CHAPTER 4

ENVIRONMENTAL IMPACTS OF CONSTRUCTION

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4.0 ENVIRONMENTAL IMPACTS OF CONSTRUCTION

Chapter 4 presents the potential environmental impacts of construction of the Bellefonte Nuclear Plant, Units 3 and 4 (BLN). In accordance with 10 CFR Part 51, impacts are analyzed, and a single significance level of potential impact to each resource (i.e., SMALL, MODERATE, or LARGE) is assigned consistent with the criteria that NRC established in 10 CFR Part 51, Appendix B, Table B-1, Footnote 3. Unless the significance level is identified as beneficial, the impact is adverse, or in the case of "small," may be negligible. The definitions of significance are as follows:

SMALL — Environmental effects are not detectable or are so minor that they neither destabilize nor noticeably alter any important attribute of the resource. For the purposes of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small.

MODERATE — Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE — Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

This chapter is divided into six sections:

- Land-Use Impacts (Section 4.1).
- Water-Related Impacts (Section 4.2).
- Ecological Impacts (Section 4.3).
- Socioeconomic Impacts (Section 4.4).
- Radiation Exposure to Construction Workers (Section 4.5).
- Measures and Controls to Limit Adverse Impacts during Construction (Section 4.6).

These sections present potential ways to avoid, minimize, or mitigate adverse impacts of construction to the maximum extent practical. For the purposes of this ER, the site, vicinity, and region are defined in Section 2.0.

4.1 LAND-USE IMPACTS

The following subsections describe the effects of site preparation and construction of BLN and the impacts on land use from construction. Subsection 4.1.1 describes impacts on land use of the site and vicinity from construction. Subsection 4.1.2 describes impacts on land use along transmission lines and within transmission access corridors. Subsection 4.1.3 describes impacts on historic and cultural resources in the site and vicinity, along transmission corridors, and in off-site areas.

4.1.1 THE SITE AND VICINITY

4.1.1.1 The Site

The BLN site encompasses 1600 ac. Figure 4.1-1 illustrates the portion of the site on which the BLN is planned. The majority of the land needed for the construction of the BLN site has already been disturbed and is described in Subsection 2.2.1.

Approximately 400 ac. of the 1600-ac. BLN site have been affected by prior construction activities, which were deferred by the TVA in 1988. Although construction is planned for areas that have been disturbed by previous construction, an estimated additional 200 ac. of the 1600-ac. site are expected to be affected by construction of the new facility. This planned additional construction area is currently covered with overgrowth and some forestation, and land use within the site consists primarily of a mix of forest and grassland zones. Land use within the site boundary is primarily deciduous forest and open developed land as described in Subsections 2.2.1.1 and 2.5.2.4, Table 2.2-1, and Figure 2.2-1.

Prime farmland is discussed in Section 2.2. There are 0.9 ac. of prime farmland located within the BLN site plot plan that fall outside the areas of previous construction. Per NUREG-1555, *Standard Review Plans for Environmental Reviews of Nuclear Power Plants*, removal of prime farmland of this quantity has minor effects. The prime farmland is currently forested and sits adjacent to the land previously used for commercial purposes. This prime farmland was identified using soil data from the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) Land Evaluation and Site Assessment System; however, it is not currently being used as farmland. It is expected to be disturbed by the construction of the BLN. The rest of the prime farmland within the site has already been impacted by previous construction; therefore, the impact on the relative value of farmland is considered SMALL.

Construction on the BLN site could begin as early as 2013 and be completed as early as 2017. The construction area includes permanent structures (primarily a power block area, cooling tower area, and intake areas) and construction laydown areas. Acreage not containing permanent structures is reclaimed to grassland, native scrub-shrub, or native forest trees to the extent consistent with erosion control, traffic safety and plant security needs. Areas occupied by the reactor buildings, as well as other principal plant structures for Units 3 and 4, are listed in Table 1.1-2 and are discussed in Section 3.1.

TVA plans to use the existing natural draft cooling towers (NDCT). Maintenance and refurbishment activities are planned for implementation prior to NDCT use. Refurbishment activities include removal of asbestos fill material and replacement with a non-hazardous

material. Removal of the material, and training to workers on the appropriate handling and disposal practices, is performed in accordance with federal, state, and local requirements.

Site preparation and construction activities that affect land use include clearing, grubbing, grading and excavating, and stockpiling soils. Permanently disturbed locations are stabilized and contoured in accordance with design specifications.

Dredge material would be disposed of on-site above the 500-year flood elevation. BMPs would be utilized to stabilize dredge material and for the operations necessary to obtain and handle borrow material. Impacts on land use of the site and vicinity from disposition of dredge material would be SMALL. Areas for borrow pits have not been determined. With borrow confined to the BLN construction footprint, and the use of best management practices in the management of affected areas, impacts would be SMALL. If borrow-affect areas are outside the BLN construction footprint, impacts could be MODERATE. Overall, therefore, impacts to land use of the site and vicinity from dredge disposal and borrow activities could be SMALL to MODERATE.

Service lines provide electrical power to the site for construction. The location of these 161-kV service lines is illustrated in Figure 3.1-6. Construction debris and other waste are planned to be removed from the site via road, rail and/or barge. Construction activities on the site are not expected to include the construction of bridges.

Construction materials are to be shipped to the site using local roadways, railroads, and waterways. Several new roadways, both temporary and permanent, are planned for the BLN site. Heavy equipment and reactor components are planned to be shipped by barge up the Tennessee River. Construction of a heavy-haul road from the barge unloading facility to the construction site is planned, and construction access to the site is provided on the south access road (County Rd. 33), so as to not impede other traffic. These roads are illustrated in Figure 3.1-6. The laydown areas are used for staging building materials and equipment used during construction, and they are also illustrated in Figure 3.1-6.

Figure 2.5-6 shows railways within the BLN region. Norfolk Southern Railroad Company (NSRC) owns and operates a railroad line located approximately 3 mi. northwest of the BLN site center point. The BLN railroad spur line, connecting the plant to the mainline, is planned to be used to support material deliveries and construction activities. Additional information on railroads in the vicinity of the BLN is provided in Subsection 2.5.2.2.5. The impact of construction is considered SMALL based on the planned minimal reconditioning of the abandoned rail spur is needed to support the facility construction.

There are no mineral resources within the BLN site that are being exploited or are of any known value (Reference 6). No adverse impacts of construction are anticipated, and no mitigation is required.

Construction activities, associated with the BLN site, which could potentially impact a floodplain or wetlands are discussed in Sections 4.2 and 4.3.

Guntersville Reservoir/Tennessee River surrounds the BLN site on three sides. The Tennessee River is not designated as a national wild or scenic river (Reference 1). There are no public recreational opportunities, such as hunting or fishing, located within the BLN site. Additional

information discussing recreational opportunities is provided in Subsections 2.5.1.3 and 2.5.2.5. Unincorporated areas within Jackson County do not have zoning laws limiting development. Further discussion of zoning laws in Scottsboro and Hollywood, Alabama, are discussed in Subsection 2.5.2.4. Because there are no national wild and scenic rivers or recreational opportunities located on the BLN site, and there are no zoning laws that affect the site no adverse impacts are experienced.

Contacted tribes and tribal lands are discussed in Subsection 2.5.3.2. No concerns regarding the construction of the BLN have been received from the contacted tribes. As a result, no adverse impacts are anticipated.

As discussed in Section 2.8, there are no related federal project activities within the BLN site, and no adverse impacts are anticipated.

Because most of the construction does not disturb any previously undisturbed land, and/or construction is planned for areas with existing structures, the impact on land use of the site from construction is considered SMALL and does not require mitigation.

4.1.1.2 The Vicinity

The vicinity and site are located entirely within Jackson County, Alabama. Land use within the BLN vicinity is primarily rural, consisting of pasture and undeveloped woodland (Reference 5). There are residential developments located along the northwest shoreline of Town Creek called Creeks Edge. These developments are located outside the city limits of Hollywood, Alabama and include 110 lots. Land use in the vicinity of the BLN is described in detail in Subsection 2.2.1.2, and Table 2.2-1, and illustrated in Figure 2.2-2. The federal lands located within the vicinity are the Guntersville Reservoir and the BLN site, both owned by the TVA (Reference 7). No adverse impacts on land use in the surrounding communities are anticipated.

The Jackson County road and highway system is illustrated in Figure 2.5-5 and discussed in Subsections 2.2.1.2 and 2.5.2. Information pertaining to the effects of construction and operational workers on the local road and highway system is presented in Sections 4.4 and 5.8.

The BLN railroad spur, which is planned to be used to support material deliveries and construction activities, connects to the mainline located approximately 3 mi. northwest of the BLN site center point. Because the mainline exists and only the BLN spur line is to be reconditioned, it is anticipated that there are no adverse impacts on existing railway service in the vicinity from BLN construction activities. Subsection 2.5.2.2.5 provides additional information on railroads in the vicinity of the BLN.

Numerous facilities within the BLN vicinity provide recreational opportunities, and these facilities are discussed in Subsections 2.5.1.3, 2.5.2.5, and 2.2.1.2. Because construction activities are within site boundaries it is anticipated that there are no adverse impacts of construction on these recreational facilities, and no mitigation is required.

There are no mineral resources adjacent to the site that are being exploited or are of any known value (Reference 6). Any pipelines located within the vicinity of the BLN are discussed in

Subsection 2.2.1. No adverse impacts of construction are anticipated, and no mitigation is required.

The Tennessee River is the only river in the vicinity of the BLN site, and it is not designated a national wild and scenic river (Reference 1). Thus, there are no adverse impacts from construction on any national wild and scenic rivers in the vicinity of the BLN. Additional information about the Tennessee River can be found in Sections 2.2 and 2.5.

Construction activities within the BLN vicinity that are expected to impact floodplains or wetlands are discussed in Sections 4.2 and 4.3.

As indicated in Section 2.8, there are no related federal project activities within the BLN vicinity; therefore, no adverse impacts on other federal project activities from construction are anticipated.

Farmland and other land-cover classifications within the vicinity are discussed in Subsection 2.2.1 and further described in Table 2.2-1 and Figure 2.2-2. Although 8945 ac. of prime farmland are located within the vicinity of the BLN, impacts on prime farmland from construction are considered SMALL, because no additional land is needed for the BLN.

Impacts on transmission corridors and rights-of-way are discussed in Subsection 4.1.2.

The impacts on land use in the vicinity of the BLN from construction of the facility are considered SMALL, because no additional land outside of the existing site boundary is needed for construction of the BLN. No mitigation is required.

4.1.2 TRANSMISSION CORRIDORS AND OFF-SITE AREAS

Transmission lines are discussed in Subsection 2.2.2 and Section 3.7. Land use within the transmission corridors is shown in Figure 4.1-2.

No new transmission lines or off-site areas for the construction of the BLN are proposed as a part of this combined license application, and there are no known land-use restrictions on the transmission corridor easements. The TVA complies with applicable laws, regulations, permit requirements, and good engineering and construction practices.

Because transmission corridors already exist, and no new transmission corridors are required, impacts on land use in the transmission corridors from construction are considered SMALL and do not require mitigation. As no off-site areas are expected to be used, impacts on land use in off-site areas from construction are considered SMALL and do not require mitigation. Land use impacts due to construction along the transmission corridors include the removal of trees and the re-clearing of existing transmission line right-of-ways. Inspection and reclearing of a portion of the existing 500-kV line corridors is required. Those sections of the presently de-energized 500-kV lines that do not have an energized 161-kV under-build have not recently undergone the normal cycles of maintenance (see Section 3.7 for more detailed discussion). No ground-disturbing work is necessary for re-clearing the ROW and no new access roads are needed. Also, because these lines are pre-existing, no additional cumulative impacts would result from the maintenance clearing. Additional information on transmission corridors is discussed in Subsection 5.6.1.

4.1.3 HISTORIC PROPERTIES

This subsection focuses on the effects of BLN construction on existing historic properties on the BLN site and within a 10-mi. radius of its center point. According to 36 CFR Part 800 (I)(1) (Reference 2), historic properties are defined as those properties that are eligible for inclusion in the National Register of Historic Places (NRHP) or that are already listed on the NRHP. Aboveground historic properties and archaeological sites are among the entities that can be considered for NRHP inclusion. According to 36 CFR 60.4 (Reference 3), aboveground historic properties can possess integrity individually or as contributing properties to historic districts. Furthermore, their significance depends on specific criteria of event, person, design/construction, or information potential, and integrity involves both architectural and aesthetic elements, including location, design, setting, materials, workmanship, feeling, and association. Archaeological sites are generally classified as prehistoric or Historic Period, and integrity depends on the existence of intact and patterned surface or subsurface cultural deposits with an emphasis on the site's ability to address scientific research questions. In general, effects from construction on aboveground historic properties include direct damage to the physical integrity of the property, which detracts from its design, materials, or workmanship, or indirect (noise-related or visual) effects to the property or its surroundings, which detracts from its historic setting, feeling, or association. Archaeological sites can be affected directly by physical damage to surface features or subsurface deposits. Such damage disrupts the patterning of the previously intact cultural deposits. Generally, noise-related effects are extraneous to archaeological sites because the integrity of site patterning is unaffected; likewise, visual effects on archaeological sites are extraneous because archaeological site integrity depends on the ability to address research questions that are independent of the preservation of site ambiance. Properties determined to be ineligible for the NRHP by the SHPO do not require protection, and are not eligible for protection by the provisions of the NHPA. The Alabama SHPO has concurred with the recommendation that BLN site construction be allowed to proceed, including within the areas occupied by archaeological sites determined not eligible for inclusion in the NRHP (see Appendix A). Therefore, the potential impacts of BLN site construction on ineligible archaeological sites range from inadvertent avoidance resulting in no impacts to total site destruction, but by definition there will be no impacts on cultural heritage. There are no requirements for measures or controls to avoid adverse impacts on ineligible sites. The determination of ineligibility defines a site as one lacking the potential to yield significant information concerning our cultural heritage beyond that already obtained in the process of adding the site to the state inventory.

Because the Federal Section 106 Process (36 CFR Part 800) has been initiated for the BLN site construction and operation phases, and because that process involves the oversight of the Alabama State Historic Preservation Office (SHPO), which also oversees State laws on historic preservation, concerns relating to Alabama state laws and plans for historic preservation are also addressed. Therefore, no separate consideration of impacts or mitigation pursuant to Alabama state law beyond the Section 106 consultation is warranted.

The number, location, and NRHP status of relevant historic properties at BLN are addressed in Subsection 2.5.3. Additional information is provided in Tables 2.5-19 and 2.5-20, and in Figures 2.5-7 and 2.5-8.

4.1.3.1 Site and Vicinity

Direct effects from BLN construction on existing historic properties are possible only within the archaeological area of potential effect (APE) for the BLN site. The archaeological APE was recommended by the Tennessee Valley Authority (TVA) in agreement with the Alabama SHPO and in consideration of BLN construction and operation plans. It includes 606 ac. (see Figure 2.5-7). The archaeological APE lies entirely within the BLN vicinity located in U.S. Public Land Survey System Township 04S, Range 07E, Sections 5, 6, 7, 8, 12, and 18 of Jackson County, Alabama, with the majority of the area situated in Section 7. Indirect (noise-related and visual) effects from BLN construction are possible on the BLN site or potentially within a 10-mi. radius of its center point (see Figure 2.5-8). The 10-mi. radius extends through portions of Jackson County, Alabama, and also includes a small area of DeKalb County, Alabama.

4.1.3.1.1 Prehistoric Archaeological Sites

Four prehistoric archaeological sites have been identified within the BLN site APE (1JA300, 1JA301, 1JA111, and 1JA113), and 20 more exist within a 1-mi. radius of the BLN site center point (Table 2.5-21). One prehistoric site within the BLN site boundaries is considered potentially eligible for listing in the NRHP (1JA111), and three prehistoric sites within the 1-mi. radius are considered potentially eligible. Additionally, 439 archaeological sites are located beyond 1 mi. but within the 10-mi. radius of the BLN site center point. Some of these are solely prehistoric, some are solely Historic Period, and some contain both prehistoric and Historic Period components. As addressed in Subsection 2.5.3, none of these sites are currently listed on the NRHP.

Between 1930 and 2006, six cultural resource surveys were conducted within or immediately adjacent to the BLN site, accounting for the 24 known prehistoric sites in the BLN site vicinity. In November 2006, archaeologists with the Nashville office of TRC Inc. (TRC) conducted the most recent of the six cultural resource surveys on the 606-ac. BLN site APE. That survey relocated the four previously recorded sites (1JA300, 1JA301, 1JA111, and 1JA113) that are situated within the APE. The survey determined that prehistoric site 1JA300 had been totally destroyed due to past construction of an intake channel for the nuclear facility, and no intact archaeological deposits were located at sites 1JA301 or 1JA113. Only 1JA111 was considered likely to have significant intact archaeological deposits and was recommended as potentially eligible for inclusion in the NRHP (for site description see Subsection 2.5.3.3 and note that site 1JA111 may be similar to site 1JA300 which contained Native American burials excavated in 1973 and 1974). TVA drafted official correspondence (described initially in Subsection 2.5.3.2) assuring site protection and avoidance for site 1JA111 (Reference 9). During the follow-up National Historic Preservation Act (NHPA) Section 106 process review, the Alabama SHPO concurred with TRC's ineligible recommendations for sites 1JA300, 1JA301, and 1JA113. Further, the SHPO agreed with the recommendation of potential eligibility for site 1JA111 and agreed that the site must be protected by avoidance during BLN construction (Reference 8). Protection measures are planned to include a 50-ft. protective buffer established around the site with further protection by an obstructive barrier consisting of construction fencing or chain link fencing, and a sign posted informing personnel that an archaeological resource protected under the Archaeological Resource Protection Act is present (see Appendix A for this and other associated historic property consultation letters).

Given TVA protection and avoidance procedures for potentially eligible site 1JA111, no effects on this site are anticipated. Properties determined to be ineligible for the NRHP do not require protection as, by definition, they contain no significant information concerning cultural heritage that could be impacted. Given the ineligible determination for sites 1JA301, 1JA113, and 1JA300 and the previous total destruction of site 1JA300, no effects from construction are anticipated for eligible or potentially eligible prehistoric archaeological sites within the BLN site APE. As for the 20 prehistoric sites beyond the BLN site APE but within 1 mi. and the numerous prehistoric and multicomponent archaeological sites within the 10-mi. radius of the BLN site center point, no effects on these sites are anticipated from construction, given that indirect (noise-related and visual) effects are extraneous considerations for archaeological sites. Because no effects are anticipated, there are no cumulative effects to the prehistoric archaeological record from BLN construction. Therefore, construction impacts on prehistoric archaeological sites on the BLN site, in its vicinity, and within a 10-mi. radius of it are considered SMALL. No mitigation is warranted.

4.1.3.1.2 Historic Archaeological Sites

One Historic Period archaeological site has been identified within the BLN site APE, and two additional Historic Period sites have been identified within a 1-mi. radius of the BLN site center point (see Table 2.5-21). Additionally, 439 archaeological sites are located beyond 1 mi., but within a 10-mi. radius of the BLN site center point. Some of these are solely prehistoric, some are solely Historic Period, and some contain both prehistoric and Historic Period components. As addressed in Subsection 2.5.3 none of these sites are currently listed on the NRHP.

The one Historic Period site within the BLN site APE (1JA1103) was identified during the 2006 TRC survey and was recommended as ineligible for inclusion in the NRHP. The TVA has also performed a deed records search which resulted in the finding that no persons of historical significance pursuant to Criterion B of 36 CFR 60.4 occupied the property. During the follow-up NHPA Section 106 process review, the Alabama SHPO concurred with the recommendation that 1JA1103 was ineligible for inclusion in the NRHP. Properties determined to be ineligible for the NRHP do not require protection as, by definition, they contain no significant information concerning cultural heritage that could be impacted. Given the ineligible determination for site 1JA1103, no effects from construction are anticipated for eligible or potentially eligible Historic Period archaeological sites within the BLN site APE. Because 1JA1103 is the only Historic Period site within the BLN site APE, and because indirect (noise-related or visual) effects are extraneous considerations for archaeological sites, no construction effects on Historic Period archaeological sites are anticipated. Because no effects are anticipated, there are no cumulative effects to the historic archaeological record from BLN construction. Therefore, construction impacts on Historic Period archaeological sites on the BLN site, in its vicinity, and within a 10-mi. radius of it are considered SMALL. No mitigation is warranted.

4.1.3.1.3 Historic Sites

This subsection refers to historic sites defined as aboveground historic properties. NRHP eligibility requirements for such properties are discussed in Subsection 4.1.3, with detailed descriptions addressed in Subsection 2.5.3.5. No aboveground historic properties with intact standing structures were identified on the BLN site during any previous survey. Therefore, the BLN site has no aboveground historic properties that are potentially eligible for listing, eligible for listing, or listed on the NRHP. However, in Jackson County, within a 10-mi. radius of the BLN site

center point, three aboveground historic properties are listed in the NRHP and four additional NRHP-eligible properties are currently pending NRHP listing. One of the four NRHP-pending properties is the Bellefonte Cemetery, which was listed in the Alabama Historic Cemetery Register in 2006. Two additional properties are listed on the Alabama Register of Landmarks and Heritage (ARLH) and share NRHP protection status. These historic properties are presented in Tables 2.5-19 and 2.5-20, and their locations are depicted in Figure 2.5-8. Because no historic sites exist within the BLN site APE, there are no direct construction effects on historic sites associated with BLN. Unlike the case with archaeological resources, indirect (noise-related or visual) effects are an intrinsic consideration in regard to potential adverse effects of construction for aboveground historic properties. However, none of the currently NRHP-listed aboveground historic properties exist within a 1-mi. radius of the BLN site center point; the closest such property (the Townsend Farmhouse) is within approximately 5 mi., and the second closest (College Hill Historic District) is within approximately 6 mi. Both have intervening topographic features that obscure visual and noise effects. These distances are beyond any noise-effect considerations for BLN construction, as is addressed in Subsection 2.5.5, and the BLN site is obscured from the viewshed of the currently NRHP-listed historic properties within the 10-mi. radius of the BLN site center point. Four additional NRHP-eligible aboveground properties exist beyond the 606-ac. APE for the BLN site: two properties (Bellefonte Cemetery and African-American Bellefonte Cemetery) are located within the 1-mi. radius and two (Carter-Hansbrough Cemetery and Old Snodgrass Place) are located just beyond the 1-mi. radius of the extant BLN site cooling towers (Reference 10). These properties are currently pending NRHP listing. Although these properties have been determined eligible for the NRHP, it has also been determined by the same cultural resource survey, survey report, and TVA and SHPO consultation (References 11 and 12), that those resources will receive no adverse impacts from BLN site construction. Consequently, there are no anticipated effects on historic sites from BLN construction. Because no effects are anticipated, there are be no cumulative effects to historic sites from BLN construction. Therefore, construction impacts on aboveground historic sites on the BLN site, in its vicinity, and within a 10-mi. radius of its center point are considered SMALL. No mitigation is warranted.

