CHAPTER 5: ENVIRONMENTAL IMPACTS OF OPERATION
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5.0 ENVIRONMENTAL IMPACTS OF OPERATION

Chapter 5 presents the potential environmental impacts of operation of Units 6 & 7. In accordance with 10 CFR Part 51, impacts are analyzed, and a single significance level of potential impact to each resource (i.e., SMALL, MODERATE, or LARGE) is assigned consistent with the criteria that NRC established in 10 CFR Part 51, Appendix B, Table B-1, Footnote 3 as follows:

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

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

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

Mitigation of adverse impacts, if appropriate, is presented. This chapter is divided into 12 subsections:

- Land Use Impacts (Section 5.1)
- Water-Related Impacts (Section 5.2)
- Cooling System Impacts (Section 5.3)
- Radiological Impacts of Normal Operations (Section 5.4)
- Environmental Impacts of Waste (Section 5.5)
- Environmental Impacts of Transmission System (Section 5.6)
- Uranium Fuel Cycle and Transportation Impacts (Section 5.7)
- Socioeconomic Impacts (Section 5.8)
- Decommissioning (Section 5.9)
- Measures and Controls to Limit Adverse Impacts During Operations (Section 5.10)
- Cumulative Impacts Related to Station Operation (Section 5.11)
- Nonradiological Health Impacts (Section 5.12)

5.1 LAND USE IMPACTS

The following subsections describe the impacts of Units 6 & 7 operations on land use at the Turkey Point plant property and the 6-mile vicinity, including impacts to historical properties and cultural resources. Subsection 5.1.1 describes impacts to the site and vicinity. Subsection 5.1.2 describes impacts along transmission corridors and offsite areas. Subsection 5.1.3 describes impacts to historical properties and cultural resources. Table 5.1-1 summarizes the permanent land disturbance.

5.1.1 THE SITE AND VICINITY

5.1.1.1 The Site

Land use impacts from construction are described in Subsection 4.1.1.1. The new Units 6 & 7 power block, cooling towers and reservoir, substation, and associated infrastructure would permanently occupy the 218-acre Units 6 & 7 plant area (Figure 3.9-1). Additional permanent supporting facilities would be located outside of the Units 6 & 7 plant area but on the Turkey Point plant property. These facilities would include the FPL reclaimed water treatment facility, reclaimed water pipelines, radial collector wells and pipelines, nuclear administration and training buildings, parking areas, laydown areas, expanded equipment barge unloading area, security buildings, heavy haul road improvements, transmission infrastructure, sanitary waste pipelines, potable water supply pipelines, access road improvements, and the spoils areas. The radial collector well laterals would be drilled horizontally in the subsurface from the well caisson to locations beneath the floor of Biscayne Bay. Table 5.1-1 identifies the permanent facilities and dedicated areas. Below-grade facilities such as pipelines are not considered permanent facilities since they are underground and the land at grade could be utilized for other uses. The laydown areas are considered permanently dedicated since they may not be fully restored to pre-construction conditions and may be used during the operation of Units 6 & 7.

As addressed in Sections 2.2 and 4.1, the Miami-Dade County Comprehensive Development Master Plan land use designation for the location of Units 6 & 7 is *Environmental Protection, Subarea F*. Necessary electrical generation and transmission facilities are permitted in this area. The Units 6 & 7 plant area and most of the surrounding land is zoned as GU (interim district), with the exception of Units 1 through 5 and the area to the north of the Units 6 & 7 plant area, which are zoned as IU-3 (Industrial, Unlimited Manufacturing District). The GU zoning district allows nuclear reactors, provided that approval by Miami-Dade County of an *Unusual Use* for the site is obtained. FPL applied for *Unusual Use* approval for the proposed Units 6 & 7 site from Miami-Dade County, which was granted in Resolution No. Z-56-07 by the Miami-Dade Board of County Commissioners in December 2007. There would be no additional changes to land use within the Turkey Point plant property for operation of Units 6 & 7.

Land use impacts on the Turkey Point plant property from the operation of Units 6 & 7 could occur from salt and other particulate deposits associated with the operation of the six mechanical draft cooling towers. Salt deposits from cooling tower operation would have a small impact on onsite vegetation, fish, waterbirds, and also critical habitat for crocodiles, including hatchlings and juveniles, in the nearby cooling canals of the industrial wastewater facility, and further afield within the 6-mile vicinity. The potential impacts of salt deposits, fogging, and shadowing are presented in Section 5.3.

Based on the limited and localized impact to permanent land use and the small, localized impacts of the cooling towers with respect to salt deposits, fogging, and shadowing, impacts to land use as a result of operation of Units 6 & 7 would be SMALL and would not warrant mitigation.

5.1.1.2 The Vicinity

As described in Subsection 2.2.1.2, current land use within 6 miles of Units 6 & 7 is described in Table 2.2-2. The vicinity includes areas that have the land use designation Environmental Protection and Open Land in the Miami-Dade County Comprehensive Development Master Plan. Biscayne National Park, Biscayne Bay Aquatic Preserve, Homestead Bayfront Park, the Model Lands Basin, and the Everglades Mitigation Bank are located in the vicinity adjacent to the plant property.

Most permanent facilities associated with the operation of Units 6 & 7 would be contained within Turkey Point plant property boundaries except for portions of the reclaimed water pipelines, potable water pipelines, transmission corridors, public access roads, and the FPL-owned fill source. The reclaimed water pipelines and transmission corridors would follow the existing transmission corridors within the vicinity of Units 6 & 7. The potable water pipelines would follow existing linear facilities (e.g., existing roads). The radial collector wells would be drilled horizontally from the Turkey Point plant property to subsurface positions of the lateral screens located below Biscayne Bay. Pipelines would be below grade, thus having minimal impact on permanent land use.

The FPL-owned fill source and portions of the reclaimed water pipelines, potable water pipelines, transmission corridors, and roads are located within the 6-mile vicinity of Units 6 & 7. The potential land use impacts of these facilities from the operation of Units 6 & 7 are described in Subsection 5.1.2.

No land use impacts from operation of Units 6 & 7 would occur to recreational or protected areas in the 6-mile vicinity. Most permanent facilities associated with Units 6 & 7 are contained within the boundaries of the Turkey Point plant property, and operational activities for these facilities would not impact land use in nearby park areas. Additionally, the Miami-Dade County Unusual Use Approval for Units 6 & 7 stipulates several mitigative actions/plans to minimize impacts to the vicinity. Therefore, impacts to land use in the 6-mile vicinity from the operation of Units 6 & 7 would be SMALL and would not warrant mitigation.

5.1.2 TRANSMISSION CORRIDORS AND OFFSITE AREAS

The preferred transmission corridors, offsite substations, FPL-owned fill source, reclaimed water pipelines, and potable water pipelines are located offsite of the Turkey Point plant property. The potential land use impacts from operation of Units 6 & 7 associated with these offsite facilities and areas are presented in the following subsections.

5.1.2.1 Transmission Corridors and Substations

Transmission Corridors

The land proposed as transmission corridors for Units 6 & 7 is described in Subsection 2.2.2 and Section 3.9. FPL would acquire new transmission line rights-of-way and would restrict incompatible uses in the rights-of-way. FPL requires that the landowners' uses in rights-of-way be compatible with the safe and reliable transmission of electricity. In areas that are in active agricultural cultivation, FPL typically allows farmers to grow feed for livestock and tree crops within the transmission line rights-of-way, subject to height limitations for vegetation and operation. FPL has established rights-of-way vegetation management and line maintenance programs and procedures that would be used to maintain the rights-of-way and transmission lines associated with Units 6 & 7 to minimize impacts. The same procedures establish strict guidelines for use of herbicide application according to federal, state, and local regulations. In addition, environmental best management practices would be used to reduce soil erosion and sedimentation. Vegetation management in forested wetlands would comply with Florida Statute 403.814 General Permits. Accordingly, impacts from the operation of Units 6 & 7 to land use in transmission corridors would be SMALL and would not warrant additional mitigation.

Substations

As described in Sections 3.7 and 4.1, construction and/or expansion of several substations would meet applicable environmental regulatory requirements for their construction and operation; accordingly, potential land use impacts from operations would be SMALL and would not warrant additional mitigation.

5.1.2.2 Makeup Water Sources

As described in Sections 3.3 and 3.4, during normal operation of Units 6 & 7, waste heat would be dissipated by mechanical draft cooling towers. Two sources of makeup water are planned to replace cooling tower blowdown for Units 6 & 7. The primary source would be water reclaimed for reuse after processing by the Miami-Dade Water and Sewer Department, conveyed via pipelines to the Turkey Point plant property. An onsite FPL reclaimed water treatment facility would further treat the reclaimed water for use in the cooling system. When reclaimed water cannot supply the quantity and/or quality of water needed for the circulating water system, a second source for makeup water would consist of radial collector wells that would withdraw saltwater from under Biscayne Bay. The well caissons would be located on the Turkey Point peninsula, east of the existing units. Each radial collector well would consist of a central reinforced concrete caisson extending below the ground level with laterals projecting from the caisson. Potential land use impacts of Units 6 & 7 operational activities for these cooling water sources are described below.

The land that would be used for the below-ground reclaimed water pipelines is identified in Figure 2.2-5. Upon completion of construction activities, the reclaimed water pipelines would be underground, functional, and permanent. Miami-Dade County or FPL would access the right-of-way during operations for maintenance along public roads or through access agreements with adjacent landowners. As a result, impacts to offsite land use from operation of the reclaimed water pipelines for Units 6 & 7 would be SMALL and would not warrant mitigation.

As described in Subsection 2.2.2, upon completion of construction activities, the radial collector well caissons and pumping station would be on Turkey Point plant property and would be functional and permanent. The subterranean lateral screens would be located on the Turkey Point plant property and offsite, with laterals projecting horizontally from a location on the property to positions underneath Biscayne Bay, and would not impact land use of the offsite land area or Biscayne Bay. Accordingly, impacts to offsite land use from operation of the radial collector wells would be SMALL and would not warrant mitigation.

5.1.2.3 FPL-Owned Fill Source

Backfill for the construction of Units 6 & 7 would be obtained from an FPL-owned fill source located on a 300-acre plot near Homestead Air Reserve Base approximately 4.5 miles northwest of the Units 6 & 7 plant area (Figure 3.9-1), other regional sources, or reused material. The FPL-owned fill source area would cease operation with the completion of Units 6 & 7 construction activities. Once its use as a borrow mining facility is completed, plans are that the area would be maintained as a surface water management area, under FPL or other local or regional ownership, management, and control. The land use impact would be SMALL.

Fill borrow material for use during operation and maintenance of Units 6 & 7 would likely be supplied through commercial providers.

5.1.2.4 Access Roadways

As described in Sections 3.9 and 4.1, the Units 6 & 7 project includes road improvements to allow access to the Turkey Point plant property for construction and operations. The improvements include the widening of three existing roadways and the development of existing unpaved roads to four paved roadways (Figure 3.9-1).

The roadways would impact approximately 128 acres of land that would not be available for other uses. However, the locations of the road improvements were selected to use, to the greatest extent practical, existing roadways to minimize environmental impacts. With local government approval for the location of the roadway improvements and the granting of easements for the roadway use, the land use impacts would be SMALL and would not require additional mitigation.

Roadway improvements installed during construction could be removed during operation. If it is determined to remove access roadway improvements, this activity would be conducted with environmental best management practices to reduce impacts to wetlands and canals. Restoration, at a minimum, would result in removal of previous building materials, maintenance of historical hydrology, and regrading to previous contours. Impacts to terrestrial and aquatic flora and fauna, including possible interactions with crocodiles and panthers along remote sections, would be reduced by removal of the road and reduction/cessation of traffic flow. Potential mitigation for impacts of roadway removal would be covered by mitigation associated with roadway improvements (see Subsection 4.3.1).

Waste Management

As described in Sections 3.4 and 3.6, cooling tower blowdown and other site wastewater streams would be collected in a common blowdown sump and injected through deep injection wells.

As described in Section 5.5, Units 6 & 7 would generate radioactive solid wastes that would be disposed of in permitted radioactive waste disposal facilities and nonradioactive solid wastes that would be disposed of in permitted landfills off of the Turkey Point plant property. Both types of solid waste are commonly generated, and permitted disposal facilities and landfills are located throughout the United States. Additionally, Units 6 & 7 would generate spent nuclear fuel, which would be safely and securely stored on the Turkey Point plant property until such time as the DOE constructs, and the NRC licenses, a high-level waste disposal facility.

Because wastewaters and wastes would be properly dispositioned, meeting regulatory permitting requirements, impacts to offsite land use from waste management activities associated with Units 6 & 7 would be SMALL and would not warrant mitigation.

5.1.3 HISTORIC PROPERTIES AND CULTURAL RESOURCES

FPL has initiated consultation with the State Historic Preservation Officer (SHPO) regarding the proposed project. FPL prepared and submitted a *Cultural Resource Assessment Survey for the Turkey Point Units 6 & 7 Site, Associated Non-Linear Facilities, and Spoils Area on Plant Property* (FPL 2009a). In addition, FPL prepared and submitted a *Cultural Resource Assessment*

Survey Work Plan for the Turkey Point Units 6 & 7 Site and Associated Non-Linear Facilities (FPL 2009b). Based on the findings contained in these two reports, which included historical research, pedestrian surveys, and field archaeological investigation (e.g., shovel testing), no further surveys or investigations are warranted at the plant or associated non-linear facilities due to the lack of any cultural resources in these areas. The SHPO has concurred with these recommendations (FDOS Jul 2009a).

FPL also prepared and submitted to SHPO a *Preliminary Cultural Resources Report for the Turkey Point Units 6 & 7 Associated Linear Facilities* (FPL 2009c) and a *Cultural Resource Assessment Survey Work Plan for the Turkey Point Units 6 & 7 Associated Linear Facilities* (FPL 2009d). These reports described (1) areas of potential effects (APEs) for physical disturbance and visual impacts to historic properties from the proposed Units 6 & 7 Project, and (2) what investigations, if any, will be required in those APEs to determine potential effects to historic properties. The SHPO concurred with the recommendations made in these submittals (FDOS Jul 2009b). FPL will proceed with the necessary research and field reconnaissance and/or investigations at the linear facilities once the locations for these facilities are finalized. The results of the field assessments conducted and FPL's recommendations on effects to historic properties will be submitted to the SHPO.

Operational activities, including maintenance, would occur in areas that were previously disturbed during construction of Units 6 & 7. It is unlikely that these areas would contain any intact historic properties once construction has been completed. FPL anticipates that operational activities would have no impacts on historic properties and would not warrant mitigation beyond that being implemented to mitigate any adverse effects associated with construction.

With operational activities, there remains the possibility for inadvertent discovery of previously unknown archaeological materials or human remains. The Unanticipated Finds Plan implemented during construction, as described in Section 4.1.3, would be slightly modified for operational activities and included in the operational procedures for Units 6 & 7.

Section 5.1 References

FDOS Jul. 2009a. Florida Department of State, Division of Historical Resources, Letter from Laura Kammerer, Deputy State Historic Preservation Officer to Matthew Raffenberg re: *Cultural Resources Assessment Survey Work Plan for the Units 6 & 7 Site and Associated Non-Linear Facilities*, July 13, 2009.

FDOS Jul. 2009b. Florida Department of State, Division of Historical Resources, Letter from Laura Kammerer, Deputy State Historic Preservation Officer to Matthew Raffenberg re: *Cultural Resource Assessment Survey Work Plan for the Turkey Point Units 6 & 7 Associated Linear Facilities*, July 13, 2009.

FPL 2009a. *Cultural Resource Assessment Survey for the Turkey Point Units 6 & 7 Site, Associated Non-Linear Facilities, and Spoils Area on Plant Property*, June 2009.

FPL 2009b. *Cultural Resource Assessment Survey Work Plan for the Turkey Point Units 6 & 7 Site and Associated Non-Linear Facilities*, June 2009.

FPL 2009c. *Preliminary Cultural Resources Report for the Turkey Point Units 6 & 7 Associated Linear Facilities*, June 2009.

FPL 2009d. *Cultural Resource Assessment Survey Work Plan for the Turkey Point Units 6 & 7 Associated Linear Facilities*, June 2009.

Table 5.1-1 (Sheet 1 of 2)
Permanent Disturbed Acreage

Disturbed Area	Acreage
Turkey Point Property	
Unit 6 & 7 plant area	218
Western laydown areas	52
Training parking	9
Nuclear Administration parking	23
Heavy haul road	5
Access road upgrades	Note (1)
Transmission infrastructure improvements	Note (1)
Transmission laydown areas	3
Sanitary waste pipeline	Note (1)
Equipment barge unloading area	0.75
“A”, “B”, “C” spoils area	211
Radial collector wells and associated facilities	3
Radial collector well laydown area	3
FPL reclaimed water treatment facility	44
FPL reclaimed water supply pipeline	Note (1)
Radial collector well water supply pipelines	13
Vicinity	
FPL-owned offsite fill source	300
Road Improvements (Note 2)	
SW 117th Ave. North	9
SW 117th Ave. South	8
SW 137th Ave.	7
SW 328th St.	24
SW 344th St.	2
SW 359th Ave. East	47
SW 359th Ave. West	31
Region	
Reclaimed water pipeline corridor	Note (3)
Potable water pipeline corridor	Note (4)
Transmission	
East Preferred Corridor (1635 acres total)	
Clear Sky to Davis	Note (5)
Davis to Miami	Note (5)
West Preferred Corridor (3356 acres total)	
Clear Sky to Levee – 1st leg	Note (5)
Clear Sky to Levee – 2nd leg	Note (5)
Clear Sky to Levee – 3rd leg	Note (5)
Levee to Pennsuco	Note (5)
West Secondary Corridor	
Clear Sky to Levee – 1st leg	Note (5)
Clear Sky to Levee – 2nd leg	Note (5)
Clear Sky to Levee – 3rd leg	Note (5)
Levee to Pennsuco	Note (5)

Table 5.1-1 (Sheet 2 of 2)
Permanent Disturbed Acreage

Disturbed Area	Acreage
West Corridor Transmission Access Road 1	11
West Corridor Transmission Access Road 2	365
Levee substation	2
Pennsuco substation	2
Davis substation	1
Turkey Point substation	1

(1) Previously disturbed area.
(2) Road improvements may be removed after Units 6 & 7 are in operation.
(3) Acreage will be restored to pre-existing conditions.
(4) Acreage will be below grade.
(5) Actual disturbed acreage will be based on required right-of-way.

5.2 WATER-RELATED IMPACTS

Water-related impacts from the operation of Units 6 & 7 could result from: (1) hydrologic alteration of local surface water bodies, including streams and wetlands, and groundwater as a result of operational diversions, (2) ground surface elevation changes as a result of subsidence caused by the withdrawal of groundwater, (3) groundwater elevation changes as a result of groundwater withdrawal operations, and (4) groundwater impacts from the deep injection wells. Impacts could also occur to water quality as a result of erosion and sedimentation and to surface water and groundwater resulting from spills of fuels, lubricants, and other operational-related pollutants. Because of this potential for impacting surface water and groundwater resources, applicants are required to obtain a number of permits as outlined in Table 1.2-1.

As described in Subsection 2.3.1, water bodies on the Turkey Point plant property that could be affected by the operation of Units 6 & 7 are the industrial wastewater facility and the barge turning basin. Offsite water bodies that could be impacted by the operational activities include Biscayne Bay, named and unnamed surface water drainage canals, and unnamed surface water drainage features that could be impacted primarily by maintenance activities along the reclaimed water pipelines, potable water pipelines, and the transmission line rights-of-way.

As described in Subsection 2.3.1, the surficial aquifer at the Turkey Point plant property is the Biscayne aquifer. The Biscayne aquifer at the Turkey Point plant property is not used as a source of potable water due to the presence of saline water. However, in Miami-Dade County, the aquifer is used as a sole-source aquifer.

