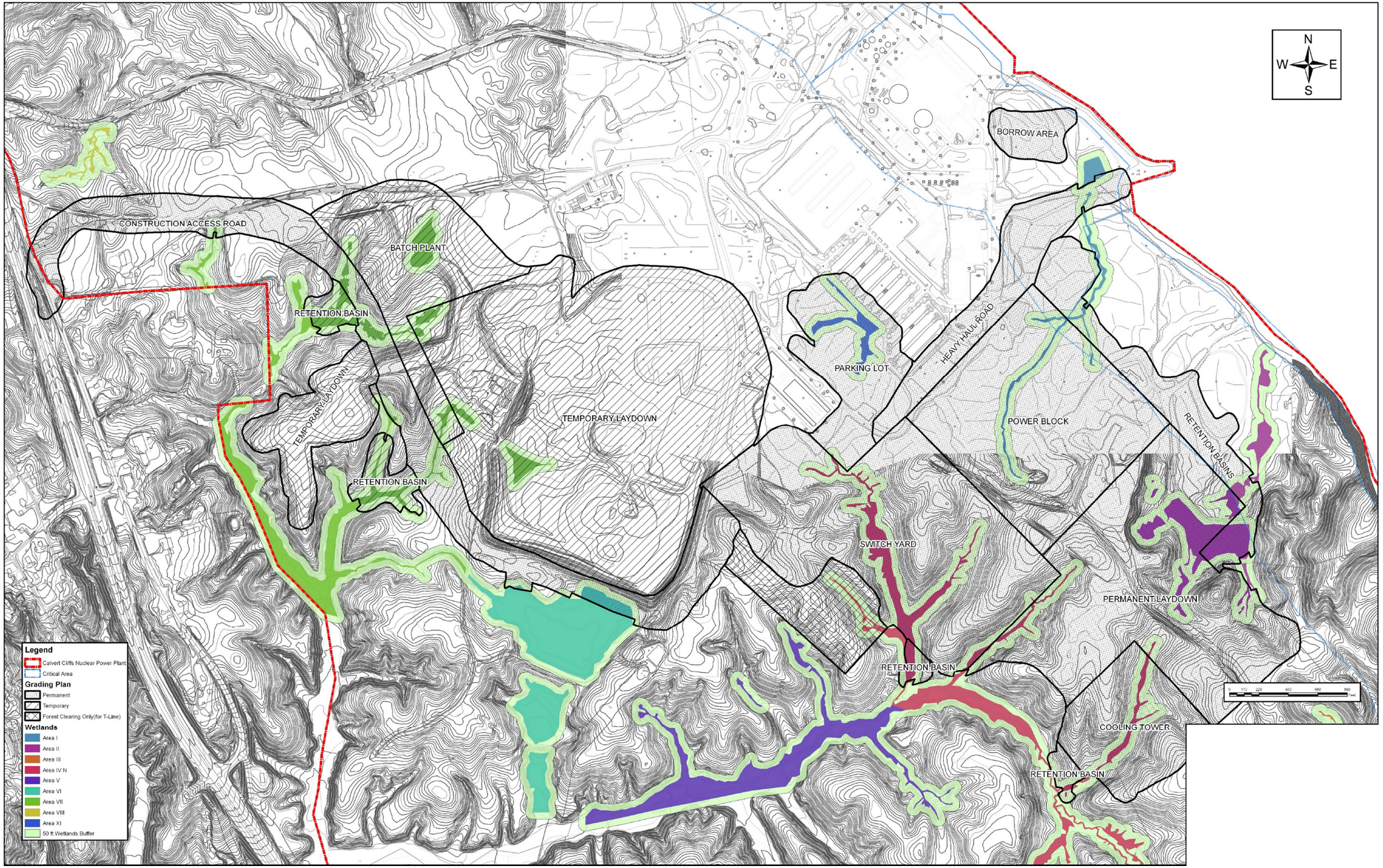

FIGURE 4.3-2 **Rev. 2**

{CCNPP} WETLAND IMPACTS

CCNPP UNIT 3 ER

4.4 SOCIOECONOMIC IMPACTS

4.4.1 PHYSICAL IMPACTS

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

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

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

4.4.1.1 The Public and Workers

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

4.4.1.2 Noise

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

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

Typical noise levels from equipment that is likely to be used during construction are provided in Table 4.4.1-1 (Beranek, 1971). Onsite noise levels that workers will be exposed to are controlled through appropriate training, personnel protective equipment, periodic health and safety monitoring, and industry good practices. Good practices such as maintenance of noise limiting devices on vehicles and equipment, and controlling access to high noise areas, duration of emission, or shielding high noise sources near their origin will limit the adverse effects of noise on workers. Non-routine activities with potential to adversely impact noise levels such as blasting will be conducted during weekday business hours and utilize good industry practices that further limit adverse effects.

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

Traffic noise in the local area will increase as additional workers commute, and materials and waste are transported to and from the construction site. Noise impacts will occur primarily

during shift changes and will not be extraordinary given the source and nature of vehicle noise and the normally varying nature of transient vehicle noise levels. Additionally, localized impacts will be reduced as distance from the construction site increases and traffic diverges outward.

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

4.4.1.3 Dust and Other Air Emissions

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

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

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

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

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

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

In summary, air emission impacts from construction are expected to be small because emissions will be controlled at the sources where practicable, maintained within established regulatory limits that were designed to minimize impacts, and distance between the construction site and the public will limit offsite exposures. Construction air emissions impacts are temporary because they will only occur during the actual use of the specific construction equipment or conduct of specific construction activities, and surfaces will be stabilized upon completion of construction activities.

4.4.1.4 Buildings

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

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

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

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

4.4.1.5 Transportation Routes

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

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

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

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

The TIA based its conclusions on the ability of the MD 2/4 roadway network to accommodate projected construction traffic volumes generated utilizing techniques to measure capacity in the form of Critical Lane Volume (CLV) at intersections with signals (e.g., stop lights) and level of service (LOS) at intersections without signals (e.g., use of signage only such as stop or yield signs). Any signal-controlled intersection with a CLV of 1450 vehicles/hour (vph) or less was

considered acceptable, based on the state and county guidelines. LOS, on the other hand, is an ordinal scale that is defined from A to F, with "A" being the best level of service. Typically, the LOS is determined for the peak hour during the identified periods as it represents "worst case" conditions. A LOS with scale of "E" or better (delays of less than 50 seconds) at an intersection without signal control was considered acceptable.

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

Nonetheless, the TIA concluded that the existing roadway system has insufficient capacity to handle this peak demand. Refer to Table 4.4.1-2. The intersections of Calvert Beach Road and Nursery Road are the most affected during the morning and afternoon peak traffic hour. The critical element in the increased traffic levels is the construction crew and not traffic delivering materials arriving to the site.

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

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

4.4.1.6 Aesthetics

{Construction activities generally will not be visible from points outside the CCNPP site boundary due to the heavily wooded area surrounding the site. Section 3.1 provides a detailed description of the site and figures that illustrate the appearance of the facility after completion. Construction activities will be visible on those portions of the facility visible in the illustrations, for example construction equipment such as cranes will be visible during use. Federal regulations require that any temporary or permanent structure, including all appurtenances, that exceeds an overall height of 200 ft (61 m) above ground level be appropriately marked with lighting. The tallest new structures on the site will be below this height; however temporary cranes used to construct these structures that are likely to require lighting during their use.

Recreational users of Chesapeake Bay to the north and east will generally be unable to view the construction site due to its elevation above the water and setback distance from the shoreline.

Portions of the construction may be visible from certain locations on the Bay (see Section 3.1), including elevated activities and those conducted along the shoreline such as the barge unloading facility, and installation of intake and discharge equipment.

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

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

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

4.4.1.7 References

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

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

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

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

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

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

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

4.4.2 SOCIAL AND ECONOMIC IMPACTS

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

4.4.2.1 Study Methods

{Changes in regional employment can result in impacts to the region's social and economic systems. An estimate of direct full-time equivalent (FTE) personnel that would be needed to construct the new unit was determined and is provided in Table 4.4.2-1. "Direct" jobs are those new construction employment positions that would be located on the CCNPP site. "Indirect jobs" are positions created off of the CCNPP site as a result of the purchases of construction

materials and equipment, and the new direct workers' spending patterns in the ROI. Examples of indirect jobs that could be generated include carpenters and other construction jobs, barbers, restaurant personnel, gas station and auto repairs jobs, convenience store cashiers, drying cleaning and laundry jobs, and so forth.