4.1.3.1.4 Historic Cemeteries

No extant Euroamerican cemeteries have been identified within the TVA-recommended APE at the BLN site. The closest Euroamerican cemeteries are the Finnell (family) Cemetery, the Hansbrough (family) Cemetery, the Norwood (family) Cemetery, an additional unnamed family cemetery, Historic Period archaeological site 1JA348 (also a family cemetery), the old African-American Bellefonte (town) Cemetery, and the old Bellefonte (town) Cemetery, with the closest of these being the Finnell Cemetery at approximately 400 ft. from the eastern boundary of the 606-ac. BLN site APE. Numerous other municipal, church, and small family cemeteries are located within a 10-mi. radius of the BLN site center point in Jackson County, but none are nearer the site than these. The eligibility of these cemeteries for inclusion in the NRHP has recently been evaluated (Reference 10) with the result that the Hansbrough Cemetery, the African-American Bellefonte Cemetery, and the Bellefonte Cemetery have been determined eligible for the NRHP and are currently pending their NRHP listing. The other cemeteries have been determined not eligible for the NRHP, with the exception of the family cemetery that is archaeological site 1JA348, which remains unassessed and was not relocated (found) during the 2008 aboveground property survey (Reference 10) (for a more detailed assessment of these historic cemeteries see Subsection 2.5.3.6, Figure 2.5-7, and Figure 2.5-8). Because none of

these cemeteries lies within the BLN site APE, none are affected by BLN construction. As archaeological site 1JA348 has not been assessed for NRHP status, was not relocated (found) during the recent aboveground historic properties survey (Reference 10), and is considered a belowground archaeological site, potential indirect effects related to noise or visual aesthetics are unsupported. For those cemeteries determined not eligible for the NRHP, there can be no adverse impacts because the concept of adverse impacts is only applicable to NRHP eligible sites. The remaining three cemeteries determined eligible for the NRHP (Reference 10) were also determined by that survey, survey report, and TVA and SHPO consultation (References 11 and 12) to have no anticipated adverse impacts from BLN site construction. Consequently, no effects on historic cemeteries from BLN construction are anticipated. Because no effects are anticipated, there are no cumulative effects to historic cemetery cultural heritage from BLN construction. Therefore, construction impacts on historic cemeteries in the vicinity of the BLN site and within a 10-mi. radius of its center point are considered SMALL. No mitigation is warranted.

4.1.3.1.5 Traditional Cultural Properties

No traditional cultural properties (TCPs) are located on the BLN site, in its vicinity, or within a 10-mi. radius of the site center point (see Subsection 2.5.3.7). Therefore, construction on the BLN site has no effect on TCPs in these areas. In addition, construction on the BLN site is not expected to contribute to cumulative effects on TCPs because there are no effects on TCPs from the BLN site to add to cumulative effects. Therefore, construction impacts on TCPs on the BLN site, in its vicinity, and within a 10-mi. radius of its center point are considered SMALL. No mitigation is warranted.

4.1.3.2 Transmission Corridor

No effects on historic properties along the extant transmission line that is to service the BLN site are anticipated; therefore, no further historic property considerations or assessments along the transmission line corridor are deemed necessary (for TVA correspondence, see Appendix A). One aboveground historic property (the Townsend Farmhouse) is located within 1.2 mi. of the transmission line corridor and is also beyond that area already assessed for potential adverse impacts by BLN site construction and operations (the 606-ac. BLN site APE and the area within 1-mi. of the cooling towers). The Townsend Farmhouse is located within 4800 ft. of the existing transmission line; however, that transmission line was extant when the property was listed on the NRHP (August 11, 2005), so its effect has already been assessed in regard to site integrity. Therefore, the Townsend Farmhouse situation is consistent with the determination that there are no anticipated effects on historic properties along the extant transmission line. Because no effects are anticipated, there are no cumulative effects to collective cultural heritage associated with the transmission corridor. Therefore, construction impacts on historic properties within the transmission corridor and within 1.2 mi. of it are considered SMALL. No mitigation is warranted.

4.1.3.3 Archaeological Monitoring

It has been determined through the Section 106 process (Section 2.5.3) that archaeological monitoring is not required during BLN construction. TVA determined, in consultation with the Alabama SHPO, that the protection procedures discussed in Subsection 4.1.3.1.1 for site 1JA111 are sufficient for protecting the site, and the remaining areas within the BLN APE have been cleared for construction (References 8 and 9). To provide assurance that cultural materials

inadvertently encountered during BLN construction are properly evaluated in compliance with provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) (43 CFR Part 10) (Reference 4), TVA cultural resource staff inform construction managers and workers during site orientation that in the event of the discovery of cultural materials described under 43 CFR 10.2(d), construction work must cease in the area of the discovery, with reasonable efforts applied to protect the area and discovered objects. In such an event, TVA cultural resource staff are informed immediately by telephone followed by a written confirmation [43 CFR 10.4(b)]. Following such notification, TVA implements procedures as described in 43 CFR Part 10, beginning with a written confirmation by certified mail of the receipt of notification.

4.1.4 REFERENCES

1. National Wild and Scenic Rivers System, Wild and Scenic Rivers by State, Website, http://www.nps.gov/rivers/wildriverslist.html, accessed August 11, 2006.

2. 36 CFR 800.16 (l) 1, “Protection of Historic Properties, Definitions, Historic Property.”

3. 36 CFR 60.4, “National Register of Historic Places, Criteria for Evaluation.”

4. Native American Graves Protection and Repatriation Act, 25 USC 3001 et seq.

5. U.S. Department of Transportation, National Transportation Atlas Databases (NTAD) 2006 Shapefile Format, CD-ROM.

6. U.S. Geological Survey, Active Mines and Mineral Processing Plants in the United States 2003, Website, http://tin.er.usgs.gov/mineplant/, accessed August 11, 2006.

7. National Atlas, Federal Land Boundaries, Indian Land Boundaries, Website, http://www.nationalatlas.gov/natlas/Natlasstart.asp, accessed August 10, 2006.

8. Letter from Colonel (Ret.) John A. Neubauer, State Historic Preservation Officer, State of Alabama, Alabama Historical Commission, to Diane A. Cargill, Cargill Archaeological Services, "AHC 06-1211, Jackson Camp, Bellefonte Nuclear Site, Jackson County, Alabama," dated July 26, 2007.

9. Letter from Thomas O. Maher, PhD., Tennessee Valley Authority, to Colonel John Neubauer, State Historic Preservation Officer, State of Alabama, Alabama Historical Commission, "AHC 2006-1211; Bellefonte NuStart Energy Development; Jackson County," dated April 17, 2007.

10. TRC, Inc., Historic Resource Survey for the Bellefonte Nuclear Site in Jackson County, Alabama, Final Report, June 2008.

11. Letter from Thomas O. Maher, Ph.D., Tennessee Valley Authority, to Stacye Hathorn, Alabama Historical Commission, "AHC 2006-1221; Bellefonte NuStart Energy Development; Nuclear Regulatory Commission Application; Jackson County, Alabama," dated May 9, 2008.

12. Letter from Elizabeth A. Brown, Deputy State Historic Preservation Officer, State of Alabama, Alabama Historical Commission, to Thomas O. Maher, Ph.D., Tennessee Valley Authority, "AHC 2006-1211; Bellefont Nustart Energy Development; Historic Resource Survey; Jackson County," dated June 10, 2008.

4.2 WATER-RELATED IMPACTS

This section describes site preparation activities, plant water supply, hydrological alterations that could result from plant construction activities, and the physical effects of hydrological alterations on other water users. Subsection 4.2.1 addresses hydrologic alterations, Subsection 4.2.2 addresses water-use impacts of plant construction activities and impacts to water quality.

Impacts to surface water bodies are considered to be SMALL due to the implementation of a construction stormwater pollution protection plan (SWPPP) and continued compliance with existing regulatory permits and applicable regulations. Impacts to wetland areas and groundwater resources are expected to be minimal while construction activities are taking place. Water bodies adjacent to the plant that could be affected by construction activities include the Guntersville Reservoir/Tennessee River and the Town Creek embayment.

4.2.1 HYDROLOGIC ALTERATIONS

This section identifies and describes the hydrologic alterations that could result from the construction of the BLN. Units 3 and 4 are planned for construction adjacent to the nonoperating Bellefonte Units 1 and 2.

Water-related impacts from construction of a nuclear power plant are similar to those from any large construction project. Large construction projects can, if not properly planned, result in impacts to groundwater, physical alterations of local streams and wetlands, and impacts to downstream water quality as a result of erosion and sedimentation, or spills of fuel and lubricants used in construction equipment. Because construction activities have the potential to harm surface water and groundwater resources, applicants are required to obtain a number of permits and develop site-specific pollution prevention/spill control plans prior to initiating construction. Effluent discharged from the facility during construction activities is monitored under the National Pollutant Discharge Elimination System (NPDES) requirements. For a description of the physical characteristics of the surface water bodies and groundwater aquifers see Section 2.3.1.

4.2.1.1 Site Preparation and Construction Activities

This section identifies proposed construction activities that could result in impacts to the hydrology at the BLN site:

- Clearing additional land at the project site and constructing infrastructure such as roads and stormwater drainage systems.
- Construction of new buildings (reactor containment structures, turbine building, cooling towers, electrical substation, and other related structures).
- Construction of additional parking lots and roads.
- Maintenance of existing cooling water intake canal and intake structure and discharge pipe for water withdrawn from and discharged into the Guntersville Reservoir/Tennessee River. Figures 3.4-2 and 3.4-3 provide details of the intake canal and discharge pipe.

- Refurbishment of existing docking facilities for barges/vessels.

- Disturbance temporarily of existing vegetated areas to establish construction laydown areas, concrete batch plants, sand/soil/gravel stockpiles, and construction-worker parking areas.

- Dewatering of foundation excavations during construction.

Power Station Area

Power station site preparation and construction of the station requires the removal of several existing structures and foundations, and disturbs other surface areas at the site. Approximately 400 ac. of the 1600-ac. site have been affected by prior construction activities. See Figure 3.1-6 for the BLN construction plan. Removal of old structures and construction of new structures results in additional alterations of the existing site; however, much of the new construction is expected to occur in areas that were previously disturbed during construction of Bellefonte Units 1 and 2 in the 1970s (Figure 3.1-6). Table 1.1-2 provides details on specific construction areas and the amount of affected area.

Excavations extend below the water table by approximately 5 - 10 ft.; however, groundwater water production from the shallow aquifer, described in Section 2.3.1, is expected to be minimal and within the capability of standard sump pumps for removal.

Removal of groundwater seepage from the excavation for dewatering is not considered a use of groundwater. Dewatering effluents are directed to the wastewater retention basin or Pond A prior to discharge at an NPDES monitored location.

Groundwater characteristics of the excavation area, including groundwater level data, groundwater flow into nuclear island excavations, and rock formation content in relation to groundwater seepage, are used to evaluate the approach used for dewatering activities. Seepage from the soil portions of the excavation slopes is expected to be slight due to the low hydraulic conductivity of the clay soils. Lowering of the perched groundwater in the soils is not expected to cause settlement of adjacent ground because the soil overlying the bedrock is mostly composed of stiff overconsolidated clays and the amount of water level reduction is slight. Therefore, current construction plans do not call for extensive dewatering activities that could affect groundwater flow and quality. Dewatering methods similar to those used in the construction of Bellefonte Units 1 and 2 for collection and pumping of groundwater seepage will be considered. Typical excavation dewatering practices (e.g., sumps and pumps at excavation low points) are expected to effectively control seepage in excavated areas during construction. In addition, dewatering effluents are directed to the wastewater retention basin or Pond A prior to discharge at an NPDES-monitored location; thereby allowing silt and other solids in the dewatering stream to settle out in the ponds rather than being released to Town Creek. Effluents released from the BLN site are monitored prior to release to maintain compliance with the state NPDES permit. Based on the above, impact due to dewatering activities is considered SMALL.

Construction activities follow BMPs for soil and erosion control as required by applicable federal and state laws and regulations. Therefore impacts to the local hydrology and wetlands from construction activities are considered to be SMALL and not warrant mitigation.

Power Production

Units 3 and 4 (power block) are located north of the partially completed Bellefonte Units 1 and 2 (Figure 3.1-6). Impacts are eliminated or reduced by the implementation of the SWPPP. Runoff is expected to be directed through existing sedimentation basins, which serve to minimize increased sedimentation downstream of the new facility's proposed power block location.

Construction Areas, Temporary Structures, and Parking Areas

Several laydown yards, temporary buildings, parking areas, and other related structures are expected to be created and utilized during construction activities. Potential erosion and sedimentation from the construction and use of these areas and structures are controlled using best management practices (BMPs), which are included in the SWPPP.

Cooling Towers

The existing cooling towers, located southeast of the proposed construction area of Units 3 and 4 (Figure 3.1-6), are expected to be utilized for new operations. Because these towers are located in an area that was previously disturbed during construction of the original Bellefonte facility, new construction is expected to result in minimal increased runoff and silt loads to the settling pond that result from heavy earth-moving activities and loss of vegetative cover. Construction of a new or relocated concrete ditch/pipeline from the proposed cooling towers area to the power block area involves little disturbance of the existing area; however, any effects that occur are expected to be temporary in nature.

Currently Undisturbed Areas

The areas proposed for additional construction are currently within previously disturbed areas with small areas of undisturbed, overgrown and forested areas. Clearing of these areas may be required as needed for construction activities. Construction activities follow BMPs for soil and erosion control as required by applicable federal and state laws and regulations. Therefore impacts to the currently undisturbed areas from construction activities are considered to be SMALL and not warrant mitigation.

Retention Ponds for Surface Water Runoff

Existing ponds are used to accommodate surface water runoff and allow sediment laden water from dewatering activities to pass through the ponds, prior to discharge at an NPDES-permitted outfall. No new stormwater retention ponds are expected to be used.

With the exception of outlying stormwater outflows in the undeveloped areas of the site, stormwater discharges from the site are directed to settling ponds prior to discharge into Town Creek (Figure 3.1-6). Stormwater from the portions of the site under construction are directed to Pond A and the construction holding pond, finally discharging from the construction holding pond to Town Creek through a monitored outfall (DSN002).

Off-site Construction

Local roads and bridges leading to the BLN site are monitored and maintained as needed during construction of the plant. The existing road system is expected to adequately handle the construction traffic required for the new facility, and no new off-site road construction is expected to be needed. Therefore, no off-site hydrologic alterations are expected.

4.2.1.2 Hydrologic Alterations Due to Construction

Maintenance dredging for sediment removal in the existing cooling water system intake channel prior to startup of the raw water system is anticipated. Maintenance dredging of the intake canal, as the term suggests, is a maintenance de-silting activity for sediment removal only. The intake canal design is not altered (modified) during this activity. A temporary increase in turbidity could occur in Guntersville Reservoir near the intake structure during construction and dredging activities. The additional turbidity from these construction activities is expected to dissipate quickly due to the location of the dredging. Riprap for the intake canal, as illustrated in Figure 3.4-2, is in place to stabilize the banks of the intake canal embayment. Construction activities are conducted in compliance with U.S. Army Corps of Engineers (USACE) and Tennessee Valley Authority (TVA) requirements, and are not expected to affect long-term water quality. Current construction plans do not call for extensive dewatering activities that could affect groundwater flow and quality. In addition, groundwater is not expected to be utilized during construction; therefore, the impact to groundwater availability is considered to be SMALL.

4.2.1.3 Water Resource Use and Consumption

Water for construction of the BLN is provided by the Guntersville Reservoir and the Scottsboro Municipal Water System. This water is drawn from Guntersville Reservoir via the existing intake structure located on the west shore of the river near Tennessee River mile (TRM) 392 or from the existing municipal services to the BLN site. Construction activities for the BLN are expected to require water amounts of approximately 345,600 to 604,800 gpd or 240 to 420 gpm for concrete batch plant operation, dust suppression, and sanitary needs. A peak use of 872,000 gpd of water could be required for startup (Reference 5). Portable toilet facilities are utilized for sanitary needs during construction. The recommended planning number for potable water consumption for workers in hot climates is 3 gpd for each worker, or approximately 5 to 7 oz. every 15 to 20 min. (Reference 1). Based on the maximum construction worker population of 3900 people (Reference 2), the potable water consumption is estimated at 11,700 gpd. It is anticipated that potable water continues to be obtained from the Scottsboro Municipal Water System. The quantities of water obtained from Guntersville Reservoir are expected to have little effect on the availability of water for other users and is considered a SMALL impact.

4.2.1.4 Water Bodies Receiving Effluents

Construction is expected to result in permanent structures occupying about 200 ac. of the site (Figure 3.1-6). Because the BLN is located on a peninsula between the Guntersville Reservoir and an embayment arm of Guntersville Reservoir known as Town Creek, both water bodies could potentially be affected by site construction activities and stormwater runoff.

Intake Structure, Intake Pipelines, Pipelines, and Discharge Pipelines

The intake and embayment, and the discharge design, are described in Sections 3.3 and 3.4, including the estimated withdrawal of Guntersville Reservoir water required for the BLN and the maximum expected discharge flow rate and water temperature. Section 4.3 provides a detailed discussion of the ecological impacts of refurbishment of the embayment and intake structure, intake pipelines, and discharge pipelines. Impacts of water intake and discharge structures are presented in Section 5.3.

The existing intake structure, located east of Units 3 and 4 (Figure 3.1-6), is planned for use in future plant operations. Maintenance dredging is expected to be necessary in the vicinity of this intake structure, and as stated in Table 1.2-1 a USACE permit is not required prior to commencing dredging activities because the dredge spoils are planned to be disposed of in an upland, on-site spoils area above the 500-year flood plain; therefore, disposition of dredge spoils is considered to be a SMALL impact. In addition, navigation in the Tennessee River and its tributaries is controlled by TVA, so no Section 10 permit (Rivers and Harbors Act of 1899, 33 USC 403) is necessary.

The combined effluent is to be discharged from the existing outfall, located downstream of the intake embayment, through an engineered diffuser designed to assure compliance with NPDES regulations and numerical limits in the BLN NPDES permit (Reference 3). Because the existing discharge structures are planned to be utilized, impacts from construction activities are considered to be SMALL. Details of the existing discharge system are presented in Subsection 5.3.2.

Effluent such as stormwater, road-dust-suppression water runoff, and other low-volume construction water uses are directed first to a settling basin(s) prior to release into Guntersville Reservoir. For additional information regarding water bodies receiving construction effluents, see Subsection 4.2.2.2.

Undisturbed Areas

Runoff from undisturbed areas follows flow paths from those areas already established unless the runoff has the potential to affect construction areas or developed areas; then additional steps may be taken to minimize the impact of effluent runoff.

4.2.1.5 Transmission Facilities

Existing transmission line rights-of-way (ROWs) are planned to be used for the BLN site, and no new transmission ROWs are expected to be needed. Subsection 4.1.2 presents additional information related to transmission corridors.

4.2.1.6 Floodplains and Wetlands

The facility is located on a peninsula between Guntersville Reservoir and the Town Creek embayment in Jackson County, Alabama. Units 3 and 4 are constructed at a grade elevation of 628.6 ft. msl, above the flood risk profile elevations and the 500-year flood elevations. The 100-year floodplain for Guntersville Reservoir varies from an elevation of 600.5 ft. msl at

TRM 390.4 to an elevation of 601.1 ft. msl at TRM 392.3. The TVA flood risk profile elevations on Guntersville Reservoir vary from an elevation of 601.8 ft. msl at TRM 390.4 to an elevation of 602.6 ft. msl at TRM 392.3. For Town Creek, the 100-year floodplain is the area lying below the elevation of 601.4 ft. msl, and the flood risk profile elevation is 603.1 ft. msl. The flood risk profile elevation is used to control flood-damageable development for TVA projects. At the BLN site, the flood risk profile elevations are equal to the 500-year flood elevations. (Reference 5).

Many wetland areas are situated in and around the BLN site; most are located along the 13-mi. shoreline that borders much of the site. Figure 2.4-1 illustrates the location of wetlands near the site. Wetlands have also developed in three ponds that were constructed in the 1970s during the initial phase of construction for Bellefonte Units 1 and 2. The dikes of two wetland ponds were breached in 1989, and 6 ac. of palustrine, emergent, persistent, and intermittently flooded wetlands developed. The third wetland pond, with an area of 12 ac., is used to filter stormwater runoff and is classified as palustrine, scrub-shrub, and permanently flooded wetland (Reference 5).

Field surveys were conducted in April 2006 to determine the presence of wetlands between the BLN parking lot and the perimeter road around the north side of the site. Wetland boundaries were flagged in the field and mapped with a Trimble ProXRS global positioning system unit capable of submeter accuracy (Reference 6). Six forested wetlands (W1 – W6) were identified within the survey area covering a total of approximately 11 ac. See Subsection 2.4.1.2.1 and Figure 2.4-1 for additional information. Individual wetlands ranged in size from 0.2 – 4.0 ac., and additional details are presented in Subsection 2.3.1.1.5.

Construction impacts to wetlands are evaluated prior to construction, and appropriate permits and procedures are used per state and federal guidelines and regulations.

Potential Construction Impacts

The TVA follows state and federal guidance and regulations to protect wetlands. Wetlands have developed in areas where ponds were created for previous construction activities. These once integral plant features are projected to be reclaimed for their original use in accordance with permitting procedures. Impacts in these vegetated or forested areas are expected to be eliminated or reduced by use of the SWPPP and BMPs and are considered to be SMALL. Routing runoff through existing sedimentation basins minimizes solids discharged to Guntersville Reservoir and Town Creek. However, approximately 11 ac. of forested wetlands are situated within the new reactor footprint. Impacts to wetlands within the construction area are considered to be MODERATE and mitigation is expected.

4.2.1.7 Potentially Affected Federal Projects

The BLN is situated adjacent to Guntersville Reservoir, which is part of the TVA Tennessee River system. The BLN project has no adverse water-related impacts on TVA or TVA's overall operations.

4.2.1.8 Effects of Alterations on Water Users

No effects on any other water users, including surface water and groundwater resources used by municipalities and industrial facilities, in the vicinity of the BLN are anticipated from water usage during construction activities.

Surface water quality in Guntersville Reservoir is good, and many municipalities use it for their sole or primary water supply. Eight municipalities draw water from Guntersville Reservoir (Table 2.3-31). The closest municipal user to the BLN discharge is Fort Payne, Alabama, located approximately 3 mi. downstream. The closest upstream industrial user is the Smurfit-Stone Container Corporation, formerly Mead Corporation, located approximately 13 mi. from the BLN site. Construction activities at the BLN are anticipated to have negligible, if any, effect on water quality or its current uses. Surface water rights concerning Guntersville Reservoir and the Town Creek embayment near the BLN site involve nonimpairment of designated uses. In addition, maintenance dredging of the intake structures for withdrawing water from Guntersville Reservoir requires USACE and TVA permits.