During normal operation of Units 6 & 7, waste heat would be dissipated by mechanical draft cooling towers. Two sources of makeup water are planned to replace cooling tower blowdown for Units 6 & 7. The primary source would be water reclaimed for reuse after processing by the Miami-Dade Water and Sewer Department, conveyed via pipelines to the Turkey Point plant property. An onsite FPL reclaimed water treatment facility would further treat the reclaimed water for use in the cooling system. When reclaimed water cannot supply the quantity and/or quality of water needed for the circulating water system, a second source for makeup water would consist of radial collector wells that would withdraw saltwater from under Biscayne Bay. The well caissons would be located on the Turkey Point peninsula, east of the existing units. Radial collector well operation is described as the makeup water supply throughout this section.

5.2.1 HYDROLOGIC ALTERATIONS AND PLANT WATER SUPPLY

Impacts resulting from surface water runoff are similar for each of the facilities described below. Any impacts resulting from Units 6 & 7 operation would be mitigated, as required by appropriate permitting authorities. Examples of permitting requirements applicable to surface water impacts include Florida Department of Environmental Protection (FDEP) requirements included in the FDEP Industrial Wastewater (IWW) permits.

These subsections identify operational activities on the Turkey Point plant property and offsite that could or would result in impacts to the hydrology at Turkey Point and in the offsite areas. These operations include:

- Operation of Units 6 & 7 and associated support facilities
- Use of the equipment barge unloading area and the heavy haul road to support maintenance activities during operations, such as heavy component replacement
- Transmission line right-of-way maintenance, reclaimed water and potable water pipelines right-of-way maintenance, deep injection well maintenance, and radial collector well maintenance
- The Units 6 & 7 plant property during operations would be subject to stormwater requirements of the existing industrial wastewater (IWW) permit applicable to the industrial wastewater facility.
- The removal of offsite road improvements added during the construction phase and restoration of the area to preconstruction conditions.

For project facilities and areas offsite of the Turkey Point plant property, including roads and transmission line and pipeline corridors, rules and guidance under the authority of FDEP (FAC 62-25) and SFWMD (FAC 40E-4) would apply to operations. Project stormwater sources would also be subject during operations to rules and guidance of the Miami-Dade County (MDC) Department of Environmental Resource Manager under MDC Code, Chapter 24.

5.2.1.1 Facilities on the Turkey Point Plant Property

5.2.1.1.1 Units 6 & 7 Plant Area

Surface Water

The Units 6 & 7 plant area would contain the principal structures, including the power blocks, makeup water reservoir and cooling towers, switchyard, and other infrastructure. Surface water that could be impacted during operation of these facilities is limited to the cooling canals of the industrial wastewater facility. Because the cooling canals of the industrial wastewater facility surround the Units 6 & 7 plant area and the berm located seaward of the eastern segment of the industrial wastewater facility provide a barrier to surface water movement, impacts to Biscayne

Bay would not occur. There is no major surface water body that discharges to Biscayne Bay in the vicinity of Units 6 & 7 where the presence of these facilities could alter hydrologic flow.

Overland flow of stormwater within the Units 6 & 7 plant area during operations would ultimately be to the industrial wastewater facility under a new or modification of the existing IWW facility permit. Overland flow to the industrial wastewater facility when compared to the amount of water circulating in the industrial wastewater facility would be insignificant.

The operation of the makeup water reservoir would alter the surface water hydrologic flow in the vicinity of the reservoir since it is a closed system and would be constructed and lined with concrete. Seepage from the makeup water reservoir could increase the level of flow within the industrial wastewater facility. Seepage could also raise the groundwater level in close proximity to the reservoir and create a greater flow to Biscayne Bay in the immediate area.

Considering all of the above influences to surface water hydrology from operations in the Units 6 & 7 plant area, impacts from hydrologic alteration would be SMALL and would not warrant mitigation.

Groundwater

The operation of the approximately 37-acre makeup water reservoir could slightly alter the groundwater hydrologic flow in the vicinity of the reservoir as a result of installation into the upper portion of the water table aquifer.

Potential seepage from the makeup water reservoir could locally alter the groundwater flow direction in the immediate vicinity of the reservoir. The alteration would depend on the amount of seepage. In the vicinity of the plant area, there are no groundwater users that would be impacted by the potentially altered flow. A local change in flow direction could result in additional groundwater flow to the surrounding industrial wastewater facility and increase locally the amount of groundwater discharging to Biscayne Bay.

Considering the limited influences to groundwater from operations in the Units 6 & 7 plant area, impacts would be SMALL and would not warrant mitigation.

5.2.1.1.2 Spoils Areas

Surface Water

Spoils areas would be established at three locations on the Turkey Point plant property to allow dewatering of materials from clearing, grubbing, and other excavation(s) (see Subsection 3.9.1.6 and Figure 3.9-1). Three separate spoils areas would be established at the southern end of the industrial wastewater facility. The spoils areas would be bermed to direct drainage from the spoils piles to the industrial wastewater facility. The potential impacts resulting from hydrologic alteration of surface water would be SMALL and would not require mitigation.

Groundwater

The spoils piles would be dewatered as part of the construction effort. Surface water runoff from the spoils areas during Units 6 & 7 operation would not result in any additional runoff to the industrial wastewater facility compared to conditions prior to spoils placement. For these reasons, there would be no impacts on groundwater from the spoils areas during operation. Impacts would be SMALL and would not require mitigation.

5.2.1.1.3 Access Roads, Heavy Haul Road, and Equipment Barge Unloading Area

Surface Water

No dredging of the equipment barge unloading area would be required to support the operation of Units 6 & 7.

As described in Section 3.9, a road system is currently in place to support existing unit operations within the Turkey Point property. These roads, especially in the vicinity of Units 3 & 4, would support the operational activities for Units 6 & 7. The heavy haul road leading from the existing equipment barge unloading area location to Units 6 & 7 and other site roads used in support of Units 6 & 7 could require maintenance during operations including repaving or other modifications. Should regrading of graveled roads be required, the impacts would be temporary and limited to the area being serviced. Surface water runoff from road maintenance activities would be managed onsite or routed to the industrial wastewater facility. Potential impacts would be temporary and could be mitigated through the use of silt fencing that would limit runoff. The use of sedimentation control could also temporarily block surface water flow. Impacts to surface water flow from road operational use and maintenance would be SMALL and would not require mitigation other than described above.

The onsite road improvements described in Chapter 4 associated with construction activities could be removed some time after the units are in operation. Should this occur, these locations would be returned to preconstruction conditions by removing the improvements, recontouring the area and reseeded or replanting native plant species. During restoration activities, environmental best management practices would be followed in accordance with the SWPPP for construction activities. Impacts would be similar to those during construction and limited to the area of the road removal activity. Therefore, impacts to surface water hydrology would be SMALL and not require further mitigation.

Groundwater

Operational use or general maintenance of site roads would not alter groundwater flow directions. However, should extensive maintenance be required that would involve the need to excavate along the roads or a portion of the road beds, the groundwater flow direction could be temporarily altered. The potential impacts would be temporary and groundwater levels and flow direction would return to those encountered before maintenance activities began. Therefore, impacts would be SMALL and would not require mitigation.

As discussed in the surface water section above, onsite road improvements made during the construction phase of the project could be removed and the areas restored to preconstruction conditions during the operational phase. Dewatering would not be required during the restoration activities. Therefore, impacts to groundwater from the restoration to preconstruction conditions would be SMALL and not require mitigation.

5.2.1.1.4 Security Facilities

Surface Water

Operation and maintenance of security facilities, through the disturbance of surface soils, could divert surface water flow within the immediate area of the facility. For example, the use of non-flow-through temporary barriers used for security or to direct vehicular traffic could alter the flow of surface water in the vicinity of the barrier. Impacts from permanent structures would be similar to those during construction. Maintenance of security buildings or other permanent security facilities could require temporary construction activities be performed. Potential impacts would be temporary and local to the activity. Because of the relatively small size of these security stations and support infrastructure (fencing, gates, turnouts, etc.), impacts to surface water flow would be SMALL and would not require mitigation.

Groundwater

As described above, the maintenance to security facilities would result primarily in impacts from the disturbance of surface soils. Impacts to groundwater from the alteration of groundwater flow could occur. However, any impacts would be temporary. Once maintenance activities cease, any alteration to groundwater flow would cease. Impacts to groundwater from the alteration of groundwater flow would be SMALL and would not require mitigation.

5.2.1.1.5 Operational Utilities

Surface Water

As described in Section 3.9, permanent utilities would be installed during construction that would support Units 6 & 7 operation. These would include above ground and underground infrastructure for power, lights, communications, potable and cooling water systems, water treatment facilities, wastewater and waste treatment facilities, fire protection, and operational maintenance gas and air systems.

Maintenance requiring the excavation of any of these utilities could impact surface water flow in the vicinity of the maintenance being performed. The use of sedimentation control could also temporarily block surface water flow. Maintenance activities performed on overhead utilities would not alter surface water flow unless the work area becomes rutted and begins to hold or redirect the flow of surface water. Should this situation occur, the area would undergo recontouring to redirect flow to its prior direction. These activities would, therefore, result in the short-term potential for impacts in relatively small areas. Impacts from these activities would be SMALL and would not require mitigation other than those specified through permit requirements.

Groundwater

Groundwater could be encountered during the maintenance excavation for underground utilities requiring the use of curtain drains or other forms of cutoff wall technologies during excavation operations. Dewatering activities, if needed, may require a permit and could require the use of a detention basin or other sedimentation control measures such as check dams, riprap, and sediment barriers based on site-specific permit requirements before discharge to a permitted outfall. Impacts to groundwater from hydrologic alteration during maintenance activities would be temporary and flow would return to normal when maintenance activities cease. Impacts would be SMALL and would not require mitigation other than that specified in the required permits.

5.2.1.1.6 Water and Sanitary Treatment Facilities

Surface Water

The FPL reclaimed water treatment facility would further treat the reclaimed water from Miami-Dade County before use. Sanitary treatment would be provided by a packaged sanitary treatment plant located on the Units 6 & 7 plant area. The sanitary treatment plant would be designed to process sanitary effluent from Units 1 through 7. None of the wastewater streams would be released to surface water bodies or to the ground surface.

Potential operational impacts of these facilities could, however, include those associated with maintenance activities. The disturbance of surface soils during maintenance activities could result in impacts similar to those resulting from the construction of the facility. Soil retention techniques such as silt barriers would be used to reduce impacts in accordance with prescribed environmental best management practices plan developed for Units 6 & 7. Should dewatering be necessary during maintenance activities, the water would be released to sediment control devices before being released in accordance with all state and local requirements. Potential impacts due to maintenance operations would be temporary and limited to the work area.

Impacts to surface water from the operations of the reclaimed water treatment facility and sanitary treatment plant would be SMALL and would not require mitigation.

Groundwater

The routine operational maintenance of the reclaimed water treatment facility and sanitary treatment plant would not result in direct impacts to groundwater. The discharge of treated wastewater and sanitary waste to the deep injection wells is addressed in Subsection 5.2.1.1.9. Maintenance activities performed at the facilities could, however, require limited dewatering. This could temporarily alter the flow of groundwater in the vicinity of the maintenance activity. Once dewatering ceases, the groundwater flow would return to normal.

Impacts to groundwater flow from the operations of reclaimed water treatment facility and the sanitary treatment plant would be SMALL and would not require mitigation.

5.2.1.1.7 Operation of the Reclaimed Water Pipelines

Surface Water

The reclaimed water delivery pipelines would connect to the FPL reclaimed water treatment facility. Therefore, a portion of the pipelines would be located within the Turkey Point plant property. Operational impacts could result from maintenance activities performed along the pipelines that could include maintaining a grassed or graveled/paved surface cover. Maintenance could require the excavation of the pipelines, which would require compliance with the environmental best management practices. The excavation and temporary stockpiling of soils would alter surface water flow. Once the maintenance activities are complete, the excavation would be filled and the area would be restored to its prior condition. The potential impact to surface water during operation of the reclaimed water pipelines would be SMALL and would not require mitigation.

Groundwater

The maintenance of the onsite portion of the reclaimed water pipelines could require the use of cutoff wall technology to limit potential impacts to groundwater flow during dewatering. The use of cutoff wall technology would alter the flow of groundwater in the vicinity of the excavation activity. Impacts would be short term and localized around the point of the dewatering. Once dewatering activities come to an end, the groundwater hydrologic flow would return to its previous conditions. Impacts during maintenance would be short term and limited to the area of maintenance activity. Therefore, impacts would be SMALL and would not require mitigation.

5.2.1.1.8 Operation of the Radial Collector Wells

A groundwater flow model (MODFLOW 2000/Visual MODFLOW) was used to assess the impacts of radial collector well operation to surface water and groundwater. The calibrated and verified groundwater model, as previously discussed in Subsection 2.3.1.2.3, was used as the basis for the predictive runs for radial collector well operation. The radial collector well conceptual model design is summarized as follows:

- The water level in Biscayne Bay was set to the long-term average of -0.81 feet NAVD 88.
- The Unit 6 & 7 plant area was assumed complete and the relevant recharge/ evapotranspiration zones were altered to reflect as-built conditions. The muck layer was removed from the plant area, as discussed in Section 3.9, and replaced with backfill.
- Three of the four radial collector wells were operational. To provide a conservative estimate of the source of water from inland areas to the radial collector wells, the three wells closest to the shore were modeled as operational.
- Four pumping wells were placed on the last 300 feet of each lateral to represent the screened intervals. Flows were distributed along the laterals to reflect friction losses and distributed flow along the length.
- The radial collector wells laterals were located within the Upper Higher Flow Zone.
- The simulation was executed at steady-state conditions.

The groundwater drawdown in Model Layer 1 (muck and rock/sandy material) and Model Layer 4 (Upper Higher Flow Zone) is depicted in Figures 5.2-1 and 5.2-2, respectively. The operational impacts of the radial collector wells to groundwater and surface water are discussed in the following sections.

Surface Water

Four radial collector wells would be installed adjacent to Biscayne Bay to provide cooling water for Units 6 & 7 (see Figure 3.1-3). The well caissons would be located on the Turkey Point peninsula, east of the existing units. Each radial collector well would consist of a central reinforced concrete caisson extending below the ground level with laterals projecting from the caisson. The well laterals would be advanced horizontally a distance of up to 900 feet and installed at a depth of approximately 25 to 40 feet below the bottom of Biscayne Bay. The four radial collector wells would provide up to 86,400 gpm (124.4 million gallons per day [mgd]) to supplement the reclaimed water source for cooling water makeup for Units 6 & 7 (Table 3.3-2).

As previously discussed in Subsection 2.3.1, surface water features within the local area of the radial collector wells included Biscayne Bay, Card Sound, the cooling canals of the industrial wastewater facility, and several surface water control canals (e.g., L-31 Canal). The surface water elevation in each of these features was set to known values based on seasonal or long-term data. Notably, the water levels in the predominant surface water features in the site were stipulated as follows: Biscayne Bay/Card Sound (-1.05 feet NAVD 88); cooling canals of industrial wastewater system (discharge side: 1.28 feet NAVD 88; intake structure: -3.38 feet NAVD 88).

As part of the steady-state radial collector well groundwater simulation, the volumetric flow rates were calculated for each of the boundary conditions (e.g., general head at Biscayne Bay/Card Sound, river boundary at the cooling canals of the industrial wastewater facility). Based on this calculation, it was observed that 97.8 percent (121.7 mgd) of the groundwater recharge originated from Biscayne Bay and 2.2 percent (2.7 mgd) originated from inland areas. Notably, 2.0 percent (2.5 mgd) originated from the cooling canals of the industrial wastewater facility. The recharge from Biscayne Bay would be predominately localized in the area of the radial collector wells.

Maintenance activities for the radial collector wells, including such activities as localized dewatering, below grade water pipeline/utility maintenance, above grade mechanical maintenance, etc. could be performed during the operation of Units 6 & 7. Water produced would be released to the industrial wastewater facility or controlled locally though the use of environmental best management practices to mitigate the potential impacts to surface water in the vicinity of the maintenance activities being performed. In summary, impacts to surface water from maintenance activities associated with operation of the radial collector wells would be SMALL and not require mitigation.

Groundwater

As previously discussed, groundwater modeling was performed to simulate the steady-state conditions resulting from operation of the radial collector wells. The cone of depression in Model Layer 1 (onshore — muck; offshore — rock/sand) ranged from 3 to 0.1 feet and was generally confined to the area local to the radial collector wells (areal extent of 211 acres based on the 0.1 foot drawdown contour in Biscayne Bay) and the Units 1 though 5 plant area, as depicted on Figure 5.2-1. The drawdown in Model Layer 4 (Upper High Flow Zone) ranged from 3 to 0.1 feet and was also generally confined to the area local to the radial collector wells (areal extent of 729 acres based on the 0.1 foot drawdown contour in Biscayne Bay) as depicted in Figure 5.2-2.

The model indicates that the uplands could be dewatered on the Turkey Point peninsula during steady-state conditions; however this would be confined to the areas immediately around the radial collector wells. Drawdown in the muck layer on the eastern shoreline, based on the results of the groundwater model, is not anticipated (Figure 5.2-1).

Based on the results of the groundwater modeling, approximately 97.8 percent of groundwater recharge to the radial collector wells would originate from Biscayne Bay and 2.2 percent would come from areas inland, including 2.0 percent from the cooling canals of the industrial wastewater facility. The remaining 0.2 percent will be from boundaries representing precipitation onshore. The 0.2 percent from precipitation recharge represents a relatively small amount of water. Because the precipitation is fresh water, it will tend to remain in the upper layers of the aquifer. Since the radial collector wells draw water at depth, the 0.2 percent is a conservative prediction of the water entering the radial collector wells. Therefore, the amount of fresh water drawn by the radial collector wells will be inconsequential and will not adversely impact the environment. Thus, impacts to the Biscayne Aquifer west of the Turkey Point property would be insignificant.

Typical maintenance on the radial collector well screens to prevent fouling could be required every 15–20 years. The well lateral screen and sand packs around the screens could be cleaned by several techniques including airbursts and jetting. The resulting impacts would be temporary and localized to the radial collector well area. Based on the above analyses, radial collector well operational impacts to groundwater, including groundwater flow and maintenance activities, would be SMALL and not warrant mitigation.

5.2.1.1.9 Operation of Deep Injection Wells

Surface Water

Wastewater, including the treated effluent from the sanitary wastewater generated by the operation of Units 6 & 7 and cooling tower blowdown, would be discharged to the Boulder Zone of the lower Floridan aquifer via twelve deep injection wells. No plant process waste streams would be discharged to surface water.

Surface water impacts could occur from deep injection well pipeline maintenance activities, including excavation to expose the pipeline between the blowdown sump and the deep injection wells, but these effects would be temporary and SMALL. Accordingly, impacts to surface water from underground injection activities would be SMALL and would not require mitigation.

Groundwater

The operation of the deep injection wells was evaluated to estimate the areal extent of groundwater influence (the injectate effective radius) in the Boulder Zone over an assumed operational lifespan of Units 6 & 7. An assumed maximum flow rate of 90 mgd was used, which is slightly higher than the expected maximum flow rate of 85 mgd. It is important to note that as described in Subsection 2.3.2.2.2.2, it is estimated that each deep injection well would have a maximum permitted injection capacity of 18.6 million gallons per day at a peak hourly flow.

However, it is estimated that each well would be operated at an injection rate of approximately 10 million gallons per day. The injectate effective radius was calculated using the equation:

$$\text{Volume} = \text{radius}^2\ \pi\ H\ n\ (7.48\ \text{g/ft}^3)$$

Where:

- Volume is the amount of water to be injected in gallons over a given period of years
- Radius (r) is the radius (miles) of injectate
- H is the vertical effective injection thickness
- n is the porosity of the formation through the injection zone

Based on a porosity of 20 percent and an effective injection thickness of 200 feet, the 60-year areal extent of injected fluid created by this injection rate would have a radius of approximately 9 miles. The results assumed the Boulder Zone is homogeneous and capable of exhibiting radial flow.