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

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

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

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

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

4.4.2.2 Construction Labor Force Needs, Composition and Estimates

4.4.2.2.1 Labor Force Availability and Potential Composition

{There will be an estimated maximum 3,950 FTE person workforce constructing the CCNPP Unit 3 power plant between 2011 and 2015, representing a significant increase in the overall employment opportunities for construction workers. In comparison, Calvert County had 2,231 construction jobs in 2006 and St. Mary's County had 1,716 construction jobs (MDDLLR, 2007). As shown in Table 4.4.2-1, this peak is estimated to last for about 12 months, from about the third quarter of the fourth year of construction through about the second quarter of the fifth year. Over the course of the entire construction period, staffing needs are estimated to increase relatively steadily from the third quarter of the first year until the peak is reached. Once the

peak has passed, the staff levels again will drop steadily, until the last 5 months of construction when employment levels will drop significantly.

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

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

Estimates about the composition of the CCNPP Unit 3 construction workforce (i.e., types of personnel needed) have not been developed for the power plant. However, existing studies of other nuclear power plant construction sites provide an indication about the potential composition of the CCNPP Unit 3 construction workforce. As shown in Table 4.4.2-2 (DOE, 2005), during the peak construction period an estimated 67% (2,635) of the construction workforce could be craft labor. Other less prevalent construction personnel could include about 8% (330) of UniStar's operation and maintenance staff, 7% (265) site indirect labor, and 6% (230) Nuclear Steam Supply System vendor and subcontractor personnel.

In more specifically reviewing only the potential craft labor force component of the entire construction workforce (see Table 4.4.2-3, DOE, 2005), the greatest levels of employment during the peak of construction could be about 18% (475) electricians and instrument fitters, 18% (475) iron workers, 17% (450) pipefitters, 10% (265) carpenters, and 10% (265) of general laborers. Table 4.4.2-4 shows the percentage of each of these craft labor categories that would be needed during seven phases of construction. Carpenters, general laborers, and iron workers would comprise the greatest proportions of the workforce during the concrete formwork, rebar installation, and concrete pouring phase of construction. Iron workers would continue to be the greatest portion of the workforce during the installation of structural steel and miscellaneous iron work. General laborers and operating engineers would be most needed during the earthwork and clearing of the site, including excavation and backfilling. The installation of mechanical equipment would primarily require pipefitters and millwrights. Pipefitters would also be the primary craft labor category working during installation of piping. Electricians would be the most prevalent during installation of the power plant instrumentation and the electrical systems (GIF, 2005).**}**

4.4.2.3 Demography

{As stated above, it is estimated that a peak of 3,950 FTE employees would be required to construct CCNPP Unit 3. As shown in Tables 4.4.2-5 and 4.4.2-6, under the 20% in-migration scenario an estimated peak of 720 construction workers would migrate into the ROI along with about 1,160 family members, for a total of 1,880. Of these, the total estimated direct in-migration would be about 1,400 people (68%) into Calvert County and 475 people (23%) into St. Mary's County. Under the 35% in-migration scenario an estimated peak of 1,260 direct workers would migrate into the ROI along with about 2,025 family members, for a total of 3,285 people. Of these, the total estimated peak in-migration would be about 2,455 people (68%) into Calvert County and 830 people (23%) into St. Mary's County.

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

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

Figure 4.4.2-1, shows the overlapping 50 mile (80 km) zones for four nuclear power plant sites surrounding the CCNPP site. The other power plants include Salem Units 1 & 2 and Hope Creek Unit 1 to the northeast, Peach Bottom Units 2 and 3 to the north, North Anna Units 1 and 2 to the southwest, and Surry Units 1 and 2 to the south/southwest. As can be seen in the figure, the CCNPP site's 50 mi (80 km) radius overlaps slightly with the 50 mi (80 km) zones of each of these facilities. The cumulative effect of a portion of the construction workforce originating from within 50 mi (80 km) of Calvert Cliffs and potentially drawing employees from these other four power plants, or significantly adding to the total employment levels for these types of facilities in these areas, would be small because of the distances and intervening political and geographical features, and would not require mitigation.**}**

4.4.2.4 Housing

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

However, since 2000, discussions with the Calvert County Department of Economic Development indicated that the housing market in Calvert County might be tight. Despite this indication, as shown in Section 2.5.2 the county issued a low of 488 authorizations for

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

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

In addition to the above housing units, there are a total of 33 apartments and townhouse complexes providing one to three bedroom rental units in the ROI. Most of these facilities are located in St. Mary's County, including 28 apartment and townhouse complexes. These rental complexes could be used to house part of the in-migrating workforce and might be a viable option to purchasing more costly single-family homes. In addition, the St. Mary's County Government has indicated that some apartment units currently used by a major employer in the county to house staff in training, might become available in the future because of potential relocation of training activities to areas outside of Maryland. These units could provide an additional housing option for the in-migrating construction workforce.

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

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

4.4.2.5 Employment and Income

4.4.2.5.1 50 mi (80 km) Comparative Geographic Area

{As stated above, it is estimated that a peak of 3,950 direct construction employees would build CCNPP Unit 3. Under the 20% peak in-migration scenario described above, it is implicit that the remaining 80% (3,160) either would be commuting from a reasonable distance on a daily basis or would stay at area hotels/motels and would be weekly/monthly commuters to the job site. Under the 35% in-migration scenario, an estimated 65% (2,570) of the peak direct construction workers would be daily or weekly/monthly commuters. The greatest proportion of these workers

would likely commute from within or near the Washington DC; Alexandria, Virginia; Annapolis, Maryland; and the Baltimore, Maryland, metropolitan areas. However, a portion of these workers also would likely originate from outside of this 50 mi (80 km) radius, from throughout the middle eastern seaboard and the remainder of the U.S. The greater the distance that they would commute and the longer that they are employed on the construction site, the more likely they would be to commute from home on a weekly or monthly basis and stay in area motels, or to become in-migrants into the ROI, as described in the housing section above. Because the employment opportunities and income would be spread over the 50 mi (80 km) radius, and an even larger geographic area and basis of comparison outside of the region, the beneficial impacts would be small and would not require mitigation.

4.4.2.5.2 Two-County Region of Influence

Direct construction workforce employment is already discussed in the demography section above. In addition to the 3,950 direct workforce, a peak of 495 indirect workforce jobs would be created in the ROI under the 20% scenario and 860 indirect jobs would be created under the 35% scenario (see Tables 4.4.2-5 and 4.4.2-6). This would result in a peak increase of 1,212 to 2,120 employed people in the ROI, depending upon the scenario selected. The peak increase in employment would range from 905 to 1,585 people in Calvert County and 310 to 535 people in St. Mary's County. Unemployed or underemployed members of the labor force could benefit from these increased employment opportunities, to the extent that they have the craft skills required (e.g., laborers, carpenters, electricians, plumbers, welders) and are hired as part of the construction workforce. These increases would result in a noticeable but small impact to the area economy, representing a maximum 4.0% increase in the 39,341 total labor force in Calvert County in 2000 and 1.2% in the 46,032 total labor force in St. Mary's County (USCB, 2000).

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

4.4.2.6 Tax Revenue Generation

4.4.2.6.1 50 mi (80 km) Comparative Geographic Area

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

wages for the region and the 50 mi (80 km) radius, it is concluded that the potential increase in state income taxes represent a small economic benefit.

Additional sales taxes also would be generated by the power plant and the in-migrating residents. Constellation Generation Group and UniStar Nuclear Operating Services would directly purchase materials, equipment, and outside services, which would generate additional state sales taxes. Also, in-migrating residents would generate additional sales tax revenues form their daily purchases. The amount of increased sales tax revenues generated by the in-migrating residents would depend upon their retail purchasing patterns, but would only represent a small benefit to this revenue stream for the region and the 50 mi (80 km) radius.