Potable water is supplied by the Scottsboro Municipal Water System (Table 2.3-31). Water for temporary fire protection, concrete batching, and other construction uses is expected to be obtained from Guntersville Reservoir. Groundwater is not expected to be used during construction. Environmental impacts to groundwater would be SMALL and are handled by state programs for environmental releases.

4.2.1.9 Effects of Alterations on Terrestrial or Aquatic Ecosystems

The greatest potential impacts during construction are expected to be from runoff that may contain higher-than-normal concentrations of silt and clay. Construction area runoff is directed to settling ponds prior to discharge to minimize this threat. NPDES limitations on physical and chemical parameters are met during construction activities and the impacts to the terrestrial and aquatic ecosystems are considered SMALL.

4.2.1.10 Construction Stormwater Control and Other Minimizing Actions

Construction impacts are considered SMALL and effectively managed by development and implementation of a site-specific construction SWPPP. The construction SWPPP addresses employee training and installation of soil erosion measures such as silt fences, straw bales, slope breakers, and other soil erosion prevention measures. The SWPPP also contains preventive maintenance procedures for construction equipment to prevent leaks and spills, procedures for storage of chemicals and waste materials, spill control practices, revegetation plans, procedures for regular inspections of soil erosion control measures, and procedures for visual inspections of discharges that could create an impact on water quality. Of importance is the fact that much of the BLN footprint is located within areas where construction was previously completed, and established stormwater drainage systems and roadways exist.

The Alabama Department of Environmental Management (ADEM) Water Division's, Industrial Division, requires industrial facilities that discharge into waters of the United States to obtain a valid site-specific NPDES permit or secure coverage under a valid general NPDES permit. A site-specific NPDES or general NPDES permit must be in place prior to conducting any activities

for which an application for a stormwater discharge permit is required. If the planned construction is expected to disturb more than 5 ac. of land, the facility must (1) obtain site-specific NPDES or general NPDES permit coverage, (2) implement BMPs, including structural (i.e., erosion control devices and retention ponds) and operational measures to prevent the movement of pollutants (including sediments) off-site via stormwater runoff, and (3) develop an SWPPP. Because construction of Units 3 and 4 is estimated to require approximately 200 ac. of newly incorporated areas as shown in Table 1.1-2, a site-specific NPDES or general NPDES permit is required. The U.S. Environmental Protection Agency (EPA) has issued BMP guidance for soil and erosion control and the development of SWPPPs. The current BLN NPDES permit lists BMPs, and the BLN is expected to follow BMPs for soil and erosion control as required by applicable federal and state laws and regulations. Following construction activities, an SWPPP that addresses (1) spill management and control for operations, (2) storage and management of chemicals, and (3) oil storage and management is developed, implemented, and maintained.

4.2.2 WATER-USE IMPACTS

The discussion of water-use impacts includes surface water and groundwater environments during the construction phase of the project. Measures to eliminate or reduce construction impacts are discussed in Subsection 4.2.1.10.

4.2.2.1 Construction Activities Potentially Impacting Water Use

Guntersville Reservoir and the Town Creek Embayment are the waters that could potentially be affected by construction activities.

Maintenance dredging for sediment removal in the existing cooling water system intake channel prior to startup of the raw water system is anticipated. A temporary increase in turbidity could occur in Guntersville Reservoir near the site during dredging activities. Dredging operations are conducted in compliance with TVA, USACE, and ADEM requirements, and are not expected to affect long-term water quality. This temporary effect is considered a SMALL on water use or water quality.

4.2.2.2 Water Bodies Receiving Construction Effluents

Impacts from effluents from construction activities are considered to be SMALL. Water is withdrawn from Guntersville Reservoir in sufficient quantities to produce concrete, provide dust suppression water for roads, and provide for other construction activities as needed. The water withdrawn is essentially consumed with no free-flowing streams or runoff generated from these activities.

Water used for construction is not heated or cooled. Temperature and velocity of construction effluents to water bodies are dependent on precipitation received at the site during construction activities. Runoff from precipitation events occurring during construction activities is discharged and managed under the SWPPP. Because precipitation events can not be predicted, it is not possible to determine temperature and/or velocity of the resulting runoff that is discharged to receiving water bodies.

Stormwater that impacts the construction areas is directed to existing and/or new settling basins to minimize any water quality impacts from its generation before being directed to a monitored discharge. Discharge and monitored runoff is expected to enter Guntersville Reservoir or the Town Creek embayment in small amounts.

Appropriate regulatory permits are obtained for construction in the affected Guntersville Reservoir and wetland areas (Table 1.2-1). The TVA has administrative and legal oversight of the Tennessee River system. As such, they are mandated to promote and preserve water quality while also fostering beneficial and economic uses. The USACE regulatory authority is based on Section 10 of the Rivers and Harbors Act of 1899 (Reference 8), which prohibits the obstruction or alteration of navigable waters of the United States without a permit. Section 404 of the Clean Water Act (Reference 9) prohibits the discharge of dredged or fill material into waters of the United States without a permit. Other laws that may affect the processing of applications for USACE permits include the National Environmental Policy Act (Reference 10), the Fish and Wildlife Coordination Act (Reference 11), the Endangered Species Act (Reference 12), the National Historic Preservation Act (Reference 13), the Deepwater Port Act (Reference 14), the Federal Power Act (Reference 15), the Marine Mammal Protection Act (Reference 16), the Wild and Scenic Rivers Act (Reference 7), and the National Fishing Enhancement Act (Reference 4).

Water discharges are monitored in accordance with applicable NPDES requirements and state water quality standards at the time of construction; no Native American tribal standards apply.

4.2.2.2.1 Preoperational Piping Flush Effluents

Prior to startup, the piping systems are cleaned with water with small amounts of detergents when required.

Water effluents are discharged to the wastewater retention basin (WWRB) with sampling conducted per the NPDES permit. Effluents containing detergent constituents are discharged to the lined wastewater Pond C, where they are sampled and disposed of per the NPDES permit or as required by applicable state and local regulations.

Because pipe cleaning discharges are monitored and restricted by the requirements of the BLN NPDES permit, the impacts to the environment from the pre-operational piping flushes are considered to be SMALL and do not warrant mitigation.

4.2.2.3 Water Quantity Used and Quantity Available to Other Users

The amount of water needed during construction does not affect water levels in Guntersville Reservoir or existing or future water rights and allocations, and does not require rationing of any existing water uses. Primary water needs at the BLN site are for concrete batch plant operations, watering of roads for dust suppression, and watering of disturbed areas to establish new cover vegetation.

Because most of the water needed for construction is expected to be withdrawn from Guntersville Reservoir, there should be no effects to the water quality or detrimental impacts that would affect any other user's consumption.

4.2.2.4 Water Quality Changes Due to Substrate Exposure

Only very localized and transient impacts due to substrate exposure are anticipated and are considered SMALL. Construction area runoff is directed to permitted outfalls and is monitored before discharge. The NPDES permit addresses discharge limits for water quality, including heavy metal concentrations. Construction impacts to the intake and discharge areas are local and transient. Large areas are not expected to be affected, and the locally affected areas are expected to recover rapidly. Measures to eliminate or reduce construction impacts are discussed in Subsection 4.2.1.10.

4.2.2.5 Effects of Alterations on Other Water Users

Eight municipalities draw water from the Guntersville Reservoir (Table 2.3-31). The closest municipal user to the BLN discharge is Fort Payne, Alabama, located approximately 3 mi. downstream. The closest upstream industrial user is the Smurfit-Stone Container Corporation, formerly Mead Corporation, located approximately 13 mi. from the BLN site. Construction activities at the BLN are anticipated to have negligible, if any, impact on water quality or its current uses. Short-term increases in turbidity from new construction at the BLN site are not expected to impact water supplies for these municipalities.

No flowing streams that affect water quality in Guntersville Reservoir or Town Creek embayment are in close proximity of the BLN site. There are no Section 303(d) designated streams that discharge upstream of the BLN site into Guntersville Reservoir or the Town Creek embayment (Subsection 2.3.3).

Based on historic and current groundwater and subsurface investigations, the Stones River Group limestone in the area of BLN has been described as a poor water-bearing formation with low water availability (Subsection 2.3.2.3.1). Recharge into the site groundwater system occurs through precipitation with no regional subsurface groundwater recharge. Groundwater is not expected to be used during construction activities; however, impacts to localized groundwater quality could occur due to unanticipated events (spills, accidents). The TVA has programs in place to minimize and address such events and there are no local groundwater users within the area affected by the construction activities; therefore, the environmental effects of these impacts to groundwater are considered SMALL and would be handled by state programs for environmental releases.

4.2.2.6 Construction Alterations to Other Users

Water quality and quantity safeguards that are implemented are expected to prevent alterations of water uses for other entities.

4.2.2.7 Construction Alterations to Terrestrial and Aquatic Ecosystems

Maintenance dredging of the intake structure area on the north shore of Guntersville Reservoir could create a temporary loss of Guntersville Reservoir shoreline-edge habitat in the affected areas. Localized shoreline and bottom materials potentially can be affected during that short construction period; however, the implementation of erosion controls are planned resulting in a SMALL impact.

4.2.2.8 Proposed Practices to Control Water-Use Impacts

The use of proven construction methods, exercising minimal land disturbances for new construction activities, and developing and implementing BMPs associated with the site-specific SWPPP and NPDES permit requirements should eliminate or reduce the potential for any water-use impacts. Measures to eliminate or reduce construction impacts are discussed in Subsection 4.2.1.10.

4.2.2.9 Water Quality Requirements for Domestic and Aquatic Ecosystems

The TVA has conducted extensive domestic and aquatic ecosystem studies on Guntersville Reservoir and compares their findings with set standards for water quality management. In addition, TVA continues to monitor the ecological health of the water within Guntersville Reservoir, including the area around the BLN (Subsection 2.3.3).

4.2.3 REFERENCES

1. U.S. Department of Health and Human Services, Public Health Service Centers for Disease Control, National Institute for Occupational Safety and Health, Working in Hot Environments, April 1986, Website, http://www.cdc.gov/niosh/hotenvt.html, accessed March 16, 2007.

2. Westinghouse Electric Company LLC, AP1000 Standard Combined License Technical Report, Construction Plan and Startup Schedule, APP-GW-GLR-036, Revision 0, August 2006.

3. Alabama Department of Environmental Management, “National Pollutant Discharge Elimination System Permit, Tennessee Valley Authority, Bellefonte Nuclear Plant, Permit Number AL0024635,” November 2004.

4. National Fishing Enhancement Act, 33 USC 2101 et seq.

5. Tennessee Valley Authority, Final Environmental Impact Statement, Bellefonte Nuclear Station, Fuel Conversion Study, October 1997.

6. Tennessee Valley Authority, Bellefonte NP Wetlands Preliminary Input_D01, April 2006.

7. Wild and Scenic Rivers Act, 16 USC 1271 et seq.

8. Rivers and Harbors Appropriation Act of 1899, 33 USC § 401.

9. Federal Water Pollution Control Act, 33 USC 1251 et seq., (also known as the Clean Water Act).

10. National Environmental Policy Act, 42 USC 4321 et seq.

11. Fish and Wildlife Coordination Act, 16 USC 661 et seq.

12. Endangered Species Act, 16 USC 1531 et seq.

13. National Historic Preservation Act, 16 USC 470 et seq.

14. Deepwater Port Act, 33 USC 1501 et seq.

15. Federal Power Act, 16 USC 791a et seq.

16. Marine Mammal Protection Act, 16 USC 1361 et seq.

4.3 ECOLOGICAL IMPACTS

This section describes the potential impacts of construction on the ecological resources of the BLN Site and vicinity. Because no other state or federal projects have been approved in the vicinity of the BLN, area disturbance is directly related to activities surrounding BLN modifications.

Generally, potential impacts associated with construction are temporary and minor, except for the addition of permanent structures, which affect a small percentage of habitats. An estimated 200 ac. of the 1600-ac. site are expected to be affected by the construction of a new facility (Figure 4.3-1). When BLN construction is complete, approximately 60 ac. of the affected acreage are expected to contain permanent structures including paved lots. Altered areas not containing permanent structures are revegetated and routinely maintained following construction. Figure 3.1-6 depicts a detailed construction plan.

4.3.1 TERRESTRIAL ECOSYSTEMS

A detailed and comprehensive description of the terrestrial environment at the BLN site is provided in Section 2.4.1.

4.3.1.1 Terrestrial Vegetation

Common effects of construction at the BLN site include temporary and long-term alteration and loss of vegetative cover, loss of habitat, increased erosion, and increased interaction between humans and wildlife. Approximately 60 ac. of mixed hardwood and pine hardwood forests, 13 ac. of native grass fields, 11 ac. of hardwood forested wetlands, and 3 ac. of scrub-shrub communities are located within the proposed construction area. These areas of land represent approximately 7 percent, 11 percent, 100 percent, and 1 percent of the above habitat types, respectively, within the formal boundary of the BLN site. The remaining acres of proposed disturbance are in areas previously disturbed by the original construction of Bellefonte Units 1 and 2. Because vegetative communities within the BLN boundary are common within the entire Sequatchie Valley, the affected area located on BLN property would be a very small percentage relative to the total areas present in the region.

Clearing activities are performed in compliance with federal and state regulations and permit requirements. The maximum area of exposed soil would be approximately 81 ac. In forested areas, contractors clear the construction area of woody vegetation and, where necessary, fill and grade the site to create a level surface. Generated waste is placed and contained on land lying on-site at BLN above the 500-year flood elevation.

Once the ground is free of vegetative cover, erosion and fugitive dust are expected. Erosion can be minimized by the effective use of best management practices (BMPs), which are specified by a stormwater pollution prevention plan (SWPPP). In consideration for potential grade and fill impacts of surface water flow outside the construction zone, a stormwater permit is obtained prior to commencing construction at the BLN site. Stormwater permits typically include grading plans that identify surface water flowing off the construction site. BMPs to control sediment flow and other mitigating features are identified when the stormwater permit is developed. Examples of BMPs used by the TVA for erosion control include but are not limited to strategically placing straw

rolls, silt fence, temporary sediment traps and check dams in watershed areas. Appropriate measures to control fugitive dust include sprinkling the construction site, as needed.

Removal of forests sometimes results in increased forest fragmentation, which can affect the movement of wildlife through habitat. However, review of the cover-type map (Figure 4.3-1) indicates the primary construction area is located within a mixed hardwood and pine hardwood forested area that was originally partially isolated from adjacent forested areas as a result of previous construction activities. Should population pressure increase, scrub-shrub areas surrounding the facility provide ample cover for animals to move from one forested area to another. Currently, no federal or state projects with the potential to further fragment wildlife habitat have been identified. Therefore, construction activities that affect a small portion of remaining forested areas are not expected to result in additional forest fragmentation or removal of potential travel corridors for terrestrial wildlife.

In non-forested areas, such as mixed native and improved grass fields or sites previously disturbed, where grading may be unnecessary, the degree of construction disturbance is expected to be less. Although the land is cleared, soil stratification may be minimally disturbed.

Transmission corridors were built along with the initial construction associated with Bellefonte Units 1 and 2. Areas associated with the right-of-way (ROW) of transmission lines are either currently maintained or were at one time. Two separate transmission lines are located on the BLN site. A 500-kV transmission line extends in a southeasterly direction and crosses both Town Creek embayment and Guntersville Reservoir. A 161-kV line runs concurrently with the 500-kV line southeastward onto the BLN but terminates on site (Figure 1.1-5). The ROW ranges from 300 ft. to 350. ft and has been maintained as grass fields where the 161- and 500-kV lines coincide. Areas where 500-kV lines are not running with 161-kV lines have not been maintained and are overgrown with scrub-shrub communities, which are secondary successional stages. A second transmission line extends northeast from the plant before turning northwest at a right angle and crossing Town Creek Embayment. The ROW for this smaller 46-kV transmission line is 50 ft. wide and is well maintained as is evident by vegetation characterized as native grass field underneath the transmission line. Endangered organisms have not been identified along ROWs. However, surveys confirming the absence of threatened or endangered species are expected prior to the start of clearing activity on transmission line ROWs. No new transmission lines are proposed.

Effects of construction on terrestrial plant communities are managed by using standard construction techniques that minimize long-term impacts, such as minimizing topsoil loss prior to revegetating or reseeding and allowing the area to develop back into a stable ecological community. Even if an area is not reseeded, some regeneration from the original root system is expected; however, invasive species are equally likely to colonize barren soils. Over time and in the absence of further disturbance, primary colonizing species are replaced by later successional species and, eventually, disturbed areas not actively revegetated develop stable communities similar to what existed prior to construction.

Another way to reduce the recovery period of temporarily disturbed areas is to refrain from grading areas, where it is practical. When invasive grading is not necessary, contractors may opt to scalp the vegetation at ground level, leaving the plant root network intact, thereby allowing the area to revegetate more rapidly than if the root network had been destroyed by grading.

Acreages that are affected by construction are common to the area and BMPs such as limiting deforestation, delineating a construction footprint and scheduling construction outside of sensitive breeding or nesting periods, are used to minimize adverse construction impacts in areas that cannot be avoided. For these reasons, effects of construction on terrestrial vegetation are considered to be SMALL.

4.3.1.2 Wildlife Resources

Direct wildlife mortality could occur during the construction period; however, this is expected to only affect organisms that cannot readily flee the construction area. Clearing, grading, excavating, and/or burying habitats within the construction zone is expected to lead to mortality of vertebrates and invertebrates. For the reasons discussed below, direct mortality of wildlife in the limited areas of construction is not expected to be great enough to cause detectable generational population effects.

Burrowing vertebrates are especially vulnerable to construction activity. Amphibians, reptiles, and mammals are three vertebrate taxa that display burrowing activity and are found on the BLN site. Densities of burrowing species at the BLN site are unknown, but most burrowing animals are also mobile and flee construction areas. Although there may be some mortality to burrowing animals during the construction period, the confined disturbance is not expected to significantly affect local populations of species that inhabit burrows, because these species are not limited to the construction area. Burrowing vertebrates are common throughout many habitats across BLN property.

Wildlife typically avoids roadways where activity and noise increase (Reference 6); however, construction machinery and personal vehicles occasionally collide with wildlife on construction sites, or while traveling to and from these sites. Wildlife species that are particularly vulnerable to collisions with vehicles are the inconspicuous, slow-moving, and/or nocturnal species such as opossums, skunks, rabbits, deer, turtles, snakes, amphibians, and birds (particularly those such as mourning doves and meadowlarks that inhabit shrubs or fields adjacent to roads). To reduce collision occurrences vehicles would be confined to roadways and authorized areas.

The potential for collisions between birds and structures, vehicles, and transmission lines also exists. Avian collisions with fabricated structures are thought to be the result of numerous factors related to species' characteristics such as flight behavior, age, habitat use, seasonal habits, and diurnal habitats; and to environmental characteristics such as weather, topography, land use, and orientation of the structures. Many authors on the subject of avian collisions with utility structures agree that collisions are not a significant source of mortality for thriving populations of birds with good reproductive potential. The U.S. Nuclear Regulatory Commission reviewed monitoring data concerning avian collisions with cooling towers at nuclear power plants and determined that overall avian mortality is low (Reference 3). Additionally, the BLN is not located within a mapped migrational flyway. Because transmission lines associated with the BLN are extant, avian mortality along transmission corridors is not expected to increase during construction. The number of construction-related bird collisions with structures is considered to be SMALL. Therefore, no plan is in place to mitigate avian mortality.

Noise, machinery activity, and fugitive dust from disturbed ground are expected to displace mobile species beyond the actual construction area, similar to animal movement away from

areas of vehicle traffic along highway systems. Heavy equipment such as scrapers and bulldozers typically emit noise at levels within the 82 – 96 dBA range at distances of 100 ft. (Table 4.4-1). Background noise ranges from 50 to 55 dBA so construction noise is expected to be substantial yet temporary (Subsection 4.4.1.5). Because a small percentage of habitat on the BLN site is expected to be disturbed, ample habitat is available adjacent to the construction site, which provides refuge for displaced animals. Avoidance behavior surrounding construction sites partially offsets the risk of wildlife colliding with equipment or vehicles. Therefore, impacts are considered to be SMALL.

Temporary disturbance and displacement of wildlife by construction activities are anticipated, but the surrounding area is expected to experience a return of most wildlife, with the exception of areas subject to routine operational noise such as the cooling towers area. Wildlife populations on-site or in nearby habitats are not adversely affected by temporary disturbance or displacement. Construction within or near habitats that are used for significant life history functions like nesting may result in a greater individual effects, which could be mediated by scheduling construction activities outside of critical time periods, such as nesting times.

In addition to habitat loss, there is a potential for the accidental release of chemicals, including petroleum products, during construction. The consequences to wildlife are most severe if toxic compounds enter surface waters. Refueling vehicles and storing fuel, oil, and other fluids during construction create a potential contamination hazard to aquifers and surface waters. Appropriate controls are activated in accordance with a site-specific spill prevention, control and countermeasure plan (SPCCP) that minimizes the potential for accidental spills.

Aside from the possibility of an accidental toxic release, the only permanent disturbance regarding construction is the loss of habitat due to the destruction of forested land or addition of permanent facilities. Consequently, effects of construction in affected areas lower the overall carrying capacity for wildlife within the BLN site. However, given the limited area of construction and that no additional transmission corridors are planned, impact to terrestrial habitats and wildlife in BLN construction areas are considered to be SMALL.

4.3.1.3 Important Terrestrial Species

Important species are federal- or state-listed (or proposed for listing) threatened or endangered species, commercially or recreationally valuable species, species that are essential to the maintenance and survival of species that are rare or commercially or recreationally valuable, species that are critical to the structure and function of the local terrestrial ecosystem, and species that may serve as biological indicators to monitor the effects of the BLN on the terrestrial environment. State and federal agencies as well as area tribal agencies have been contacted and concerns regarding species impacts are addressed in Section 2.4. Concerns were limited to endangered plant and animal species within the area and wetlands that may be affected by construction.

4.3.1.3.1 Vertebrates

A comprehensive list and detailed descriptions of state- and federal-protected important species are provided in Tables 2.4-1, 2.4-3 and 2.4-4. The gray bat (*Myotis grisescens*) and Indiana bat (*Myotis sodalis*) are the only species listed by the U.S. Fish and Wildlife Service (USFWS) that

potentially utilize habitat on or adjacent to the BLN site for foraging behaviors. Red-tailed hawks (Buteo *jamaicensis*), protected under the Migratory Bird Treaty Act (Reference 4), have been identified nesting within habitat located in the construction area.