The effective thickness of the injection zone is at least in part dependent upon the density difference between the wastewater being injected and the groundwater within the Boulder Zone. This is due to stratification that would be caused in the Boulder Zone by this difference in water density. The density of the wastewater injectate is a function of both its temperature and total dissolved solid (TDS) concentration. Injectate that is denser than Boulder Zone water would migrate downward in the formation, thus increasing the vertical effective injection thickness. This would be the scenario during 100 percent saltwater injectate at a lower temperature. Injectate that is less dense than the Boulder zone water would stratify and decrease the vertical effective injection thickness. This would be the scenario during 100 percent reclaimed water injectate at higher temperatures. Based on these differences in Units 6 & 7 operation and the resultant injectate density differences, a range of effective thickness was included in the evaluation.

A sensitivity analysis was performed that varied the porosity and vertical effective injection thickness, as discussed above. As summarized in Table 5.2-1, a change in the porosity across the unit or a change in the estimated vertical effective injection thickness, based on potential density/stratification effects, would change the radius of influence, varying between 3.2 and 12.3 miles for 60 years.

The Underground Source of Drinking Water (USDW), as defined by the Florida Department of Environmental Protection (FDEP), is an aquifer that contains a TDS concentration of less than 10,000 mg/L and contains a sufficient quantity of water to supply a public water system. In the area of the Turkey Point plant property, the base of the USDW is approximately 1450 feet below land surface.

As discussed in Subsection 2.3.1.2, in the area of the Turkey Point plant property, the base of the USDW is below the base of the Upper Floridan aquifer and above the top of the Avon Park Permeable Zone. The top of the Boulder Zone (i.e., the injection zone) is estimated to be approximately 2900 feet below land surface. The Middle Confining Unit, which separates the USDW from the injection zone, is at least 1000 feet thick. Based on reported data from southeast Florida, the vertical hydraulic conductivity of this unit is anticipated to be between 1.3E-04 ft/day and 0.24 ft/day. The effective thickness of the Boulder Zone in the area of the Turkey Point plant property is estimated to be 200 feet for permitting applications; and the transmissivity is reported to be between 3.2E06 ft^2/day and 24.6E06 ft^2/day.

During 2003, the EPA evaluated the Miami-Dade County deep injection wells due to water quality issues. During that evaluation, the EPA regarded the pressure head resulting from injection to be negligible due the Boulder Zone's high karstification and fracturing. The pressure head buoyancy in the Boulder Zone was determined to be approximately 70 feet when injecting fresh domestic effluent at a rate of 112.5 mgd. That evaluation would indicate that the total head pressure due to injection and buoyancy resulting from deep injection well operation for Units 6 & 7 would be less than 70 feet using reclaimed water as the source for cooling water. The use of seawater as the source of cooling water would result in even less total head pressure than that when using reclaimed water.

The deep injection wells would be installed in accordance with an FDEP underground injection well permit and local permit requirements. The injection casing in the deep injection wells for Units 6 & 7 would be seated at a greater depth than other regional injection wells to maximize the thickness of the confining strata between the injection zone and base of the USDW. The current standard practice of grouting the pilot hole would also be employed to prevent the possible development of the double borehole conditions. The data collected during drilling and testing of the exploratory well would be used to evaluate the proposed system and would be submitted to the FDEP in support of the Class I injection well construction permit application for the Units 6 & 7 deep injection wells.

Water quality and pressure monitoring would be conducted in two separate intervals in the Floridan aquifer as mandated by the UIC permit. General UIC permit requirements include monthly reporting of the average, minimum, and maximum injection pressure, flow rate, volume, and annular pressure. The UIC permit would also require mechanical integrity tests in the deep injection wells to be performed every 5 years. The monitoring program objective would be to detect vertical migration of injected fluids into the Upper Floridan aquifer through the confining layer overlying the Boulder Zone. Sections 6.3 and 6.6 describe the operational monitoring of the deep injection wells.

Based on the above analyses, potential impacts from the operation of the deep injection wells to groundwater would be SMALL and not warrant mitigation beyond that described previously.

5.2.1.1.10 Transmission Rights-of-Way

Surface Water

Potential operational impacts along the proposed transmission rights-of-way would result from maintenance activities. These transmission lines would include the underground lines from Units 6 & 7 to the Clear Sky substation and the overhead lines from the Clear Sky substation to offsite substations. As described in Section 3.7, FPL regularly inspects transmission lines. Vehicular traffic could result in the rutting of the access roads along the rights-of-way that could impact surface flow in the vicinity of the disturbances. FPL would repair any areas of disturbed soils, recontour the area, and reestablish the vegetative cover, if necessary, in a timely manner that would reduce the potential for erosion through surface water runoff.

It could be necessary to perform maintenance that would require excavation and dewatering along the transmission lines. Water from the dewatering process would be routed to a detention basin or other sediment removal process before being released in accordance with FDEP-approved methods and in accordance with FDEP permit requirements.

Impacts to hydrologic flow from operation and maintenance of the transmission lines on the Turkey Point plant property would be SMALL and would not require mitigation in addition to those described.

Groundwater

It could be necessary to perform maintenance that would require excavation and dewatering along the transmission lines. The dewatering activity would create temporary drawdown of the water table. Water from the dewatering process would be routed to a retention basin or other sediment removal process before being released in accordance with approved methods and permit requirements. The water table and flow would return to normal once dewatering has ceased.

Impacts to groundwater hydrologic flow from operation and maintenance of the transmission lines on the Turkey Point plant property would be SMALL and would not require mitigation in addition to those described.

5.2.1.2 Offsite Facilities

5.2.1.2.1 Fill Borrow Areas

Surface Water

Fill borrow material for use during operation and maintenance of Units 6 & 7 would be supplied through a commercial provider. The FPL-owned fill source would not be restored to preexisting conditions. The water management feature that would be created from the excavation activities would be designed to store excess stormwater to complement regional wetland rehydration projects. A perimeter berm could also be used to restrict the flow of surface water onto the property and used to reroute the surface water flow to maintain the original flow direction. Impacts on surface water flow would be SMALL.

Groundwater

Surface water resulting from precipitation routed to the FPL-owned fill source for disposal/storage could increase the elevation of the water in the borrow pit. An increase in elevation of the ponded water could also raise the level of the adjacent groundwater that could alter the groundwater flow direction in the vicinity of the borrow pit. However, the elevation change would be temporary and the water table would return to normal once the storm event ends. The impacts from hydrologic alteration would be SMALL and would not require additional mitigation.

5.2.1.2.2 Transmission Rights-of-Way Maintenance

Surface Water

Potential operational impacts along the offsite portions of the proposed transmission rights-of-way would be similar to the segments on the Turkey Point plant property. During operations, potential impacts from maintaining hydrologic flow could occur. As described in Section 3.7, FPL regularly inspects the transmission lines. Vehicular traffic could result in the rutting of the access roads along the rights-of-way, which could impact surface flow in the vicinity of the disturbances. Should soil disturbance be required during maintenance operations within the rights-of-way, silt fence technology would be used to minimize impacts to nearby surface waterbodies/drainage features.

To reduce the potential for erosion through surface water runoff, areas of disturbed soils would be repaired, areas recontoured, and vegetative cover reestablished, if necessary, in a timely manner. Accordingly, impacts to hydrologic flow from operation of the offsite transmission lines would be SMALL and would not require further mitigation.

Groundwater

It could be necessary to perform maintenance that would require excavating and dewatering along the transmission lines. The dewatering activity could create temporary drawdown of the water table. Dewatering could impact areas off the right-of-way. However, the water table and flow would return to normal once dewatering ceased. Impacts to groundwater hydrologic flow from operation of the offsite transmission lines would be SMALL and would not require mitigation.

5.2.1.2.3 Reclaimed and Potable Water Pipelines

Surface Water

Potential operational impacts along the reclaimed and potable water pipelines would result from maintenance activities. Impacts would be to areas previously disturbed during construction of the pipelines. Vehicular traffic could result in the rutting of the access roads along the rights-of-way which could impact surface flow in the vicinity of the disturbances. Maintenance activities would be accomplished in accordance with established protocols and applicable regulations.

Impacts to surface water hydrologic flow from operation of the reclaimed and potable water pipelines would be SMALL and would not require mitigation.

Groundwater

It could be necessary to perform maintenance that would require excavation and dewatering along the reclaimed and potable water pipelines. The dewatering activity could create temporary drawdown of the water table. Dewatering could impact areas off the right-of-way. However, the water table and flow would return to normal once dewatering ceased. Impacts to groundwater hydrologic flow from operation of the reclaimed and potable water pipelines would be SMALL and would not require mitigation.

5.2.1.2.4 Offsite Roads

Surface Water

Once construction activities cease, the offsite construction access roads would not normally be used by operations workers to access Units 6 & 7. However, the offsite construction access roads could be used, if needed, to access the Turkey Point plant property for special events or for the special delivery of equipment or supplies. Impacts to surface water from the use of the offsite roads during operations would, therefore, be less than that encountered during the period of construction. Impacts could still occur from any necessary maintenance activities to the roadways which would include excavation activities or the addition of surface water culverts should they be needed, but these impacts would be temporary. Impacts to surface water hydrology resulting from these activities during operations would be SMALL and would not require mitigation.

However, the offsite roadway improvements described in Chapter 4 could be removed some time after the units are in operation. Should this occur, these locations would be returned to preconstruction conditions by removing the improvements, recontouring the area, and reseeded or replanting native plant species. During restoration activities, environmental best management practices would be followed in accordance with the SWPPP for construction activities. Impacts would be similar to those during construction, limited to the area of the road removal activity, and be of short duration. Therefore, impacts to surface water hydrology would be SMALL and not require further mitigation.

Groundwater

Once construction activities cease, the offsite construction access roads would not normally be used by operations workers to access Units 6 & 7. The construction access roads could be used, if needed, to access the Turkey Point plant property for special events or for the special delivery of equipment or supplies. Impacts to groundwater from the use of the offsite roads during operations would be less than that encountered during the period of construction. However, impacts could still occur from any necessary maintenance activities. These activities could also require dewatering. Impacts resulting from these activities would be temporary and groundwater levels would return to normal. Impacts to groundwater hydrology resulting from these activities during operations would be SMALL and would not require mitigation.

As described in the surface water section above, offsite road improvements made during the construction phase of the project could be removed and the areas restored to preconstruction conditions during the operation phase. Dewatering would not be required during the restoration activities. Therefore, impacts to groundwater from the restoration to preconstruction conditions would be SMALL and not require mitigation.

5.2.2 WATER USE IMPACTS

As described in Section 3.3, public water in the amount of 936 gpm (1.35 mgd) to 2553 gpm (3.68 mgd) would be supplied by Miami-Dade a new potable water pipelines for the operation of Units 6 & 7. Operational impacts to existing public infrastructure are described in Section 5.8.

Two sources of makeup water are planned to replace cooling tower blowdown for Units 6 & 7. The primary source would be reclaimed water from the Miami-Dade Water and Sewer Department (MDWASD) South District Wastewater Treatment Plant (SDWWTP). When reclaimed water cannot supply the quantity and/or quality of water needed for the circulating water system, a second source for makeup water would consist of radial collector wells that would withdraw saltwater from under Biscayne Bay. The ratio of water supplied by the two makeup water sources would vary based on the availability and/or quality of reclaimed water from MDWASD.

5.2.2.1 Surface Water

5.2.2.1.1 Reclaimed Water and Potable Water

Reclaimed water from the SDWWTP would supply approximately 60 mgd for the operation of Units 6 & 7. Based on MDWASD data from 2006, the MDWASD was disposing of 295 mgd of wastewater by deep well injection and surface water discharge to offshore locations. Of the 295 mgd, 106 mgd was being injected into south Florida aquifers. The South District of the MDWASD alone discharged 94 mgd to the Boulder Zone of the Floridan Aquifer. As of 2006, the MDWASD was treating and reusing 18 mgd of wastewater (SFWMD 2008). The South Florida Water Management District (SFWMD) will require the MDWASD to increase their reuse of treated wastewater to at least 170 mgd during the period of their current permit which will expire in 2030 (SFWMD 2010). The SFWMD estimates that MDWASD will increase the output of water available for reuse to 193 mgd by 2025 which would represent a usage of 51% of the MDWASD's wastewater output (SFWMD 2008). The additional reuse water will be used for a number of proposed projects, which include the discharge of reuse water for Everglade restoration projects (SFWMD 2007).

The Florida legislature recently enacted new legislation that eliminates the option for coastal communities to use ocean outfalls for the disposal of effluent from a wastewater treatment plant. The MDWASD has initiated a review of the changes necessary to the wastewater system to meet the mandates. One result is the addition of high-level disinfection to facilities that currently do not have this level of treatment. These facilities then could either discharge their reclaimed water to injection wells (in the Boulder Zone) or find other reuse options.

Use of reclaimed water was also addressed by the water use permit for the Miami-Dade consolidated public water supply, issued by the South Florida Water Management District (November 1, 2010). The permit contained several limiting conditions (Nos. 39–43) that apply to the reuse of reclaimed water. Condition 39 requires the MDWASD to implement 170 mgd of reuse projects. Exhibit 14 of the permit presents a table of reuse projects and deadlines to meet the permit limiting condition. Also presented in Exhibit 14 and Limiting Condition 41 of the permit is the requirement that MDWASD work with FPL to provide up to 70 mgd of reclaimed water for nuclear projects and 14 mgd for Unit 5. The reuse projects listed in Exhibit 14 for the SDWWTP total 188 mgd of reclaimed water. The largest of the reuse projects planned for the SDWWTP are: (1) furnishing 75.7 mgd of reclaimed water for the Biscayne Bay Coastal Wetlands Project, a component of the Comprehensive Everglades Restoration Plan, scheduled for implementation in 2022, and (2) a proposed well field mitigation project that is projected to need 18.6 mgd of reclaimed water. If the largest reuse projects listed in the exhibit are met as projected, reclaimed water from the SDWWTP may not be sufficient to meet all of the water demand for the operation of Units 6 & 7. To compensate for this potential shortfall, a second source for makeup water would consist of radial collector wells that would withdraw saltwater from under Biscayne Bay.

The potential water use impacts resulting from operation of the radial collector wells are described in Subsection 5.2.2.1.2.

The use of reclaimed water for Units 6 & 7 would be a beneficial and cost-effective means of increasing the use of reclaimed water in Miami-Dade County and would help the County meet its reclaimed water compliance requirements. In the absence of reuse opportunities, this treated domestic wastewater would likely continue to be discharged to the ocean or deep injection wells. Miami-Dade County has challenging water goals to eliminate ocean outfalls and increase the amount of water that is reclaimed for environmental benefit and other beneficial uses. The beneficial use of reclaimed water for Units 6 & 7 would enable the County to meet approximately half of its reclaimed water goal and provide environmental benefits by reducing the volume of wastewater discharged to ocean outfalls or deep injection wells. For these reasons, the use of reclaimed water for Units 6 & 7 would have a positive impact on surface water.

Potable water supplied by Miami-Dade County for Units 6 & 7 operation would be covered under MDWASD's consumptive use permit from the SFWMD. The potable water would come from the Biscayne Aquifer and not from surface water sources. Therefore, there would be no surface water impacts.

5.2.2.1.2 Radial Collector Wells

As described in Subsection 2.3.1, Biscayne Bay is hydrologically connected to the upper zone of the Biscayne aquifer. Based on groundwater modeling described above, the radial collector wells would be recharged at a rate of 97.8 percent (121.7 mgd) from Biscayne Bay. This would be predominately localized in the area of the radial collector wells. The remaining recharge would be from surface water (e.g., cooling canals) and groundwater beneath the plant property. The amount of saltwater used (up to approximately 121.7 mgd if 97.8 percent saltwater) compared to the size of the saltwater resource available would be insignificant. Impacts to Biscayne Bay surface waters would be SMALL and would not require mitigation.

Monitoring of the water quality from the radial collector wells would be performed to determine whether the water being pumped is saltwater by monitoring the groundwater elevation data in the near shore areas adjacent to the radial collector well locations. (See Sections 6.3 and 6.6 regarding planned pilot studies and monitoring associated with the radial collector wells.)

5.2.2.1.3 Offsite Facilities

Water use impacts for off-site facilities during operations would be minimal. Operational water requirements would primarily be for personnel use at these facilities. This could include potable and sanitary water use. Off-site potable and sanitary water use would likely be provided by groundwater supplied by Miami-Dade County where plans are to build facilities to support extended operations; for example switchyard facilities. These would likely support small intermittent work activities and would not likely be a major user of water. Therefore impacts to surface water would be anticipated to be SMALL.

Water requirements during operational maintenance construction activities not associated with personnel use would likely include water associated processes, for example the use of water during the mixing of concrete. Any water use during this type of activity would be associated with the commercial concrete supplier and not directly related to Unit 6 & 7 activities. Any water directly required by FPL during maintenance activities could be transported from an existing FPL facility and would likely be supplied by county potable supply. Therefore, minimal impacts would result from off-site water use to surface water resources at these facilities.

5.2.2.2 Groundwater

5.2.2.2.1 Reclaimed Water and Potable Water

As previously described, the reclaimed water that would be supplied by the Miami-Dade SDWWTP currently is being injected into the Boulder Zone of the lower Floridan aquifer. The Boulder Zone is used in south Florida for industrial and municipal wastewater disposal. MDWASD plans to distribute the reclaimed water once the water has undergone additional treatment. This system is anticipated to be in place by 2013.

The appropriate use of reclaimed water would reduce the rate of increase of groundwater used in the Miami/Dade County area by public water users. A reduction in the amount of wastewater currently being injected by MDWSD would also allow the district to process wastewater currently being discharged offshore.

The use of reclaimed water as makeup water for Units 6 & 7 would reduce the amount of reclaimed water that would be discharged to deep injection wells by 18 mgd to 60 mgd. The use and deep injection of reclaimed water by Units 6 & 7 would represent up to approximately 64% of the wastewater injected by the South District of the MDWSD, approximately 57% of the total wastewater injected by MDWSD, and approximately 19% of the total amount of wastewater treated by the MDWSD during 2006. By the time of Units 6 & 7 operation, MDWSD is projected to be producing up to 193 mgd of reclaimed water for use. Units 6 & 7 usage would represent up to 31 percent of the reclaimed water projected to be available by 2025. As MDWSD increases their ability to raise the quality of wastewater treatment, the availability of reclaimed water for reuse would also increase.

The use of reclaimed water by Units 6 & 7 and injection of the wastewater could increase the current amount of water being injected into the Boulder Zone via deep well injection depending on whether MDWSD service area grows to continue the need to inject or decides to reduce offshore discharges by performing deep injection of these waters. The Boulder Zone is used as a disposal zone and not as a source of water production. The Units 6 & 7 deep injection wells would be in accordance with FDEP permit requirements requiring the installation of multiple surface casings and grouting processes to limit the potential of creating pathways from the Boulder Zone upward to the USDW which could impact use. Therefore, impacts to groundwater use from the use of reclaimed water would be SMALL and would not require mitigation.

5.2.2.2.2 Radial Collector Wells

The radial collector well laterals would be installed beneath Biscayne Bay in areas where the bottom of the bay would readily facilitate the vertical movement of saltwater from the bay to the underlying aquifer formation where the collection screens would be located.

As described in Subsection 5.2.1.1.8, it is estimated that the radial collector wells would be recharged at a rate of 97.8 percent (121.7 mgd) from Biscayne Bay. This would be predominately localized in the area of the radial collector wells. The remaining recharge would be from the inland area west of the radial collector wells, including the cooling canals of the industrial wastewater facility, estimated at 2.5 mgd, and other areas, estimated at 0.2 mgd, including groundwater beneath the plant property. Recharge from groundwater would occur in an area where the groundwater is too brackish for potable use.