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

4.4.2.6.2 Two-County Region of Influence

{In 2006, Constellation Energy paid about $15.8 million in Calvert County property taxes (including $10.3 million in personal property and $5.5 million in operating real property taxes) for Units 1 and 2, and in 2007 it paid about $16.2 million in property taxes (including $10.6 million in personal property and $5.6 million in operating real property taxes),

The total project capital cost estimated for CCNPP Unit 3 is **[ ]** billion (in 2007 dollars). In 2007, the CCNPP Unit 3 site is estimated to generate **[ ]** million in total property taxes in its current, substantially undeveloped state. Investments in planning, engineering, and an assumed limited work authorization from 2008 through 2010 would result in UniStar paying increased county total property taxes, from about **[ ]** million in 2008, to **[ ]** million in 2009, to **[ ]** million in 2010. Even more substantial increases in total property tax payments would occur in subsequent years once major construction activities commence, including **[ ]** million in 2011, **[ ]** million in 2012, **[ ]** million in 2013, **[ ]** million in 2014, and **[ ]** million in 2015. The maximum of **[ ]** million would represent a significant **[ ]** percent increase in Calvert County's $78.8 million in annual property (real and personal) tax revenues for fiscal year 2005, and a **[ ]** percent increase in total county revenues of $174.1 million (see Section 2.5.2).

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

Additional county income taxes would be generated by the in-migrating residents, although the amount cannot be estimated because of the variability of investment income, retirement contributions, tax deductions taken, applicable tax brackets, and other factors. It is estimated that Calvert County would experience a $66.5 million increase in annual wages from the direct workforce. St. Mary's County would experience an estimated annual increase of $22.5 million from the direct workforce. Relative to the existing total wages for the ROI, it is concluded that the potential increase in county income taxes represent a small economic benefit to the jurisdictions.

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

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

4.4.2.7 Land Values

{The Maryland Department of Natural Resources evaluated three industrial facilities to determine how their presence might affect area property values. The three industrial facilities included CCNPP Units 1 and 2, the Alcoa Eastalco Works in Frederick County, and the Dickerson Generating Plant in Montgomery County. The study showed that residential property values were not adversely affected by their proximity to the CCNPP site. Overall, Maryland power plants have not been observed to have negative impacts on surrounding property values. This lack of impact is partially attributed to impact mitigation fees imposed in Maryland Power Plant Research Program (PPRP) conditions stipulated in Certificates of Public Convenience and Necessity (CPCNs). It is concluded that the impacts to land values would be SMALL, and would not require mitigation.**}**

4.4.2.8 Public Services

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

<u>Police</u>

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

Similarly, representatives from St. Mary's County Government have stated that the Sheriff's Department currently has the typical ongoing need for additional staff. They felt that the peak in-migrating workforce and their families into the county would minimally increase their needs from their current levels, but not enough to warrant taking action.

<u>EMS and Fire Suppression Services</u>

The Calvert County and St. Mary's County have large volunteer fire departments that appear to be doing an excellent job of meeting the needs of their residents. The Calvert County Public Safety office has indicated that they have ongoing needs for some staff, renovation or construction of facilities for three departments, new vehicles, and new equipment. However, representatives of

both departments felt that construction of the power plant generally would not create additional needs beyond those that already exist. Calvert County did state that the Emergency Management office staff would be affected by having to conduct emergency planning activities for the new power plant.

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

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

Educational System

As described above, an estimated 535 to 940 new households would in-migrate into Calvert County for construction of CCNPP Unit 3. The estimated $29.0 to $71.2 million in increased annual property taxes that would be paid to Calvert County by UniStar during construction of CCNPP Unit 3, which include levies for the Calvert County Public School System, would provide additional funds to meet the educational needs of children for the in-migrating operational workforce. Calvert County Public Schools indicated that some of these current needs include providing additional special services (i.e., special education) for its students. If enrollment levels were to increase as a result of constructing the power plant, the district might seek assistance in recruiting additional teachers and would install modular classrooms. However, in general, the district did not feel that the in-migrating workforce would have an impact on the system. Thus, it is concluded that the impacts to the Calvert County Public School System would be SMALL, and would not require mitigation.

The St. Mary's County Government stated that the educational facilities in St. Mary's County Public School System already are operating about at capacity. However, representatives of the county stated that school enrollment has been relatively stable for the last few years, they are completing construction of a new elementary school, and don't anticipate building a new high school until about 2012. Because they are generally able to meet existing needs, they are now focused more on improving students' performance. The in-migration of an estimated 182 to 318 new households into the county from construction of the CCNPP Unit 3 could place greater demands on the system. Although the school district could receive some additional funding from property taxes generated by these new households (likely to be minimal because adequate housing units are already available in the county and those units are already being taxed), it would not receive additional funding directly from the power plant because CCNPP Unit 3 does not pay property taxes to St. Mary's County. Because the St. Mary's County Public School System is at

capacity and would not receive additional funding, the impacts of the power plant would be SMALL and no mitigation would be required.**}**

4.4.2.9 Public Facilities

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

4.4.2.10 References

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4.4.3 ENVIRONMENTAL JUSTICE IMPACTS

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

Section 2.5.1 provides details about the general population characteristics of the study area. Section 2.5.4 provides details about the number and locations of minority and low income populations within a 50 mi (80 km) radius of the **{**CCNPP**}** site, and subsistence uses.

4.4.3.1 Minority and Low Income Populations and Activities

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

Because the power plant site is already developed and access is restricted, no minority or low income residences would be removed or relocated within the ROI. Additionally, the distance of the plant from area residents, in general, is great enough that none of these populations would be directly affected by construction of the power plant (i.e., noise, air quality, and other disturbances from the footprint of the facility).**}**

4.4.3.1.1 50 Mile (80 km) Comparative Geographic Area

<u>Employment and Income</u>

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

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

There are no unique minority or low income populations within the comparative geographic area that would likely be disproportionately adversely impacted by construction of the proposed power plant because they are located more than 30 mi (48 km, or outside of the ROI) from the CCNPP Unit 3 site where no environmental impacts (e.g., noise, air quality, water quality, changes in habitat, aesthetic, etc.) would likely occur.**}**

4.4.3.1.2 {Two-County} Region of Influence

Employment and Income

{Unemployed or underemployed members of minority and low income groups within the ROI also could benefit from increased employment opportunities, to the extent that they have the craft skills required (e.g., laborers, carpenters, electricians, plumbers, welders) and are hired as part of the construction workforce. The beneficial impacts of increased employment opportunities are likely to be more noticeable for minority and low-income populations within the 20 mi (32 km) radius that includes most of the ROI because of the potential hiring levels relative to the smaller existing workforce base. As shown in Table 4.4.3-1, minority and low income populations within a 20 mi (32 km) radius that comprises the ROI are located at least 11 mi (18 km) to the south in St. Mary's County and over 19 mi (30.6 km) away in Dorchester County. Because of their limited geographic extent and the level of impacts, the beneficial impacts of these potential new employment opportunities likely would be SMALL.

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

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

4.4.3.2 Subsistence Activities

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

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

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

Table 4.4.1-1 Typical Noise Levels of Construction Equipment
(Page 1 of 1)

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

Table 4.4.1-2 Projected Traffic Conditions During Construction
(Page 1 of 1)

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

LOS: Level of Service
CLV: Critical Lane Volume

Table 4.4.2-1 Estimated Average FTE Construction Workers, by Construction Year/Quarter at the CCNPP (Page 1 of 1)

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

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

Table 4.4.2-2 Total Peak On-Site Nuclear Power Plant Construction Labor Force Requirements (based on an average of single power plants) (Page 1 of 1)

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

Notes:

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

Table 4.4.2-3 Peak On-Site Nuclear Power Plant Construction Craft Labor Force Requirements (based on an average of single power plants) (Page 1 of 1)

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

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

Table 4.4.2-4 Nuclear Power Plant Craft Labor Force Composition by Phases of Construction (in percent)
(Page 1 of 1)

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

Table 4.4.2-5 Estimates of In-Migrating Construction Workforce in Calvert County and St. Mary's County, 20% In-Migration Scenario, 2011-2015
(Page 1 of 1)

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

Notes:

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

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

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

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

Table 4.4.2-6 Estimates of In-Migrating Construction Workforce in Calvert County and St. Mary's County, 35% In-Migration Scenario, 2011-2015 (Page 1 of 1)