Most birds are protected under the Migratory Bird Treaty Act (Reference 4), which states it is unlawful to take any part of a migratory bird, its nest or its eggs. During a site reconnaissance visit, a red-tail hawk nest was located within a portion of the construction area. Red-tailed hawks are abundant throughout the United States and not considered threatened or endangered. These hawks usually nest between late February and May; however, they reuse nests from year to year, and at times they skip a year between nest uses (Reference 1). When the nest is not in use, it is expected to be relocated to an undisturbed area. Although the red-tailed hawk nest is the only identified nest within the construction area, due to the type of habitat it is typical for a number of bird nests to be present within the canopy.

Gray bat roost within cave-like habitats and forage along forested shoreline habitat. The Indiana bat, which also roosts in caves, utilizes riparian and floodplain areas for summer foraging. Both bat species have been observed hibernating or roosting within 9 mi. of the BLN site. Proposed construction activities require the removal of hardwood and pine-hardwood forested areas, but the affected area amounts to 7 percent of total hardwood and pine-hardwood forested areas within the BLN site. These areas are not adjacent to shorelines that are typically utilized by bats. Therefore, the proposed construction activities are not expected to adversely affect either the gray or Indiana bat.

State-protected terrestrial species potentially occurring on or immediately adjacent to the BLN site include Rafinesque's big-eared bat and the long-tailed weasel. The direct taking of state-protected, non-game species without proper permitting is prohibited; however, the taking of habitat for these species is not prohibited. Rafinesque's big-eared bat utilizes trees, caves, and other natural areas as roosting sites. Although a very small percentage of forested areas are expected to be affected, deforestation associated with construction activities would be restricted to winter months when the bat is limited to hibernacula.

Conversely, proposed construction activities are not expected to adversely affect the long-tailed weasel, whose populations are associated with high-quality, early successional habitats. Damage to early successional habitat is limited to areas strongly dominated by low quality cedar growth. Furthermore, the weasel is a highly mobile and elusive organism, capable of avoiding construction activities.

Alterations occurring from proposed construction at the BLN site are limited to habitat types common to the surrounding area. Therefore, construction activities are not expected to permanently adversely affect the constellation of residential wildlife populations. Impacts are considered to be SMALL.

4.3.1.3.2 Plant Species

The USFWS is concerned with plant species considered endangered, threatened, or those which are candidates (Table 2.4-2). Although many species of interest are listed, Morefield's leather-flower (*Clematis morefieldii*), and Price's potato-bean (*Apios priceana*) are the only plants of concern for which habitat exists on BLN property. However, habitat for Morefield's

leather-flower and Price's potato-bean was not located within the projected construction disturbance areas. (Subsection 2.4.1.4.1).

In conclusion, the direct, indirect, and cumulative impacts to resident biota, including state-listed species, from construction of the BLN facility is considered to be SMALL.

4.3.1.4 Important Terrestrial Habitats

Important habitats include wildlife sanctuaries, refuges, and preserves; habitats identified by state or federal agencies as unique, rare, or of priority for protection; wetlands and floodplains; and land areas identified by the USFWS as critical habitat for species listed as threatened or endangered. Only wildlife areas and wetlands are found within the vicinity of the BLN site.

Wildlife areas in proximity to the BLN site include: Mud Creek Wildlife Management Area, Bellefonte Island, Coon Gulf, and Section Bluff (Figure 2.4-3). The BLN site encompasses 1600 ac. of land, and construction activity is not planned directly adjacent to any designated wildlife area. The distance between these wildlife areas and the BLN site provides ample buffer for any construction noise originating from the BLN site. Therefore, impacts to wildlife areas are considered to be SMALL.

Wetland areas are also considered important habitats. Six individual hardwood forested wetlands within the proposed construction zone were delineated by the TVA in May 2006. The individual wetlands range in size from 0.2 ac. to 4.0 ac. and total approximately 11 ac. On a five-point functionality scale, the wetlands range from Category 3 rating (high degree of functionality) to Category 2 rating (moderate degree of functionality) (Subsection 2.4.1.2.1) The U.S. Army Corps of Engineers is responsible for determining jurisdiction over wetlands and providing guidance regarding compensatory mitigation and the need for permitting. Adverse impacts to wetlands on the BLN site are considered to be MODERATE and are expected to require mitigation. Mitigation is accomplished through local wetland mitigation banks if credits are available or through more traditional means such as restoration or enhancement of an existing wetland on-site or wetland creation.

4.3.2 AQUATIC ECOSYSTEMS

A detailed and comprehensive description of the aquatic environment at the BLN site is provided in Subsection 2.4.2 (Figure 2.4-1). Figure 3.1-6 depicts the BLN construction plan and adjacent water bodies.

The intake structure, discharge structure, and transmission lines were initially constructed with Bellefonte Units 1 and 2. These structures are to be utilized for Units 3 and 4, thus reducing construction in the water.

Although construction does not occur along the waters edge, BMPs provided by site-specific SWPPP and SPCCP guidance minimize the risk of surface water contamination by construction activities. Stormwater potentially carrying sediments, fuel and lubricants is directed into the wastewater retention basin (WWRB) (Figure 2.4-4) to minimize water quality impacts to surrounding water bodies (Section 4.2).

Populations of aquatic organisms commonly collected in Guntersville Reservoir and Town Creek are not considered fragile. Should physical or chemical pollutants temporarily reduce habitat quality, mobile organisms would retreat to other areas. Installation of riprap, as a measure of bank stabilization permanently alters benthic habitat. However increased surface area associated with riprap usually induces productive communities of invertebrates.

Transmission line maintenance procedures are discussed in detail in Section 5.6. The TVA adheres to strict protocol regarding transmission line maintenance near aquatic habitat (Section 5.6). Examples of common BMPs employed along transmission lines include: temporary stream crossings to traverse the stream without damaging the banks, and maintaining a streamside management zone to preserve bank integrity (Reference 7). Therefore, returning transmission lines to working order is not expected to degrade aquatic habitat.

4.3.2.1 Guntersville Reservoir

Potential impacts to the Guntersville Reservoir during the construction of the BLN are considered to be SMALL, similar to those measured during the construction of Bellefonte Units 1 and 2. Because intake and discharge structures are already in place, new construction is not expected to occur near the banks of the reservoir, and accidental discharge and stormwater runoff is limited under the SWPPP and SPCCP, which are implemented prior to construction initiation.

Upon assessing the material condition of the docking facilities refurbishment (maintenance) as needed will be performed to return the facilities to original condition. Any disturbance of the aquatic environment is considered to be similar but of smaller effect than that experienced during the Bellefonte Unit 1 and 2 construction of the docking facility. Therefore, its potential impact is considered SMALL. Figure 2.1-1 provides location detail for the docking facility.

Although preliminary surveys indicate that the existing intake channel may function appropriately without maintenance dredging, it is anticipated that sediment deposition prior to construction will make dredging of the intake channel necessary. TVA is expected to obtain appropriate permits from ADEM and USACE and use appropriate mitigation. Dredging of any kind is an invasive, though temporary, activity. Essentially all benthic communities within the intake canal are expected to be destroyed. Although temporary increases in turbidity are unavoidable, resuspension of toxicants such as heavy metals, polychlorinated biphenyls, or DDT is not expected to occur. Waste materials are generated from dredging activity. Construction of BLN could, therefore, involve dredging material from the existing BLN intake within the 100-year floodplain. Consistent with Executive Order 11988, dredging is considered to be a repetitive action in the floodplain that should result in minor impacts because the dredged material would be spoiled outside of the floodplain. The BLN project would comply with the TVA Flood Control Storage Loss Guideline because there would be no loss of flood control storage (i.e., the dredge spoil would be placed and contained on land lying on-site at BLN above the 500-year flood elevation). Precautions including use of BMPs are expected to be utilized to prevent the reentry of the spoil material into the reservoir.

As predredge conditions return, benthic communities recolonize the area, and suspended solids that once caused temporary increases in turbidity settle out of the water column. Dredging associated with construction has a severe, but ephemeral, effect on a small portion of the

Guntersville Reservoir. However areas to potentially be dredged are not considered unique to the reservoir or critical habitat for wildlife populations.

4.3.2.2 Town Creek Embayment

Town Creek embayment is an extensive shallow overbank, which flows into the Tennessee River at Tennessee River mile (TRM) 393.4. Town Creek embayment is located west of the BLN construction area. An SPCCP specific to the construction period, as well as an SWPPP, provides measures to prevent runoff and chemical discharge to Town Creek embayment, and is prepared before construction begins. Therefore, impacts to Town Creek embayment are considered to be SMALL.

4.3.2.3 Intermittent Streams

One mapped intermittent stream is located on the western edge of the BLN property (Figure 2.4-4). Given its distance from the BLN construction area, the intermittent stream would not be affected by construction activity.

4.3.2.4 On-site Ponds

Several pond areas exist on the BLN site. Over time, on-site ponds have developed communities of vegetation kept in check by grass carp, fish, amphibians, invertebrates, and beavers (Subsection 2.4.2). The WWRB (Figure 2.4-1) functions as a settling pond and cascades into Pond A which is a functioning stormwater retention pond. Pond A discharges to Town Creek. Toxic wastes would not be disposed of in the WWRB, and solids are expected to settle in either the WWRB or Pond A. Based on the functioning of the existing site ponds, the impacts to on-site ponds were determined to be SMALL.

4.3.2.5 Fisheries Resources

Guntersville Reservoir supports a multimillion dollar sport fishery (Section 5.3) with the predominant game fish being largemouth bass. The reservoir itself is more than 70 mi. long which leaves ample habitat for fish to utilize. Community structure from three sampling points within the reservoir are not substantially different. Any loss of habitat would be negligible given the vast habitat area within the reservoir.

Construction activities associated with or near the Guntersville Reservoir may involve pile driving related to potential refurbishment (maintenance) of docking facility supports, maintenance dredging of intake canal, barge traffic transporting construction materials, and other noise-producing activities. Subsection 4.4.1.5 provides a detailed discussion related to construction noise and attenuation measures. Construction on the banks is not planned; however, some noise is expected to travel from the construction site through soil and water media, potentially affecting the audio-sensory system of fishes. Noise attenuates with distance from the source. Activities that emit loud and sudden noise are expected to cause more stress to hearing in fishes than constant noise, because reaction time is eliminated.

In addition to a pressure and vibration sensitive lateral line, fishes have a structurally complex internal hearing mechanism. Ears of fishes are fluid-filled chambers containing otolith organs and

sensory cilia lateral to the brain. Similar to terrestrial vertebrates, fishes convert acoustic energy to electrical signals that are deciphered by the brain for information. Unlike most vertebrates, fish continue to produce sensory hair cells throughout their life, implicating regenerating ability for fishes that endure hearing loss due to noise stress. (Reference 5)

Fishes adjacent to the BLN site during construction are expected to experience some degree of stress to their hearing mechanism, which may at least temporarily cause them to relocate or cause a temporary threshold shift, which may affect their foraging and predator avoidance capabilities. However, because Guntersville Reservoir is more than 70 mi. long, impacts to fish populations stemming from BLN construction noise is considered to be SMALL.

4.3.2.6 Important Aquatic Species

A comprehensive list and detailed descriptions of federal- and state-protected important species are provided in Section 2.4. Only Anthony's river snail and the pink mucket mussel were listed by USFWS potentially utilizing habitat adjacent to the BLN construction site. However, neither species has been observed adjacent to the BLN site (Section 2.4.2).

Anthony's riversnail is typically associated with lotic systems on substrate that varies from gravel to boulders; however, the riversnail has been found in pools adjacent to shoals. The Tennessee River population has been located in waters 10 – 13 ft. deep in lotic habitat downstream of Nickajack Dam. This species was historically identified within the Tennessee River from Knoxville, Tennessee, to Muscle Shoals, Alabama. However, extant populations are found within the Tennessee River just upstream of the mouth of the Sequatchie River at TRM 423, to just downstream of Bridgeport Island at TRM 411 in Jackson County, Alabama, and in the lower Limestone Creek in Limestone County, Alabama. Habitat for this species previously occurred adjacent to the BLN site; however, increased siltation resulting from impoundment of the reservoir has reduced habitat quality. Riversnails were not identified adjacent to the BLN during a previous survey and are not known to occur within 10 mi. of the BLN site. Therefore, the disturbance along the intake canal does not adversely affect the Anthony's river snail.

The pink mucket mussel has been located in free-flowing sections of large rivers, typically in silt-free, gravel substrate. Prior to the impoundment of the river, habitat for this species occurred immediately adjacent to the BLN site and increased siltation. During a 1981 survey, two live mussels were collected within the upper end of Long Island (TRM 417). In 1991, empty valves of an unknown age were found during a survey at TRM 418 (Reference 2). However, no live pink mucket mussels or empty valves were discovered near the BLN during the 1995 or 2007 surveys (Subsection 2.4.2.5).

Alterations occurring from proposed construction projects are temporary and limited to aquatic habitat types common to the surrounding area. The BLN construction activities do not permanently adversely affect residential aquatic wildlife populations and impacts are therefore considered to be SMALL.

4.3.3 REFERENCES

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3. U.S. Nuclear Regulatory Commission, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (NUREG-1437), Final Report, 1996.

4. U. S. Fish and Wildlife Service. Birds Protected by the Migratory Treaty Act, Website, http://www.fws.gov/migratorybirds/intrnltr/mbta/mbtandx.html#alpha1, accessed May 23, 2007.

5. Hastings M. C. and A. N. Popper, *Effects of Sound on Fish*, January 2005.

6. U.S. Department of Transportation, *Synthesis of Noise Effects on Wildlife Populations*, FHWA-HEP-06-016, September 2004.

7. Tennessee Valley Authority, *A Guide for Environmental Protection and Best Management Practices for Tennessee Valley Authority Transmission Construction and Maintenance Activities*, TVA/LR/NRM 92/1, 1992.

4.4 SOCIOECONOMIC IMPACTS

The discussion of socioeconomic impacts is divided into three sections. Subsection 4.4.1 describes physical impacts of station construction on the community. Subsection 4.4.2 describes the social and economic impacts of station construction on the surrounding region. Subsection 4.4.3 describes environmental justice impacts as a result of site construction.

4.4.1 PHYSICAL IMPACTS

Construction activities can cause temporary and localized physical impacts such as noise, odors, vehicle exhaust, and dust. This section addresses potential construction impacts that may affect people, buildings, roads, aesthetics, and recreational opportunities.

4.4.1.1 Workers and the Local Public

A detailed description of the BLN site and vicinity is provided in Sections 2.1 and 2.2. The site is largely developed, with some buildings and roadways in place from past activities. Within the BLN site, new construction and rehabilitation of existing buildings and roads is necessary.

Beyond the immediate site boundary, the area is rural, bound by water features, woods, and pastureland. As shown in Table 2.5-2, the 2007 projected permanent population for the area within 10 mi. is 25,483. Population distribution details are given in Subsection 2.5.1. Construction is estimated to begin in 2011, with the peak phase of construction targeted for three years later. The estimated on-site workforce during the peak construction phase increases to 3900, and then diminishes until completion of the construction phase.

People who could be vulnerable to noise, fugitive dust, and gaseous emissions resulting from construction activities at the plant are listed below in order of most vulnerable to least vulnerable:

- Construction workers and personnel working on-site.
- People working or living immediately adjacent to the site.
- Transient populations (i.e., temporary employees, recreational visitors, tourists).

Construction workers within the site boundary experience the most physical impact due to plant construction activities. The TVA is an equal opportunity employer. Workers have adequate training and personal protective equipment to minimize the risk of potentially harmful exposures. Emergency first-aid care is available at the construction site, and regular health and safety monitoring is conducted during construction. These activities are performed in compliance with local, state, and federal regulations, and site-specific permit conditions. Reasonable efforts are made to ensure that transient populations are aware of the potential impacts of construction activities.

The Creeks Edge residential area is located northwest of the BLN site on the shoreline of Town Creek. Potential impacts and mitigation measures on area aesthetics, noise, and air quality are discussed in Subsections 4.4.1.4, 4.4.1.5, and 4.4.1.6, respectively.

Impacts of transmission corridor construction and service lines providing electrical power during construction are discussed in Subsection 4.1.1. No new transmission lines are proposed as a part of the BLN construction.

4.4.1.2 Buildings

Construction activities are not anticipated to affect any off-site buildings, primarily due to distance. Figure 2.5-29 and Subsection 2.5.5 indicate that the nearest residence is approximately 0.5 miles (mi.) from the site, outside of the site boundary. The nearest business is approximately 0.75 mi. from the site. In the event that pile driving is necessary, the building(s) most vulnerable to shock and vibration are those associated with the plant and located within the BLN site.

Significant industrial and commercial facilities located within the vicinity of the BLN site are detailed in Subsection 2.5.2.

Historically significant buildings or recognized cultural resources existing within the BLN site are discussed in Subsection 2.5.3. Construction impacts on historically significant buildings are discussed in Subsection 4.1.3.

4.4.1.3 Transportation

Transportation is described in Sections 2.5 and 4.1. No public transportation routes are located within the site boundary. Construction is planned for existing and new roads inside the BLN site. Physical impacts due to site road construction would be limited to plant construction workers.

A railroad spur enters the site on its southwestern boundary, extends across the southwest half of the site, and ends in the existing part of the site. Upgrading this existing rail spur is necessary to support equipment delivery. Since reconstruction of the rail line spur outside the site boundary makes use of pre-existing right-of-way, construction impacts are expected to be minimal.

Plant construction at the BLN site increases traffic on local roads. Subsection 4.1.1 describes the transport of construction materials and workforce to the site by public roads. Traffic access to the site is described in Subsection 2.5.2. Both construction workers and truck deliveries access the site via U.S. Highway 72 (U.S. 72) and Jackson County Road 33 (County Rd. 33). Operational workers and security personnel are expected to access the site during the construction and the operation period using U.S. 72 and Bellefonte Road.

The county roads are two-lane, paved roads and have a maximum capacity of 1700 cars per hour in each direction of travel (Reference 13). For BLN, County Rd. 33 is planned to be used as the sole access road for construction workers. During the peak construction period, a single “construction” shift of 10 hrs during daylight hours is scheduled. However, to accommodate construction traffic converging on the site during this shift, staggered shift starts are expected to be utilized. As construction ramps up, scheduling of a night shift dedicated to preparation of the site for the next day's construction work is expected. Traffic into the site to the construction worker parking lot is unrestricted, reducing the potential for traffic buildup on County Rd. 33 and the site access road. Site security is planned to be performed on pedestrian traffic crossing from the unsecured parking lot to the site's work areas. The percentage of construction workers per

shift is 70 percent for the day shift and 30 percent for the night shift. A bounding estimate of 100 daily truck deliveries is assumed for this analysis with all deliveries occurring during daytime hours and inbound shipments occurring outside of the startup shift hours. These deliveries include shipments of materials, trash removal, etc. It is also assumed that there is one worker per vehicle and no carpooling.

Initially, staggered day shifts are not expected. However, after the fourth year of construction, the shifts are expected to be staggered to accommodate road limitations. Based on the total expected construction workforce of 3250 (as discussed in Section 4.4.2.1) and the 70/30 percent split in workers between the day and night shifts, the expected maximum workforce using County Rd. 33 for the day shift would be 2275 construction workers. Dividing this number into two staggered shifts results in 1138 construction workers accessing the site during the staggered shifts (2275 / 2), or 2-hour time period for the construction force to access the site. This traffic load is less than the maximum capacity of County Rd. 33 (1700 cars per hour). The utilization of staggered times also leaves extra road capacity that could prove useful for scheduling flexibility and the occasional delivery during day shift start times. This peak is expected to last for 2 years. The night shift workforce is expected to consist of 975 workers (3250 x 0.3), and staggered shifts for the nighttime workers during the peak construction period are not expected.

Operation of both BLN units is expected to require approximately 1000 operations and security workers that work on shifts around the clock and access the site using Bellefonte Road. The Bellefonte Road capacity of 1700 cars per hour (Reference 13) is not expected to be exceeded during any phase of the construction and operation of the plant.

U.S. 72 has sufficient capacity to handle an increase in traffic due to construction. Based on available data, County Road 33 may require mitigation measures to handle an increase of this magnitude. Consideration for expansion of this road should be evaluated (Reference 13).

Impacts to transportation from construction workers and deliveries are considered to be of SMALL impact for all roads except County Rd. 33, which is expected to be a temporary MODERATE TO LARGE impact during the construction period. Potential mitigation measures include establishing a centralized parking area away from the site and shuttling construction workers to the site, encouraging carpooling, installing traffic-control lighting and directional signage, county road modifications, and staggering shifts further to avoid traditional traffic congestion time periods.

4.4.1.4 Aesthetics

The location of parks and reservoirs in the region are described in Subsections 2.2.1 and 2.5.2. Because the immediate area outside the site boundary is bound by water features, woods, and the ridge line, direct visual access to plant construction is limited primarily to plant employees, residents in the Creeks Edge housing addition located northwest of the site across Town Creek, and nearby recreational sportsmen utilizing Town Creek. Negative visual impacts are lessened along Guntersville Reservoir due to the ridge line running adjacent to the reservoir between it and the plant. Section 3.1 describes construction materials used to lessen the visual impact of the site on the vicinity.

As the viewshed analysis in Subsection 2.2.1 states, the BLN uses natural-draft cooling towers that are 474 feet (ft.) in height. These towers were completed in the 1970s, and any effect on local viewsheds has already occurred. Based on viewshed analysis, the cooling towers are most visible from Guntersville Reservoir and its associated parks. Guntersville Reservoir is a 69,000 acre (ac.) lake with an adjoining 6000 ac. of natural woodland. The lake hosts numerous water sports activities throughout the year including boating, swimming, and fishing. Because the visual effects are inversely proportional to distance, the effects of the towers on most of the other parks in the region are minimal.

Figure 4.4-1 illustrates the effect of the towers as a function of distance and angle of vision occupied by the cooling towers. As the distance from the cooling towers increases, the angle of vision occupied by the cooling towers decreases significantly. Most of the parks in the region are located more than 18.6 mi. from the site. Although the towers may be visible at that distance, the two cooling towers occupy less than one-half of a degree of vision.

Section 3.1 describes construction materials that ultimately lessen the visual impact of the site on the vicinity. The tallest structures on-site during the construction of Units 3 and 4 are the existing cooling towers. Aircraft warning lights are an essential federal requirement of temporary and permanent structures that exceed 200 ft. (Reference 16). The appropriate warning lights were installed on the cooling towers during the construction of Bellefonte Units 1 and 2, and are maintained through construction and operation at the site. The existence of these lights is not expected to cause any additional aesthetic impact to vicinity residents.

During construction there is no steam plume from the cooling towers, so there is no steam plume impact to aesthetics.

Based on existing structures and the topographic layout of the vicinity, the impact of construction at the BLN site on aesthetics and recreational opportunities is considered to be SMALL and requires no mitigation efforts.

Further discussion on the impacts of recreational activities is discussed in Subsection 4.4.2.6.