Based on the amount of expected recharge from groundwater sources and the non-potable classification of the groundwater at the site (due to its salinity), the predicted impacts to groundwater use due to the operation of the radial collector wells would be SMALL.

Monitoring wells would be installed and used to monitor whether the system is pumping seawater or groundwater by monitoring the groundwater elevation data in the nearshore areas adjacent to the radial collector well locations.

Based on the groundwater modeling of the radial collector wells and the resultant modeled impacts of the influence of the wells on groundwater flow, impacts to groundwater use from the operation of the radial collector wells as a cooling water makeup source would be SMALL and would not require mitigation.

5.2.2.2.3 Offsite Facilities

Water use impacts for off-site facilities during operations would be minimal. Operational water requirements would primarily be for personnel use at these facilities. This could include potable and sanitary water use. Off-site potable and sanitary water use would likely be provided by groundwater supplied by Miami-Dade County where FPL currently has or plans to build facilities to support extended operations; for example switchyard facilities. These would likely support small intermittent work activities and would not likely be a major user of water. Therefore, impacts to groundwater resources would be SMALL.

Water requirements during operational maintenance construction activities not associated with personnel use would likely include water associated processes, for example, the use of water during the mixing of concrete. Any water use during this type of activity would be associated with the commercial concrete supplier and not directly related to FPL activities. Any water directly required during maintenance activities could be transported from an existing FPL facility and would likely be supplied by county potable water supplies. Therefore, minimal impacts would result from off-site water use to groundwater resources at these facilities.

5.2.3 WATER QUALITY IMPACTS

Surface water and groundwater quality data are summarized in Subsection 2.3.3. Impacts to the existing water quality from the operations of Units 6 & 7 are described below.

5.2.3.1 Surface Water

5.2.3.1.1 Onsite Operations

The surface water bodies that could be impacted by operation of Units 6 & 7 are Biscayne Bay, wetlands, and the cooling canals of the industrial wastewater facility. Because of the existing operational layout of the Turkey Point plant property, surface water flow is primarily to the industrial wastewater facility, which would limit impacts to offsite areas.

Impacts to surface water quality could occur from soil disturbance and erosion from maintenance activities, which could result in increased sediment loading to nearby water bodies. Also, pollutants associated with vehicular traffic and equipment operation and maintenance could impact nearby surface water bodies. The use of environmental best management practices along with a spill prevention plan would prevent or minimize the potential impacts of releases to the environment.

Any ground-disturbing activities that meet federal, state, and local regulations requiring approval permits would be permitted and overseen by state and federal regulators, and guided by environmental best management practices and spill prevention plans. Any impacts to surface water quality during operations would be SMALL and would not require mitigation beyond environmental best management practices and other permit requirements.

The onsite roadway improvements described in Chapter 4 could be removed some time after the units are in operation. Should this occur, these locations would be returned to preconstruction conditions by removing the improvements, recontouring the area, and reseeding or replanting native plant species. During restoration activities, environmental best management practices would be followed in accordance with the SWPPP for construction activities and a spill prevention plan. Impacts to water quality would be similar to those during construction and limited to the area of the road improvement removal activity. Therefore, impacts to onsite surface water quality would be SMALL and not require further mitigation.

5.2.3.1.2 Radial Collector Wells

Operation of radial collector wells installed beneath Biscayne Bay would not impact the water quality of the bay. Although recharge would occur from the bay, it is estimated to be a small percentage of natural freshwater recharge. Additionally, although 2.0 percent of recharge (2.5 mgd) is predicted to originate from the cooling canals of the industrial wastewater facility, which are hypersaline, this recharge water drawn towards the radial collector wells will remain at depth within the aquifer due to the placement of the radial collector well laterals below the seabed and due to the higher density of this hypersaline water relative to seawater. Effects on salinity of the bay, based on the predicted amount of withdrawal versus the natural recharge, would be minimal.

Monitoring wells would be installed and used to monitor the groundwater level and water quality at and near the radial collector well locations to ensure impacts to local water quality, particular surface water quality, are minimal.

Impacts to water quality from operation of the radial collector wells would be SMALL and not require mitigation.

5.2.3.1.3 Offsite Facilities

Operational maintenance activities along the transmission rights-of-way, the reclaimed water pipelines, substations, potable water pipelines, and other off-site facilities could result in impacts to surface water quality. These impacts could result from surface water runoff, which could include the transport of chemical releases to the environment or from the transport of sediment to nearby surface water features. Any minor spills of diesel fuel, hydraulic fluid, lubricants, or other construction-related pollutants along the routes or offsite facilities would be cleaned up quickly to prevent potential contaminants from moving into nearby surface waters. Impacts would be small, localized, and temporary. A new SWPPP and a spill prevention plan would be prepared or an existing SWPPP and spill prevention plan would be modified to include the operations and maintenance activities associated with Units 6 & 7.

In the unlikely event small amounts of pollutants escape into the environment during operations and maintenance, because Units 6 & 7 would operation under a SWPPP and spill prevention plan, any impacts to surface water quality would be SMALL and would not require mitigation beyond those described in this subsection or required by permit.

The offsite roadway improvements described in Chapter 4 could be removed some time after the units are in operation. Should this occur, these locations would be returned to preconstruction conditions by removing the improvements, recontouring the area, and reseeding or replanting native plant species. During restoration activities, environmental best management practices would be followed in accordance with the SWPPP for construction activities. Impacts to water quality would be similar to those during construction and limited to the area of the road improvement removal activity. Therefore, impacts to offsite surface water quality would be SMALL and not require further mitigation.

5.2.3.2 Groundwater

5.2.3.2.1 Onsite Operations

The Turkey Point plant property overlies a portion of the Biscayne aquifer, which is saline in this area. The Biscayne aquifer beneath the Turkey Point plant property is connected hydrologically to both Biscayne Bay and the cooling canals of the industrial wastewater facility. As described in Subsection 2.3.1, the Biscayne aquifer in the vicinity of the Turkey Point plant property is not used as a source of drinking water due to the encroachment of saltwater into the aquifer up to 6 to 8 miles inland. Groundwater does provide one of the sources of water for the industrial wastewater facility along with surface runoff and natural precipitation that percolates to the water table and then moves laterally to the industrial wastewater facility. Should the area undergo a period of drought, the lowering of the water table would create flow from the industrial wastewater facility to groundwater. This could allow the water in the canals to recharge groundwater in the area.

In the unlikely event small amounts of contaminants escape into the environment, they would have only a small, localized, and temporary impact on the water table aquifer.

Impacts to groundwater quality would be SMALL and would not require mitigation beyond that described or required by federal and state permits.

The onsite roadway improvements described in Chapter 4 could be removed some time after the units are in operation. Should this occur, these locations would be returned to preconstruction conditions by removing the improvements, recontouring the area, and reseeding or replanting native plant species. During restoration activities, environmental best management practices would be followed in accordance with the SWPPP for construction activities. Impacts to groundwater water quality would be similar to those during construction and limited to shallow groundwater in the area of the road improvement removal activity. Impacts to onsite ground water quality would be SMALL and not require further mitigation.

5.2.3.2.2 Makeup Water Reservoir

Potential seepage from the makeup water reservoir could flow to the Biscayne aquifer within the industrial wastewater facility that discharges hypersaline water to the Biscayne aquifer. The

Biscayne aquifer beneath the Turkey Point plant property consists of saltwater. The makeup water reservoir would not be used for the storage of water from the radial collector wells.

The reclaimed water and radial collector well water would be collected in basins beneath the cooling towers, isolated from the cooling water reservoir. However, cooling tower plumes would impact the water stored in the cooling water reservoir. Water in the cooling water reservoir would dilute the fallout from the cooling tower plumes.

Potential seepage would flow into the Biscayne aquifer which contains saltwater and receives hypersaline water from the industrial wastewater facility. Therefore, impacts to the water quality of the Biscayne aquifer as the result of seepage from the cooling water reservoir would be SMALL and would not require mitigation.

5.2.3.2.3 Radial Collector Wells

As described in Subsection 5.2.2.2, it is estimated that the radial collector wells would be recharged at a rate of 97.8 percent (121.7 mgd) from Biscayne Bay. This would be predominately localized in the area of the radial collector wells. The remaining recharge would be from surface water (e.g., cooling canals) and groundwater beneath the plant property, thereby having minimal effect on the Biscayne aquifer where used as a water source. The majority of recharge flow would come from the local area of the radial collector wells where the groundwater is too brackish for potable water use. As discussed above, any hypersaline water drawn into the aquifer from the cooling canals would not impact potable water supplies, which are further inland, due to the presence of brackish, non-potable water near the coast. Therefore, impacts to groundwater quality as a result of radial collector well operations would be SMALL and not require mitigation.

5.2.3.2.4 Deep Injection Wells

Wastewater generated from the operation of Units 6 & 7, including water from blowdown sump discharge and treated liquid radwaste, would be injected into the Boulder Zone of the lower Floridan aquifer through the use of twelve deep injection wells. The Boulder Zone is used in south Florida for the disposal of industrial and municipal waste. The Units 6 & 7 deep injection wells would be permitted by FDEP and installed in accordance with FDEP requirements which include the installation and grouting to surface a series of well casings designed to prevent the flow of water between the various aquifer units encountered.

The estimated total injection rate would range from approximately 85 mgd for the 100 percent radial collector well supply to 18 mgd for the 100 percent reclaimed water cooling water makeup supply. Operation of Unit 6 & 7 would follow the FDEP permitting process for injection well permits including monitoring requirements for groundwater quality and groundwater elevation data in overlying aquifers. Tables 3.6-2 (as amended in ER Revision 3) and 3.6-3 summarize the expected water quality of the effluent discharged to the deep injection wells based on the reclaimed water and radial collector well cooling water makeup options, respectively.

As discussed in Subsection 5.2.1.1.9, the impacts from hydrologic alterations in the USDW resulting from the use of the deep injection wells would be SMALL. The potential impacts to water quality of the USDW would also be SMALL if there are no hydrologic impacts to the USDW. Within the Boulder Zone, groundwater quality impact from operations would be SMALL. Deep injection well operation would be in accordance with other deep injection waste disposal operations currently taking place in south Florida and in accordance with rules and regulations developed by the state of Florida as represented by the current deep well injection permitting process. The overlying USDW would be monitored for hydrologic impacts and water quality.

5.2.3.3 Offsite

Due to the existence of shallow groundwater at or just below ground surface in south Florida, groundwater impacts are more likely to occur than in areas where the water table is deeper. As described above, Unit 6 & 7 would operate its offsite facilities under a SWPPPs/spill prevention plans or procedures which would include the use of environmental best management practices. Any minor spills of diesel fuel, hydraulic fluid, lubricants, or other operational/maintenance-related pollutants along the proposed routes or at offsite facilities would be cleaned up quickly to prevent potential contaminants from moving into the groundwater.

In the unlikely event small amounts of pollutants escape into the environment during offsite facility operations and maintenance, because of operation under a SWPPPs/spill prevention plans or procedures including environmental best management practices, impacts would have only a small, localized, and temporary impact on the water quality at the release. Any impacts to groundwater quality would be SMALL and would not require mitigation beyond those described in this subsection or required by permit.

The offsite roadway improvements described in Chapter 4 could be removed some time after the units are in operation. Should this occur, these locations would be returned to preconstruction conditions by removing the improvements, recontouring the area, and reseeding or replanting native plant species. During restoration activities, environmental best management practices would be followed in accordance with the SWPPP for construction activities. Impacts to groundwater quality would be similar to those during construction and limited to the area of the road improvement removal activity. Therefore, impacts to offsite groundwater quality would be SMALL and not require further mitigation.

Section 5.2 References

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SFWMD (South Florida Water management District) 2008. South Florida Water Management *District Current and 2025 Projected Reuse Summary*. Water Supply Department. April 25, 2008.

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Table 5.2-1
Estimated Injection Radii for 10-Year and 60-Year Periods

10 Year injection Period at 0.2 Porosity						
Injection Rate (gpd)	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**
Vol (gallons over the period of injection)	3.285E+11	3.285E+11	3.285E+11	3.285E+11	3.285E+11	3.285E+11
n, porosity	0.2	0.2	0.2	0.2	0.2	0.2
H, effective thickness (ft)	100	200	300	400	500	600
Time (years)	10	10	10	10	10	10
Radius of Impact (miles)	5.0	3.5	2.9	2.5	2.2	2.0
60 Year injection Period at 0.2 Porosity						
Injection Rate (gpd)	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**
Vol (gallons over the period of injection)	1.971E+12	1.971E+12	1.971E+12	1.971E+12	1.971E+12	1.971E+12
n, porosity	0.2	0.2	0.2	0.2	0.2	0.2
H, effective thickness (ft)	100	200	300	400	500	600
Time (years)	60	60	60	60	60	60
Radius of Impact (miles)	12.3	8.7	7.1	6.1	5.5	5.0
10 Year injection Period at 0.5 Porosity						
Injection Rate (gpd)	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**
Vol (gallons over the period of injection)	3.285E+11	3.285E+11	3.285E+11	3.285E+11	3.285E+11	3.285E+11
n, porosity	0.5	0.5	0.5	0.5	0.5	0.5
H, effective thickness (ft)	100	200	300	400	500	600
Time (years)	10	10	10	10	10	10
Radius of Impact (miles)	3.2	2.2	1.8	1.6	1.4	1.3
60 Year injection Period at 0.5 Porosity						
Injection Rate (gpd)	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**	**90 mgd**
Vol (gallons over the period of injection)	1.971E+12	1.971E+12	1.971E+12	1.971E+12	1.971E+12	1.971E+12
n, porosity	0.5	0.5	0.5	0.5	0.5	0.5
H, effective thickness (ft)	100	200	300	400	500	600
Time (years)	60	60	60	60	60	60
Radius of Impact (miles)	7.8	5.5	4.5	3.9	3.5	3.2

Figure 5.2-1 Radial Collector Well Drawdown within the Top Layer

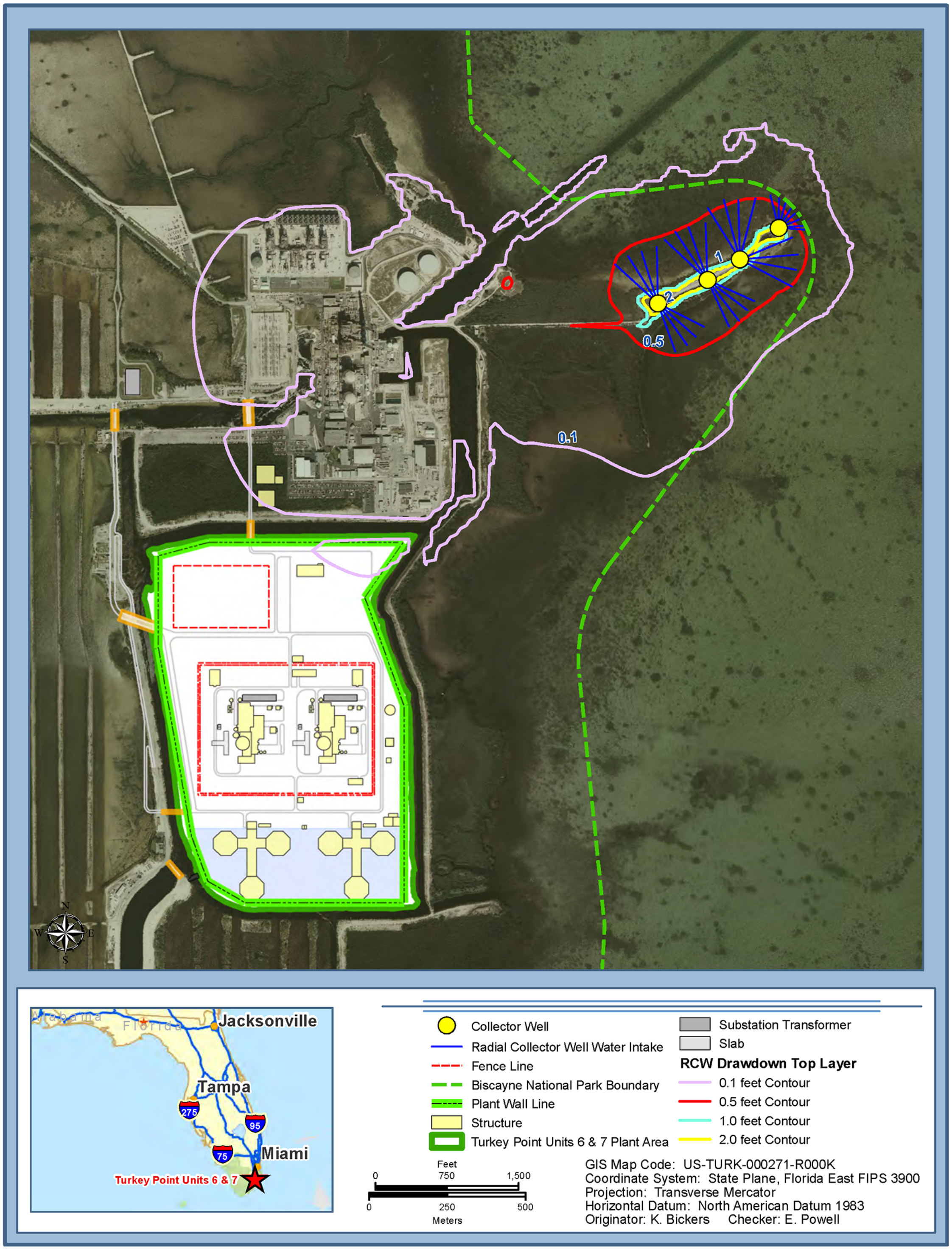
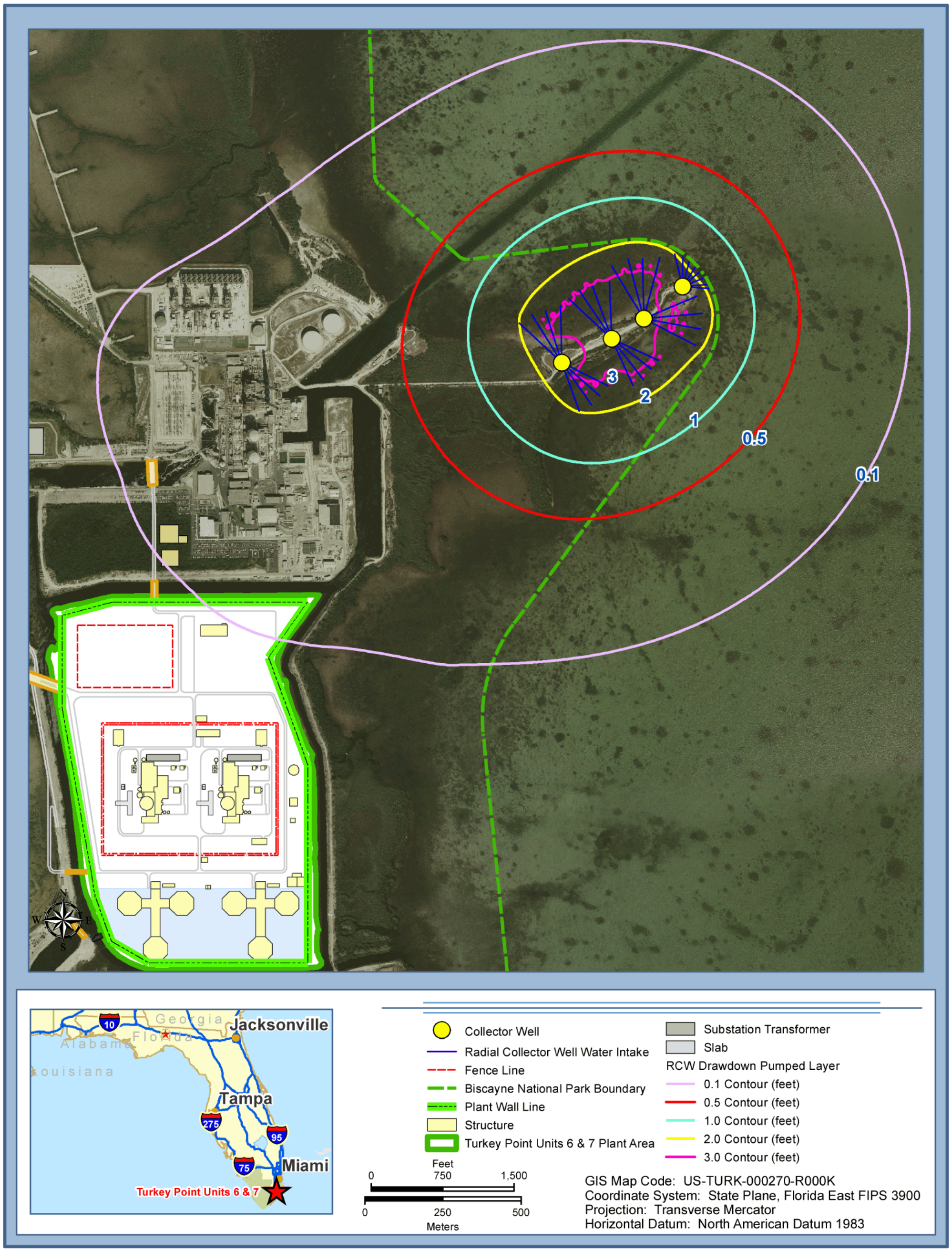