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

Notes:

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

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

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

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

Table 4.4.3-1 Minority and Low Income Populations Within About 20 Linear Miles (32 km) of the CCNPP Site (Page 1 of 1)

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

Notes:

n/a = not applicable

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

FIGURE 4.4-1 **Rev. 2**

{CCNPP} TRAFFIC IMPACT ASSESSMENT STUDY AREA

CCNPP UNIT 3 ER

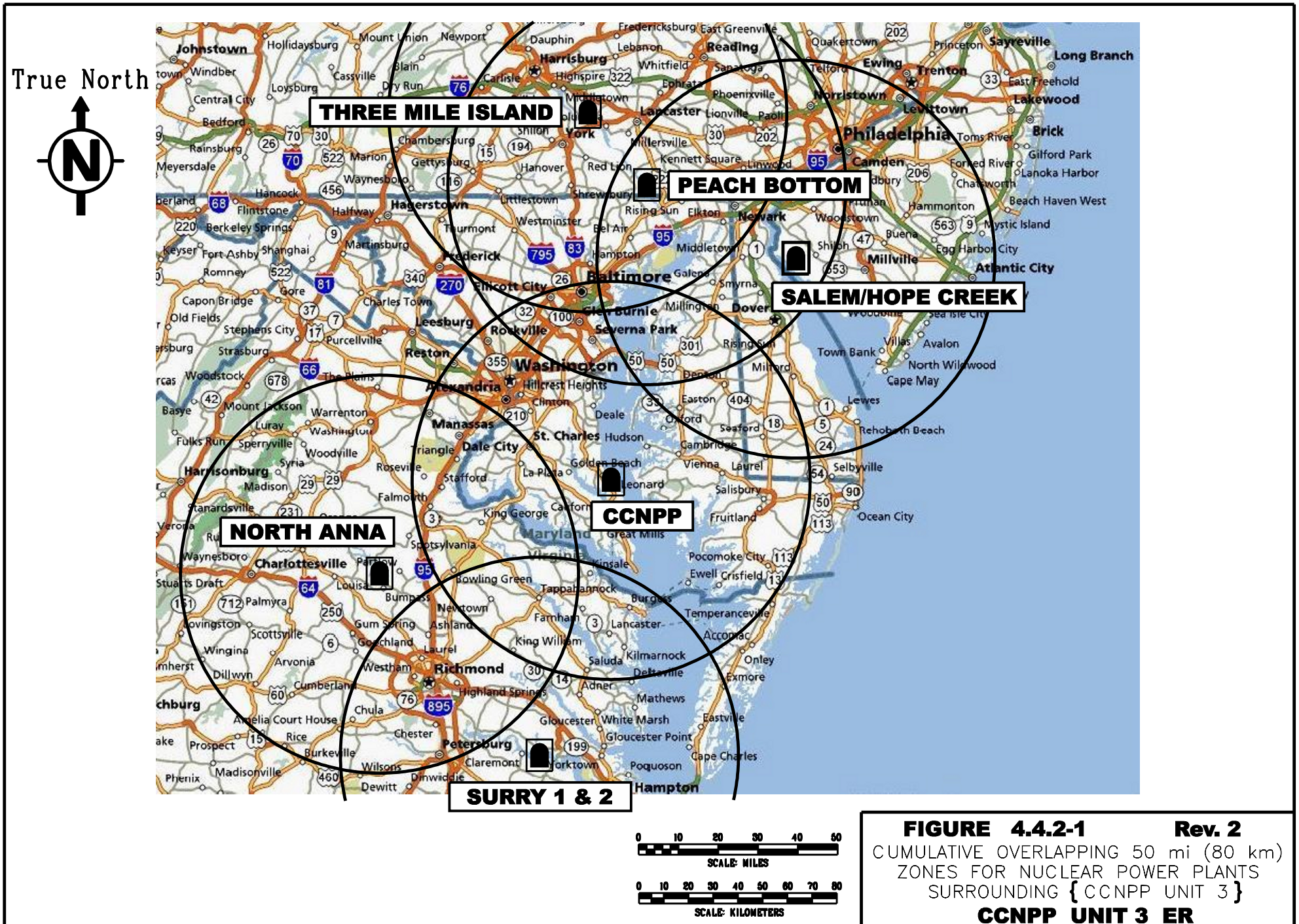

FIGURE 4.4.2-1 **Rev. 2**

CUMULATIVE OVERLAPPING 50 mi (80 km) ZONES FOR NUCLEAR POWER PLANTS SURROUNDING {CCNPP UNIT 3}

CCNPP UNIT 3 ER

4.5 RADIATION EXPOSURE TO CONSTRUCTION WORKERS

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

4.5.1 SITE LAYOUT

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

4.5.2 RADIATION SOURCES AT CCNPP UNITS

{During the construction of CCNPP Unit 3, the construction workers will be exposed to radiation sources from the routine operation of CCNPP Units 1 and 2. Sources that have the potential to expose CCNPP Unit 3 workers are listed in Table 4.5-1. They are characterized as to location, inventory, shielding, and typical local dose rates. Interior, shielded sources are not included. Figure 4.5-2 and Figure 4.5-3 show the locations of these sources. These sources are discussed in the Offsite Dose Calculation Manual (ODCM) (CCNPP, 2005), the annual Radiological Effluent Release Report (CCNPP, 2006a), and the Radiological Environmental Operating Report (CCNPP, 2006b) for CCNPP Units 1 and 2. The four main sources of radiation to CCNPP Unit 3 workers are gaseous effluents, liquid effluents, the Independent Spent Fuel Storage Installation (ISFSI) and the Interim Resin Storage Area. These are discussed below.

All gaseous effluents flow out the CCNPP Units 1 and 2 plant stacks. The releases are reported annually to the NRC. For example, the annual gaseous releases from CCNPP Units 1 and 2 for 2005 were reported as 191 Ci (7.07E+12 Bq) of fission and activation gases, 1.36E-3 Ci (5.03E+07 Bq) of I-131, 1.35E-5 Ci (5.00E+05 Bq) of particulates with half-lives greater than eight days, and 6.48 Ci (2.40E+11 Bq) of tritium. Doses to the general population are also reported annually.

Effluents from the liquid waste disposal system produce small amounts of radioactivity in the discharge to the Chesapeake Bay. The annual liquid radioactivity releases for 2005 were reported as 0.11 Ci (4.07E+09 Bq) of fission and activation products, 991 Ci (3.67E+13 Bq) of tritium, and 0.141 Ci (5.22E+09 Bq) of dissolved and entrained gases (CCNPP, 2006a).

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

4.5.3 HISTORICAL DOSE RATES

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

4.5.3.1 Gaseous and Liquid Effluent Historical Measurements

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

and, prior to that, the Radiological Environmental Monitoring Program Annual Reports. The Annual Radioactive Effluent Release Report for 2005 provides a whole body dose of 0.005 mrem (0.05 μSv) and a critical organ dose of 0.095 mrem (0.95 μSv) to the maximally exposed member of the public due to the release of gaseous effluents from the existing units. The Annual Radioactive Effluent Release Report for 2005 provides a whole body dose of 0.004 mrem (0.04 μSv) and a critical organ dose of 0.017 mrem (0.17 μSv) to the maximally exposed member of the public due to the release of liquid effluents from the existing units. The controlling pathway was the fish and shellfish pathway. Construction workers will not ingest food (edible plants or fish) grown in effluent streams as part of their work activity, therefore, only external pathways will be considered.

4.5.3.2 ISFSI Historical Measurements

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

4.5.3.3 Resin Storage Area Historical Measurements

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

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

4.5.4 {PROJECTED DOSE RATES AT CCNPP UNIT 3

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

4.5.4.1 Gaseous Dose Rates

The annual dose rate from gaseous effluents to construction workers on the CCNPP Unit 3 site is bounded by the following equation:

$$D(r) = 98020\, r^{-1.8342} \text{ (mrem/year)}$$

$$\text{where } r = \text{distance from stack to worker location in feet}$$

This parametric equation is based on annual average, undepleted, ground level X/Qs that are based on CCNPP site specific meteorology for the years 2000 to 2004. Note that only those wind directions which could carry gaseous effluents from the stacks to the CCNPP Unit 3 workers were included in the present analysis. Thus, the directions from ENE through the S, through SSW are included. The χ/Q data used are provided in Table 4.5-6. A bounding curve was then fitted to a power equation as shown in Figure 4.5-8.