4.4.1.5 Noise

The potential impacts of noise from BLN site construction have been analyzed by projecting noise levels at the site and vicinity from various construction-related sources. Projected levels are compared to ambient measurements described in Section 2.5, as well as to federal noise level guidelines. The results of these comparisons are then used to determine the magnitude of noise impacts at the various receptors identified in Section 2.5.

The U.S. Department of Housing and Urban Development (HUD) has established noise impact guidelines for residential areas based on day-night average sound levels (Ldn) (Reference 9). Some states and municipalities have established noise control regulations or zoning ordinances that specify acceptable noise levels. Neither the State of Alabama nor Jackson County have developed noise regulations that specify acceptable community noise levels.

A special version of equivalent sound levels (Leq), and the most common measure of environmental noise levels is the day-night average level (Ldn). The Ldn is valid for a 24-hr.

period and is computed the same as a 24-hr. Leq except that the prevailing sound level in the calculation has a 10-dB penalty added between the hours of 2000 and 0700. For the purpose of this ER, noise impacts are assessed using the Ldn of 60 – 65 dBA as the level below which noise levels would be considered acceptable for residential and outdoor recreational uses. Noise levels below 60 – 65 dBA are considered to be of small significance (Reference 4).

Typical construction noise is generated by internal combustion engines (front end loaders, tractors, scrapers/graders, heavy trucks, cranes, concrete pumps, generators, etc.), impact equipment (pneumatic equipment, jack hammers, pile drivers, etc.) and other equipment such as vibrators and saws. The amount of impact construction noise has on the surrounding environment depends on numerous factors including sound intensity, frequency, duration, location on site, the number of noise sources, time of day, weather conditions, wind direction, time of year, etc.

Nuisance noise can be caused by the operation of heavy equipment, particularly vehicle and machine backup-alarms. Equipment noise can also be categorized as being either continuous or impulse in nature. Stationary equipment is considered to operate in one location for one or more days at a time; pumps, generators, compressors, screens, are typical examples of stationary equipment. In addition, pile drivers and pavement breakers are sometimes categorized as stationary equipment. Mobile equipment includes machinery that performs cyclic processes such as: bulldozers, scrapers, loaders, and haul trucks. The equipment type, age of equipment, specific model, equipment condition and the operation performed influence equipment noise. Because of design improvements and technological advances new machines have been quieted for many situations. Newer equipment is noticeably quieter than older models due primarily to better engine mufflers, refinements in fan design and improved hydraulic systems (Reference 10).

Many noise studies utilize noise levels based upon limited available data samples and documentation collected more than 30 years ago. Noise levels as generated by typical equipment are shown in Table 4.4-1. This information is being utilized to illustrate a worst case scenario.

Attenuated noise levels calculated in Table 4.4-1 are considered maximum noise levels. Construction equipment generally do not operate at maximum levels continuously, therefore actual noise levels are expected to be less than those predicted at the fence line. Utilization of modern equipment, mufflers, hydraulic systems, etc. should reduce these noise levels further. For the majority of the construction activities, noise levels would be considered to be comparable to or below the background levels (50 – 55 dBA) and below the 60 – 65 dBA classification of acceptable noise levels by HUD at each of the receptors.

Those construction activities that generate noise above 60 – 65 dBA levels at the fence line would be temporary. With the exception of scheduling a night shift dedicated to preparation of the site for the next day's construction activities, most construction activities would occur during normal daylight hours between 0700 and 1700. There are occasions when construction activities must be scheduled during night time hours. Typical instances include continuous concrete pours to ensure homogeneity and strength of the structures. At these times the noise level remains upwards of 60 – 90 dB at a distance of 100 ft. from the equipment, but should be attenuated to

below the acceptable 65 dBA at the site boundary, depending on the location of the continuous pour. (Reference 8).

The nearest residences are located across Town Creek (Creeks Edge Addition) from the northwestern fence line. Because water is between the northwestern fence line and the residences, construction noise would not be attenuated with distance as it would by natural insulators (ground cover, earthen berms, grass, trees with foliage, etc.). If construction activities occur within 400 ft. of the northwestern fence line (such as the temporary construction parking lot, as illustrated in Figure 4.1-1) or noise levels become excessive, the nearby residences could be temporarily impacted by construction noise above the acceptable 60 – 65 dBA and background levels. Altering terrain during construction activities in this location could increase or decrease impact noise levels across Town Creek. Common practices to mitigate noise include, but are not limited to: noise reduction devices on heavy equipment (mufflers), limiting driving speeds, Jake brakes and tail-gate slamming, constructing earthen berms, placement of foliage, ground cover, etc. between the noise sources and receptors.

Additional receptor locations are described in Section 2.5, including receptor locations mentioned in the Final Environmental Impact Study conducted at the BLN in 1997 (Reference 9) including fence line, nearest residences, heron rookery, Sand Mountain area, and other sensitive receptor locations. Recreation locations were also selected. Sensitive receptors would not be located within the fence line of the facility, and therefore would not be dramatically impacted by construction noise.

Other receptors (recreation areas, hospitals, schools, etc.) are located at distances where noise levels during construction activities would be comparable to background levels. New home construction located across Town Creek and to the northeast of the existing residences was noted during the ambient noise survey. Off-site new home construction can add to the noise at the BLN site.

Unusual noise due to construction activities may be necessary, such as blasting, demolition and testing of the emergency warning siren, and could result in temporarily excessive noise levels. The noise generating processes are expected to fluctuate throughout the construction period. Steam is not anticipated to be used for cleaning of equipment; therefore, steam blows are not an anticipated noise-generating construction activity at BLN. Blasting and demolition occur early in the project at intermittent frequencies and only occur during the daylight hours (between 0700 and 1700). If the construction activities are in close proximity to the northwestern fence line or boundary, then the residences closest to the fence line could temporarily experience noise from the construction equipment. Potential mitigation measures include, but are not limited to, the use of blasting blankets, notification of the surrounding receptors prior to unusual noise events (blasting, emergency siren testing, etc.), building berms, noise reduction devices on heavy equipment (mufflers), limiting tailgate slamming, placement of foliage and ground cover between noise sources and receptors, and limiting noise-generating activities to daylight hours.

Based upon the projected noise levels at various site and vicinity receptors and the duration of construction activities, noise impacts from BLN site construction are expected to be SMALL, for the surrounding communities and SMALL to MODERATE for the nearest residents of Creek's Edge addition.

4.4.1.5.1 Transmission Line Noise Due to Construction

Existing transmission lines are used at the BLN site. Noise produced by improvement of transmission line towers, transmission lines, and corridors is temporary. Transmission line corridor maintenance, after the initial maintenance activity is performed, is scheduled on a periodic basis and is of short duration; therefore these activities are expected to have SMALL noise impacts to surrounding communities and habitat.

4.4.1.5.2 Traffic Noise Due to Construction

Noise analysis was conducted related to traffic noise along the access road to the BLN site and the connecting U.S. 72. Construction work force traffic, and especially the delivery of heavy equipment, is a temporarily imposed noise impact to receptors along the access road between U.S. 72 and the BLN entrance. Noise impacts along U.S. 72 increases slightly because the highway is currently utilized by tractor trailers, machinery transports, automobiles, etc.

Traffic noise levels along the access road would increase during construction. Much of the traffic during the construction period would be at the beginning and end of the work shift. Traffic during the peak hours would result in an increase in traffic noise levels along the access road from about 51 dBA to about 58 dBA at 100 ft. for the three hours scheduled for shift changes during peak construction, as described in Subsection 4.4.1.3. Traffic noise during the peak hours could be noticeable at nearby residences. Heavy truck traffic, usually occurring outside of shift-change hours, would be the most bothersome and could approach levels of 70 to 90 dBA at 50 ft. from the road. Peak traffic noise during construction is expected to have a SMALL to MODERATE impact at approximately two homes and one business along the southern access road. Off-peak traffic would have a SMALL impact to surrounding communities. Noise mitigation measures include, but are not limited to: enforcing low speed limits, maintaining good road conditions, minimizing Jake-braking, maintaining equipment with noise reduction devices (mufflers), utilizing barge traffic for large equipment, and controlling the time of day the peak traffic would occur.

4.4.1.6 Air Quality

Regional air quality is discussed in Section 2.7. Areas having air quality that does not meet the National Ambient Air Quality Standards (NAAQS) are designated by EPA as non-attainment areas. The nearest non-attainment areas to the BLN site are Jefferson and Shelby counties (located outside the 50-mi. region), non-attainment areas under the 8-hr. ozone standard.

Temporary and minor impacts to local ambient air quality could occur as a result of normal construction activities. In the vicinity, those impacted could include the Creeks Edge housing addition located northwest of the site across Town Creek. Fugitive dust and fine particulate matter emissions – including those less than 10 microns (PM-10) in size, are generated during earth-moving and material-handling activities. Construction equipment and off-site vehicles used for hauling debris, equipment, and supplies also produce emissions. The pollutants of primary concern include fugitive dust, reactive organic gases, oxides of nitrogen, carbon monoxide, and, to a lesser extent, sulfur dioxides. Variables affecting construction emissions (e.g., type of construction vehicles, timing and phasing of construction activities, and haul routes) cannot be accurately determined until the project is initiated. Actual construction-related emissions cannot be effectively quantified before the project begins. General estimates are available and the

impacts on air quality can be minimized by compliance with federal, state and local regulations that govern construction activities and emissions from construction vehicles (Reference 12). Required pre-construction permits obtained from the Alabama Department of Resources, and other federal and state agencies, are expected to be in place prior to the commencement of construction. Air pollutant control measures, which include limits for noted pollutants, are part of the controls prescribed by these agencies.

While emissions from construction activities and equipment are unavoidable, a mitigation plan minimizes impacts to local ambient air quality and the nuisance impacts to the public in proximity to the project, particularly the residents living at Creeks Edge. The mitigation plan includes, at a minimum:

- Phased construction to minimize daily emissions
- Proper maintenance of construction vehicles to maximize efficiency and minimize emissions

Specific mitigation measures to control fugitive dust are identified in a dust control plan, or similar document, prepared prior to project construction. These mitigation measures could include any or all of the following:

- Stabilize construction roads and spoil piles.
- Limit speeds on unpaved construction roads.
- Water unpaved construction roads to control dust.
- Perform housekeeping (e.g., remove dirt spilled onto paved roads).
- Cover haul trucks when loaded or unloaded.
- Minimize material handling (e.g., drop heights, double-handling).
- Cease grading and excavation activities during high winds and during extreme air pollution episodes.
- Phased grading to minimize the area of disturbed soils, and
- Use temporary or permanent vegetative road medians and slopes.

Impacts to air quality from construction are considered to be SMALL and do not warrant mitigation beyond these measures.

4.4.2 SOCIAL AND ECONOMIC IMPACTS

This subsection evaluates the demographic, economic, infrastructure, and community impacts to the vicinity and region as a result of constructing two Westinghouse AP1000 nuclear units at the BLN site. The evaluation assesses impacts of construction related activities and of an

in-migrating construction workforce on population, regional labor, tax revenues, infrastructure and community services, housing, education and recreational activities within the vicinity and region. The communities within the vicinity are anticipated to be less impacted by the construction of the BLN based upon previous experience with the construction of Bellefonte Units 1 and 2.

4.4.2.1 Demography

Population estimates and projections for the region are discussed in Subsection 2.5.1.

Industry, heavy construction, and unemployment data are discussed Subsection 2.5.2.

During the peak construction period, there is an on-site workforce of approximately 3900 which includes a construction workforce of approximately 3250 (construction workers, engineers, managers, etc.) and approximately 650 operations workers (includes security personnel). Figure 4.4-2 and Table 4.4-X1 show the temporal distribution of workers for construction of the new units. Trade skills represented in the labor pool include electrical workers, welders, and pipe fitters. To ensure the necessary labor pool is available as the demand for workers increases, construction companies recruit employees from local technical school programs and work with school administrators to build up curriculum in the necessary labor trade areas. National labor trade union organizers, such as the American Federation of Labor, have made it a high priority to train new entrants in the construction industry as the need for labor ramps up. Additionally BLN recruits their Nuclear Process Operator-qualified (NPO-qualified) workers from among those working at other project sites.

Based on current employment levels in the construction industry in Alabama, Georgia, and Tennessee, and given the significant growth between 1997 and 2002 in the region (Alabama saw more than a 16.5 percent increase, Georgia saw a 118.4 percent increase, and Tennessee saw a 19.7 percent increase in the number of heavy-construction workers), it is assumed that 50 percent of the construction workforce come from the existing local/regional industry and the other 50 percent migrate into the region, and that each construction worker in-migrates with their family (References 5, 6, and 11). The assumption that 50 percent of the workforce comes from outside the region is used in the analysis as a bounding approach for estimating incoming population.

The assumed family size of four is based on U.S. Census Bureau 2000 data (Reference 2), which states that the average family size in the United States is 3.14 persons. Expectations are that the worker family size would be typical of the U.S. Census Bureau data; however, for estimating family size in this report, the value of 3.14 persons per family was rounded up to bound the U.S. Census Bureau value. The U.S. Census Bureau data are used instead of Jackson County family size, because the in-migrating construction workers are expected to come from outside Jackson County.

The county population due to the BLN is expected to gradually increase over the span of 5 years, increasing the population by approximately 100 people in year 2010, and the population increase resulting from on-site workers is expected to peak at 7800 people in 2015 (3900 multiplied by 50 percent [to account for in-migration] multiplied by household size of four).

Jackson County population with the BLN project is assumed to increase from approximately 59,100 to approximately 63,700 between the year of 2010 and 2019. It is assumed that all workers and their families settle in Jackson County. Therefore, the influx of the on-site workforce and their families would likely contribute the following percentage population increases in Jackson County during construction: approximately 1 percent at the beginning of Unit 3 site preparation; up to 12.7 percent at peak construction period; and 3 percent at the completion of Unit 4 construction. Therefore construction-phase workers and their families represent a small percentage of the existing county population, and the impact is anticipated to be SMALL. Within Jackson County, the impacts to the communities within the BLN vicinity (the main recipient of workers being Scottsboro and the area along its major transportation routes) are expected to be MODERATE.

4.4.2.2 Economy

The economy of the region surrounding the BLN, including industry, workforce, unemployment, and future economic outlook, is described in Subsection 2.5.2.

The in-migration of construction workers is likely to create new indirect service jobs in the area and increase the amount of money used to purchase goods and services. The U.S. Department of Commerce Bureau of Economic Analysis, Economics and Statistics Division, provides multipliers for industry jobs, earnings, and expenditures. The economic model they use is called the Regional Input-Output Modeling System (RIMS II). This model incorporates buying and selling linkages among regional industries creating multipliers for both jobs and monetary expenditures.

The multiplier from RIMS II analysis for construction jobs is 1.4218. Thus, for every newly created construction job, an estimated additional 0.422 jobs are created in the region. The RIMS II (utilities) multiplier for operations jobs is 1.759. Thus, for every job of operation worker, an estimated additional 0.759 jobs are created in the region. Operations jobs occur as the construction jobs approach the end of the construction phase, with some overlap. The peak period for construction and operations workforces combined is between July and October 2015.

Starting in 2010, indirect jobs are created by construction jobs; approximately 200 new indirect jobs are created by 2012 and 1370 new indirect jobs during the peak construction period in 2015. The indirect jobs due to operations are forecasted to begin at the end of 2012; approximately 500 indirect jobs are created during the peak construction period in 2015, with a high of 760 indirect jobs at the end of the construction ramp down. When combined with the construction and operations jobs, total indirect jobs (1870) contribute to a peak of approximately 5770 jobs in 2015. A net loss of 1110 indirect jobs, from the peak construction time to the beginning of the operations period, is expected to be partially offset by the normal projected population increases that would help maintain indirect jobs created during the construction phase. The total jobs loss from the peak construction to the beginning of commercial operation is 4010. Any permanent effects are discussed in Chapter 5.

For every dollar input into the BLN site, an additional 0.443 dollars is added to the regional economy (Reference 7). A limited quantity of material and services are purchased from within the BLN region in support of plant construction. Most materials for construction are procured through bulk contracts in order to obtain bulk pricing incentives. This somewhat limits regional

procurement (within 50 mi of the BLN site). Specific items that are not likely to be purchased regionally include rebar and major plant equipment, such as pumps, valves, tanks and other vessels. Safety-related concrete is expected to be purchased locally, as are many consumable items such as cleaning supplies and office supplies, along with miscellaneous services, such as janitorial services, paving, landscaping, and maintenance on temporary buildings. Other regional expenditures would include items such as office furniture and equipment, construction trailers and vehicles, trucks, and scaffolding. Estimated regional purchases total about $41 million throughout the construction period, as detailed below:

Category	Construction (Total $)
• Consumables	2,000,000
• Miscellaneous Services	5,000,000
• Safety-Related Concrete	14,000,000
• Other	20,000,000
Total	41,000,000

In addition to direct expenditures on construction-related materials and services, expenditures and benefits associated with the construction workforce include the creation of jobs, employee purchasing, and increased tax revenues. When comparing the influx of the construction workforce with the relatively small population of the vicinity, the increase in expenditures and benefits is substantial. When comparing the influx of the construction workforce with the larger population of the region, the increase in expenditures and benefits is proportionally smaller. Thus the impact from plant construction expenditure and employees is considered a MODERATE to LARGE beneficial impact in the vicinity and a SMALL beneficial impact in the region.

4.4.2.2.1 Regional Taxes and Political Structure

Regional taxes and the political structure of the BLN site area are discussed in Subsection 2.5.2. Several types of taxes are generated by construction activities and purchases, and by workforce expenditures at the BLN site. These would include income taxes on wages and salaries; sales and use taxes on corporate and employee purchases; and personal property tax associated with employees.

The BLN region encompasses three states: Alabama, Georgia, and Tennessee. As of January 1, 2008, the state sales tax rates for these three states were 4 percent, 4 percent, and 7 percent, respectively (Reference 14). TVA estimates regional expenditures for materials and services throughout the construction of BLN to be $41 million. Based on the percent of the BLN region that each state occupies, estimated state sales tax revenue from procurement of materials and services for the duration of construction is as follows:

- Alabama: $940,222
- Georgia: $276,150
- Tennessee: $741,349

At the state level, the tax revenue generated by $41 million in expenditures over the construction period of BLN would have a SMALL beneficial impact, though larger beneficial impacts could be seen at a regional level, based on the spatial distribution of companies from which goods and services are procured.

TVA makes tax equivalent payments to eight states, including Alabama. The State of Alabama then allocates its tax equivalent payments from TVA in accordance with Title 40 “Revenue and Taxation,” Chapter 28 “Distribution of Payments Made In Lieu of Taxes,” Sections 40-28-1 through 40-28-4. Alabama distributes 78 percent of the TVA tax equivalent payments to the 16 TVA-served counties based on a formula from TVA's book value of power property and sales in each of these counties. These counties may share a portion of their payments with municipalities. Some of these payments may be used in support of school systems, hospitals, and other public services within their boundaries. The remainder of the tax equivalent payments is either retained for the state's general fund or distributed to counties not served by the TVA (Reference 3). For additional information related to TVA funds associated with the influx of construction population see Subsection 2.5.2.3.

Based on assumptions made on DOE/EIS-0288 data, the average person-year salary is expected to be $65,000 (Reference 17). For the BLN (i.e., Units 3 and 4) construction cycle, a total of 10,631 person-years are expected, resulting in a total economic input as a result of wages of approximately $691 million. Based on the RIMS II direct-effect economic multiplier for construction (Reference 18) within the region, the total economic impact related to wages is expected to be approximately $994.7 million.

The state of Alabama has a general sales tax rate of 4 percent that applies to most purchases of goods and services. In addition, Jackson County has a 2 percent general sales tax rate. Towns and cities also have their own sales taxes at varying rates. The county rate of 2 percent would yield to Jackson County about 0.75 percent of total wages in sales tax, or about $7,500 for every $1 million in wages. All of the county sales tax is allocated to the Jackson County School System.

As stated in ER Subsection 2.5.2.3, payments made in lieu of taxes received from the TVA to Jackson County via the State of Alabama in FY 2007, based on the Bellefonte Units 1 and 2 property value, totaled $10.4 million. While the TVA book value of Bellefonte Units 1 and 2 decreases due to amortization, the book value of BLN (i.e., Units 3 and 4) increases due to capital expenditures. This may or may not result in the amount of payments in lieu of taxes remaining at or above this level during construction. Factors that could affect the amount of in lieu of taxes depend on the amount of BLN capital expenditures, the timing of the BLN capital expenditures, and other TVA capital expenditures. Based on DOE/EIS-0288 data, 40 percent of the annual allocation goes to the Jackson County and City of Scottsboro Public School systems each year (Reference 17). In FY 2007, 40 percent of the annual allocation to Jackson County ($10.4 million) amounted to approximately $4.2 million for the two school systems. The remaining revenue is used by Jackson County to fund public services.

As discussed in ER Subsection 2.5.2.8.2, for the 2004 - 2005 school year, an average of approximately $7100 per student was spent on education between the Jackson County and City of Scottsboro Public School systems. It is estimated that the direct population increase from the BLN on-site construction workforce will result in 1350 new students entering the Jackson County education system during peak construction period. This increased student population would result in an increase in spending of approximately $9.6 million per year. This could potentially result in an approximate $5.4 million shortfall in school system funding, although local taxes only comprise 21.3 to 26.2 percent of the school system funding with Federal, State, and other sources contributing the balance of funds.

Education costs during initial construction, up until the third quarter of the third year, would be well below the costs incurred during the peak construction phase and would allow a gradual phase-in of revenues and expenses to meet the costs associated with the increased student population. In addition, from the last year of construction through the BLN operational phase, the annual payment in lieu of taxes is expected to meet educational expenditure demand.

Additional tax revenues are to be generated by this increased economic activity involving the plant and plant workers. Such revenues (e.g., property taxes, income taxes, real estate transfer fees, and motor vehicle taxes) are collected by or on behalf of the state government and then distributed to the jurisdictions, including schools and public services.

The effect of an influx of families on other areas of public finance (e.g., fire, police, ambulance, and hospitals) should be minimal. Additional and new equipment would be required for the police and fire departments, but these items are expected to be covered by the additional tax revenues and payments in lieu of taxes. Potential impacts on community services are further discussed in Subsection 4.4.2.3.

Given the structure by which the TVA makes payments in lieu of taxes, the general distribution structure of funding by the state of Alabama, as well as the increase in personal sales and property tax, the potential impact of taxes within the region is expected to be SMALL and beneficial. The potential impact within Jackson County, Alabama, is expected to be a MODERATE to LARGE beneficial impact.

Given the structure by which the TVA makes payments in lieu of taxes, the general distribution structure of funding by the state of Alabama, as well as the increase in personal sales and property tax, the potential impact of taxes within the region is expected to be SMALL and beneficial. The potential impact within Jackson County, Alabama, is expected to be a MODERATE to LARGE beneficial impact.