Figure 5.2-2 Radial Collector Well Drawdown in Model 4 (Upper Higher Flow Zone)



5.3 COOLING SYSTEM IMPACTS

This section describes the impacts of the cooling systems associated with operation of Units 6 & 7. The different aspects of cooling system impacts are addressed separately in the following sections:

- Intake system (Subsection 5.3.1)
- Discharge system (Subsection 5.3.2)
- Heat dissipation (Subsection 5.3.3)
- Impacts to members of the public (Subsection 5.3.4)

5.3.1 INTAKE SYSTEM

During normal operations of Units 6 & 7, waste heat would be dissipated by mechanical draft cooling towers. Two sources of makeup water are planned to replace cooling tower blowdown for Units 6 & 7. The primary source would be water reclaimed for reuse after processing by the Miami-Dade Water and Sewer Department (MDWASD), conveyed via pipelines to the Turkey Point plant property. An onsite FPL reclaimed water treatment facility would further treat the reclaimed water for use in the cooling system. When reclaimed water cannot supply the quantity and/or quality of water needed for the circulating water system, a second source for makeup water would consist of radial collector wells that would withdraw saltwater from under Biscayne Bay. The well caissons would be located on the Turkey Point peninsula, east of the existing units. Each radial collector well would consist of a central reinforced concrete caisson extending below the ground level with laterals projecting from the caisson.

Approximately 60 million gallons per day (mgd) of reclaimed water would be delivered to Units 6 & 7 via pipelines from the MDWASD South District Wastewater Treatment Plant (SDWWTP), a distance of approximately 9 miles. An alternate supply of up to 124.4 mgd would be obtained from the radial collector wells.

Hydrodynamic and physical impacts are described in Subsection 5.3.1.1. Potential impacts to important aquatic resources from operation of the cooling water makeup sources for Units 6 & 7 are addressed in Subsection 5.3.1.2.

5.3.1.1 Hydrodynamic Descriptions and Physical Impacts

Reclaimed Water

Treated wastewater from the SDWWTP would be used as cooling tower makeup for Units 6 & 7. The water would undergo secondary treatment and high-level disinfection at the SDWWTP before being piped to Turkey Point, where it would undergo further treatment for use in the mechanical draft cooling towers (see Subsection 3.4.2).

The reclaimed water would not be hydraulically connected to any aquatic habitats. The reclaimed water would be transported via closed pipelines from the SDWWTP to the FPL reclaimed water treatment facility and then to the makeup water reservoir. No hydrodynamic or physical impacts would result from the delivery of reclaimed water to Units 6 & 7.

Radial Collector Wells

As described in Subsection 5.2.1.1.8, four radial collector wells (Figure 3.1-3) with multiple collection screens for each well would be installed in the Biscayne aquifer formation beneath Biscayne Bay to provide up to 124.4 mgd of makeup water. Each radial collector well would consist of a central reinforced concrete caisson extending below the ground level with laterals projecting from the caisson. The well laterals would be advanced horizontally a distance of up to 900 feet and installed at a depth of approximately 25 to 40 feet below the bottom of Biscayne Bay. The radial collector wells would collect groundwater recharged from saltwater through the porous limestone subsurface beneath Biscayne Bay.

The operation of the radial collector wells and the potential impacts on water bodies including Biscayne Bay and the cooling canals in the industrial wastewater facility have been evaluated through groundwater modeling. Based on the evaluation, impacts would be SMALL. Collection of Biscayne Bay water via the radial collector wells would not affect the surface waters of Biscayne Bay. The volume of water drawn into the wells would be minor compared with the volume of water in Biscayne Bay, which is connected directly to the Atlantic Ocean.

5.3.1.2 Aquatic Resources

The use of reclaimed water would not impact any aquatic resources because aquatic organisms would have no contact with this water, which would be subjected to secondary treatment and high level disinfection, then transported via pipelines to the FPL reclaimed water treatment facility. Withdrawal of saltwater from Biscayne Bay through the radial collector wells would not affect aquatic resources in Biscayne Bay. Biscayne Bay, which is connected directly to the Atlantic Ocean, would not experience a noticeable loss of water to the radial collector wells. Also, because the water is not collected directly by the wells, but instead flows through the porous limestone approximately 25 to 40 feet below the bottom of Biscayne Bay, no aquatic organisms in Biscayne Bay would be affected. The flow rate at the sediment-water interface resulting from the radial collector well operation would be approximately 0.00002 feet per second.

Operation of the radial collector wells is not anticipated to result in significant adverse effects on seagrasses. Seagrasses have low nutrient requirements and are able to recycle nutrients efficiently, so that they are strong competitors under low nutrient levels (Koch, 2001; Armitage et al., 2005). *Thalassia testudinum* is the dominant species of seagrass in the area and is more tolerant of low phosphorus/nutrient environments that could potentially result from induced flow through the seabed.

There are several macroinvertebrates and vertebrate species that utilize the seagrass beds of Biscayne Bay, including the areas over which the proposed radial collector well laterals will be located. Based on studies performed in 2009, the fish and invertebrates observed in the area are well adapted to living in areas of relatively swift currents associated with tidal exchange and wind and wave-driven shallow water turbulence. There is little likelihood that they would be affected by the very minor velocity changes at the seabed expected from operation of the radial collector wells.

Therefore, the impacts to aquatic life as a result of radial collector well operation would be SMALL and not warrant mitigation.

The operation of the radial collector wells and the potential impacts on water bodies including Biscayne Bay and the cooling canals in the industrial wastewater facility have been evaluated through groundwater modeling (Section 5.2 and FSAR Appendix 2CC). Based on the model results, the steady-state operation of the radial collector wells could dewater the upland layer (areas above the high water shoreline) on the Turkey Point peninsula. Drawdown in the uplands on the Turkey Point peninsula would range from 1 to 3 feet. Drawdown west of Turkey Point would be generally confined to the shoreline adjacent to Units 1 through 5 and would be approximately 0.1 feet (Figure 5.2-1). Based on the evaluation, impacts with respect to aquatic vegetation (e.g. shoreline mangroves) would be SMALL and not warrant mitigation. Additionally, impacts to important aquatic species from operation of the radial collector wells would be SMALL and would not require mitigation.

A small, localized drop in the water table may affect wetlands in the area; however, no important aquatic species would be impacted. When the elevation of surface water in a wetland is gradually reduced, whether through natural or human causes, most mobile organisms, such as fish and many invertebrates, would simply relocate to deeper, more suitable water. Rooted vegetation may extend their roots to reach the deeper groundwater. Some invertebrates (and even a few types of fish) can produce dormant cysts that can “hatch” or become active later when water levels return to normal. The only aquatic species in the wetlands near the radial collector wells that is afforded special status is the mangrove rivulus. The rivulus is a Florida species of special concern that inhabits crab burrows in mangrove areas (Smithsonian 2008). The rivulus can swim to another location when its habitat becomes unsuitable. In fact, the rivulus is capable of moving across mud even after most surface water has disappeared. This fish can survive for up to 60 days in damp leaves and surface litter (Florida Museum of Natural History 2008). Any potential drawdown of water in mangrove wetlands would not significantly impact the rivulus.

5.3.2 IMPACTS OF COOLING SYSTEM DISCHARGE SYSTEM ON AQUATIC ECOSYSTEMS

The blowdown from the cooling towers would be discharged by way of the blowdown sump to the Boulder Zone, a deep (approximately 2900 feet below grade) and highly cavernous zone of saline groundwater that is used for underground injection of industrial and domestic wastes in South Florida. Radionuclide transport analysis for the deep injection wells was performed to determine impacts (i.e., dose) to potential receptors present at the closest point(s) to the Turkey Point plant property (Section 5.4). Based on the analysis and resulting receptor doses, impacts to the Boulder Zone from cooling system discharge containing radioactive effluent were found to be SMALL. Based on these results, the operation of the deep injection wells would meet the requirements established by the EPA, and imposed by the underground injection control permit.

No aquatic organisms would be exposed to chemical or thermal effects of the blowdown. There is no reasonably foreseeable pathway by which groundwater in the Boulder Zone could reach surficial aquifers or surface waters. No impacts to aquatic resources would result from cooling water discharge.

5.3.3 HEAT DISCHARGE SYSTEM

5.3.3.1 Heat Dissipation to the Atmosphere

As described in Section 3.4, a closed-cycle circulating water system would be used for Units 6 & 7 consisting of three mechanical draft cooling towers for each unit to remove excess heat from the circulating water system. In addition, a single mechanical draft cooling tower would be used for heat removal from the service water system for each unit. The service water system cooling tower would be much smaller than the circulating water system cooling towers. Therefore, the analysis focuses on the circulating water system cooling towers.

Cooling towers evaporate water to dissipate heat to the atmosphere. Evaporation is followed by partial recondensation, which, with the right atmospheric conditions, creates a visible mist or plume. The plume creates the potential for shadowing, fogging, icing, and localized increases in humidity. In addition, small water droplets are blown out of the tops of the cooling towers. These water droplets are referred to as drift and could be deposited, along with any dissolved salts, on vegetation and surfaces surrounding the cooling towers.

For Units 6 & 7, the EPA CALPUFF (U.S. EPA 2007a) and AERMOD (U.S. EPA 2007b) dispersion models were used to evaluate cooling tower plume behavior and to estimate the frequency of occurrence and length of visible cooling tower plumes. These models are the preferred models for calculating deposition and fogging by the Florida Department of Environmental Protection (FDEP) and were used for consistency between the FDEP review and this ER. Five years (2001 through 2005) of hourly meteorological data from the Miami

International Airport (surface and upper air observations) were used. Physical and performance characteristics of the mechanical draft cooling towers (as presented in Table 3.4-2) relevant to the modeling effort are as follows:

Parameter	Value
Number of Towers (Per Unit)	3
Circulating Water flow (Per Tower)	210,367 gpm
Cycle of Concentrations (COC)[a]	1.5 to 4
Approximate Height	67 feet
Approximate Base Diameter	246 feet
Number of cells (Per tower)	12
Number of fans per cell	1
Exit air delivery per fan	1,764,500 actual cubic feet per minute
Design Wet Bulb Temperature	83.9°F
Design Range	24.4°F
Design Approach	7.1°F
Drift Rate	0.0005% (of the flow rate)
Heat Rejection Rate (million BTU/hr)	7,628
Solids Concentration (ppm)	50,000

(a) COC for marine water is 1.5 and COC for reclaimed water is 4

5.3.3.1.1 Length and Frequency of Elevated Plumes for Mechanical Draft Cooling Towers

The analysis of cooling tower plume behavior for the five year simulation period (2001-2005) indicated that the predicted plumes would remain primarily onsite. Visible vapor plumes would occur approximately 1722 hours per year, or about 20 percent of the year. Visible vapor plumes would occur during the winter months (719 hours), the spring (387 hours) and fall (387 hours) months. Only about 13 percent (230 hours) of the total hours with visible vapor plumes occur during the summer. During daylight hours, visible vapor plumes are predicted to occur for only 584 hours/year (7 percent of the time). Visible vapor plumes during daylight hours are predicted to occur at a higher frequency during the winter (213 hours) than other seasons.

Visible vapor plumes from the cooling towers would remain close to each of the towers during the daylight, when the plumes are the mostly visible. The results for daylight hours indicate that for the majority of the time, plume heights would be less than 400 meters and plume lengths would be less than 300 meters. Plume heights greater than 1000 meters are predicted to occur only one hour per year, while plume lengths in excess of 5000 meters would only occur 40 hours per year.

The design of the cooling towers minimizes tower visibility and improves plume dissipation. The additional water and heat released to the atmosphere by the cooling tower plumes would have a SMALL impact on the local environment, and no mitigation would be required.

5.3.3.1.2 Ground-Level Fogging and Icing

Fogging from mechanical draft cooling towers occurs when the visible plume intersects with the ground, appearing like fog to an observer. An analysis of cooling tower fogging and icing was performed using the EPA CALPUFF dispersion model. The results indicated that there were no predicted occurrences of ground-level fogging during the summer season, and minimal localized occurrence of fogging during the autumn and spring seasons at the Units 6 & 7 plant area. During the winter season, fogging was observed to occur for a total maximum of 20 hours during daylight hours (for the 5-year simulation period) at offsite areas on the eastern and southeastern perimeter of the Turkey Point plant property.

Icing from the mechanical draft cooling towers could be the result of ground-level fogging when ambient temperatures are below freezing. However, the CALPUFF model predicted that no ground-level icing would occur as a result of cooling tower operation. Therefore, there would be no ground-level icing impacts as a result of cooling tower operation.

The impacts attributable to fogging and icing as a result of the operation of the Units 6 & 7 cooling towers would be SMALL and no mitigation is required.

5.3.3.1.3 Solids Deposition

Water droplets blown from the mechanical draft circulating water system cooling towers (known as “drift”) would have the same concentration of solids as the water in the makeup water reservoir. As the water droplets blown from the cooling towers evaporate, either in the air or on vegetation or equipment, these solids would be deposited. The dissolved and suspended solid concentrations in the makeup water reservoir would be controlled through use of the makeup and blowdown water lines. As described in Section 3.4, makeup water to the circulating water system cooling towers may be provided via the use of reclaimed water and/or saltwater from radial collector wells installed below Biscayne Bay. For conservatism, the maximum total dissolved solids value was used from the radial collector wells, which would be in the range of 30,000 parts per million (ppm) during normal operating conditions.

The estimated amount of dissolved solids that could potentially escape from all of the cooling towers as drift is 75 kg/hour during normal operation. This amount of material could be released and dispersed over the area surrounding the Turkey Point plant property once both units are operational. A description of the results of an analysis of cooling tower plume drift and deposition is provided in Subsection 5.3.3.2.2.

5.3.3.1.4 Cloud Formation, Cloud Shadowing, and Additional Precipitation

Although there would be visible plumes during some periods of operation, adverse effects attributable to cloud shadowing or additional precipitation would not be significant. Given the large distance from Units 6 & 7 to the boundary of the Turkey Point plant property on the western and northern perimeters, the lack of permanent residences at the eastern and southern perimeters (where fogging is predicted to be most prevalent), and the low profile of the mechanical draft cooling towers, the cooling tower plumes would not be visible from offsite locations except on rare occasions. The impacts of cloud shadowing or additional precipitation, therefore, would be SMALL and no mitigation is required.

5.3.3.1.5 Interaction with Existing Pollution Sources

No synergistic effects of cooling tower plumes mixing with plant radiological (see Section 5.4) or any other gaseous releases (see Subsection 5.5.1.3) would occur. Any gaseous effluents released from the plant during operation would be at a different elevation or at a location well removed from the cooling towers. Any such releases would also be at or near ambient temperature, and no significant plume rise from those releases would occur. The plume from the service water cooling towers would be small when compared to the main cooling towers. The potential for the mixing of the plumes would be minimal and at different locations from where any water droplets in the cooling tower plume would still be present.

Interactions with other sources of air pollution would be SMALL and no mitigation is required.

5.3.3.1.6 Ground-Level Humidity Increase

Increases in the absolute and relative humidity could result from the operation of the mechanical draft cooling towers. Based on CALPUFF modeling, no discernible increase in atmospheric humidity at offsite locations would result from the operation of the Units 6 & 7 cooling towers. Ground-level humidity increases would be SMALL and no mitigation is required.

5.3.3.2 Impacts of Heat Discharge System on Terrestrial Ecosystems

The approximately 9400-acre Turkey Point plant property consists primarily of wetlands, including an approximate 5900-acre industrial wastewater facility as well as wetland areas that were filled for industrial/developed land associated with the existing units (see Subsection 2.4.1). Plant communities within the Turkey Point plant property are those common to disturbed soils in this region (see Subsection 2.4.1). Upland areas are occupied by Australian pine, Brazilian pepper, and buttonwood. Wetland species include mangrove species and salt-tolerant herbaceous plants such as saltwort and glassworts. Four federally listed animal species have been observed within the Turkey Point plant property boundaries (primarily American crocodiles), as well as numerous state-listed species and state species of special concern (primarily water birds). Additional “important” species, as defined in NUREG-1555, found on the plant property include game animals common to this region, whitetail deer, and dove and rabbit species. Given that wetland habitats predominate, impacts to the small number of terrestrial game species found on the Turkey Point plant property would be SMALL.

Impacts of cooling system operation on terrestrial biota could occur from operation of the makeup water reservoir, cooling towers, and the supply of makeup water. Potential impacts of the makeup water reservoir are described in Subsection 5.3.3.2.1. Potential cooling tower operational impacts on terrestrial biota could result from increased salt deposits, vapor plumes, icing, precipitation modifications, noise, and avian collisions with structures (e.g., the cooling towers). Each potential impact of cooling tower operation is addressed in Subsection 5.3.3.2.2.

5.3.3.2.1 Makeup Water Reservoir

The makeup water reservoir at the southern end of the Units 6 & 7 plant area would occupy approximately 37 acres of land currently occupied by hypersaline mudflats, wetland spoil areas, mangrove heads, and a remnant canal (see the habitat descriptions in Subsection 2.4.1; Figure 2.4-2).

The makeup water reservoir would be lined with concrete; thus, no shoreline vegetation would be developed. Potential use of the makeup water reservoir by resting or roosting wintering waterbirds is unknown but likely, given the location of the reservoir within the Atlantic migration pathway and the proximity of the reservoir to other open water habitats (i.e., the cooling canals of the industrial wastewater facility, Biscayne Bay, Card Sound) historically used by migratory waterbirds. Given the sources of makeup water and the treatment of the water before use in the reservoir, fish occurrence in the reservoir is not anticipated and, therefore, use of the reservoir as foraging habitat by piscivorous birds is not anticipated. There are no uses of this reservoir other than providing a source of makeup water.

5.3.3.2.2 Cooling Towers

Salt Drift

Three mechanical draft cooling towers would be associated with each unit, and the six towers would be located within the makeup water reservoir. Habitat surrounding the cooling towers consists of the reservoir, Units 6 & 7 facilities to the north, the cooling canals of the industrial wastewater facility to the south and west, and Biscayne Bay to the east. Vegetation near the cooling towers would be subjected to salt deposits attributable to drift from the towers. Salt deposits could possibly cause vegetative stress, either directly by salts onto foliage or indirectly from accumulation of salts in the soil.

