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