The equation is:

$$\frac{X}{Q}(r) = 60.205 r^{-1.8342}$$

Where *r* is the stack to target distance in feet.

The dose rates were calculated for an onsite location with a known χ/Q for the years 2001 through 2005 according to the Regulatory Guide 1.109 (NRC, 1977) method with Total Effective Dose Equivalent (TEDE) calculations according to Federal Guidance Reports 11 (EPA, 1988) and 12 (EPA, 1993). The gaseous releases are shown in Table 4.5-7. The 2005 releases gave the highest dose rates. This data was then used to establish the dose rate to χ/Q ratio which was used to derive a parametric equation to bound the dose rate from the 2005 releases.

4.5.4.2 Liquid Dose Rates

The dose from liquid effluents is conservatively calculated assuming all the exposure is from deposition on the shoreline. The historical liquid effluents and dilution rates for the years 2001 through 2005 are given in Table 4.5-8, the dose at the shoreline is 0.32 mrem/yr (3.2 μSv/yr).

The actual discharge from CCNPP Units 1 and 2 is 850 ft (259 m) away from shore. The dilution factor at the shore would provide a significant reduction but is conservatively ignored. The LADTAPII computer code (NRC, 1986) was used to make these calculations. LADTAPII assumes a 12 hours/year occupancy rate which had to be scaled up to by the factor 8766/12 for annual dose rate calculations.

4.5.4.3 ISFSI Dose Rates

The dose rate had to be calculated at various distances and directions from the ISFSI. The dose rate also had to be projected into the future as more spent fuel was loaded into storage canisters and stored at the ISFSI from CCNPP Units 1 and 2. TLD readings around the ISFSI as shown in Figure 4.5-9 were used to develop the following equation for 2005 dose rate as a function of location:

$$\mathrm{DR}_{\mathrm{N},2005} = 76\,\omega\,\mathrm{e}^{-0.00195\mathrm{x}} \quad (mrem/year)$$

Where x = source surface to target distance (ft)

ω = solid angle of the ISFSI bunkers and an equivalent air scattering source above it.

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

$DR\_S(t) = DR_{N,2005}\ F\_S(t)$ (mrem/year)

where, $F\_S(t) = -170.8456 + 0.08521\ t$

and where t is in absolute year (such as 2015).

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

included in the annual average. The short term affect of ISFSI spent fuel loading is important for consideration in the CCNPP Unit 3 ALARA program.

4.5.4.4 Resin Area Dose Rates

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

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

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

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

4.5.5 COMPLIANCE WITH DOSE RATE REGULATIONS

CCNPP Unit 3 construction workers are, for the purposes of radiation protection, members of the general public. This means that the dose rate limits are considerably 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 deal 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 (CFR, 2007a) and 10 CFR 20.1302 (CFR, 2007b). Compliance with 10 CFR 20.1302 is discussed in Section 4.5.7. The design objectives of 10 CFR 50, Appendix I (CFR, 2007c) apply relative to maintaining dose as low as reasonably achievable (ALARA) for construction workers. Also, 40 CFR 190 (CFR, 2007d) applies as it is referred to in 10 CFR 20.1301. Note that 10 CFR 20.1201 through 20.1204 do not apply to the construction workers as they are considered members of the public and not radiation workers.

4.5.5.1 10 CFR 20.1301

{The 10 CFR 20.1301 (CFR, 2007a) limits annual doses from licensed operations to individual members of the public to 0.1 rem (1 mSv) TEDE (total effective dose equivalent.) In addition, the dose from external sources to unrestricted areas must be less than 0.002 rem (0.02 mSv) in any one hour. This applies to the public both outside of and within controlled areas. 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 by zone are given in Table 4.5-9. For an occupational year, i.e., 2,200 hours onsite, the maximum dose would be on the road by the ISFSI or the Resin Storage Area where the dose would be 0.0388 rem (388 mSv) and less than .002 rem (0.02 mSV) in any one hour. This assumes the worker stood on the road for all working hours in one year. This value is less than the limits specified above for members of the public. Therefore, construction workers can be considered to be members of the general public for the purpose of not requiring radiation protection or monitoring.

4.5.5.2 10 CFR 50, Appendix I

The 10 CFR 50, Appendix I criteria (CFR, 2007c) apply only to effluents. The purpose of the criteria are to assure adequate design of effluent controls. The annual limits for liquid effluents are 3 mrems (30 μSv) to the total body and 10 mrems (100 μSv) to any organ. For gaseous effluents, the pertinent limits are 5 mrems (50 μSv) to the total body and 15 mrems (150 μSv) to organs including skin. Table 4.5-10 shows that there is no dose rate to workers in a construction zone from effluents that exceeds 1 mrem/year (10 μSv/year). Therefore, the criteria have been met. Note that CCNPP Unit 3 occupational zones, during construction, are treated, for purposes of these criteria, as unrestricted areas.

4.5.5.3 40 CFR 190

The 40 CFR 190 (CFR, 2007d) 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 CCNPP Unit 3 construction workers on the plant site, just as they apply to members of the general public who live offsite. The most limiting part of the regulation states "The annual dose equivalent (shall) not exceed 25 millirems (per year) to the whole body." In the case of CCNPP Units 1 and 2 effluent releases, if this regulation is met for the whole body, then the thyroid and organ components will also be met.

Table 4.5-9 shows that the maximum dose rate in any of the construction zones is 38.83 mrem/2,200 hours (388 mSv/2,200 hours). The units are expressed to be clear that an occupancy of 2200 hours is assumed. The use of 2,200 hours assumes the worker takes 2 weeks vacation or sick time per year, works 40 hours per week for 50 weeks per year, and works 10% overtime per year. Note, that this dose rate is for the maximum dose rate locations adjacent to the ISFSI and Resin Storage Areas. The ALARA program described below will not allow workers to linger or work full shifts at these locations. The maximum dose rates for all other Construction Zones are less than 25 mrem/year (0.25 msievert/year). Therefore, the requirements of 40 CFR 190 will be met for all construction workers.**}**

4.5.6 {COLLECTIVE DOSES TO CCNPP UNIT 3 WORKERS

The collective dose is the sum of all doses received by all workers. It is a measure of population risk. The total worker collective dose for the combined years of construction is 15.4 person-rem (0.154 person-Sieverts). This is a best estimate and is based upon the worker census and occupancy projections shown in Table 4.5-11 and Table 4.5-12. The breakdown of collective dose by construction year and occupancy zone is given in Table 4.5-13. This assumes 2,200 hours per year occupancy for each worker.**}**

4.5.7 RADIATION PROTECTION AND ALARA PROGRAM

{Due to the exposures from CCNPP Units 1 and 2 normal operations, there will be a radiation protection and ALARA program for CCNPP Unit 3 construction workers. This program will meet the guidance of Regulatory Guide 8.8 (NRC, 1978) to maintain individual and collective radiation exposures ALARA. This program will also meet the requirements of 10 CFR 20.1302.

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 CCNPP Unit 3 is not required. Construction workers will be treated, for purposes of radiation protection, as if they are members of the general public in unrestricted areas.

However, they are exposed to effluent radioactivity and direct radiation sources from CCNPP Units 1 and 2. The most important reason for the ALARA program is that these source levels may vary over time from the projections made here. There may also be additional sources, unaccounted for by the above projections.