4.4.2.3 Infrastructure and Community Services

The water and wastewater infrastructure already exist due to the previous construction of Bellefonte Units 1 and 2. In addition, local public services affected by plant operation include: education, transportation, public safety, social services, public utilities, tourism and recreation. These are described in detail in Subsection 2.5.2. In general, impacts to each of these services from plant construction are expected to be minimal. It is likely that the percentage of construction workers accompanied by their families, moving into the region would concentrate in several large communities with well developed public services, such as Scottsboro and Hollywood, Alabama.

Diversification of settlement would minimize the likelihood of any one community's services being overburdened. Some of the construction personnel would commute from existing homes in the region; and therefore, not act as a burden upon local public services.

The demand on potable water utilities and waste treatment increases during construction at the BLN site. Considering the estimated on-site workforce during the peak construction phase that moves into the vicinity with families, the population increases by 7800 people (or one-half of the total number of anticipated workers multiplied by the assumed family size of four). The potable water used for human consumption at the BLN site is expected to be obtained from the city of Scottsboro, Alabama. The Scottsboro Municipal Water System currently uses approximately 75.0 percent (6 million gallons per day [Mgd]) of their normal utilization condition capacity of 8 Mgd. It is anticipated that the average per capita amount of water consumed per day is 90 gallons (gal.), resulting in an overall increase in consumption of approximately 700,000 gal. by the additional population. This represents an additional 8.8 percent usage of system capacity, bringing total usage to approximately 83.8 percent of capacity during the peak construction phase. Within the vicinity of the plant, the current drinking water treatment capacity, including reserve, is 12 Mgd. The current wastewater treatment reserve capacity is 5 Mgd and the wastewater treatment plant is operating at 4 Mgd (80 percent). During the peak construction phase, it is anticipated to operate at 94 percent or approximately 4.7 Mgd. According to officials, there are no concerns with water supplies as water systems in Jackson County are generally not operating at or near capacity.

The impacts of water treatment services due to increased population are expected to be SMALL, with no mitigation required.

Water for construction activities, such as concrete batch plant operation, dust suppression, and sanitary needs, of the BLN would be provided by the Guntersville Reservoir and the Scottsboro Municipal Water System as discussed in Subsection 4.2.1. Because most of the water needed for construction is expected to be withdrawn from Guntersville Reservoir, impacts of on-site construction activities on water treatment services are expected to be SMALL.

There are 95 sworn police officers and 435 firefighters in Jackson County. The ratio of police officers to current residents in Jackson County, Alabama, is 1:565, and the ratio of firefighters to current residents is 1:123. With the increase in population due to the total on-site workforce during the peak construction phase and their families plus normal population growth, the ratio of police to residents would become 1:727, and the ratio of firefighters to residents would become 1:159 in Jackson County. Although these ratios increase during the construction of the BLN, this increase would only be short-term, and the expected ratios are within the national recommended range for police (1 police officer for every 250 to 1000 persons) and above the national ratio for firefighters (1 firefighter for every 262 persons), as discussed and referenced in Subsection 2.5.2.7.2.

The impacts of on-site construction activity on local police and firefighters are expected to be SMALL and offset by increased tax revenue.

Traffic counts for roads within the vicinity of the site are discussed in Section 2.5. Effects of construction on transportation are discussed in Subsection 4.4.1. Effects of construction on education are discussed Subsection 4.4.2.

Highlands Medical Center is the only hospital in Jackson County, Alabama. Additional information on medical care is discussed in Subsection 2.5.2. Because the hospital has adequate beds and staff, the impacts of plant construction on medical services are expected to be SMALL and not warrant mitigation. Social services, such as Medicaid and welfare, are funded through the Federal and State governments. The BLN construction boom is not expected to have an impact on these social services.

4.4.2.4 Housing

Regional housing availability is described in Subsection 2.5.2. The majority of the BLN employees are projected to live in Jackson County, Alabama. However, a few may opt to live in some of the surrounding counties.

Because construction of the BLN site is not a permanent condition, during the peak construction phase it is probable that not all of the estimated 3900 workers would move into the region and need housing. Jackson County has a total of 2553 vacant housing units, with 894 available for sale or rent. It is also probable that workers on short-term assignments would utilize transient housing in the form of hotels, motels, and campgrounds. As of July 2008, there are more than 330 hotel guest rooms and 320 campsites in Jackson County, and two additional hotels are planned for Scottsboro that are expected to provide an additional 150 to 160 hotel rooms. For this analysis, a conservative assumption is made suggesting 1950 workers (or half of the total anticipated peak on-site workforce of 3900, which includes 3250 construction and 650 operations workers) need housing during the peak construction phase, thus one housing unit per worker is required, for a total of 1950 units. This represents a deficit in the number of housing units available in Jackson County, although workers are anticipated to also utilize available housing in surrounding counties. Table 4.4-2 describes household growth trends in Jackson County.

The impacts of plant construction on the housing market in Jackson County are expected to be MODERATE to LARGE based on an estimated deficit in the number of available houses. The construction workforce will likely compete with lower-wage employees for housing, forcing up rental prices and decreasing availability (Reference 15). There are several small rural communities around the BLN site on both sides of the Tennessee River. While there are adequate roads and bridges in Jackson County between the site and many of these communities, on the east side of the river the local geography makes commuting to the site from those more distant locations, such as Dutton and Pisgah, less convenient. There are also less housing opportunities available in these communities because of their rural nature and availability of services. Therefore, a majority of workers are expected to concentrate in the communities nearer to the site and in larger cities within the BLN region. With mitigation, this impact to the housing market caused by increased competition for housing could be reduced to SMALL to MODERATE. Utilization of transient housing and hotels in Jackson County and surrounding counties by workers on short-term assignments is expected to also reduce the estimated housing deficit. The availability of housing would be reviewed again during the construction phase to assess whether mitigation efforts are needed. These efforts could include housing assistance for employees, transportation assistance for commuting employees, or remote parking areas with shuttles.

4.4.2.5 Education

A detailed description of the BLN regional public education system is described in Subsection 2.5.2.

The public school systems within Jackson County (Scottsboro City and Jackson County) are likely to receive the greatest impact from the BLN project in the way of an increased school-age population. The effects on school systems outside of Jackson County are expected to be negligible, because workers migrating to areas outside Jackson County are expected to move into nearby cities (such as Huntsville or Fort Payne, Alabama and Chattanooga, Tennessee) or into communities located along the major transportation routes between these cities, which already support a greater population (and likely greater school-age population) than Jackson County.

At peak construction it is estimated that 1950 workers and their families in-migrate to the BLN region, resulting in an estimated total of 7800 additional people (1950 multiplied by family size of four). The U.S. Census Bureau estimate for 2005 for Jackson County indicates 17 percent of the county's total population are school-age children (between the ages of 5 and 18) (Reference 19). The anticipated school-age population derived from the peak construction total is approximately 1350 (7800 multiplied by 17 percent). As an upper bounding estimate of population increase in Jackson County, it is assumed that all of the in-migrants settle in Jackson County.

Based on the 2004 - 2005 enrollment data for the Jackson County and Scottsboro City School Districts, the total number of students enrolled was 8734 (Subsection 2.5.2.8.2). Jackson County and Scottsboro City school districts employed 478 and 203 teachers, respectively, for a total of 681 during the 2004 - 2005 school year (References 20 and 21), which yields an average student-to-teacher ratio of approximately 12.8:1 within Jackson County, as a whole. If no additional teachers were hired and approximately 1350 additional students moved into Jackson County at peak construction due to the BLN project, the ratio would be approximately 14.8:1 ([1350 plus 8734 students] divided by 681 teachers). To maintain the 2004 - 2005 ratio of 12.8:1, a total of approximately 788 teachers (or 107 additional teachers) would be required by the time of peak construction.

In 2015, assuming normal growth of the current population, the total estimated number of school-age students (BLN-related population increase plus projected baseline population), in Jackson County is approximately 11,765. With no increase in the number of teachers, the overall student-to-teacher ratio would be 17.3:1. To maintain the 2004 - 2005 ratio of 12.8:1, a total of approximately 920 teachers (or approximately 240 additional teachers) would be needed by the time of peak construction.

This impact on Jackson County schools is expected to be lessened by some students enrolling in private schools or in schools outside of Jackson County, along with the gradual increase in the school-age population leading up to the peak construction period in 2015. Because the BLN-related population increase is planned to increase gradually over a 5-year period (Subsection 4.4.2.1), school districts in Jackson County are expected to have adequate time to respond to increased resource needs that result from school-age population increases due both to the BLN project and normal population growth.

In addition to a shortage of teachers and staff, other potential impacts to Jackson County schools could include overcrowding of classrooms and other school facilities, a shortage of classroom equipment and materials, and the need for additional school buses. The impacts of construction on the educational system of Jackson County, Alabama are expected to be MODERATE to LARGE but temporary, depending on the speed with which current school district expansion plans are implemented.

Mitigative measures could include hiring additional teachers and other required staff, and purchasing or leasing modular classrooms, additional materials, and school buses. Temporary or modular buildings offset temporary growth by providing classroom space, and they allow school systems time to build classrooms and facilities. The National Center for Education Statistics (NCES) acknowledges that temporary or modular buildings are often used by schools to reduce overcrowding (Reference 1). Other measures identified by NCES that could help reduce school overcrowding include adopting year-round or split-day schedules, staggering lunch schedules, and using off site instructional facilities. A discussion of tax revenues generated by the construction of BLN, some of which may be used to support schools, is located in Subsection 4.4.2.2.1.

Teachers and staff can be recruited through local training facilities, such as the Ernest Pruett Center of Technology, and through colleges, and universities in the BLN region. In addition, collaborative approaches to addressing potential education impacts could help mitigate impacts and support education goals.

TVA recognizes the opportunity to partner with local community colleges and technical schools to ensure the local population acquires skills that enhance their eligibility for future job opportunities in trained craft trades and engineering positions. Because there are approximately 4 years of lead time prior to the start of plant construction, TVA is developing a marketing strategy that includes high-school and middle-school students, and adults in the surrounding communities. This marketing strategy for recruiting will include branding to present a consistent look and message. TVA conducts training programs at the Ernest Pruett Center of Technology (EPCOT) for the Widows Creek Fossil Plant. TVA would likely establish a similar arrangement with EPCOT for training needs at BLN.

4.4.2.6 Recreation

Outdoor activities in the area include backpacking, climbing, camping, fishing, and hunting. Several state parks are located within the region and provide numerous facilities and recreational opportunities, including camping facilities, beach complexes, fishing centers, and hiking trails. Some facilities offer golf courses and upscale overnight accommodations. Local tourism and recreation is described further in Section 2.5.

Recreational areas within the BLN region could potentially be impacted by the increased population of BLN workers and their families and the increased competition for transient housing (as discussed in Subsection 4.4.2.4). Workers who relocate to the region are expected to utilize recreational areas and facilities to a similar degree as the permanent population of the region. Because many of the recreational opportunities of the region are outdoor activities without associated maximum capacities, it is difficult to accurately estimate utilization by the local permanent population. However, in 2007, the average peak daily transient population in the BLN

region was 109,204, and the estimated permanent population was 1,158,869 (as discussed in Subsection 2.5.1.4). Thus, on an average day, it is estimated that approximately 8.6 percent (109,204 / [1,158,869 + 109,204] x 100) of the total population of the region is transient. If a similar percentage of the additional BLN population utilized these same recreational areas, the impact would be SMALL and potentially beneficial. The impact on recreation due to increased competition for transient housing is expected to be SMALL to MODERATE; however, the construction of two new hotels in 2008 and other potential housing mitigation measures discussed in Subsection 4.4.2.4 are expected to decrease impacts on recreation due to the anticipated housing deficit.

Traffic congestion is expected to only impact recreation with respect to the recreational areas located along the primary access routes to the BLN site (Bellefonte Road and County Road 33, as discussed in Subsection 4.4.1.3). The nearest parks to the BLN site (Camp Jackson, a Boy Scout camping facility located 4.2 mi. from the site, and Jackson County Park, located 7.5 mi. from the site) are more than 4 mi. away. The nearest observed recreational activity to the BLN site (and only recreational area identified along the Bellefonte Road or County Road 33 access routes) is a small boat dock and sport fishing area immediately adjacent to the site. Due to the limited capacity and utilization of this dock area, as well as the measures taken by the BLN site to minimize traffic impacts along site access routes (such as staggered worker shifts and other traffic mitigation measures discussed in Subsection 4.4.1.3), impacts of traffic during construction on recreation would be SMALL and require no mitigation beyond the potential measures given in Subsection 4.4.1.3.

4.4.3 ENVIRONMENTAL JUSTICE IMPACTS

Executive Order 12898 (59 FR 7629) directs federal executive agencies to consider environmental justice under the National Environmental Policy Act. This Executive Order ensures that minority and/or low-income populations do not bear a disproportionate share of adverse health or environmental consequences of a proposed project, which in this instance would be construction of new reactors at the BLN site.

Subsection 2.5.4 describes the evaluation process used to identify minority and low-income populations living within the region that meet the conditions associated with the NRC guidance. Census blocks, block groups, and relative distances of minorities and low-income populations around the BLN site are identified in Tables 2.5-22 and 2.5-23, and Figures 2.5-9, 2.5-10, 2.5-11, 2.5-12, 2.5-13, 2.5-14, 2.5-15, 2.5-16, 2.5-17, 2.5-18, 2.5-19, 2.5-20, 2.5-21, 2.5-22, 2.5-23, 2.5-24, 2.5-25, 2.5-26, 2.5-27, and 2.5-28.

In general, the spatial distribution of minority populations in the region is random, with clusters occurring in urban areas. Locally, there are two minority populations identified on the opposite side of Town Creek from the site. Because the effects of construction occur primarily to the site and adjacent properties, it is anticipated that there is no disproportionate impacts to minority populations.

The nearest low-income population is in Scottsboro, Alabama, 6 mi. away from the BLN site. Many of the identified low-income populations are located within or near urban areas with the exception of one block group south of Huntsville, Alabama. Because of their distance from the site and geographic location, it is anticipated that the impacts to the population would be SMALL.

4.4.3.1 Potential Environmental Impacts

For the purposes of this environmental justice assessment, environmental impacts under consideration due to plant construction include potential impacts due to land use, water, and ecology. Ecological resources are a concern in the event that any minority or low-income populations in the area are dependent on fishing or farming for subsistence. Potential impacts due to land use are covered in detail in Section 4.1. Impacts due to water are covered in Section 4.2. Ecological impacts are covered in Section 4.3.

As outlined in Subsection 4.4.1, the BLN site construction is to remain within the site boundary. Therefore most of the impacts on the population are on the properties adjacent to the site.

As discussed in Section 4.1, the impacts on the surrounding public from any land use impacts as a result of plant construction would be SMALL. Because the effects are small and because of the spatial distribution of minorities and low-income population in the region, the potential for disproportionate land-use impacts on minority and low-income populations are SMALL.

As described in Section 4.2, the impacts on the surrounding public from any water related impacts as a result of plant construction would be SMALL. Because the effects are small and because of the spatial distribution of minorities and low-income population in the region, the potential for disproportionate water related impacts on minority and low-income populations are SMALL.

As described in Section 4.3, the impacts on the surrounding public from any ecological impacts as a result of plant construction would be SMALL. Because the effects are small and because of the spatial distribution of minorities and low-income population in the region, the potential for disproportionate ecological impacts on minority and low-income populations are SMALL.

Based on input from these sections, and the minimal construction activities anticipated outside the BLN site boundary, physical impacts are expected to be SMALL. Given the SMALL impacts overall, combined with the distribution patterns of minority and low-income populations stated earlier, the disproportionate impacts on minority populations is minimal and the potential for disproportionate impacts to low-income populations is SMALL. Construction on the BLN site complies with existing regulatory permits and applicable regulations.

4.4.3.2 Potential Socioeconomic Impacts

The socioeconomic impact categories with the greatest potential to affect minorities and low-income populations are transportation, housing, and education. The rest of the socioeconomic effects, which include public safety, noise, social services, public services, economy, and recreational resources are SMALL or beneficial, and resulting impacts to minority and low-income populations would also be SMALL or beneficial, regardless of their spatial distribution relative to the site.

Transportation during construction is expected to have a MODERATE to LARGE impact on local roads including U.S. 72, County Roads 33 and 113, and Bellefonte Road. Although few houses are located along the access roads, the residential properties present are rural houses on acreages or farms. The access roads provide access to, but are not adjacent to, the Creeks

Edge housing addition. Transient populations may utilize the southern access road to fish from the banks of the Guntersville Reservoir, but boat ramps are not located along the access roads. There are two aggregate minority plus Hispanic blocks that are located between the BLN site and U.S. 72, and one on the northwest side of U.S. 72. However, none of the minority blocks are located adjacent to the access roads. Thus, the minority populations are not expected to be adversely impacted by the construction traffic. The low-income populations in the vicinity are not located adjacent to the roads expected to be impacted. Therefore, low-income populations are not disproportionately affected.

The impacts of plant construction on the housing market in Jackson County are expected to be MODERATE to LARGE based on an estimated deficit in the number of available houses. However, this effect is expected to last during the construction phase. Based on the distribution pattern of minorities, the impact of this housing deficit on minority populations is not disproportionate. Because available housing in the vicinity is limited, there is a potential for increased demand from the influx of plant construction workers to result in rental rate and housing cost increases. Any such increases would affect the low-income population in the vicinity disproportionately to higher income groups, which could better absorb the increased costs. With mitigation measures, such as those described in Subsection 4.4.2.4, this impact can be reduced to SMALL to MODERATE. The availability of housing would be reviewed again during the construction phase to assess if mitigation efforts are needed. These efforts could include housing assistance for employees, transportation assistance for commuting employees, or remote parking areas with shuttles.

The impacts on the local education system are expected to be MODERATE to LARGE. The effects are also expected to be temporary. Because these impacts affect every school in the county, there is no disproportionate impact on minority or low-income populations.

Because the remainder of the effects are small and because of the spatial distribution of minorities and low-income population in the region, the potential for disproportionate socioeconomic impacts in these categories on minority and low-income populations are SMALL.

No additional land must be procured beyond the current site and no relocations to local off-site roads as a result of construction of a new facility are expected.

Several positive socioeconomic impacts were described in Subsection 4.4.2, principally applicable to the counties in the region, and would be realized by the construction of a new facility at the BLN. These include increased employment opportunities, as well as possible income increases, both directly and indirectly related to plant construction. These beneficial impacts also would be realized by minority and low-income populations.

4.4.3.3 Transmission Corridors

No new transmission lines or off-site areas used for the construction of the BLN are proposed as a part of this project. Because no new transmission corridors are required, impacts to off-site land use from the construction of new transmission corridors are SMALL. There are no disproportionate impacts due to land use on minorities and low-income populations.

4.4.3.4 Conclusion

Based on the Environmental Justice analysis, impacts on minority and low-income populations within the vicinity and region are expected to be SMALL with no mitigation required, with the exception of housing.

4.4.4 REFERENCES

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TABLE 4.4-1
ATTENUATED NOISE LEVELS (dBA) EXPECTED FROM CONSTRUCTION EQUIPMENT

Type of Noise Generating Equipment	Distance from Source (in feet)			
	50[a]	100	400	2000[b]
Heavy Trucks	89	83	71	57
Dump Trucks	88	82	70	56
Concrete Mixer	85	79	67	53
Jack Hammer	88	82	70	56
Scraper	89	82	71	57
Dozer	102	96	84	70
Generator	76	70	58	44
Crane	88	82	70	56
Loader	86	80	68	54
Grader	91	85	73	59
Dragline	85	79	67	53
Pile Driver	95	89	77	63
Fork Lift	95	89	77	63

Noise attenuation calculation. Noise level change (dBA) = 20 log (d^1/ d^2) where d^1 is the original distance from the source and d^2 is the measured distance from the source.

a) Maximum Noise levels (dBA) at 50 ft.

b) 2000 ft. is the approximate minimum distance from the potential major construction activities and the fence line.

TABLE 4.4-2
JACKSON COUNTY HOUSEHOLD GROWTH TRENDS

JACKSON COUNTY HOUSEHOLDS

Year	Population	Population Percent Change	Average Change in People/yr	Average Change in Households/yr
2006	53,745	-0.06	-30	-8
2000	53,926	1.14	613	153
1990	47,796			

NOTE:

The change in number of households per year is based on an average family size of four.

