permanently converted to scrub/shrub vegetation because of vegetation management practices and include areas within and adjacent to transmission line corridors and bridges.

5 Includes all land currently classified as "developed" or "quarry" that will be impacted by construction activities.

6 Total impacts do not include areas within the Susquehanna River that will be affected temporarily or permanently by construction activities.

n/a = not applicable

Table 4.3-4— Pre- and Post-Construction Land Cover within the Susquehanna Riverlands Environmental Preserve

Land Cover Type	Pre-Construction[1]		Total Impacts[2]		Total Additions[3]		Post-Construction[4]	
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
Upland Forest	107.1	43.3	6.5	2.6	0.0	0.0	100.6	40.7
Upland Scrub/Shrub	4.0	1.6	0.1	0.0	0.0	0.0	3.9	1.6
Old Field/Former Agricultural	13.4	5.4	4.9	2.0	0.0	0.0	8.6	3.5
Agricultural	92.9	37.6	16.5	6.7	0.0	0.0	76.4	30.9
Palustrine Forested Wetlands	19.5	7.9	1.2	0.5	0.0	0.0	19.2	7.8
Palustrine Scrub/Shrub								
Wetlands	1.3	0.5	0.0	0.0	0.0	0.0	1.3	0.5
Palustrine Emergent Wetlands	7.2	2.9	3.0	1.2	0.0	0.0	6.5	2.6
Developed	40.4	16.4	2.0	0.8	30.9	12.5	69.3	28.1
Waterbodies	38.0	15.4	0.2	0.1	0.0	0.0	38.0	15.4
Streams	9.6	3.9	0.6	0.3	0.0	0.0	9.5	3.8
Total[5]	333.2	134.8	34.9	14.1	30.9	12.5	333.2	134.8

Notes:

[1] Acreage for land cover types is based on a combination of plant community and wetlands surveys and aerial photographs.

[2] Includes permanent and temporary losses, permanent conversions, and previously developed areas impacted by construction.

[3] Includes post-construction additions to developed areas, permanent conversions of forested land cover to scrub/shrub.

[4] Temporary losses to upland habitat have been included in the post-construction total for the "developed" land cover category. Although it is assumed that these areas would be revegetated and allowed to revert to a natural state following construction with certain portions potentially designated for wetland or other habitat mitigation. Post-construction acreages for wetlands, streams, and waterbodies are based on permanent losses only (see Table 4.3-3, Permanent Losses)

[5] Total represents areas within the BBNPP Project Boundary only.

Table 4.3-5— Construction Impacts to Plant Communities and Other Habitats within the Susquehanna Riverlands IBA # 50

Land Cover Type	Permanent Losses[1]		Temporary Losses[2, 3]		Permanent Conversions[4]		Impacts to Previously Developed Land[5]		Total Impacts[6]	
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
Upland Forest	66.8	27.0	9.0	3.6	17.6	7.1	n/a	n/a	93.4	37.8
Upland Scrub/Shrub	9.1	3.7	1.9	0.8	0.0	0.0	n/a	n/a	11.0	4.5
Old Field/Former Agricultural	17.5	7.1	24.2	9.8	0.0	0.0	n/a	n/a	41.7	16.9
Agricultural	21.9	8.9	17.8	7.2	0.0	0.0	n/a	n/a	39.7	16.1
Palustrine Forested Wetlands	0.4	0.2	1.0	0.4	6.9	2.8	n/a	n/a	8.3	3.4
Palustrine Scrub/Shrub Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	n/a	n/a	0.0	0.0
Palustrine Emergent Wetlands	0.7	0.3	2.3	0.9	0.0	0.0	n/a	n/a	3.0	1.2
Waterbodies	0.0	0.0	0.2	0.1	0.0	0.0	n/a	n/a	0.2	0.1
Streams	0.1	0.0	0.6	0.2	0.0	0.0	n/a	n/a	0.7	0.3
Total for Plant Communities and Other Habitats	**116.6**	**47.2**	**57.0**	**23.1**	**24.5**	**9.9**	**0.0**	**0.0**	**198.0**	**80.1**
Developed	n/a	n/a	n/a	n/a	n/a	n/a	8.4	3.4	8.4	3.4
Total for all Land Cover Types									**206.4**	**83.5**

Notes:

[1] Areas categorized as permanent losses will be occupied by permanent structures, pavement or intensively-managed exterior grounds once construction is completed.

[2] Temporary impacts from construction activities will occur in areas that include laydown, construction parking, warehouses, the concrete batch plant, and other construction-related facilities. These areas will be graded and revegetated following construction and allowed to revert to a natural state.

[3] Temporary losses to wetlands and other regulated waters are related to wetland and stream mitigation activities and for construction of electrical ducts, raw water, blowdown and deicing lines.

[4] Areas categorized as permanent conversions are forested areas (wetland and upland) that will be cleared and permanently converted to scrub/shrub vegetation because of vegetation management practices and include areas within and adjacent to transmission line corridors and bridges.

[5] Includes all land currently classified as "developed" or "quarry" that will be impacted by construction activities.

[6] Total impacts do not include areas within the Susquehanna River that will be affected temporarily or permanently by construction activities.

n/a = not applicable

Table 4.3-6— Pre- and Post-Construction Land Cover within the Susquehanna Riverlands IBA # 50

Land Cover Type	Pre-Construction[1]		Total Impacts[2]		Total Additions[3]		Post-Construction[4]	
	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres	Hectares
Upland Forest	459.3	185.9	93.4	37.8	0.0	0.0	365.9	148.1
Upland Scrub/Shrub	34.3	13.9	11.0	4.5	17.6	7.1	40.9	16.5
Old Field/Former Agricultural	84.7	34.3	41.7	16.9	0.0	0.0	43.0	17.4
Agricultural	156.6	63.4	39.7	16.1	0.0	0.0	117.0	47.3
Palustrine Forested Wetlands	52.2	21.1	8.3	3.4	0.0	0.0	44.9	18.2
Palustrine Scrub/Shrub								
Wetlands	3.1	1.3	0.0	0.0	6.9	2.8	10.0	4.0
Palustrine Emergent Wetlands	13.0	5.3	3.0	1.2	0.0	0.0	12.3	5.0
Developed	101.4	41.1	8.4	3.4	177.7	71.9	270.8	109.6
Waterbodies	41.3	16.7	0.2	0.1	0.0	0.0	41.3	16.7
Streams	10.6	4.3	0.7	0.3	0.0	0.0	10.5	4.3
Total[5]	956.6	387.1	206.4	83.5	202.2	81.8	956.6	387.1

Notes:

[1] Acreage for land cover types is based on a combination of plant community and wetlands surveys and aerial photographs.

[2] Includes permanent and temporary losses, permanent conversions, and previously developed areas impacted by construction.

[3] Includes post-construction additions to developed areas, permanent conversions of forested land cover to scrub/shrub.

[4] Temporary losses to upland habitat have been included in the post-construction total for the "developed" land cover category. Although it is assumed that these areas would be revegetated and allowed to revert to a natural state following construction with certain portions potentially designated for wetland or other habitat mitigation. Post-construction acreages for wetlands, streams, and waterbodies are based on permanent losses only (see Table 4.3-5, Permanent Losses)

[5] Total represents areas within the BBNPP Project Boundary only.

Figure 4.3-1— BBNPP Project Boundary and Limit of Disturbance