Some features of the CCNPP Unit 3 Construction ALARA Program will be:

- The CCNPP Unit 3 ALARA Committee will operate in parallel with the CCNPP Units 1 and 2 ALARA Committee. The Committee will meet quarterly, will review monitoring, and review worker dose rate and dose projections. The Committee will be empowered to stop work if the "general public" status of any construction worker(s) is jeopardized. The Committee will publish a dose and dose rate report for construction workers.
- Unit 3 radiation protection personnel will report to the Committee. The Radiation Protection Department will be in charge of radiation monitoring, worker census, source census and use this data to project worker doses and dose rates on a monthly basis into the next quarter and will report to the Committee.
- The CCNPP Units 1 and 2 ODCM and other CCNPP Unit 1 and 2 processes such as the ISFSI projected loading process, will be updated to link dose important CCNPP Unit 1 and 2 activities to projected CCNPP Unit 3 construction worker ALARA dose.
- The Committee will periodically identify and direct construction management to control the occupancy of areas, such as the road between the ISFSI and the Resin Storage Area, where dose rates can be high enough that workers might exceed 40 CFR 190 limitations for example, when spent fuel casks are being transported to the ISFSI.
- The Committee will establish a radiation monitoring program to assure 40 CFR 190 regulations are met for CCNPP Unit 3 Construction workers. It is expected that monitoring will require either special instruments and/or measurements closer to sources and projected by calculation further out to where workers will be.
- The Committee will require, before any high dose rate evolutions, such as the transport of fuel to the ISFSI, or transport of resins to the Resin Storage Area, or transport on site of large, radioactive components, that the CCNPP Unit 3 ALARA evaluation be revised.
- Consumption of edible plants growing onsite or fishing onsite will not be allowed.
- The program will survey the radiation levels in construction areas and will survey radioactive materials in effluents released to construction areas to demonstrate compliance with dose limits for CCNPP Unit 3 workers.
- The program will comply with the annual dose limit in 10 CFR 20.1301 by measurement or calculation to verify the total effective dose equivalent to the individual worker likely to receive the highest dose from any onsite operation does not exceed the annual dose limit.**}**

4.5.8 REFERENCES

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

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

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

CFR, 2007d. Title 40, Code of Federal Regulations, Part 190, Environmental Radiation Protection Standards for Nuclear Power Operations, 2007.

{CCNPP, 2005. Offsite Dose Calculation Manual for Calvert Cliffs Nuclear Power Plant, Revision 8, Calvert Cliff Nuclear Power Plant, July 14, 2005.

CCNPP, 2006a. 2005 Radioactive Effluent Release Report, for the year 2005, Calvert Cliffs Nuclear Power Plant, July 13, 2006.

CCNPP, 2006b. Annual Radiological Environmental Operating Report for the Calvert Cliffs Nuclear Power Plant Units 1 and 2 and the Independent Spent Fuel Storage Installation for the year 2005, Calvert Cliff Nuclear Power Plant, April 2006.**}**

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

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

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

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

Table 4.5-1 Source List for CCNPP Units 1 and 2
(Page 1 of 2)

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

Table 4.5-1 Source List for CCNPP Units 1 and 2
(Page 2 of 2)

Source	Location	Radioactive Inventory	Shielding	Typical Dose Rates
West Road Cage	On 45 ft (13.7 m) Elevation ~120 ft (~36.6 m) Auxiliary Building rollup doors	Interim storage of spent resins and filters	None	< 5.0 mrem/hr (<0.05 msievert/hr) at the cage fence

Notes:

(a) The gaseous releases reported for 2005 were 191 Ci (7.07E+12 Bq) of fission and activation gases, 1.36E-3 Ci (5.03E+07 Bq) of I-131, 1.35E-5 Ci (5.00E+05 Bq) of particulates with half-lives greater than eight days, and 6.48 Ci (2.40E+11 Bq) of tritium. These are typical compared to recent years.

(b) Liquid effluents from the liquid waste disposal produce small amounts of radioactivity in the discharge to the Chesapeake Bay. The annual liquid radioactivity releases for 2005 were reported as 0.11 Ci (4.07E+09 Bq) of fission and activation products, 991 Ci (3.67E+13 Bq) of tritium, and 0.141 Ci (5.22E+09 Bq) of dissolved and entrained gases. These are typical compared to recent years.

Table 4.5-2 Historical All-Source Compliance for Offsite General Public
(Page 1 of 1)

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

	Historical Site Boundary Doses Reported to NRC (mrem/year)/(msievert/year)			Percent of 40 CFR 190 Limit by Year of Operation		
Limits	**75**	**25**	**25**	**Percent of Limit**		
Year	**Thyroid**	**WB**	**Other Organs**	**Thyroid**	**WB**	**Other Organs**
2005	0.006/0.00006	0.005/0.00005	0.095/0.00095	0.01	0.02	0.38
2004	0.007/0.00007	0.002/0.00002	0.006/0.00006	0.01	0.01	0.02
2003	0.006/0.00006	0.004/0.00004	0.023/0.00023	0.01	0.02	0.09
2002	0.003/0.00003	0.007/0.00007	0.174/0.00174	0.00	0.03	0.70
2001	0.005/0.0005	0.010/0.0001	0.351/0.00351	0.01	0.04	1.40
2000	0.018/0.00018	0.018/0.00018	0.211/0.00211	0.02	0.07	0.84
1999	0.011/0.00011	0.013/0.00013	0.686/0.00686	0.01	0.05	2.74
1998	0.005/0.00005	0.005/0.00005	0.302/0.00302	0.01	0.02	1.21
1997	0.005/0.00005	0.009/0.00009	0.235/0.00235	0.01	0.04	0.94
1996	0.005/0.00005	0.012/0.00012	0.245/0.00245	0.01	0.05	0.98
1995	0.007/0.00007	0.017/0.00017	0.132/0.00132	0.01	0.07	0.53
1994	0.024/0.00024	0.039/0.00039	0.473/0.00473	0.03	0.15	1.89
1993	0.099/0.00099	0.125/0.00125	0.466/0.00466	0.13	0.50	1.86
1992	0.125/0.00125	0.114/0.00114	0.420/0.0042	0.17	0.46	1.68
1991	0.167/0.00167	0.045/0.00045	0.292/0.00292	0.22	0.18	1.17
1990	0.070/0.0007	0.070/0.0007	0.370/0.0037	0.09	0.28	1.48
1989	0.526/0.00526	0.113/0.00113	0.674/0.00674	0.70	0.45	2.70
1988	1.130/0.00113	0.120/0.0012	0.500/0.005	1.51	0.48	2.00
1987	0.381/0.00381	0.250/0.0025	1.360/0.00136	0.51	1.00	5.44
1986	0.685/0.00685	0.093/0.00093	0.643/0.00643	0.91	0.37	2.57
1985	0.800/0.008	0.010/0.0001	0.030/0.0003	1.07	0.04	0.12
1984	0.710/0.0071	0.110/0.0011	0.020/0.0002	0.95	0.44	0.08
1983	0.150/0.0015	0.060/0.0006	0.030/0.0003	0.20	0.24	0.12
1982	0.220/0.0022	0.034/0.00034	0.080/0.0008	0.29	0.14	0.32
1981	0.100/0.001	0.002/0.00002	0.080/0.0008	0.13	0.01	0.32
1980	0.170/0.0017	0.009/0.00009	N/A/N/A	0.23	0.04	N/A

Table 4.5-3 Historical ISFSI Exposures by Year
(Page 1 of 1)

Average TLD Exposures by Year Digitized from Figure 4.5-5 of 2005 REMP Report (mRoentgen/30 days) (These are historical values and are listed as reported, in English units)		
Year	**ISFSI**	**Control**
1990	3.96	N/A
1991	3.95	4.11
1992	4.28	4.40
1993	3.99	4.19
1994	4.73	4.63
1995	5.14	4.69
1996	5.01	4.20
1997	5.56	4.31
1998	6.20	4.56
1999	6.07	4.47
2000	5.72	3.88
2001	6.88	4.15
2002	7.23	4.48
2003	8.46	4.60
2004	8.27	4.51
2005	8.14	4.02

Note:

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

Table 4.5-4 Historical ISFSI Net Trend
(Page 1 of 1)

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

Notes:

(a) Slightly adjusted such that 1993 net TLD dose is zero.
(b) 1991 and 1992 provide baseline before first spent fuel stored at ISFSI in 1993.
(c) SI Units assume 1Roentgen = 1rem = 0.01 Sv which is correct to +/- 10%.