To evaluate the effect of salt deposits on plants, an order-of magnitude approach was used because some plant species are more sensitive to salt deposits than others, and tolerance levels of most species are not well known. Deposits of salt drift at rates of 1 to 2 kilogram/hectare/month (kg/ha/mo) is generally not damaging to plants, while deposition rates approaching or exceeding 10 kg/ha/mo in any month during the growing season could cause leaf damage in many species (NUREG 1437).

The AERMOD model was used to predict the amount of salt deposits from operation of the Units 6 & 7 cooling towers. The simulation was modeled based on the cooling tower operational parameters previously presented, and the 2001 through 2005 Miami meteorological data for upper air and surface data. The monthly depositions rates, based on an annual basis, are depicted in Figure 5.3-1. These monthly deposition rates are a conservative representation of depositional rates calculated for the four seasons (e.g., northeast-southwest bearing of depositional plume). Maximum salt deposition is predicted near the makeup water reservoir (up to 105 kg/ha/mo).

Beyond the makeup water reservoir, the deposition rates are predicted to decrease rapidly. The monthly salt deposition in the cooling canals of the industrial wastewater facility ranges from 1 to 70 kg/ha/month. This depositional rate is considered both conservative and bounding since evaporation of the solution drift has not been considered and it has been assumed that the saltwater is from the radial collector wells, which are assumed to operate on a full time basis. The radial collector wells are a backup water source, reclaimed water is the primary source, and operation of these wells is anticipated to be on an intermittent, as needed basis. Salt deposition of greater than 10 kg/ha/mo would generally be confined to the plant property, with the exception of the adjacent southeastern perimeter, as depicted on Figure 5.3-1. However, the vegetation surrounding the plant property is dominated by coastal mangroves, specifically the salt-tolerant red mangrove (Rhizophora mangle), which has developed physiological characteristics to allow the plants to survive in highly saline soils and areas of salt spray. Due to the mangroves' ability to tolerate elevated salinity, they are often found near monocultures in areas that are uninhabitable by freshwater and/or terrestrial vegetation. Considering the existing salt-tolerant vegetative community surrounding the plant area, the potential impacts of salt drift to vegetation would be SMALL and not warrant mitigation.

The industrial wastewater facility and nearby/adjacent canals and wetlands have been designated as critical habitat for the federally threatened American crocodile. The maximum predicted salt deposition rate to the industrial wastewater facility in the vicinity of the cooling towers ranges from 1 to 70 kg/ha/month (annual basis; see Figure 5.3-1). This annualized salt deposition range of 1 to 70 kg/ha/month was normalized to salinity based on the annual site rainfall (approximately 58 inches annually). The resulting salinity range was calculated to be approximately 0.0008 to 0.06 parts per thousand (ppt). This range in salinity concentration is about 3 orders of magnitude lower than the existing salinity in the industrial wastewater facility. Salt deposited within the industrial wastewater facility would be circulated within the system with subsequent combination with much higher salinity water. Salinity levels within the cooling canals of the industrial wastewater facility are typically 40–50 parts per thousand, a level that could adversely impact young crocodiles. Hatchlings and juvenile crocodiles have underdeveloped osmoregulatory capabilities and need fresh- to brackish water at least once per week to maintain normal growth rates. FPL's crocodile program collects hatchling crocodiles and transfers them to juvenile refugia constructed by FPL, many on the tops of the cooling canal berms. The juvenile crocodile refugia, based on observations performed in 2008 are depicted on Figure 5.3-2. Several types of refugia have been used, including refugia in the test canals north of the cooling canals of the industrial wastewater system, ponds excavated on berms of the active canals and test cooling canals, refugia resulting of dredging of berms, refugia at the Everglades Mitigation Bank, and natural refugia outside of the cooling canals of the industrial wastewater system. As is depicted in Figure 5.3-2, the majority of juvenile crocodile refugia are south of the area where the majority of salt deposition occurs (i.e., areas greater than 10 kg/ha/month).

Salinity levels in these juvenile crocodile refugia vary depending on conditions such as seasonal rainfall and evaporation rates. Additionally, due to precipitation, a freshwater lens typically develops in these refugia during the late summer months, during the post-hatching period when exposure to low-salinity water is necessary. The increase in salinity corresponding to the maximum salt deposition rate is approximately 0.06 ppt. Growth rates of Turkey Point crocodile hatchlings are equal to or greater than those from reference populations. Based on the locations of the juvenile crocodile refugia with respect to the predicted salt deposition, the predicted impact to salinity, and FPL's ongoing management activities that include monitoring and providing habitats for young crocodiles, predicted salt depositions from operation of the Units 6 & 7 cooling towers into the industrial wastewater facility and refugia would not sufficiently alter relevant salinity levels to impact crocodile growth and/or survival rates.

Waterbirds constitute a major component of terrestrial fauna found within the industrial wastewater facility. These birds forage on the fish inhabiting the canals, primarily hardy species of fish that can tolerate the harsh conditions (high salinities and temperatures) within the industrial wastewater facility. Salt deposits would not impact canal salinities sufficiently to eliminate or reduce fish populations and, therefore, would not impact waterbird use of the industrial wastewater facility.

Any impacts from salt drift on local terrestrial ecosystems would be SMALL and would not warrant mitigation beyond the crocodile management program identified above.

Vapor Plumes and Icing

As described in Subsection 5.3.3.1.1, plumes would be visible during daylight hours less than 7 percent of the time during all seasons. Most of the visible plume would be during the winter season.

As described in Subsection 5.3.3.1.2, ground-level fogging as a result of cooling tower operation is predicted to occur for only a maximum of 55 hours (5-year simulation period) at the Units 6 & 7 plant area and less than 5 hours (5-year simulation period) at any offsite areas. Icing resulting from cooling tower operation would not occur. Therefore, the impacts of vapor plumes, fogging, and icing on terrestrial ecosystems would be SMALL and would not warrant mitigation.

Clouds and Precipitation Modification

As described in Subsection 5.3.3.1.4, no significant increase in local precipitation would occur as a result of cooling tower operation. Any additional precipitation would be small in comparison with the average rainfall in the region, which has been shown to range from 45 inches (114 centimeters [cm]) to 66 inches (168 cm) (Refer to Table 2.7-3).

Because operation of the cooling towers would not result in a significant increase in precipitation, the impacts would be SMALL, and no mitigation is required.

Noise

Noise generated from cooling tower operations would be approximately 73 decibels adjusted (dBA) at 200 feet from the tower (Subsection 5.3.4.2). This is below the 80 to 85 dBA level known to startle or frighten some birds and small mammals (Golden et al. 1980). Therefore, noise from the towers would not disturb wildlife at distances greater than 200 feet from the towers. Additionally, the estimated noise level (73 dBA) associated with the new cooling towers at 200 feet would drop below 60–65 dBA, the level the NRC considers of small significance (NUREG-1437), within an additional 200–300 feet due to attenuation. Noise impacts to terrestrial biota would be SMALL and not warrant mitigation.

Avian Collisions

The mechanical draft towers would rise approximately 67 feet above the basin curb (Table 3.4-2). Taller, natural draft cooling towers have been associated with bird kills, but the shorter mechanical draft cooling towers would pose little risk to birds and cause minimal mortality (NUREG-1437). Therefore, impacts to birds from collisions with new cooling towers would be SMALL and would not warrant mitigation.

5.3.4 IMPACTS TO MEMBERS OF THE PUBLIC

This subsection describes the potential health impacts associated with the cooling system for Units 6 & 7. These include impacts to human health from etiological agents and from noise resulting from operation of the cooling system.

As described in Section 3.4, the circulating water system for Units 6 & 7 would use a closed-cycle, wet cooling system with mechanical draft cooling towers for heat dissipation.

5.3.4.1 Etiological Agent Impacts

Etiological agents that are associated with cooling ponds or towers and thermal discharges can have negative impacts on human health. The presence and concentration of these agents can be increased by the addition of heat. These agents include the enteric pathogens *Vibrio* spp., *Salmonella* spp., *Shigella* spp., and *Plesiomonas shigelloides*, as well as *Pseudomonas aeruginosa*, thermophilic fungi, noroviruses, and toxin-producing algae such as *Karenia brevis*, which causes red tide when present in high concentrations. They also include the bacteria *Legionella* spp., which causes Legionnaires' disease, and free-living amoebae of the genera *Naegleria, Acanthamoeba*, and *Cryptosporidium*. Exposure to these agents, or in some cases the endotoxins or exotoxins they produce, can cause illness or death (NUREG-1555).

These agents are the cause of potentially serious human infections, the most serious of which is attributed to *Naegleria fowleri*. *Naegleria fowleri* is a free-living amoeba that occurs worldwide. It is present in soil and virtually all natural surface waters such as lakes, ponds, and rivers. *Naegleria fowleri* grows and reproduces well at high temperatures (104ºF to 113ºF) and has been isolated from waters with temperatures as low as 79.7ºF. *Naegleria fowleri* thrives in warm, fresh water, particularly if the water is stagnant or slow-moving. These protozoa are found in a variety of water bodies, including lakes, ponds, and poorly maintained swimming pools and hot tubs. Since a primary food source for the amoebae is coliform bacteria, the presence of significant numbers of coliform bacteria would promote growth of this amoeba. Although exposure to this organism is very common, the chance is less than 1 in 100 million that a person exposed to water inhabited by *Naegleria* would become infected. Symptoms of these infections include changes in the ability to taste or smell, rapidly followed by headache, fever, nausea, and vomiting. While the disease is not transmissible from person to person, it is usually fatal (GBRA May 2002).

As presented in Section 3.4, makeup water for the circulating water system would be provided from two sources. Reclaimed water would be provided by the MDWASD. This reclaimed water would undergo pretreatment as well as the addition of biocide and algaecide. The Florida Department of Environmental Protection regulations require high-level disinfection prior to MDWASD supplying the reclaimed water for industrial use in open cooling towers. High-level disinfection includes additional total suspended solids control (beyond secondary treatment levels) to maximize disinfection effectiveness to result in reclaimed water in which fecal coliform values (per 100 milliliter of sample) are below detectable limits. These treatments would eliminate or minimize etiological agents from this makeup water source.

Saltwater makeup from radial collector wells could also be supplied for the circulating water system. Since the etiological agents of concern are primarily found in freshwater, they would not be present in the makeup water from the radial collector wells.

The cooling tower blowdown and other plant wastewater streams would be collected in a common blowdown sump and injected underground via the deep injection wells. These waste streams would not be discharged to waters that have the potential for direct contact by members of the public.

The makeup water reservoir would be located within the Turkey Point plant property, precluding access by members of the public. Personnel access to the makeup water reservoir would be strictly controlled by administrative controls and security patrols. Personnel protective measures (i.e., personal protective equipment, personnel monitoring) related to work activities requiring personnel contact with reservoir systems would be controlled by the worker protection plan. The risk to personnel health from etiological agents associated with the makeup water reservoir would be SMALL and would not warrant mitigation.

The risk to public health from etiological agents associated with the cooling system for Units 6 & 7 would be SMALL and would not warrant mitigation.

5.3.4.2 Noise

A noise survery was conducted in June 2008. The highest recorded noise level for onsite measurements was 68 dBA.The noise impacts of Units 6 & 7 were evaluated using the equipment associated with normal operation of the facility. The noise level generated by each cooling tower would be on the order of 88 dBA at 3 feet from the towers, 73 dBA at 200 feet from the towers, and 65 dBA at 400 feet from the towers, which is within the Units 6 & 7 plant area.

The design of Units 6 & 7 includes components that mitigate noise from being emitted to the surrounding environment. Most of the noise sources associated with Units 6 & 7 cooling systems would be cooling water pumps and cooling towers. The cooling water pumps would be in buildings that mitigate sounds emitted by equipment. The noise from cooling towers would be mitigated by their inherent design (e.g., splash guards on air inlets to mitigate sounds generated by falling water. stacks on mechanical fans that direct noise vertically).

As reported in NUREG-1437, and referenced in NUREG-1555, noise levels below 65 dBA are considered of small significance. In addition, there are no applicable state or local environmental noise regulations for unincorporated areas of Miami-Dade County, where Turkey Point is located (Subsection 2.7.7). Therefore, noise impacts would be SMALL and would not warrant mitigation.

5.3.4.3 Conclusion

Human health impacts to the surrounding population associated with the operation of the cooling system would be SMALL and would not warrant mitigation.

Section 5.3 References

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Figure 5.3-1 Predicted Monthly Salt Deposition

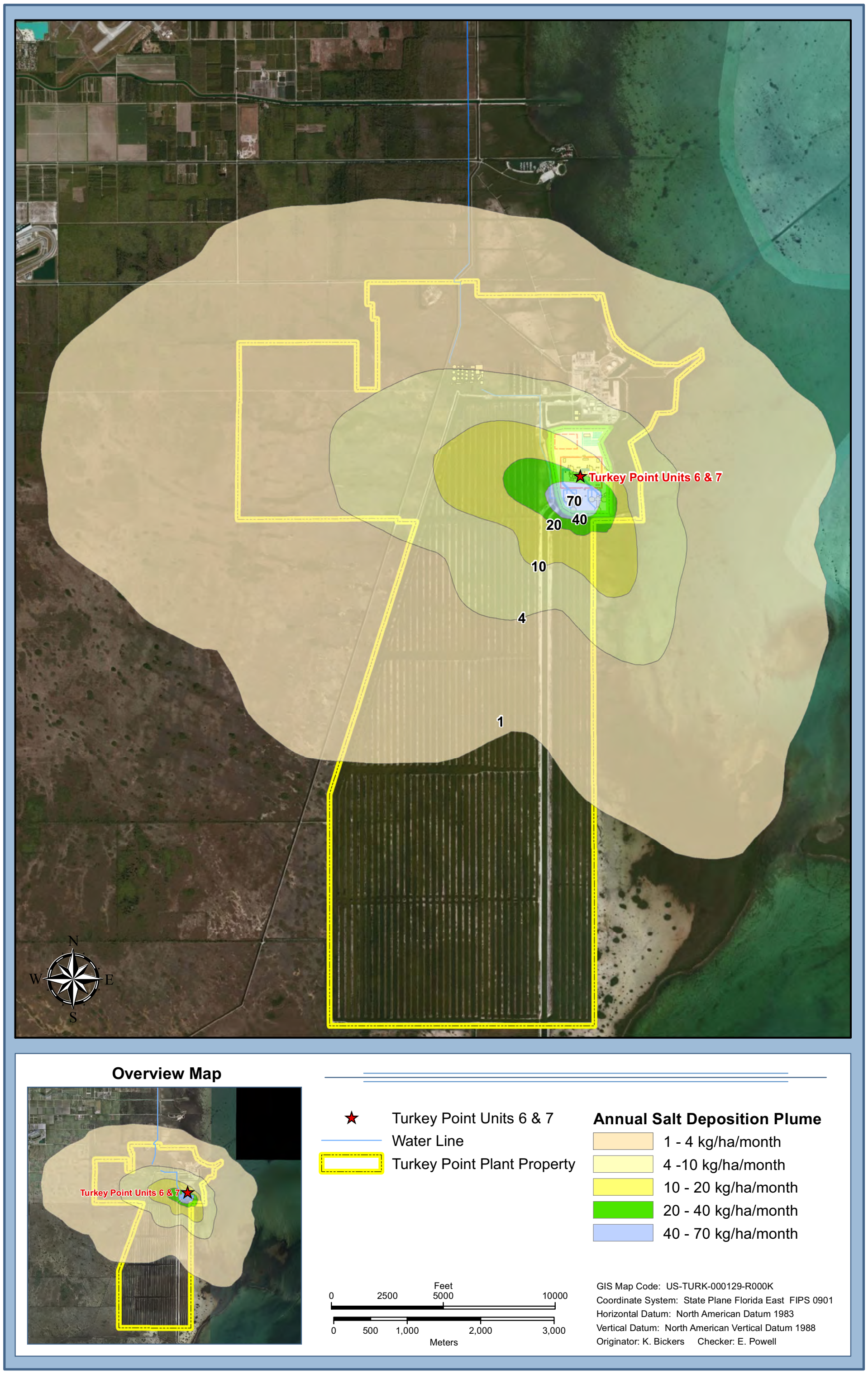

Figure 5.3-2 Crocodile Areas in Relation to Salt Deposition Plume

5.4 RADIOLOGICAL IMPACTS OF NORMAL OPERATION

This section describes the radiological impacts of normal plant operation on members of the public, plant workers, and biota. Subsection 5.4.1 describes the offsite radiological exposure pathways. Subsection 5.4.2 estimates the maximum doses to the public from the operation of each new unit. Subsection 5.4.3 evaluates the impacts of these doses by comparing them to regulatory limits. Subsection 5.4.4 considers the impact to nonhuman biota that are present along the exposure pathways. Finally, Subsection 5.4.5 describes the radiation doses to plant workers.

5.4.1 EXPOSURE PATHWAYS

Small quantities of radioactive liquids and gases would be discharged to the environment during normal operation. The impacts of these releases and any direct radiation to individuals, population groups, and biota in the vicinity of the new units were evaluated by considering the most important pathways from the release points to the receptors of interest. The most important pathways are those that could yield the highest radiological doses for a given receptor. The relative importance of a pathway is based on the type and amount of radioactivity released, the environmental transport mechanism, and the consumption or usage factors of the receptor.

The exposure pathways considered and the analytical methods used to estimate doses to the maximally exposed individual (MEI) and to the population within 50 miles of the new units are based on RG 1.109, *Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I,* and RG 1.111, *Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors.* An MEI is a hypothetical member of the public who receives the maximum possible calculated dose. Use of the MEI allows comparisons with established dose criteria for the public. Population doses were calculated for the year 2090, the assumed end of plant life, when the population is projected to be at its peak after the currently projected 60 years of plant operation. This is based on 40 years of operation under the initial operating license plus one 20-year license renewal. In 2090, food production rates within 50 miles of Units 6 & 7 are projected to increase at the same rate as population growth. Population doses are calculated considering the following three counties located within 50 miles of the plant: Broward, Miami-Dade, and Monroe. The southeast corner of Collier County also falls within 50 miles, but this is less than 10 percent of the total county land area and there is no population in this region. Therefore, the impact on this county would be negligible.

5.4.1.1 Liquid Pathways

Treated liquid radioactive waste from Unit 6 & 7 operation would be diluted with the blowdown sump discharge flow prior to ultimate release to the Boulder Zone via the deep injection wells (see Section 3.5). As discussed in Subsection 2.3.2, the highly saline Boulder Zone of the Lower Floridan aquifer is used for deep well injection of treated municipal wastewater and reverse osmosis concentrate in Miami-Dade County. Injection occurs below the middle confining layer at depths of approximately 2700 feet or greater, approximately 900 feet below the base of the lowest underground source of drinking water. The Boulder Zone is currently not a source for potable water and there is no viable pathway for the injection well releases to reach potable water. Hence, there is no liquid effluent pathway dose due to normal plant operations.

For off-normal operations, a conceptual receptor exposure scenario has been developed that considers the Boulder Zone for potable water use. Although unrealistic, this scenario is considered to bound any other potential exposure scenarios, such as vertical migration from the Boulder Zone to potable water aquifers despite the presence of dual zone monitoring wells.

The conceptual exposure scenario considers a receptor created by the drilling of a water supply well into the Boulder Zone for potable water use. An initial evaluation of receptor distance from the deep injection wells was performed to determine the most realistic location of the receptor, based on distance from the Turkey Point Plant property and any potential land use constraints at each location. This was performed to determine a realistic scenario for the potential receptor. The results of this initial evaluation are summarized in the paragraphs below.