(Reference 1)

TABLE 4.4-X1 (Sheet 1 of 2)
BLN WORKFORCE POPULATION ESTIMATES

Date	Site-Specific Civil Structural	Site-Specific Fitters	Site-Specific Electricians	Site-Specific Miscellaneous Direct	Unit 3 Civil Structural	Unit 3 – Pipefitters	Unit 3 - Electricians	Unit 3 – Miscellaneous Direct	Unit 3 – Testing & Startup Support	Unit 4 – Civil Structural	Unit 4 – Pipefitters	Unit 4 – Electricians	Unit 4 – Miscellaneous Direct	Unit 4 – Testing & Startup Support	Distributable Indirect Support [a]	Non-Manuals [a]	OPERATIONS	SECURITY	TOTAL CONSTRUCTION WORKFORCE [a]	TOTAL ON-SITE WORKFORCE [a]
1/1/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	3
4/1/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	5	5
7/1/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	0	0	36	36
10/1/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46	0	0	46	46
1/1/2011	48	0	0	56	0	0	0	0	0	0	0	0	0	0	37	88	0	0	229	229
4/1/2011	57	0	0	56	0	0	0	0	0	0	0	0	0	0	40	102	0	0	255	255
7/1/2011	84	14	18	62	0	0	0	0	0	0	0	0	0	0	63	123	0	0	364	364
10/1/2011	88	16	26	62	0	0	0	0	0	0	0	0	0	0	68	148	0	0	408	408
1/1/2012	94	20	30	62	0	0	0	0	0	0	0	0	0	0	73	175	0	0	454	454
4/1/2012	102	28	38	62	0	0	0	0	0	0	0	0	0	0	82	193	0	0	505	505
7/1/2012	106	34	42	58	72	0	0	0	0	0	0	0	0	0	113	221	0	0	646	646
10/1/2012	116	34	42	54	80	0	0	0	0	0	0	0	0	0	119	241	125	50	686	861
1/1/2013	120	34	42	52	176	0	0	2	0	0	0	0	0	0	157	272	162	54	855	1071
4/1/2013	122	34	44	46	202	34	84	18	0	0	0	0	0	0	214	301	199	58	1099	1356
7/1/2013	122	34	44	42	256	92	112	22	0	72	0	0	0	0	289	324	235	63	1409	1707
10/1/2013	114	34	44	40	282	218	136	36	0	80	0	0	0	0	359	343	272	67	1686	2025
1/1/2014	110	34	44	40	288	254	150	70	0	176	0	0	2	0	427	422	309	71	2017	2397
4/1/2014	108	30	44	40	290	284	154	74	20	202	34	84	18	0	513	435	346	75	2330	2751
7/1/2014	106	28	44	38	308	302	184	74	30	256	92	112	22	0	600	454	383	79	2650	3112
10/1/2014	106	28	42	30	302	332	218	104	40	282	218	136	36	0	685	458	420	83	3017	3520

TABLE 4.4-X1 (Sheet 2 of 2)
BLN WORKFORCE POPULATION ESTIMATES

Date	Site-Specific Civil Structural	Site-Specific Fitters	Site-Specific Electricians	Site-Specific Miscellaneous Direct	Unit 3 Civil Structural	Unit 3 – Pipefitters	Unit 3 - Electricians	Unit 3 – Miscellaneous Direct	Unit 3 – Testing & Startup Support	Unit 4 – Civil Structural	Unit 4 – Pipefitters	Unit 4 – Electricians	Unit 4 – Miscellaneous Direct	Unit 4 – Testing & Startup Support	Distributable Indirect Support [a]	Non-Manuals [a]	OPERATIONS	SECURITY	TOTAL CONSTRUCTION WORKFORCE [a]	TOTAL ON-SITE WORKFORCE [a]
1/1/2015	106	28	40	24	298	334	214	88	50	288	254	150	70	0	706	460	456	88	3110	3654
4/1/2015	100	28	38	22	252	342	223	94	80	290	284	154	74	20	707	454	493	92	3162	3747
7/1/2015	86	28	32	18	226	336	245	97	80	308	302	184	74	30	718	453	530	96	3218	3844
10/1/2015	70	28	28	18	173	291	246	77	100	302	332	218	104	40	706	442	567	100	3175	3842
1/1/2016	46	20	18	6	94	265	114	68	170	298	334	214	88	50	642	409	609	100	2836	3545
4/1/2016	0	0	0	0	22	174	12	38	170	252	342	223	94	80	462	377	652	100	2246	2998
7/1/2016	0	0	0	0	0	0	0	0	154	226	336	245	97	80	367	338	694	100	1843	2637
10/1/2016	0	0	0	0	0	0	0	0	80	173	291	246	77	100	316	299	729	150	1582	2461
1/1/2017	0	0	0	0	0	0	0	0	60	94	265	114	68	170	273	194	739	163	1238	2140
4/1/2017	0	0	0	0	0	0	0	0	60	22	174	12	38	170	151	146	749	175	773	1697
7/1/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	154	55	114	758	188	323	1269
10/1/2017	0	0	0	0	0	0	0	0	0	0	0	0	0	80	28	109	768	200	217	1185
1/1/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	60	21	15	768	200	96	1064
4/1/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	60	21	0	768	200	81	1049
7/1/2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	768	200	0	968

a) Approximations carried into the ER text include 3250 for the peak TOTAL CONSTRUCTION WORKFORCE (shown in table as 3217 on 7/1/2015); 3900 for the peak TOTAL ONSITE WORKFORCE (shown in table as 3844 on 7/1/2015); and 1000 for the Operations workforce (shown in table as 968 [768 – Operations, 200 – Security] from 10/1/2017 forward).

4.5 RADIATION EXPOSURE TO CONSTRUCTION WORKERS

This section evaluates the potential radiological dose impacts to construction workers at the BLN site resulting from the operation of Bellefonte Unit 3. Because a portion of the Unit 4 construction period overlaps operation of Unit 3, construction workers at Unit 4 would be exposed to direct radiation and gaseous radioactive effluents from Unit 3. Doses to construction workers during construction of Unit 3 are not evaluated since the only radiation sources prior to the start-up of Unit 3 are background sources.

4.5.1 SITE LAYOUT

The BLN power block areas are shown on FSAR Figure 2.1-201. Construction activity for Unit 4 is outside the protected area for Unit 3 but inside the owner-controlled area.

4.5.2 RADIATION SOURCES

Construction workers at a new facility on the BLN site would not be exposed to any radiation sources until Unit 3 becomes operational. Workers constructing Unit 4 could be exposed to direct radiation, and to gaseous radioactive effluents emanating from the routine operation of Unit 3. Radiation dose to construction workers is due to direct radiation and airborne effluents from BLN Unit 3, and from background radiation.

The radiation exposure at the site boundary is considered in DCD Section 12.4.2. As stated in that DCD section, direct radiation from the containment and other plant buildings is negligible. Additionally, there is no contribution from refueling water because the refueling water is stored inside the containment instead of in an outside storage tank.

Small quantities of monitored airborne effluents are normally released through the plant vent or the turbine building vent. The plant vent provides the release path for containment venting releases, auxiliary building ventilation releases, annex building releases, radwaste building releases, and gaseous radwaste system discharge. The turbine building vents provide the release path for the condenser air removal system, gland seal condenser exhaust and the turbine building ventilation releases. The expected radiation sources (nuclides and activities) in the gaseous effluents are listed in DCD Table 11.3-3.

Exposure of Unit 4 construction workers to radioactive liquid effluents is not evaluated because the discharge structure and blowdown piping is expected to be completed during Unit 3 construction. The only exposure of Unit 4 construction workers to liquid effluents would be due to the tie-in of Unit 4 piping. The exposure from this activity should be negligible.

4.5.3 CONSTRUCTION WORKER DOSE ESTIMATES

The determination of construction worker doses due to Unit 3 operation depends on the airborne effluent released and the atmospheric transport to the worker location. The atmospheric dispersion calculation used the guidance provided in Regulatory Guide 1.111, meteorological data for the year beginning April 1, 2006 and ending March 31, 2007, and downwind distances to the construction worker locations. The XOQDOQ computer code (NUREG/CR-2919) was used to determine the χ/Q and D/Q values for the nearest location along the Unit 3 protected area

fence in each direction as well as the nearest point of the Unit 4 shield building construction area. The χ/Q and D/Q results and the distances used are given in Table 4.5-1.

The methodology used to calculate the doses to construction workers due to the normal effluent releases complies with the guidance provided in Regulatory Guide 1.109. Construction worker doses were estimated by use of the GASPAR computer code (NUREG/CR-4653). The Total Effective Dose Equivalent (TEDE), which is the sum of the Deep Dose Equivalent (DDE) and the Committed Effective Dose Equivalent (CEDE), was determined based on the GASPAR results. The annual TEDE dose was corrected for the actual time the construction workers are on site by multiplying by a ratio of hours worked per year to hours in a year.

Construction worker doses were conservatively estimated using the following information:

- The estimated maximum dose rate for each pathway.
- A construction worker exposure time of 2080 hrs. per year.
- A peak loading of 2100 construction workers per year for Unit 4 construction.

4.5.4 COMPLIANCE WITH DOSE REGULATIONS

BLN Unit 4 construction workers are, for the purposes of radiation protection, members of the general public. This means that the dose rate limits are lower than the 100 mrem/year limit to be considered a radiation worker. The construction workers (with the exception of certain specialty contractors loading fuel or using industrial radiation sources for radiography) do not work with radiation sources.

There are three regulations that govern dose rates to members of the general public. Dose rate limits to the public are provided in 10 CFR 20.1301, 10 CFR 20.1302, and 10 CFR Part 50, Appendix I. The design objectives of 10 CFR Part 50, Appendix I apply relative to maintaining dose as low as reasonably achieveable (ALARA) for construction workers. In addition, 40 CFR Part 190 applies as it is referenced in 10 CFR 20.1301. The requirements of 10 CFR 20.1201 through 20.1204 do not apply to the construction workers as they are considered members of the public and not radiation workers.

4.5.4.1 10 CFR 20.1301

The 10 CFR 20.1301 limits annual doses from licensed operations to individual members of the public to 100 mrem TEDE (total effective dose equivalent). In addition, the dose from external sources to unrestricted areas must be less than 2 mrem in any one hour. This applies to the public both outside and within access controlled areas. Given that the relevant sources are relatively constant in time, the hourly limit is met if the annual limit is met. The maximum dose rates are given in Table 4.5-2. For an occupational year, i.e., 2080 hrs. on-site, dose at the Unit 4 construction area would be 0.54 mrem TEDE. The use of 2080 hrs. assumes the worker works 40 hrs. per week for 52 weeks per year. The maximum dose anywhere on-site that would be accessible to a construction worker would be 7.1 mrem per year in the NNE sector at the Unit 3 fence line. This assumes the worker stood at this point on the fence line for all working hours for the entire year. This value is less than the limits specified above for members of the

public. Therefore, construction workers can be considered to be members of the general public for the purpose of not requiring radiation protection or monitoring.

4.5.4.2 10 CFR PART 50, Appendix I

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

4.5.4.3 40 CFR PART 190

The 40 CFR Part 190 criteria apply to annual doses, here called dose rates because the units are in mrem per year, received by members of the general public exposed to nuclear fuel cycle operations, i.e., nuclear power plants. Therefore, these regulations apply to BLN Unit 4 construction workers on the plant site, just as they apply to members of the general public who live off-site. The most limiting part of the regulation states “The annual dose equivalent (shall) not exceed 25 mrem (per year) to the whole body.” In the case of BLN Unit 3 effluent releases, if this regulation is met for the whole body, then the thyroid and organ components are expected to also be met.

Table 4.5-4 shows that the whole body dose rate is 0.5 mrem/2,080 hrs. The units are expressed to be clear that an occupancy of 2080 hrs. is assumed. Therefore, the requirements of 40 CFR Part 190 are met for all construction workers.

4.5.5 COLLECTIVE DOSES TO BLN UNIT 4 WORKERS

The collective dose is the sum of all doses received by all workers. It is a measure of population risk. The total worker collective dose is 1.13 person-rem. This estimate is based upon the construction workforce of 2100 and assumes 2080 hrs. per year occupancy for each worker.

4.5.6 RADIATION PROTECTION AND ALARA PROGRAM

Due to the exposures from BLN Unit 3 normal operations, there would be a radiation protection and ALARA program for BLN Unit 4 construction workers. This program meets the guidance of Regulatory Guide 8.8 to maintain individual and collective radiation exposures ALARA. This program also meets the requirements of 10 CFR 20.1302. Measures and controls to protect Unit 4 construction workers are given in Section 4.6. The construction worker impact due to radiation exposures from Unit 3 normal operations is SMALL.

Because the construction workers are not radiation workers, but are, for the purposes of radiation protection, members of the general public, individual monitoring and training of construction workers on BLN Unit 4 is not required. Construction workers would be treated, for purposes of radiation protection, as if they are members of the general public in unrestricted areas.

TABLE 4.5-1
CONSTRUCTION WORKER χ/Q AND D/Q VALUES

Location [a]	Sector	Distance (miles)	Distance (meters)	χ/Q No Decay Undepleted (sec/m^3)	χ/Q 2.26 Day Decay Undepleted (sec/m^3)	χ/Q 8.00 Day Decay Depleted (sec/m^3)	D/Q (m^{-2})
Unit 3 Fence Line	S	0.08	128	1.80E-04	1.80E-04	1.70E-04	2.60E-07
Unit 3 Fence Line	SSW	0.11	178	1.70E-04	1.70E-04	1.60E-04	2.50E-07
Unit 3 Fence Line	SW	0.18	292	8.40E-05	8.40E-05	7.90E-05	1.30E-07
Unit 3 Fence Line	WSW	0.15	238	6.80E-05	6.70E-05	6.30E-05	5.50E-08
Unit 3 Fence Line	W	0.12	193	5.90E-05	5.90E-05	5.50E-05	3.00E-08
Unit 3 Fence Line	WNW	0.11	184	4.90E-05	4.80E-05	4.60E-05	3.20E-08
Unit 3 Fence Line	NW	0.11	184	6.10E-05	6.00E-05	5.70E-05	4.70E-08
Unit 3 Fence Line	NNW	0.12	187	7.90E-05	7.90E-05	7.40E-05	6.70E-08
Unit 3 Fence Line	N	0.11	178	1.40E-04	1.40E-04	1.30E-04	1.20E-07
Unit 3 Fence Line	NNE	0.11	169	3.20E-04	3.20E-04	3.00E-04	2.70E-07
Unit 3 Fence Line	NE	0.11	169	1.90E-04	1.90E-04	1.80E-04	2.00E-07
Unit 3 Fence Line	ENE	0.09	149	9.60E-05	9.60E-05	9.00E-05	1.20E-07
Unit 3 Fence Line	E	0.07	119	9.80E-05	9.80E-05	9.10E-05	1.30E-07
Unit 3 Fence Line	ESE	0.07	116	7.30E-05	7.30E-05	6.80E-05	1.00E-07
Unit 3 Fence Line	SE	0.07	116	8.00E-05	8.00E-05	7.50E-05	1.10E-07
Unit 3 Fence Line	SSE	0.07	119	1.30E-04	1.30E-04	1.20E-04	1.70E-07
Unit 4 Shield Building	SE	0.14	232	2.20E-05	2.20E-05	2.10E-05	4.40E-08

a) The χ/Q and D/Q values are calculated at the nearest point of the Unit 3 fence line to the Unit 3 plant vent for each sector and at the nearest point of the Unit 4 shield building to the Unit 3 plant vent.

TABLE 4.5-2
CONSTRUCTION WORKER DOSE COMPARISON TO 10 CFR 20.1301 CRITERIA

Type of Dose	Dose Limits[a] (TEDE)	Estimated Dose[b]
Annual dose	100 mrem	0.54 mrem
Maximum dose rate in any hour	2 mrem/hr	2.6E-04

Dose Rate at Unit 3 Fence Line

Direction	Annual TEDE (mrem/yr)
S	4.2
SSW	4.0
SW	2.0
WSW	1.3
W	1.3
WNW	0.9
NW	1.2
NNW	1.7
N	3.1
NNE	7.1
NE	4.3
ENE	2.2
E	2.3
ESE	1.7
SE	1.9
SSE	3.0

a) 10 CFR 20.1301 Criteria.

b) At Unit 4 shield building construction area.

TABLE 4.5-3
COMPARISON WITH 10 CFR PART 50 APPENDIX I CRITERIA FOR EFFLUENT DOSES

	Annual Dose (mrem)	
	Annual Limit[(a)]	Estimated Dose
Whole body dose from liquid effluents	3 mrem	Negligible
Organ dose from liquid effluents	10 mrem	Negligible
Whole body dose from gaseous effluents	5 mrem	0.5 mrem
Skin dose from gaseous effluents	15 mrem	2.1 mrem
Organ dose from all effluents (thyroid)	15 mrem	0.9 mrem

a) 10 CFR Part 50, Appendix I criteria

TABLE 4.5-4
COMPARISON OF CONSTRUCTION WORKER DOSE FROM GASEOUS EFFLUENT DISCHARGES TO 40 CFR PART 190 CRITERIA

Type of Dose	Annual Dose Limits[a]	Evaluated Dose[b]
Whole body dose	25 mrem	0.5 mrem
Thyroid doses	75 mrem	0.9 mrem
Other organ doses (skin)	25 mrem	2.1 mrem

a) 10 CFR Part 20 requires that the dose to an individual from radioactive effluents also meet 40 CFR Part 190 limits.

b) At Unit 4 shield building construction area.

4.6 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

This section summarizes the principal adverse environmental impacts of construction of BLN and the associated measures and controls to limit these impacts. A modified Leopold Matrix has been developed to assess the cause-and-effect relationships between potential environmental disturbances and the corresponding affected environmental receptors/resources (Table 4.6-1).

The table compares environmental disturbances versus environmental receptors (resources). The top horizontal axis on the impact matrix represents the principal environmental disturbances that could result from construction activities. The left vertical axis depicts the environmental receptors or resources that could potentially be affected by those disturbances. The table also summarizes measures and controls that have been identified for mitigating construction impacts.

The significance indicators provided in Table 4.6-1 are designated using the following descriptors: SMALL (S), MODERATE (M), or LARGE (L). The significance indicators are defined in Section 4.0.

The assignment of significance levels (S, M, L) in Table 4.6-1 are based on the assumption that for each impact, corresponding mitigation measures and controls (or equivalents) are implemented. A blank cell in the elements column (“potential environmental disturbances”) denotes “no impact” of that type on the environmental resource.

Each “Impact Description or Activity” attribute is assigned a number. Similarly, each “Specific Measures and Controls” attribute is assigned a number in parenthesis which corresponds to the “Impact Description or Activity”.

The measures and controls described previously and in Table 4.6-1 are considered reasonable from a practical, engineering, and economic view. They are based on statutes and regulatory requirements, or they are accepted practices within the construction industry. Therefore these controls and measures are not expected to present an unreasonable or undue hardship.

Based on a review of the construction impacts described in this chapter, some general measures and controls for reducing these impacts at the BLN include:

- Phase I archaeological survey has been completed and is described in Subsection 2.5.3.1.
- Ecological survey has been completed and is described in Subsections 2.4.1.4.1, 2.4.2.4, and 2.4.2.5.4.
- Planning and engineering studies have been completed to determine how best to locate and construct infrastructure facilities (parking lots, storage facilities, office buildings, roads, etc.) so as to reduce construction impacts.
- Geologic borings, soil tests, and groundwater well data are used in combination with the planning and engineering studies to develop a storm water pollution prevention plan.

- Fugitive dust emissions are suppressed by spraying water on excavated soil and unpaved roadways during dry weather.

- Standard Tennessee Valley Authority (TVA) safety plan is prepared, and construction employees receive appropriate training in safety procedures, such as the use of hazardous materials and measures to be taken in the event of leaks, spills or releases.

- Materials safety data sheets are required for use of applicable hazardous materials at the BLN site. Construction employees are trained in the appropriate use of hazardous materials. Hazardous materials are used in accordance with applicable federal, state, and local law and regulations.

- Hazardous wastes are treated, stored, and disposed of in accordance with the Resource Conservation and Recovery Act, and any other applicable federal, state, and local law and regulations. Construction employees are trained in the appropriate handling and disposal of hazardous wastes, such as asbestos materials.

- Safety/environmental officer oversees and inspects construction activities.

- Construction activities are performed in accordance with applicable local, state, and federal ordinances, laws, regulations, and permits intended to prevent or minimize adverse environmental effects of construction activities on air, water, and land, and on workers and the public.

- Construction activities comply with applicable permits and licenses.

- Construction activities are performed in compliance with applicable corporate safety and construction procedures.

- Pertinent construction permits and environmental requirements are included in construction contracts.

More specific mitigation measures are detailed in Table 4.6-1.

TABLE 4.6-1 (Sheet 1 of 9)
SUMMARY OF MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

ENVIRONMENTAL RESOURCES (Section Reference)		Potential Environmental Impacts and Significance Levels														Impact Description or Activity	Specific Measures and Controls
		Noise	Erosion	Dust	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use Prot/Rest.	Water-Use Prot/Rest.	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomics	Rad Exp to Constr. Wkr.	Other Site-Specific		
4.1	**Land-Use Impacts**																
4.1.1	The Site and Vicinity		S			S			S-M							1. Construction of new buildings and impervious surfaces 2. Ground-disturbing activities, including grading and re-contouring 3. Removal of existing vegetation 4. Removal of hazardous wastes/materials 5. Stockpiling of soils on-site 6. Disposition of dredge materials and use of borrow material.	(1) Land has already been dedicated as the site for Bellefonte Units 1 and 2 and much of the site has been previously disturbed. No additional land is needed to complete construction of BLN. (1 and 2) Limit ground disturbances to the smallest amount of area practical to construct and maintain the units. (1 and 2) Conduct ground-disturbing activities in accordance with regulatory and permit requirements; use adequate erosion control measures to minimize impacts. (3) Limit vegetation removal to the area within the BLN site designated for construction activities. (4) Removal of hazardous wastes/materials through training and rigorous compliance with applicable regulations. (5) Restrict soil stockpiling and reuse to designated areas on the BLN site. (6) Use BMPs and minimize footprint to the degree feasible. (6) Placement of dredge materials above the 500-year flood elevation.

TABLE 4.6-1 (Sheet 2 of 9)
SUMMARY OF MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

ENVIRONMENTAL RESOURCES (Section Reference)		Potential Environmental Impacts and Significance Levels														Impact Description or Activity	Specific Measures and Controls
		Noise	Erosion	Dust	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use Prot/Rest.	Water-Use Prot/Rest.	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomics	Rad Exp to Constr. Wkr.	Other Site-Specific		
4.1.2	Transmission Corridors and Off-site Areas		S			S										1. There are no new transmission corridors to be sited nor lines to be constructed as part of this project. Construction power is to be provided from the existing on-site 161-kV switchyard.	(1) Apply TVA's Sensitive Area Review (SAR) process (as described in the transmission section of the ER), re-clear the existing line corridors as needed and proceed to re-establish the normal cycle of maintenance on the existing 500-kV and 161-kV lines. (1) Limit vegetation removal and construction activities to corridor, and to fall and winter to avoid nesting activities. (1) Restrict sites regarding access to corridor for construction equipment. (1) Minimize potential spills of hazardous wastes/ materials through training and rigorous compliance with applicable regulations. (1) Minimize potential impacts through avoidance, and compliance with permitting requirements and best management practices.
4.1.3	Historic Properties		S						S							1. Erosion and ground-disturbing activities on the BLN site, as well as activities to bring the de-energized portions of the existing transmission lines into the normal maintenance cycle.	(1) Conduct cultural resource surveys, including subsurface sampling prior to initiating ground-disturbing activities to identify buried historic, cultural, or paleontological resources. (1) Consult with State Historic Preservation Office if a cultural resource is discovered. (1) Halt work if a potential historic, cultural, or paleontological resource is discovered.

TABLE 4.6-1 (Sheet 3 of 9)
SUMMARY OF MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

ENVIRONMENTAL RESOURCES (Section Reference)		Potential Environmental Impacts and Significance Levels														Impact Description or Activity	Specific Measures and Controls
		Noise	Erosion	Dust	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use Prot/Rest.	Water-Use Prot/Rest.	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomics	Rad Exp to Constr. Wkr.	Other Site-Specific		
4.2	**Water-Related Impacts**																
4.2.1	Hydrologic Alterations						S					S				1. Maintenance activities on water intake structures could result in minor hydrologic changes.	(1) Adhere to applicable regulations and permits.
4.2.2	Water-Use Impacts		S	S			S						S			1. Water used in dust suppression would have a small effect on water usage 2. Increased worker population would result in a small increase in water use 3. Water drawn from reservoir for plant cooling	(1 and 2) No measures or controls are necessary because impacts are expected to be too small to warrant consideration of any mitigation measures.