Table 4.5-5 Historical Resin Area TLD Readings for 2001 through 2005
(Page 1 of 1)

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

Note:

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

Table 4.5-6 Historical Annual Average χ/Q (sec/m^3) In CCNPP Unit 3 Directions (Page 1 of 1)

Normal Effluent Annual Average, Undecayed, Undepleted χ/Q Values for Ground Level Release Without Building Wake Using CCNPP Meteorological Data for Directions that Could Affect CCNPP Unit 3 Workers				
Downwind Direction	**Distance from Stacks to CCNPP Unit 3 Location**			
	0.5 mi (0.8 km)	**0.62 mi (1.0 km)**	**1.5 mi (2.4 km)**	**2.5 mi (4.0 km)**
ENE	3.19E-05	2.15E-05	2.74E-06	8.81E-07
E	2.35E-05	1.59E-05	2.02E-06	6.49E-07
ESE	2.22E-05	1.50E-05	1.90E-06	6.10E-07
SE	1.64E-05	1.12E-05	1.41E-06	4.43E-07
SSE	1.20E-05	7.51E-06	9.39E-07	2.94E-07
S	1.13E-05	7.70E-06	9.54E-07	2.96E-07
SSW	1.05E-05	7.17E-06	8.87E-07	2.74E-07

Table 4.5-7 Historical Gaseous Releases for 2002 through 2005
(Page 1 of 1)

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

Table 4.5-8 Historical Liquid Releases 2001 through 2005
(Page 1 of 2)

Isotope	2001 Release Ci (Bq)	2002 Release Ci (Bq)	2003 Release Ci (Bq)	2004 Release Ci (Bq)	2005 Release Ci (Bq)
Ag-110M	3.45E-02 (1.28E+09)	2.03E-02 (7.49E+08)	2.22E-03 (8.22E+07)	2.65E-04 (9.81E+06)	9.78E-06 (3.62E+05)
Ba-140	None Detected	2.88E-05 (1.07E+06)	None Detected	None Detected	None Detected
Ba-24	4.66E-03 (1.72E+08)	None Detected	None Detected	None Detected	None Detected
Be-7	None Detected	3.94E-04 (1.46E+07)	None Detected	None Detected	None Detected
Ce-144	1.19E-03 (4.40E+07)	None Detected	2.25E-04 (8.33E+06)	None Detected	None Detected
Co-57	1.19E-03 (4.39E+07)	3.50E-04 (1.30E+07)	7.61E-05 (2.82E+06)	1.62E-05 (5.99E+05)	1.39E-06 (5.14E+04)
Co-58	3.04E-01 (1.13E+10)	4.29E-02 (1.59E+09)	1.44E-02 (5.33E+08)	5.90E-03 (2.18E+08)	2.39E-03 (8.85E+07)
Co-60	1.95E-02 (7.22E+08)	1.94E-02 (7.19E+08)	3.64E-03 (1.34E+08)	1.77E-03 (6.53E+07)	5.94E-04 (2.20E+07)
Cr-51	5.64E-02 (2.09E+09)	1.09E-02 (4.03E+08)	1.54E-03 (5.71E+07)	6.88E-04 (2.55E+07)	3.89E-04 (1.44E+07)
Cs-134	3.30E-03 (1.22E+08)	2.35E-04 (8.68E+06)	7.95E-05 (2.94E+06)	2.78E-04 (1.03E+07)	7.55E-05 (2.79E+06)
Cs-137	9.39E-03 (3.48E+08)	4.44E-04 (1.64E+07)	3.17E-04 (1.17E+07)	7.34E-04 (2.71E+07)	1.32E-04 (4.89E+06)
Eu-154	6.99E-04 (2.59E+07)	3.32E-04 (1.23E+07)	2.03E-04 (7.51E+06)	None Detected	None Detected
Eu-155	2.23E-04 (8.25E+06)	3.63E-04 (1.34E+07)	1.47E-04 (5.44E+06)	None Detected	None Detected
Fe-55	1.07E-01 (3.96E+09)	1.19E-01 (4.41E+09)	2.71E-02 (1.00E+09)	1.51E-02 (5.59E+08)	8.67E-02 (3.21E+09)
Fe-59	5.02E-03 (1.86E+08)	2.25E-03 (8.33E+07)	5.80E-05 (2.14E+06)	5.35E-06 (1.98E+05)	1.66E-05 (6.13E+05)
I -131	1.42E-03 (5.26E+07)	3.51E-04 (1.30E+07)	6.04E-04 (2.24E+07)	2.93E-04 (1.08E+07)	1.58E-04 (5.86E+06)
I -132	None Detected	2.40E-04 (8.88E+06)	None Detected	None Detected	None Detected
I -133	8.97E-05 (3.32E+06)	4.95E-05 (1.83E+06)	1.57E-05 (5.80E+05)	3.55E-05 (1.31E+06)	1.59E-05 (5.86E+05)
La-140	None Detected	9.69E-05 (3.59E+06)	None Detected	None Detected	None Detected
Mn-54	5.75E-03 (2.13E+08)	4.66E-03 (1.72E+08)	7.45E-04 (2.76E+07)	1.81E-04 (6.68E+06)	4.11E-05 (1.52E+06)

Table 4.5-8 Historical Liquid Releases 2001 through 2005
(Page 2 of 2)

Isotope	2001 Release Ci (Bq)	2002 Release Ci (Bq)	2003 Release Ci (Bq)	2004 Release Ci (Bq)	2005 Release Ci (Bq)
Na-24	None Detected	None Detected	2.49E-06 (9.21E+04)	None Detected	None Detected
Nb-95	5.96E-02 (2.20E+09)	2.16E-02 (7.98E+08)	2.65E-03 (9.82E+07)	3.06E-04 (1.13E+07)	1.60E-04 (5.93E+06)
Nb-97	3.54E-05 (1.31E+06)	None Detected	None Detected	None Detected	None Detected
Ni-63	None Detected	None Detected	None Detected	2.17E-03 (8.03E+07)	6.16E-03 (2.28E+08)
Ru-103	5.42E-04 (2.01E+07)	7.10E-05 (2.63E+06)	None Detected	None Detected	None Detected
Sb-124	3.42E-03 (1.26E+08)	6.43E-05 (2.38E+06)	5.50E-04 (2.04E+07)	None Detected	None Detected
Sb-125	2.15E-02 (7.96E+08)	1.70E-02 (6.30E+08)	8.85E-03 (3.27E+08)	1.44E-04 (5.33E+06)	8.57E-06 (3.17E+05)
Sn-113	5.45E-03 (2.02E+08)	2.18E-03 (8.06E+07)	5.27E-05 (1.95E+06)	None Detected	None Detected
Sn-117M	3.77E-04 (1.40E+07)	3.86E-04 (1.43E+07)	1.08E-03 (3.98E+07)	3.20E-05 (1.18E+06)	1.28E-04 (4.74E+06)
Sr-89	7.63E-04 (2.82E+07)	9.51E-06 (3.52E+05)	4.84E-04 (1.79E+07)	None Detected	3.83E-04 (1.42E+07)
Sr-90	2.12E-05 (7.84E+05)	None Detected	1.89E-06 (7.00E+04)	None Detected	None Detected
Te-125M	None Detected	None Detected	None Detected	None Detected	1.27E-02 (4.70E+08)
Te-132	None Detected	1.44E-04 (5.33E+06)	None Detected	None Detected	None Detected
W -187	None Detected	7.15E-06 (2.65E+05)	None Detected	None Detected	None Detected
Zn-65	1.54E-06 (5.70E+04)	None Detected	None Detected	None Detected	None Detected
Zr-95	3.59E-02 (1.33E+09)	1.12E-02 (4.15E+08)	1.46E-03 (5.41E+07)	1.59E-04 (5.88E+06)	1.17E-04 (4.34E+06)
Zr-97	5.61E-05 (2.08E+06)	None Detected	None Detected	None Detected	None Detected
Total	6.82E-01 (2.52E+10)	2.75E-01 (1.02E+10)	6.65E-02 (2.46E+09)	2.81E-02 (1.04E+09)	1.10E-01 (4.08E+09)
Dilution Flowft^3/sec (L/sec)	3705.3 (130.85)	2738.4 (96.71)	4924.0 (173.89)	5147.8 (181.79)	5147.8 (181.79)

Table 4.5-9 Projected Dose Rates from all Sources by Construction Zone (Page 1 of 1)