Receptor 1 is located southeast of the deep injection wells at an approximate distance of 2084 feet. This location is part of Biscayne National Park. The location is not considered a realistic receptor location for a water supply well since it is located on land that is only accessible from Biscayne Bay, would generally not be considered usable for applications that would require a freshwater supply (e.g., residence), and access would not likely be granted by the park. This scenario was therefore determined to be unrealistic and was not further considered.

Receptor 2 is located north of the deep injection wells at an approximate distance of 9824 feet. This location is located in Homestead Bayfront Park. The location is not considered a realistic location for a water supply well since it is located within a county park and therefore is unlikely to be a realistic area usable for applications that would require a freshwater water supply (e.g., residence). This receptor location was therefore determined to be unrealistic and was not further considered.

Receptor 3 is located northwest of the deep injection wells at an approximate distance of 9776 feet. This location is on land not owned by FPL and is considered a realistic location for the installation and use, by a residence, of a water supply well in the Boulder Zone. This location was therefore evaluated for liquid effluent doses.

In order to determine the decay time for the injectate front to reach Receptor 3, an analysis was performed that considered the injection rate, aquifer thickness, and porosity of the Boulder Zone. The resulting time required for the injectate front to reach the receptor (from initiation of Units 6

& 7 operation) is approximately 13.7 years. This horizontal travel time through the Boulder Zone is used in the dose calculation described below.

The NRC-endorsed LADTAP II computer program (PNL Apr 1986) was used to calculate doses to an individual at Receptor 3 from liquid effluents. This program implements the radiological exposure models described in RG 1.109 to estimate the doses. The following exposure pathways are considered in LADTAP II:

- Consumption of contaminated drinking water
- Consumption of meats and vegetables produced with contaminated irrigation water (there are no milk animals within five miles of the plant)

The only site-specific input parameters used in LADTAP II are the following:

- Liquid effluent discharge — A discharge rate of 27.9 cfs was used, corresponding to the reclaimed water dilution flow rate of 12,500 gpm, which bounds the saltwater discharge rate of 58,000 gpm, as it yields less dilution (Subsection 2.3.2).
- Source terms — The isotopic activity releases are from DCD Table 11.2-7.
- Irrigation rate — The irrigation rate was assumed to be 110 l/m^2-month, corresponding to 1 inch per week.
- Transit time — The transit time from discharge to drinking water and irrigated foods was assumed to be 13.7 years, the time required for the injectate to reach Receptor 3.

The resulting maximum doses per unit are 2.5 mrem to the total body, 2.4 mrem to the thyroid, and 3.1 mrem to the liver of a child. Even though these doses are not due to normal operations, they conform to the 10 CFR 50, Appendix I guidelines of 3 mrem total body and 10 mrem organ.

5.4.1.2 Gaseous Pathways

The NRC-endorsed GASPAR II computer program (PNL Mar 1987) was used to calculate doses to the MEI, the population, and biota from gaseous effluents. This program implements the radiological exposure models describe in RG 1.109 to estimate the doses. The following exposure pathways are considered in GASPAR II:

- External exposure to immersion/submersion by an airborne plume
- External exposure to standing on contaminated ground

- Inhalation of airborne radioactivity
- Ingestion of radioactivity in meat and milk
- Ingestion of radioactivity in garden vegetables

The input parameters for the gaseous effluent exposure pathway are presented in Table 5.4-1 and the receptor locations are shown in Table 5.4-2. The receptor locations are those at which the maximum atmospheric dispersion and deposition factors occur for each exposure pathway.

5.4.1.3 Direct Radiation

Contained sources of radiation at Units 6 & 7, including the refueling water storage tank, will be shielded such that the direct dose rate at the Turkey Point plant property boundary is negligible (WEC 2011). Therefore, the impact of direct radiation would be SMALL and would not warrant additional mitigation. No further consideration of direct radiation is provided.

5.4.2 RADIATION DOSES TO MEMBERS OF THE PUBLIC

Based on the parameters in Tables 5.4-1 and 5.4-2, the GASPAR II computer program was used to calculate annual doses from gaseous effluents from one new unit to the MEI, the population, and biota. As stated above, there is no dose due to liquid effluents during normal operations. The MEI doses were determined by considering the maximally exposed adult, teenager, child, and infant at the following locations:

- Nearest site boundary (nearest boundary of the Turkey Point plant property)
- Nearest residence (2.7 miles)
- Nearest vegetable garden
- Nearest meat cow pasture

There are no milk animals within five miles of Units 6 & 7. The maximum total body and organ doses are presented in Table 5.4-3. In this table, the contributions from viable pathways are summed to obtain a total dose for each organ and age group. Although Table 5.4-2 shows the vegetable garden is farther away than the residence and the meat animal, the garden doses were added to the doses from the other two pathways. For comparison, Table 5.4-2 includes dose estimates at the limiting Turkey Point plant property boundary location, where no established human exposure pathways have been identified. In effect, doses were calculated at two locations: Turkey Point plant property boundary and the merged residence/garden/meat animal location. The latter location represents the MEI. Table 5.4-3 shows that the maximum doses from each unit occur at the Turkey Point plant property boundary and that most of the dose is a result of the external exposure pathways. The maximum total body dose is 3.9 mrem/year to the adult, the teen, and the child while the maximum organ doses are 14 mrem/year to the skin and 7.5 mrem/year to the thyroid of the child. These are theoretical doses based on conservative assumptions. Table 5.4-5 shows comparable doses from the operation of Units 3 and 4 are negligible.

5.4.3 IMPACTS TO MEMBERS OF THE PUBLIC

Table 5.4-4 shows that even the site boundary doses, which bound the MEI, are within the design objectives of 10 CFR Part 50, Appendix I. Table 5.4-5 shows that the total site doses from the two new units as well as the two existing units are within the regulatory limits of 40 CFR Part 190. Since the dose limits for members of the public in 40 CFR Part 190 are more restrictive than those in 10 CFR 20.1301(a)(1), demonstration of compliance with the limits of 40 CFR Part 190 is also a demonstration of compliance with the 0.1 rem total effective dose equivalent (TEDE) limit of 10 CFR 20.1301(a)(1). Table 5.4-6 shows that collective doses from the new units to the population within 50 miles of the plant are extremely low compared to collective doses from natural background radiation. Based on the estimated doses from the new units, impacts to members of the public would be SMALL and would not warrant additional mitigation.

5.4.4 IMPACTS TO BIOTA OTHER THAN MEMBERS OF THE PUBLIC

Radiation exposure pathways to biota other than members of the public were examined to determine if these pathways could result in doses to biota greater than those predicted for humans. Immersion and ground deposition doses are largely independent of organism size, and the doses to humans, calculated as described in Subsection 5.4.2, can be applied to biota except that the location of the biota is as shown in Table 5.4-2. The maximum total body dose to a human from inhalation, vegetable, plume, and ground deposition pathways, as calculated by GASPAR II, was applied to biota except that the ground deposition dose was increased by a factor of two to account for the proximity of terrestrial organisms to the ground. The resulting dose to biota species represented by muskrat, raccoon, heron, and duck is 26 mrad/year or 0.07 mrad/day per unit. The International Council on Radiation Protection states that “if man is adequately protected, then other living things are also likely to be sufficiently protected,” (ICRP 1977), and the National Council on Radiation Protection concurs with this conclusion (NCRP 1991). Furthermore, the International Atomic Energy Agency (IAEA) concludes that there is no scientific evidence that chronic dose rates below 100 mrad per day are harmful to plants and animals (IAEA 1992). It is seen that the biota dose is well within the IAEA guideline. Therefore, impacts to biota other than members of the public would be SMALL and would not warrant additional mitigation.

5.4.5 OCCUPATIONAL DOSES

For Units 6 & 7, the estimated annual occupational dose, including outage activities, is 67 person-rem per unit (WEC 2011). By comparison, the annual collective dose per operating PWR in the U.S. was 87 person-rem in 2006 (US NRC, 2007). The health physics program described in FSAR Section 12.5 and the radiation protection features described in FSAR Section 12.3 would ensure that occupational exposures are maintained ALARA. The dose to Unit 7 construction workers during the operation of Unit 6 and the existing units is addressed in Section 4.5. With the collective worker dose smaller than that for existing reactors, the impact on occupational doses would be SMALL and no new mitigation measures or controls would be warranted.

Section 5.4 References

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Table 5.4-1
Gaseous Effluent Exposure Pathway Parameters

Parameter	Value	Basis/Source
Release source terms	See DCD Table 11.3-3	The DCD table shows the expected annual activity releases by isotope.
Atmospheric dispersion and deposition factors	See Tables 2.7-16, 2.7-17, 2.7-18	Table 2.7-16 shows the dispersion and deposition data for the nearest site boundary, residence, vegetable garden, and meat animal. Tables 2.7-17 and 2.7-18 show dispersion and deposition data for 160 sectors representing 16 directions and 10 distance segments out to 50 miles. The dispersion and deposition data at the assumed biota location at a distance of 0.25 mile were obtained from Table 2.7-17.
Individual consumption rates	See RG 1.109	The values from Tables E-5 and E-4 of RG 1.109 were used for the MEI and the average person within the population, respectively.
50-mile population	6.28E06	This is the projected population for the year 2090, the end of plant life. It was used to conservatively maximize population doses. This projection represents an increase of a factor of 1.81 over the 2010 population.
50-mile population distribution	See Table 2.5-1	Table 2.5-1 shows the population distribution in 2090 for 160 sectors representing 16 directions and 10 distance segments out to 50 miles.
50-mile milk production	7.89E04 L/yr	Milk cows in the four counties within 50 miles represent approximately 0.046% of the state total (USDA Jun 2004). The annual production of milk in the state (USDA 2008) was multiplied by 0.046% to estimate the production within 50 miles as 4.36E04 L/yr. Assuming production to increase with the population, this production rate was multiplied by the population growth factor of 1.81 to project the production in 2090.
50-mile meat production	1.18E05 kg/yr	Beef cows and broilers in the four counties within 50 miles represent approximately 0.21% and 0.0017%, respectively, of the state totals (USDA Jun 2004). The annual productions of red meat (USDA 2007) and broiler (USDA 2008) in the state were multiplied by these percentages and summed to estimate the total meat production within 50 miles as 6.53E04 kg/yr. Assuming production to increase with the population, this production rate was multiplied by the population growth factor of 1.81 to project the production in 2090.
50-mile vegetable production	1.09E08 kg/yr	The harvested land area in the four counties within 50 miles represents approximately 2.6% of the state total (USDA Jun 2004). The annual production of vegetables in the state (USDA 2008) was multiplied by 2.6% to estimate the production within 50 miles as 6.04E07 kg/yr. Assuming production to increase with the population, this production rate was multiplied by the population growth factor of 1.81 to project the production in 2090.
Fraction of year leafy vegetables grown	1	This is the most conservative value.
Fraction of year milk cows on pasture	1	This is the most conservative value.
Fraction of maximum individual's vegetable intake from own garden	0.76	This is the default value from RG 1.109, Table E-15.
Fraction of milk-cow feed from pasture	1	This is the most conservative value.
Average absolute humidity for growing season	8 g/m^3	This is the default value in GASPAR II (PNL Apr 1987). It was used when a value of zero is input.
Fraction of year goats at pasture	1	This is the most conservative value.
Fraction of goat feed from pasture	1	This is the most conservative value.
Fraction of year beef cattle at pasture	1	This is the most conservative value.
Fraction of beef cattle feed from pasture	1	This is the most conservative value.

Table 5.4-2
Gaseous Effluent Exposure Pathway Receptor Locations

Nearest Receptor	Direction	Distance (miles)
Site Boundary (Turkey Point plant property boundary)	SSE	0.35
Residence	N	2.7
Vegetable Garden	NW	4.8
Meat Animal	N	2.7
Biota	SSE	0.25

Table 5.4-3
Gaseous Pathway Doses for Maximally Exposed Individuals

	Dose (mrem/year) per Unit							
Pathway	**Total Body**	**GI-Tract**	**Bone**	**Liver**	**Kidney**	**Thyroid**	**Lung**	**Skin**
Site Boundary								
External								
Plume	2.6	2.6	2.6	2.6	2.6	2.6	2.7	13
Ground	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2
Total	3.6	3.6	3.6	3.6	3.6	3.6	3.8	14
Inhalation								
Adult	0.28	0.28	0.046	0.29	0.29	2.7	0.37	0
Teen	0.28	0.29	0.055	0.29	0.30	3.3	0.42	0
Child	0.25	0.25	0.067	0.26	0.27	3.9	0.36	0
Infant	0.15	0.14	0.034	0.16	0.16	3.5	0.22	0
Total								
Adult	3.9	3.9	3.6	3.9	3.9	6.3	4.1	14
Teen	3.9	3.9	3.7	3.9	3.9	6.9	4.2	14
Child	3.9	3.8	3.7	3.9	3.9	7.5	4.1	14
Infant	3.7	3.7	3.6	3.8	3.8	7.1	4.0	14
Residence								
External								
Plume	0.0067	0.0067	0.0067	0.0067	0.0067	0.0067	0.0074	0.046
Ground	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0066	0.0077
Total	0.013	0.013	0.013	0.013	0.013	0.013	0.014	0.053
Inhalation								
Adult	0.0012	0.0012	0.00016	0.0012	0.0012	0.0096	0.0015	0
Teen	0.0012	0.0012	0.00019	0.0012	0.0012	0.012	0.0016	0
Child	0.0010	0.0010	0.00023	0.0011	0.0011	0.014	0.0014	0
Infant	0.00059	0.00058	0.00012	0.00063	0.00063	0.012	0.00087	0
Vegetable								
Adult	0.0064	0.0065	0.033	0.0064	0.0061	0.086	0.0055	0
Teen	0.0092	0.0093	0.050	0.0096	0.0091	0.11	0.0083	0
Child	0.020	0.019	0.11	0.021	0.020	0.21	0.018	0
Meat								
Adult	0.0026	0.0036	0.011	0.0027	0.0026	0.0094	0.0025	0
Teen	0.0021	0.0027	0.0095	0.0022	0.0021	0.0070	0.0020	0
Child	0.0038	0.0040	0.018	0.0039	0.0038	0.011	0.0037	0
Total MEI Dose[(a)]								
Adult	0.023	0.025	0.058	0.023	0.023	0.12	0.023	0.053
Teen	0.026	0.026	0.073	0.026	0.026	0.14	0.026	0.053
Child	0.038	0.037	0.15	0.039	0.038	0.24	0.037	0.053
Infant	0.014	0.014	0.013	0.014	0.014	0.025	0.015	0.053

(a) Total MEI dose is the sum of the residence, vegetable, and meat pathways

Table 5.4-4
Comparison of Maximally Exposed Individual Doses with 10 CFR 50, Appendix I Criteria

	Location	Dose per Unit	Dose Limit per Unit
Liquid Effluent			
Total Body (mrem)	None	0	3
Maximum Organ — Bone (mrem)	None	0	10
Gaseous Effluent			
Gamma Air (mrad)	Site Boundary	4.2	10
Beta Air (mrad)	Site Boundary	18	20
Total Body[(a)] (mrem)	Site Boundary	3.6	5
Skin[(a)] (mrem)	Site Boundary	14	15
Iodines and Particulates, Maximum Organ[(b)] — Thyroid (mrem)	Site Boundary	4.9	15

(a) External doses from Table 5.4-3.
(b) From Table 5.4-3, excluding plume contribution from noble gases.

Table 5.4-5
Comparison of Maximally Exposed Individual Doses with 40 CFR 190 Criteria

	Site Dose (mrem/year)			
	Units 6 & 7[(a)]	Units 3 & 4[(b)]	Site Total	Limit
Total Body	7.8	0.0029	7.8	25
Thyroid	15	0.0059	15	75
Other Organ – Lung	8.4	0.0059	8.4	25

(a) Double the site boundary doses in Table 5.4-3
(b) Bounding values from five years of annual effluent reports; lung dose assumed to be same as thyroid dose.
Note: Column (b) is actual doses. Column (a) is theoretical doses.

Table 5.4-6
Collective Doses Within 50 Miles

	Dose (Person-rem/year) per Unit		Two-Unit Dose (Person-rem/year)	
	Total Body	Thyroid	Total Body	Thyroid
Liquid Effluents	0	0	0	0
Gaseous Effluents				
Noble Gases	2.1	2.1	4.2	4.2
Iodines and Particulates	1.2	4.7	2.4	9.4
H-3 and C-14	0.69	0.69	1.4	1.4
Total	4.0	7.5	8.0	15.0
Total	4.0	7.5	8.0	15.0
Natural Background[(a)]	2.5 x 10^6			

(a) Based on dose rate of 300 mrem/yr (NCRP 1987)

5.5 ENVIRONMENTAL IMPACTS OF WASTE

Operation of Units 6 & 7 would generate several identifiable waste streams. These wastes would be regulated, as appropriate, during all stages including generation, management, handling, treatment, storage, transportation, and disposal. This section describes the potential environmental impacts associated with these wastes. The description is divided into subsections that address both nonradioactive and mixed wastes.

5.5.1 NONRADIOACTIVE WASTE SYSTEM IMPACTS

Descriptions of the Units 6 & 7 nonradioactive waste systems, waste stream discharges, and chemical concentrations are presented in Section 3.6. The following summarizes the impacts resulting from nonradioactive discharges to the environment.

Nonradioactive wastes would be managed in accordance with applicable federal, local laws and regulations, and permit requirements, as identified in Section 1.2. Management practices would include:

- Recyclable wastes, such as scrap metal, lead acid batteries, and paper collected at Units 6 & 7 would be recycled offsite at an approved recycle facility, as is currently performed for the existing units.
- Wastes (e.g., used oil, antifreeze, rags) would be collected and stored temporarily onsite until recovered at an offsite permitted recycling/recovery facility or disposed of at an offsite licensed commercial waste disposal facility, if found to be hazardous.
- Hazardous waste (e.g., paint and solvent wastes) would be disposed of in accordance with 40 CFR Parts 261 and 262.
- Water discharges from cooling and auxiliary systems (e.g., cooling tower blowdown, sanitary wastewater treatment effluent, and other wastewater effluent streams collected in the blowdown sump) from routine plant operations would be discharged to the Boulder Zone via deep injection wells as permitted by the Florida Department of Environmental Protection.
- Storm water would be discharged to the cooling canals of the industrial wastewater facility as permitted by the Florida Department of Environmental Protection.
- Waste sludge generated at the tertiary water treatment plant and sanitary wastewater treatment plant would be disposed of in an offsite landfill.

The assessment of potential impacts resulting from the discharge of nonradioactive wastes is presented in the following subsections.

5.5.1.1 Impacts of Discharges to Land

Operation of Units 6 & 7 would result in the generation of solid wastes, including trash, water treatment resins, water and sanitary treatment residuals, and waste generated from the removal of access roads. Applicable Florida requirements and standards would be met regarding the handling, transporting, and disposal of solid wastes offsite (e.g., Solid Waste Management Facilities Rule 62-701, Florida Administrative Code [F.A.C.]). Onsite disposal of uncontaminated sediment and excavated material would be stockpiled in areas with appropriate engineering controls to limit surface water runoff. The impacts of the disposal of these wastes to land are discussed in the following paragraphs.

As discussed in Section 3.6, Turkey Point Units 6 & 7 would produce approximately 1000 tons annually of nonradioactive, nonhazardous waste requiring disposal in landfills, including spent filters from water and wastewater treatment. In 2008, Miami- Dade County disposed of approximately 2.2 million tons of waste in both commercial and private landfill facilities (Miami-Dade County, undated). The percent of waste requiring disposal in landfills from Turkey Point Units 6 & 7 represents approximately 0.05 percent of the total tons disposed in landfills by Miami-Dade County in 2008. It is likely that the quantities of construction rubble would be low when compared to the overall waste volumes disposed in landfills. Therefore, the potential impacts from land disposal of nonradioactive, nonhazardous solid wastes would be SMALL and not warrant mitigation.