TABLE 4.6-1 (Sheet 4 of 9)
SUMMARY OF MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

ENVIRONMENTAL RESOURCES (Section Reference)		Potential Environmental Impacts and Significance Levels														Impact Description or Activity	Specific Measures and Controls
		Noise	Erosion	Dust	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use Prot/Rest.	Water-Use Prot/Rest.	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomics	Rad Exp to Constr. Wkr.	Other Site-Specific		
4.2.3	Water-Quality Impacts		S			S	S		S			S				1. Potential maintenance or refurbishment of the barge facility, and maintenance dredging of the intake canal, blowdown diffuser, and Tennessee River adjacent to the BLN site 2. Potential erosion, and sediment and stormwater runoff from construction activities into water bodies 3. Potential minor spills of hazardous materials	(1) Use of best management practices in addition to TVA, USACE, and ADEM controls to protect affected water bodies. (2) Install stormwater drainage system at construction sites and stabilize disturbed soils. (2) Use best management practices to minimize erosion and sedimentation. (3) Use best construction practices to maintain equipment, and prevent spills and leaks. (3) Invoke BLN spill prevention control and countermeasure plan for construction practices.

TABLE 4.6-1 (Sheet 5 of 9)
SUMMARY OF MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

ENVIRONMENTAL RESOURCES (Section Reference)		Potential Environmental Impacts and Significance Levels														Impact Description or Activity	Specific Measures and Controls
		Noise	Erosion	Dust	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use Prot/Rest.	Water-Use Prot/Rest.	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomics	Rad Exp to Constr. Wkr.	Other Site-Specific		
4.3	**Ecological Impacts (i.e., impacts on the physical environment)**																
4.3.1	Terrestrial Ecosystems	S	S			S			S		M		S			1. Clearing and grading and habitat loss: animals, such as birds and mammals, displaced from the construction site; less mobile animals killed 2. Wildlife startled or frightened away by construction noises 3. Potential impacts from bird collisions with manmade structures (cranes, buildings) during construction 4. Release of hazardous materials or wastes 5. Construction of residences and facilities to support increased worker population 6. Construction activities disturb wetlands.	(1) Limit clearing to the smallest amount of area practical to construct and maintain the corridor (1) Use established procedures for minimizing erosion or sediment deposition on terrestrial habitat. (2) Schedule some construction activities for periods when they do not affect birds or the terrestrial ecosystem. (3) Impact is very small and no reasonable mitigation measures have been identified (4) Use best construction practices to maintain equipment and prevent spills and leaks. (5) Comply with zoning ordinances to prevent/limit effects of new housing construction on habitat. (6) Consult with U.S. Army Corps Engineers regarding compensatory mitigation and preparation of any applicable wetlands permitting requirements.

TABLE 4.6-1 (Sheet 6 of 9)
SUMMARY OF MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

ENVIRONMENTAL RESOURCES (Section Reference)		Potential Environmental Impacts and Significance Levels														Impact Description or Activity	Specific Measures and Controls
		Noise	Erosion	Dust	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use Prot/Rest.	Water-Use Prot/Rest.	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomics	Rad Exp to Constr. Wkr.	Other Site-Specific		
4.3.2	Aquatic Ecosystems	S	S			S	S					S	S		S	1. Potential impacts to surface water from stormwater pollution and spills 2. Erosion and runoff into nearby water bodies 3. Potential impacts to surface-water from increased sediment load during construction 4. Temporarily degraded aquatic habitat due to construction near the Tennessee River or wetlands.	(1) Develop and implement a construction stormwater pollution prevention plan. (1) Invoke spill prevention control and countermeasure plan for construction activities. (2 and 3) Implement erosion and sediment control plans that incorporate recognized best management practices. (2, 3, and 4) Install appropriate barriers and use best management practices to protect river prior to construction.

TABLE 4.6-1 (Sheet 7 of 9)
SUMMARY OF MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

ENVIRONMENTAL RESOURCES (Section Reference)		Potential Environmental Impacts and Significance Levels														Impact Description or Activity	Specific Measures and Controls
		Noise	Erosion	Dust	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use Prot/Rest.	Water-Use Prot/Rest.	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomics	Rad Exp to Constr. Wkr.	Other Site-Specific		
4.4	**Socioeconomic Impacts (i.e., impacts on the human environment)**																
4.4.1	Physical Impacts	S-M		S		M-L				S					S	1. Potential temporary and limited noise impacts to workers 2. Potential for worker accidents 3. Increased air and dust emissions from construction equipment 4. Increased debris to existing landfills	(1) Make public announcements or give prior notification of atypically loud construction activities. (1, 2, and 3) Train and appropriately protect BLN employees and construction workers to reduce the risk of potential exposure to noise, dust, and exhaust emissions. (1, 2, and 3) Manage concerns from workers or adjacent residents or visitors on a case-by-case basis through an employee-concerns resolution program. (2) Use dust control measures such as watering, stabilizing disturbed areas, covering trucks. (2) Provide on-site services for emergency first aid, and conduct regular health and safety monitoring. (3) Provide appropriate job training to construction workers. (3) Prepare a dust suppression plan and water unpaved roads and construction areas. (4) Establish procedures for, and perform audits to verify, waste disposal according to applicable regulations such as the Resource Conservation and Recovery Act (RCRA) (4) Establish a waste minimization program

TABLE 4.6-1 (Sheet 8 of 9)
SUMMARY OF MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

ENVIRONMENTAL RESOURCES (Section Reference)		Potential Environmental Impacts and Significance Levels														Impact Description or Activity	Specific Measures and Controls
		Noise	Erosion	Dust	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use Prot/Rest.	Water-Use Prot/Rest.	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomics	Rad Exp to Constr. Wkr.	Other Site-Specific		
4.4.2	Social and Economic Impacts				M–L				S				S–L			1. Traffic congestion impacts in the vicinity of BLN due to increased traffic during peak construction period 2. Potential short-term housing shortage 3. Potential for increased housing construction impacts 4. Potential short-term ability of infrastructure and schools to accommodate influx of students without additional facilities and teachers 5. Potential for increased traffic accidents with increased construction traffic 6. Beneficial impact on economy 7. Beneficial impact on Jackson County tax revenue	(1) Develop traffic-control mitigation plan. (1) Establish centralized parking area away from site and shuttle construction workers to the site. (1) Install traffic control lighting. (1) Stagger shifts, encourage car pooling, and time deliveries to avoid shift change or commute times. (1) Erect signs alerting drivers of construction and potential for increased construction traffic. (2) Anticipate that any housing shortages are mitigated through new construction in anticipation of arrival of construction workforce. (3) Comply with land-use ordinances to prevent over-crowding and promote "smart growth." (4) Fund additional community facilities and infrastructure, police, and fire protection through increased revenues that result from the large construction project. (5) Use procedures and employee training program to reduce potential for traffic accidents. (6) Impact is beneficial and does not necessitate mitigation. (7) Impact is beneficial and does not necessitate mitigation.
4.4.3	Environmental Justice Impacts				S				S	S			S			1. No disproportionately high or adverse impacts identified	(1) No mitigation measures required beyond those listed above.

TABLE 4.6-1 (Sheet 9 of 9)
SUMMARY OF MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING CONSTRUCTION

ENVIRONMENTAL RESOURCES (Section Reference)		Potential Environmental Impacts and Significance Levels														Impact Description or Activity	Specific Measures and Controls
		Noise	Erosion	Dust	Traffic	Effluents and Wastes	Surface Water	Groundwater	Land-Use Prot/Rest.	Water-Use Prot/Rest.	Terrestrial Ecosystem	Aquatic Ecosystem	Socioeconomics	Rad Exp to Constr. Wkr.	Other Site-Specific		
4.5	**Radiation Exposure to Construction Workers**																
4.5.1	Worker Impacts													S		1. Actions to protect construction workers while the first unit is operating and the second is being built	(1) Take measures such as monitoring workers, providing radiation worker training, and developing work plans that minimize worker radioactive exposure.

4.7 CUMULATIVE IMPACTS RELATED TO CONSTRUCTION ACTIVITIES

In accordance with NUREG-1555, Environmental Standard Review Plan (ESRP) 4.7, this section summarizes potential cumulative environmental impacts associated with the construction of the BLN facility.

4.7.1 CUMULATIVE ENVIRONMENTAL IMPACTS

This subsection has identified the cumulative impacts associated with the construction of BLN. As identified in NUREG-1555, ESRP 4.7, cumulative impact is defined as:

> The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

As identified in NUREG-1555, ESRP 4.7, the anticipated magnitude of the potential cumulative impacts was surmised from the following information:

- Identification of the geographic area to be considered in evaluating cumulative impacts.
- Identification of past, present, and reasonably foreseeable federal, nonfederal, and private actions that could have meaningful cumulative impacts with the proposed action.
- Information on cumulative impacts of relevant actions within the identified geographic area.

4.7.2 IDENTIFICATION OF CUMULATIVE IMPACTS ASSOCIATED WITH THE PROPOSED ACTION AND PAST AND PRESENT ACTIONS

The U.S. Environmental Protection Agency (EPA) provides the following guidance in identifying and determining cumulative impacts: Cumulative impacts can affect a broad array of resources and ecosystem components. In addition to considering the biological resources that are the staple of National Environmental Policy Act (NEPA) analysis, examples of other resources that should be considered include socioeconomic services and issues, human health, recreation, quality of life issues, and cultural and historical resources (Reference 1).

Cumulative impacts associated with construction of the BLN in conjunction with past and present actions are listed in Table 4.6-1. The table provides a summary of cumulative impacts associated with construction of BLN and impacts in the region due to pre-existing human activities. For example, with respect to water use and aquatic impacts, the analysis in the previous subsections of Section 4 already accounts for the changes in the Tennessee River due to the construction and operation of TVA's dams, including the Guntersville Reservoir. This analysis uses the NRC's three-level standard of significance levels for each element (SMALL, MODERATE, or LARGE). The use of these significance levels provides a characterization of the cumulative impacts on the region's ecological resources, socioeconomic resources, human health, recreation, quality of life issues, and cultural and historical resources that are associated with constructing the BLN.

Section 4.0 defines the significance levels that were used in the evaluation of environmental impacts resulting from BLN construction. The significance level of potential impact to each resource (i.e., SMALL, MODERATE, or LARGE) is assigned consistent with the criteria that NRC established in 10 CFR Part 51, Appendix B, Table B-1, Footnote 3. The impact categories evaluated in this section are consistent with those used in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437, Volumes 1 and 2.

The potential impacts resulting from construction of two new nuclear units at the BLN site are evaluated in Sections 4.1, 4.2, 4.3, 4.4, and 4.5, in light of the pre-existing conditions in the region caused by past and present human actions. For the duration of the construction of the proposed action, the evaluation took into account the potential impacts from factors known or likely to affect the environment. This included considering conditions at the site and surrounding region from past and present human activities.

For most impact areas, TVA anticipates the potential cumulative impacts resulting from construction to be generally SMALL, and additional mitigation would not be warranted. However, several impacts from construction could result in a SMALL to MODERATE impact, or in one case, a temporary MODERATE to LARGE impact. In these cases, mitigation measures may be warranted, as discussed in the applicable impact evaluation summaries in Sections 4.1, 4.2, 4.3, 4.4, and 4.5.

4.7.3 IDENTIFICATION OF CUMULATIVE IMPACTS ASSOCIATED WITH FUTURE KNOWN FEDERAL, NONFEDERAL, AND PRIVATE ACTIONS

The evaluation of cumulative impacts associated with the BLN project identifies the 50-mi. radius BLN region as the geographic area to be considered in evaluating cumulative impacts. The region surrounding the BLN site comprises a 50-mi. radius that includes all or part of 25 counties in three states (10 in Alabama, 7 in Georgia, and 8 in Tennessee). Subsection 2.2.3 provides a description of the region while Table 2.2-1 provides a tabulation of areas within the region, organized by land use category.

TVA's evaluation of cumulative impacts identified only one other scheduled major project within the BLN region with the potential for cumulative impacts with the construction of the BLN. As part of the Base Realignment and Closure Act of 2005 (BRAC), Redstone Arsenal, located at the periphery of the 50-mi. BLN region, is to be realigned (Subsection 2.5.1.2.1). It is estimated that this realignment will involve between 10,000 and 16,000 new direct and indirect jobs during construction, and approximately 4870 new direct and indirect jobs are expected in the surrounding four-county region during operation of Redstone Arsenal after realignment. Because BRAC construction is expected to be completed prior to the BLN construction commencement date of mid-2013, there should be no competition in the hiring of a BLN construction workforce due to BRAC, and cumulative impacts of these projects are expected to be SMALL.

Additionally, since the Redstone Arsenal is located at the periphery of the 50-mi. BLN region, construction at and operation of the Redstone Arsenal should have little or no environmental impact (including socioeconomic impact) in the vicinity of BLN. Therefore, the cumulative impacts of BLN and Redstone Arsenal should not be significantly different than the impacts discussed in Subsection 4.7.1.

4.7.4 REFERENCES

1. U.S. Environmental Protection Agency (EPA), Office of Federal Activities (2252A), Consideration of Cumulative Impacts in EPA Review of NEPA Documents, EPA 315 R 99-002/May 1999.

4.8 SEPARATION OF “CONSTRUCTION” AND “PRECONSTRUCTION” IMPACTS

[Note: In the context of this ER section, the term "construction" has two decidedly different meanings. When printed in italics, the term construction is referring to the specific term that is defined in 10 CFR 50.10, as discussed below. When italics are not used, the term "construction" is referring to the more commonly used general term that includes the sum total of the activities necessary to build the two-unit nuclear plant, including the associated supporting structures and facilities.]

In addition to the cumulative impacts attributable to the construction of the entire BLN facility that are summarized in Table 4.6-1, a breakdown or separation of estimated "construction" and "preconstruction" environmental impacts is provided in Table 4.8-1 for the purpose of assessing impacts attributable specifically to the construction of structures, systems, or components (SSCs) as defined in 10 CFR 50.10. The remaining BLN construction activities can be considered to be either "preconstruction" or "other than construction" under the definition of construction in 10 CFR 50.2.

Table 4.8-1 provides estimates of the percentage of impacts attributable to construction and to "preconstruction," as well as a summary of the basis for the estimates. In order to divide the impacts of construction and preconstruction activities for the purposes of Table 4.8-1, TVA performed a simplified calculation to determine the percent of activities that are safety-related and the percent that are non-safety-related, and used those percentages as a surrogate for the percent of impacts that are attributable to construction activities and preconstruction activities. The scope of construction as defined in 10 CFR 50.10(a)(1) is somewhat broader than safety-related activities, and therefore the analysis in Table 4.8-1 may tend to slightly overestimate the impacts due to preconstruction activities and slightly underestimate the impacts of construction activities. However, a precise estimate of the percent of activities that fall within the scope of 10 CFR 50.10(a)(1) is not available, whereas TVA does have a basis for the labor estimates of those activities that are safety-related. Since the difference between "safety-related" activities and 50.10 construction activities is relatively small with respect to the determination of environmental impacts from a passive plant such as the AP1000, TVA believes that the percentage of safety-related activities provides a useful "order of magnitude" estimate of the impacts of the 50.10 construction activities.

The estimated construction-related impacts presented in the table were based primarily on two factors, namely the area associated with the construction of safety-related SSCs and the labor hours associated with the construction of safety-related SSCs. Information related to these two factors is provided as follows:

Construction Area — The BLN site consists of approximately 1600 contiguous ac., exclusive of off-site linear facilities (discharge pipelines, electric transmission line corridors, and rail corridors). The total estimated area to be developed for the BLN is estimated to be approximately 600 ac., including approximately 400 ac. disturbed by previous construction activities for Units 1 and 2 (exclusive of the electric transmission lines) and approximately 200 ac. affected by construction of Units 3 and 4. Of these developed areas, approximately 50 ac. are expected to be developed for safety-related SSCs (25 ac. each for BLN 3 and BLN 4). The area that is expected to be

developed for the construction of safety-related SSCs therefore represents approximately 8 percent of the total area that is expected to ultimately be developed (excluding electric transmission lines). For the purposes of this assessment, the impacted area associated with safety-related SSCs is considered to be less than 10 percent.

Labor Hours

Preliminary construction estimates for all phases of development of two AP1000 units on a greenfield site concluded that the estimated labor hours associated with the construction of SSCs is approximately 36 percent of the total labor hours associated with the development of the entire two-unit plant site. Adjusting the greenfield site labor estimate to account for the preconstruction work that has already been completed at the BLN site (i.e., site clearing/grading, dredging, intake and discharge piping and structures, and cooling towers complete), it is estimated that the total labor hours associated with the construction of SSCs at BLN would account for approximately 40 percent of the total labor hours remaining to complete the development of the two-unit BLN site.

TABLE 4.8-1 (Sheet 1 of 4)
SUMMARY OF CONSTRUCTION-AND PRECONSTRUCTION-RELATED IMPACTS FOR SAFETY-RELATED STRUCTURES, SYSTEMS, OR COMPONENTS

Section Reference	Potential Impacts and Significance [a]	Estimated Impacts (%) Construction [b]	Estimated Impacts (%) Preconstruction	Basis of Estimate
ER Section 4.1 Land-Use Impacts				
ER Subsection 4.1.1 The Site and Vicinity	S – Erosion S – Effluents and Wastes S-M – Land-Use Protection/Restoration	10	90	Estimates are based on the area of land use that will be dedicated to safety-related structures, systems, or components (SSCs) and the assumption that the construction of SSCs will occur on no more than approximately 50 acres (25 acres each for BLN Units 3 and 4) of the project area being developed (that is, 600 acres, excluding off-site electric transmission lines) (8%, restated as <10%).
ER Subsection 4.1.2 Transmission Corridors and Off-Site Areas	S – Erosion S – Effluents and Wastes	0	100	Neither transmission corridors nor any other off-site areas associated with construction of BLN is included in the definition of construction of SSCs.
ER Subsection 4.1.3 Historic Properties	S – Erosion S – Land-Use Protection/ Restoration	0	100	The impact of historic properties will apply only to preconstruction activities, because they will be identified prior to land clearing, grading, installation of drainage, erosion and other environmental mitigation measures, and construction of temporary roads and laydown areas.
ERSection 4.2 Water-Related Impacts				
ER Subsection 4.2.1 Hydrologic Alterations	S – Surface Water S – Aquatic Ecosystem	10	90	Estimates are based on the area of land use that will be dedicated to safety-related structures, systems, or components (SSCs) and the assumption that the construction of SSCs will occur on no more than approximately 50 acres (25 acres each for BLN Units 3 and 4) of the project area being developed (that is, 600 acres, excluding off-site electric transmission lines) (8%, restated as <10%).

TABLE 4.8-1 (Sheet 2 of 4)
SUMMARY OF CONSTRUCTION-AND PRECONSTRUCTION-RELATED IMPACTS FOR SAFETY-RELATED STRUCTURES, SYSTEMS, OR COMPONENTS

Section Reference	Potential Impacts and Significance [a]	Estimated Impacts (%) Construction [b]	Preconstruction	Basis of Estimate
ER Subsection 4.2.2 Water-Use Impacts	S – Erosion S – Dust S – Surface Water S – Socioeconomics	10	90	Estimates are based on the area of land use that will be dedicated to safety-related structures, systems, or components (SSCs) and the assumption that the construction of SSCs will occur on no more than approximately 50 acres (25 acres each for BLN Units 3 and 4) of the project area being developed (that is, 600 acres, excluding off-site electric transmission lines) (8%, restated as <10%).
ER Subsection 4.2.3 Water Quality Impacts	S – Erosion S – Effluents and Wastes S – Surface Water S – Land-Use Protection/ Restoration S – Aquatic Ecosystem	10	90	Estimates are based on the area of land use that will be dedicated to safety-related structures, systems, or components (SSCs) and the assumption that the construction of SSCs will occur on no more than approximately 50 acres (25 acres each for BLN Units 3 and 4) of the project area being developed (that is, 600 acres, excluding off-site electric transmission lines) (8%, restated as <10%).
ER Section 4.3 Ecological Impacts (i.e., impacts on the physical environment)				
ER Subsection 4.3.1 Terrestrial Ecosystems	S – Noise S – Erosion S – Effluents and Wastes S – Land-Use Protection/ Restoration M – Terrestrial Ecosystem S – Socioeconomics	0	100	Ecological impacts will occur during preconstruction activities and mobile wildlife species are expected to vacate the site until construction is complete. Impacts to native plants will occur during land clearing and preparation.

TABLE 4.8-1 (Sheet 3 of 4)
SUMMARY OF CONSTRUCTION-AND PRECONSTRUCTION-RELATED IMPACTS FOR SAFETY-RELATED STRUCTURES, SYSTEMS, OR COMPONENTS

Section Reference	Potential Impacts and Significance [a]	Estimated Impacts (%) Construction [b]	Preconstruction	Basis of Estimate
ER Subsection 4.3.2 Aquatic Ecosystems	S – Noise S – Erosion S – Effluents and Wastes S – Surface Water S – Aquatic Ecosystem S – Other Site-Specific	40	60	Estimates are based on the percent of total project labor hours that will be dedicated to the construction of safety-related structures, systems, or components (SSCs), all of which will be in the power block areas for BLN (approximately 40%).
ER Section 4.4 Socioeconomic Impacts (i.e., impacts on the human environment)				
ER Subsection 4.4.1 Physical Impacts	S-M – Noise S – Dust S – Water-Use Protection/ Restoration S – Other Site-Specific	25	75	Most perceptible noise impacts at off-site locations will occur during the most intense operations in the power block area and will include pile driving of SSCs. Air emissions will occur in the vicinity of the SSCs (power block area) during construction. Estimates are based on the average of the percent of labor hours dedicated to safety-related structures, systems, or components (SSCs) (40%) and the percent of land dedicated to SSCs (10%) (Average stated as 25%).
ER Subsection 4.4.2 Social and Economic Impacts	M-L – Traffic S – Land-Use Protection/ Restoration S-L – Socioeconomics	40	60	Estimates are based on the percent of total project labor hours that will be dedicated to the construction of safety-related structures, systems, or components (SSCs), all of which will be in the power block areas for BLN (approximately 40%).

TABLE 4.8-1 (Sheet 4 of 4)
SUMMARY OF CONSTRUCTION-AND PRECONSTRUCTION-RELATED IMPACTS FOR SAFETY-RELATED STRUCTURES, SYSTEMS, OR COMPONENTS

Section Reference	Potential Impacts and Significance [a]	Estimated Impacts (%) Construction [b]	Preconstruction	Basis of Estimate
ER Subsection 4.4.3 Environmental Justice Impacts	S – Traffic S – Land-Use Protection/ Restoration S – Water-Use Protection/ Restoration S – Socioeconomics	40	60	Estimates are based on the percent of total project labor hours that will be dedicated to the construction of safety-related structures, systems, or components (SSCs), all of which will be in the power block areas for BLN (approximately 40%).
ER Section 4.5 Radiation Exposure to Construction Workers				
ER Subsection 4.5.1 Worker Impacts	S – Radiation Exposure to Construction Workers	20	80	Estimates are based on 50% of the workforce remaining during the completion of the SSCs for BLN Unit 4 (half of 40%).

a) The assigned potential impact significance levels of (S)MALL, (M)ODERATE, or (L)ARGE are based on the assumption that mitigation measures and controls would be implemented.

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