Maximum Construction Zone Dose Rates (mrem/year) Assuming 2,200 Hours per Year Occupancy		
Zone	**Zone Description**	**Dose Rate mrem/2,200 hours (msieverts/2,200 hours)**
B	Batch Plant	0.05 (0.0005)
C	Construction on main structures	1.32 (0.0132)
L	Laydown	21.46 (0.2146)
O	Office/Trailer	0.02 (0.0002)
P	Parking	20.27 (0.2027)
R	Roads	38.83 (0.3883)
S	Shoreline, tunnel, barge, in/out flow	0.23 (0.0023)
T	Tower/Basin/Desalinization	0.01 (0.0001)
W	Warehouse	0.02 (0.002)

Table 4.5-10 Projected Dose Rates from Effluents by Construction Zone (Page 1 of 1)

Maximum Dose Rate mrem/year (msievert/year) Assuming Full Time Occupancy			
Zone	**Zone Description**	**Gaseous Effluents**	**Liquid Effluents**
B	Batch Plant	0.03 (0.0003)	0.00 (0.0000)
C	Construction on main structures	0.11 (0.0011)	0.00 (0.0000)
L	Laydown	0.07 (0.0007)	0.00 (0.0000)
O	Office/Trailer	0.04 (0.0004)	0.00 (0.0000)
P	Parking	0.15 (0.0015)	0.00 (0.0000)
R	Roads	0.18 (0.0018)	0.00 (0.0000)
S	Shoreline, tunnel, barge, in/out flow	0.55 (0.0055)	0.32 (0.0032)
T	Tower/Basin/Desalinization	0.02 (0.0002)	0.00 (0.0000)
W	Warehouse	0.03 (0.0003)	0.00 (0.0000)

Table 4.5-11 Projected Construction Worker Census 2010 to 2015
(Page 1 of 1)

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

Table 4.5-12 Projected Construction Worker Occupancy by Zone (Page 1 of 1)

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

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

Table 4.5-13 Unit 3 Collective Dose to Construction Workers
(Page 1 of 1)

		Collective Dose (person-rem) (person-sievert) by Zone						
Zone	**Zone Description**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**By Zone**
B	Batch Plant	0.000/ 0.00000	0.000/ 0.00000	0.000/ 0.00000	0.000/ 0.00000	0.000/ 0.00000	0.000/ 0.00000	**0.001/ 0.00001**
C	Construction on Main Structures	0.127/ 0.00127	0.587/ 0.00587	1.098/ 0.01098	1.168/ 0.011680	1.238/ 0.01051	1.051/ 0.01051	**5.270/ 0.0527**
L	Laydown	0.023/ 0.00023	0.100/ 0.00100	0.179/ 0.00179	0.183/ 0.00183	0.186/ 0.00186	0.152/ 0.00152	**0.823/ 0.00823**
O	Office/Trailer	0.003/ 0.00003	0.015/ 0.00015	0.027/ 0.00027	0.027/ 0.00027	0.028/ 0.00028	0.022/ 0.00022	**0.122/ 0.00122**
P	Parking	0.082/ 0.00082	0.380/ 0.0038	0.716/ 0.00716	0.765/ 0.00765	0.815/ 0.0815	0.694/ 0.00694	**3.453/ 0.03453**
R	Roads	0.132/ 0.00132	0.597/ 0.00597	1.097/ 0.01097	1.148/ 0.01148	1.199/ 0.01199	1.004/ 0.01004	**5.178/ 0.05178**
S	Shoreline, Tunnel, barge, In/Out Flow	0.015/ 0.00015	0.065/ 0.00065	0.114/ 0.00114	0.114/ 0.00114	0.114/ 0.00114	0.091/ 0.00091	**0.512/ 0.00512**
T	Tower/Basin/ Desalinization	0.001/ 0.00001	0.003/ 0.00003	0.005/ 0.00005	0.005/ 0.00005	0.005/ 0.0005	0.004/ 0.00004	**0.024/ 0.00024**
W	Warehouse	0.000/ 0.00000	0.000/ 0.00000	0.001/ 0.00001	0.001/ 0.00001	0.001/ 0.00001	0.000/ 0.00001	**0.003**/ 0.00003
	By Year	**0.384/ 0.00384**	**1.747/ 0.01747**	**3.238/ 0.03238**	**3.411/ 0.03411**	**3.585/ 0.03585**	**3.021/ 0.03021**	**15.386/ 0.15386**

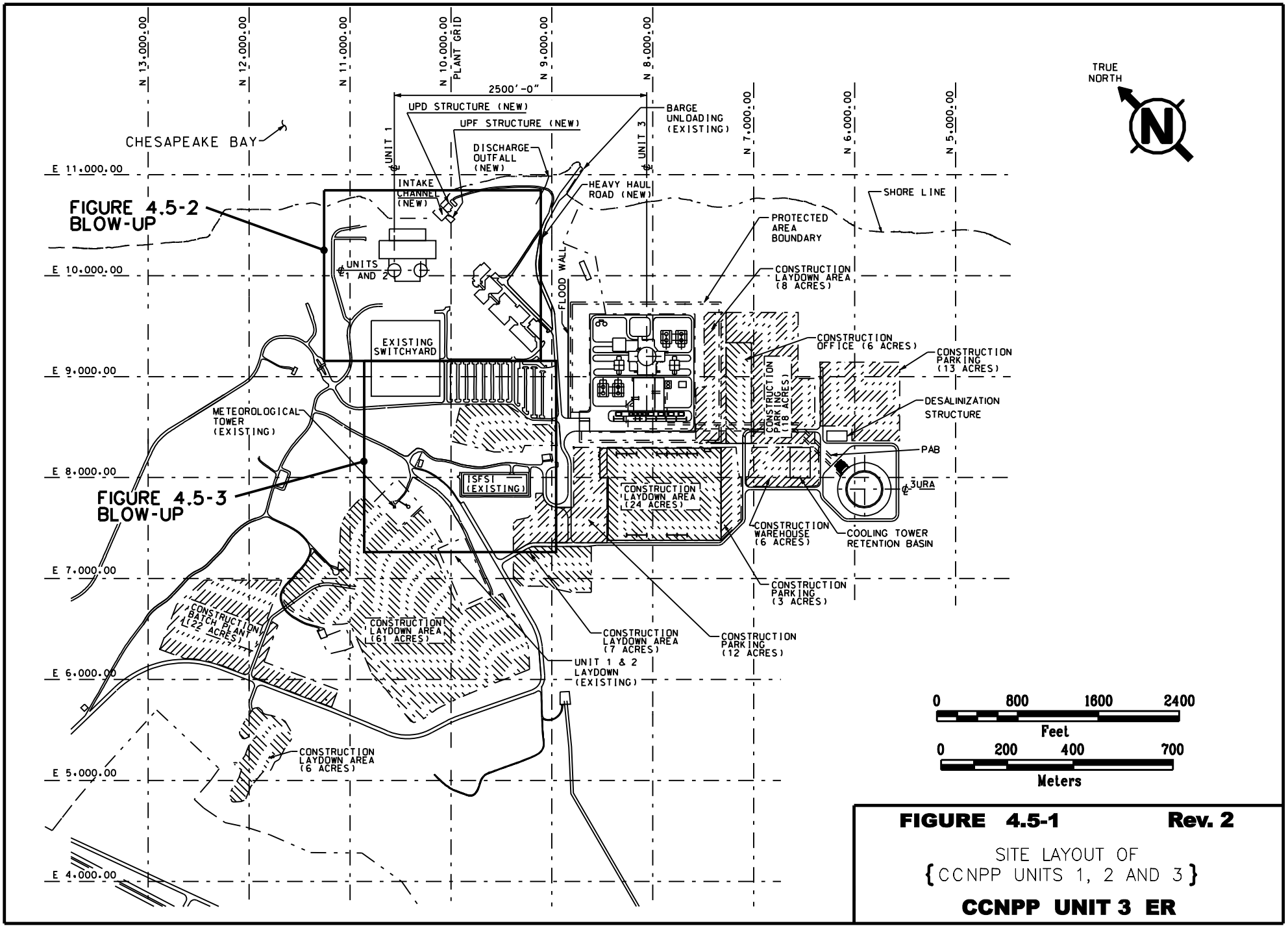

FIGURE 4.5-1 **Rev. 2**

SITE LAYOUT OF
{CCNPP UNITS 1, 2 AND 3}

CCNPP UNIT 3 ER