The FPL Reclaimed Water Treatment Facility is expected to produce approximately 435 tons of waste sludge per day, which would be disposed of at an offsite permitted landfill. This amount of waste sludge requiring disposal in landfills per day represents approximately seven percent of the 2.2 million tons of waste disposed in landfills by Miami-Dade County in 2008. Therefore, the potential impacts from land disposal of the Reclaimed Water Treatment Facility waste sludge would be SMALL and not warrant mitigation.

The sanitary wastewater treatment facility will be constructed to treat sanitary waste from Turkey Point Units 1 through 4, Units 6 & 7, Land Utilization Facilities, and the FPL reclaimed water treatment facility. Approximately 1300 gallons per day of 1.5-2 percent residual sludge, or biosolids, are anticipated to be produced daily. The residual sludge will be transported and disposed of offsite by a licensed contractor. Based on the small amount of residual biosolids anticipated to be produced from the Turkey Point Units 1 through 4, Units 6 & 7, Land Utilization Facilities, and the FPL reclaimed water treatment facility, the potential impacts from land disposal of the sanitary wastewater treatment waste sludge would be SMALL and not warrant mitigation.

5.5.1.2 Impacts of Discharges to Water

Nonradioactive wastewater from routine plant operations would include cooling tower blowdown, plant auxiliary systems, and water treatment. Ambient or baseline water quality characteristics are described in Subsection 2.3.3. Table 3.6-1 lists potential water treatment chemicals that would be used. Tables 3.6-2 and 3.6-3 list the estimated constituent and concentrations in the nonradioactive liquid waste stream from Units 6 & 7 that would be discharged to the deep injection wells for the reclaimed water and saltwater water makeup water to the circulating water system, respectively. Sanitary waste would be collected and treated in an onsite sewage treatment plant, the design and operation of which would ensure that the effluents meet the applicable effluent requirements.

The wastewater and sanitary waste treatment effluent would be disposed of using deep injection wells under the provisions of the Underground Injection Control (UIC) Rule in 62-528 F.A.C. Therefore, the effluent limits would be set by the underground injection control permit, thus regulating the effluent concentrations and operation of the deep injection wells. The wastewater would be discharged into the Boulder Zone approximately 2900 feet underground.

Considering the anticipated amount of dilution for wastewater discharged to the Boulder Zone and the limits that would be placed on discharges by the underground injection control permit, the potential impacts from wastewater/sanitary discharge from Units 6 & 7 on groundwater would be SMALL. There would be no impacts on surface water or groundwater from wastewater/sanitary waste discharge. As identified in Section 1.2, the current zero discharge National Pollutant Discharge Elimination System permit (62-620 and 62-621 F.A.C, promulgated by the U.S. EPA to the state of Florida through 403.0885 Florida Statutes) for industrial wastewater identifies the limits on various chemical constituents that can be released to the industrial wastewater facility. The impacts of the addition of impervious surfaces would be negligible because environmental best management practices (e.g., oil-water separators) would be employed to control storm water runoff. Therefore, environmental impacts from storm water discharges would be SMALL and would not warrant mitigation.

5.5.1.3 Impacts of Discharges to Air

Operation of Units 6 & 7 would result in small amounts of gaseous emissions to the air from equipment associated with plant auxiliary systems (e.g., diesel generators, diesel-driven fire pumps, etc.). This equipment would operate only infrequently (e.g., during startup/shutdown or testing), and, thus, the related emissions would be intermittent. Projected emissions from the diesel-fueled equipment are provided in Table 3.6-4.

Under state of Florida prevention of significant deterioration review requirements, all major new or modified sources of air pollutants under the Clean Air Act must be reviewed and a preconstruction permit issued. The EPA has promulgated prevention of significant deterioration regulations under 40 CFR Part 51.166. Florida's prevention of significant deterioration rules, promulgated from EPA CFR Part 51.166, are codified under 62-212.400, F.A.C. The air emission sources as a result of operation of Units 6 & 7 would be permitted under this rule. Included in this rule are limits for regulated pollutants.

Based on the estimated amount of potential air emissions, the intermittent nature of the potential emissions, and the requirement to adhere to prevention of significant deterioration requirements, impacts to air quality would be SMALL and would not warrant mitigation.

5.5.2 MIXED WASTE IMPACTS

The term mixed waste refers specifically to waste that is regulated as both radioactive waste and hazardous waste. Radioactive materials at nuclear power plants are regulated by the NRC under the Atomic Energy Act of 1954 (Atomic Energy Act, 42 USC 2011 et seq.). Hazardous wastes are regulated by the state of Florida, which is an EPA-authorized state (i.e., a state authorized by the EPA to regulate those portions of the federal act) under the Resource Conservation and Recovery Act (RCRA 42 USC 6901 et seq).

Mixed waste generated from the operation of Units 6 & 7 was assessed based on the following laws and regulations. The radioactive component of mixed waste must satisfy the definition of low-level waste in the Low-Level Radioactive Waste Policy Amendments Act of 1985. The hazardous component must exhibit at least one of the hazardous waste characteristics identified in 40 CFR Part 261, Subpart C, or be listed as a hazardous waste under 40 CFR Part 261, Subpart D.

5.5.2.1 Plant Systems Producing Mixed Waste

A 1990 survey conducted by the NRC identified the following types of mixed low-level waste at reactor facilities (NUREG-1437):

- Waste oil from pumps and other equipment.
- Chlorinated fluorocarbons resulting from cleaning, refrigeration, degreasing, and decontamination activities.
- Organic solvents, reagents, compounds, and associated materials such as rags and wipes.
- Metals such as lead from shielding applications and chromium from solutions and acids.
- Metal-contaminated organic sludge and other chemicals.
- Corrosive liquids consisting of organic and inorganic acids.

The types of mixed waste generated by the AP1000 would be consistent with the types identified by the NUREG-1437 survey, and an AP1000 unit would generate a limited volume of mixed waste (i.e., approximately 25 cubic feet annually) per the DCD. However, it is anticipated that little to no mixed waste would be produced by Units 6 & 7. The following paragraphs contain proposed procedures for the handling and minimization of mixed waste, should it be generated as a result of the operation of Units 6 & 7.

5.5.2.2 Mixed Waste Storage and Disposal Plans

The volume of mixed waste would be reduced or eliminated by one or more of the following methods before disposal: decay, stabilization, neutralization, filtration, or chemical/thermal destruction by an outside vendor. Some small quantities of mixed waste, if generated, would be temporarily stored onsite until suitable treatment options or disposal sites are available. Possible options would be shipment to a permitted mixed waste disposal facility, shipment to a treatment facility, or storage onsite. Occupational chemical and radiological exposures could occur during the testing of mixed wastes to determine if the constituents are chemically hazardous. Appropriate hazardous chemical control and radiological control measures would be applied during testing, handling, and storage of mixed wastes, in accordance with 10 CFR Part 20 guidelines, and could include any of the following:

- Segregate mixed wastes from nonhazardous wastes.
- Designate and use an area only for storage of mixed waste and exclude its use for storage of unrelated materials or equipment or for other functions.
- Provide a secondary containment for liquid mixed wastes being stored (for example, berm and line areas where drums are stored).
- Label the containers properly and in accordance with regulatory requirements.
- Post and/or provide applicable material safety data sheets, emergency spill response procedures, and a spill kit in the area.
- Fence and lock the gate to the accumulation area or long-term storage area when authorized personnel are not present.
- Post signs at the entrance to the storage area indicating, for example: “MIXED HAZARDOUS WASTE AREA” and “DANGER—UNAUTHORIZED PERSONNEL—KEEP OUT.”

5.5.2.3 Waste Minimization Plan

A waste minimization program could be developed and implemented, if necessary. The following elements of such a program may include:

- Maintenance Program — Equipment maintenance programs would be periodically reviewed to establish improvements in corrective and preventive maintenance that would reduce equipment failures that could generate mixed waste. Maintenance procedures would be reviewed to address activities that result in the production of waste in the form of process materials, scrap, and cleanup residue. In addition, the need for revising operational procedures, modifying equipment, and segregating and recovering the mixed wastes would be addressed.

- Recycling and Reuse — Opportunities for reclamation and reuse of waste materials would be used whenever feasible. Tools, equipment, and materials would be decontaminated for reuse or recycle whenever practical to minimize the amount of waste for disposal. Impediments to recycling would be challenged to enable generators to recycle whenever practical.

- Segregation — If radioactive or hazardous waste is generated, proper handling, containerization, and separation techniques would be employed. This would minimize cross-contamination and the unnecessary generation of mixed waste.

- Decay in Storage — Some portion of the mixed waste would be radionuclides with relatively short half-lives. The NRC generally allows facilities to store waste containing radionuclides with half-lives of less than 120 days until 10 half-lives have elapsed and the radiation emitted from the unshielded surface of the waste is indistinguishable from background levels. The waste could then be disposed of as a nonradioactive waste. Radioactive waste could also be stored for decay under certain circumstances in accordance with 10 CFR Part 20. For mixed waste, storage for decay would be particularly advantageous because the waste could be managed solely as a hazardous waste after the radionuclides decayed to background levels, thereby simplifying the management of these wastes to meet applicable requirements.

- Work Planning — Pre-job planning would be performed to determine what materials and equipment would be needed to perform the anticipated work. One objective of this planning would be to prevent pollution and minimize the amount of mixed waste that may be generated and to use only the materials necessary to accomplish the work. Planning would also prevent mixing of materials or waste types.

- Tracking Systems — Development of a tracking system to monitor waste generation data and identify waste minimization opportunities to reduce environmental impacts would be considered. This would provide essential feedback to successfully guide future efforts. The data collected by the system would be used for internal reporting. The tracking system would provide feedback on the progress of the waste minimization program, including the results of the implementation of pollution prevention technologies.

- Training and Awareness Programs — Educate employees in the principles and benefits of the waste minimization plan, solutions to current and potential environmental management problems could be found. Details of the training program would be outlined in the Nuclear General Employee Training.

5.5.2.4 Environmental Impacts of Mixed Waste

Industry-accepted chemical handling techniques, pre-job planning, and compliance with an approved facility waste minimization plan (as addressed in Subsection 5.5.2.3) would ensure that only small quantities of mixed wastes would be generated by the new units. Therefore, environmental impacts of mixed waste would be SMALL and would not warrant mitigation.

5.5.3 CONCLUSIONS

Small quantities of chemical constituents would be released to the water and air from operation of the new units. These constituents would be limited and permitted under the Florida Department of Environmental Protection permits. Waste minimization programs would reduce the amount of wastes, including mixed wastes, generated by operation of the new units. To the extent practical, nonradioactive liquids and solid wastes would be recycled. For wastes that cannot be recycled, applicable federal, Florida, and local requirements and standards would be met with regard to the handling, transporting, and disposal of solid wastes offsite. Therefore, the impacts of waste generation would be SMALL and would not warrant mitigation.

5.6 ENVIRONMENTAL IMPACTS OF TRANSMISSION SYSTEMS

The potential environmental impacts of transmission system operation are described in this section. Environmental impacts of transmission facility construction (new rights-of-way and/or modification of existing rights-of-way) are described in Section 4.3. Possible impacts from transmission system operation, including transmission line vegetation management and transmission system maintenance, are described in this section relative to terrestrial and aquatic resources and members of the public.

Power generated at Units 6 & 7 would be transmitted over new circuits using new and existing rights-of-way (see Subsection 2.2.2). To the extent practicable, the proposed transmission lines would be collocated with FPL's existing transmission lines.

As part of the state certification proceeding, FPL is proposing transmission corridors of variable widths up to 3700 feet wide connecting the terminal points of the proposed transmission lines. The new transmission lines would be located in a much narrower right-of-way somewhere within these corridors. Once the certification proceeding is concluded and FPL obtains the property interests required to construct the proposed transmission lines, the boundary of the corridors would narrow to only that land in the transmission line rights-of-way. After constructing the new transmission lines, the proposed transmission corridors would have no further legal significance. Therefore, this section addresses the environmental impacts of operation and maintenance of the transmission lines within the rights-of-way.

The 500 kV and 230 kV rights-of-way are variable in width and total approximately 89 miles in length. All existing and proposed rights-of-way are located in Miami-Dade County. Subsection 2.2 describes the land characteristics of the area contained in these rights-of-way. One short 230 kv (0.4-mile) line, completely within the Turkey Point plant property and traversing previously developed land, would connect the new Clear Sky substation to the existing Turkey Point substation.

FPL conducts routine maintenance in existing rights-of-way in compliance with applicable federal, state, and local laws, regulations, and permit requirements. Right-of-way maintenance activities in new and/or modified rights-of-way also would be the responsibility of FPL and would comply with local, state, and federal requirements.

5.6.1 IMPACTS TO TERRESTRIAL RESOURCES

Line maintenance and vegetation management for the proposed transmission lines would be site-specific, based on location, terrain, and the surrounding environment. Consistent with existing practices, vegetation would be managed by trimming, mowing, and application of approved growth regulators and herbicides, targeting species that are incompatible with the safe access, operation, and maintenance of the transmission system (Subsection 3.7.3.2). In the transmission line rights-of-way, plant species that attain heights greater than 14 feet would typically removed to maintain proper clearance to conductors. The buildup of vegetation in the transmission line rights-of-way would also be monitored and reduced if it reaches levels that may threaten the operation of the transmission lines. Many segments of these transmission line rights-of-way cross cultivated lands and other open land use characteristics (e.g., sawgrass marsh), where the height of the vegetation would not threaten transmission operation. Maintenance operations would be rarely required in these areas.

As identified in Subsection 2.4.1.2, multiple federal- and state-listed endangered and threatened species, candidate species, and state species of special concern are found in Miami-Dade County, the county containing all of the proposed and existing transmission corridors (see Table 2.4-3). During a recent reconnaissance (April and June 2008) of these corridors, a single Everglade snail kite was the only federally listed fauna observed in or near the corridors (ENP segment). These kites feed almost exclusively on apple snails and, thus, use extensive marsh systems or lake littoral zones as foraging habitat.

Subsequent to the 2008 transmission corridor reconnaissance, an Eastern indigo snake was observed at two locations on the Eastern Preferred transmission corridor in 2011. Eastern indigo snakes inhabit a variety of habitats.

Portions of the transmission corridors on the Turkey Point plant property cross canals/wetlands designated as critical habitat for the federally threatened crocodile. State canals crossed by the transmission corridors may be used by the endangered Florida manatee. Wood storks periodically nest in four colonies along Tamiami Trail near the south-to-north leg of the proposed Clear Sky-to-Levee corridor. Critical habitat has not been defined for the stork, but habitat management guidelines (USFWS 1990) for the species include recommendations relating to transmission structures and other construction activities near stork breeding colonies. FPL's commitment to the preservation of the environment led to the development and implementation, in consultation with the U.S. Fish and Wildlife Service (USFWS), of the FPL Avian Protection Plan. This plan provides for guidelines and avian-friendly design standards that minimize the likelihood of collisions and electrocutions of wood storks and other birds from electrical facilities. The Florida panther is an endangered species that inhabits saw palmetto thickets and hardwood areas in the Everglades. There have been approximately 60 sightings of panthers during the last 20 years in the Everglades area crossed by the two alternative corridors for the Clear Sky-to-Levee transmission corridor. Routing the transmission line along either corridor could temporarily disturb Florida panthers, although actual operation of the transmission lines should have little to no impact on panthers. Several species that are state-listed or species of special concern were observed during recent reconnaissance of this area: snowy egret, tricolored heron, and white ibis. Surveys of the transmission corridors for listed plants documented approximately 30 plant species within/adjacent to the corridors. Given that the sensitive plants discovered within the transmission corridor already exist within managed and/or maintained habitats and FPL's practice to avoid these sensitive plants to the extent practicable, impacts of continued operation and maintenance of the transmission lines on sensitive plants would be SMALL.

FPL considers threatened or endangered species in its selection of corridors in transmission line rights-of-way and in its transmission line right-of-way maintenance program. For example, FPL's collocation of the proposed transmission lines in existing transmission line rights-of-way would minimize the impacts on plant and animal populations as a result of construction, maintenance, and operation of the proposed transmission lines. FPL would consult with the USFWS and the Florida Fish and Wildlife Conservation Commission on appropriate avoidance or mitigation methods in a post-certification process pursuant to conditions of the state's certification of the Turkey Point project under the Florida Electrical Power Plant Siting Act.

Other important species, as defined in NUREG-1555, likely to use these transmission line rights-of-way include game species such as white-tailed deer, feral hog, and rabbit and dove species. However, the short-term and infrequent vegetation management activities employed to maintain these transmission lines would only disturb these species for the duration of the maintenance activity and would not permanently disrupt or displace them. Maintaining the rights-of-way in an early stage of vegetative succession may benefit some of these wildlife species.

The NRC evaluated the potential impacts of transmission line maintenance and vegetation management practices on terrestrial biota, including practices similar to those employed by FPL, in the Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants (NUREG-1437). The GEIS concluded that typical line maintenance and vegetation management practices do not lower habitat diversity or produce significant changes in surrounding habitats, and generally result in impacts to wildlife of SMALL significance. FPL's maintenance procedures are site-specific, based on local terrain and plant communities, and therefore minimize impacts of transmission line maintenance activities on terrestrial resources. Most of the habitats crossed by the proposed transmission corridors are agricultural and/or open (e.g., sawgrass marsh) and will require only infrequent management. Given the types of habitats within the rights-of-way, the infrequency of required maintenance, and the NRC (1996) evaluation of potential impacts, the impacts of maintenance activities on terrestrial biota would be SMALL.

Impacts of maintenance activities on existing transmission line rights-of-way are typically found to be insignificant with only SMALL impacts to floodplains and wetlands (NUREG-1437). Construction and/or clearing of rights-of-way typically have greater potential for impacts than maintenance activities, but they too can be completed with little or no impacts. For example, most herbaceous, shrub-dominated, and open water wetlands would be spanned during maintenance or repair activities and would not be affected by transmission line maintenance.

Even though most of the aquatic habitat between spans will still function as wetlands, pads and foundations built to support transmission poles and access roads for maintenance will replace some wetland habitats and may alter local hydrology. FPL will be required by the Florida Department of Environmental Protection and the U.S. Army Corps of Engineers to avoid and minimize such impacts to the extent practical, and where impacts are unavoidable, to mitigate the value and functions of any wetlands disturbed by construction Given the amount of wetland habitats disturbed during construction in the vicinity of the proposed transmission lines associated with this project, impacts of maintenance and operation of these transmission lines are expected to be SMALL. Mitigation methods pertaining to wetlands in transmission corridors were discussed in Subsection 4.3.1.3.1.

Avian mortalities resulting from collisions with transmission lines, as evaluated in the GEIS (NUREG-1437), are typically insignificant and any associated impacts are SMALL for operating nuclear plants. However, given that a new transmission line right-of-way, including transmission poles, would be established close to four wood stork colonies and the operation of new transmission lines within 3 miles of colonies is not recommended (USFWS 1990), regulatory agencies would be consulted once a corridor is approved and the final right-of-way alignment is chosen. In addition, FPL would employ environmental best management practices and implement the FPL Avian Protection Plan for maintenance activities.

No significant impacts from electromagnetic fields associated with transmission lines were identified in the GEIS for terrestrial resources (NUREG-1437); therefore, such impacts would be SMALL. Florida established limits on electric and magnetic field exposure from electric facilities in 1989. The Florida legislature granted the Florida Department of Environmental Protection (F.A.C. 62-814.100) exclusive jurisdiction to regulate electric and magnetic fields associated with electric facilities and required it to establish rules regulating electric and magnetic field exposure from those facilities. FPL facilities comply with the rules established by the FDEP.

Multiple studies quantified the amount of ozone generated by transmission lines and concluded that the amount produced was insignificant and too low to cause significant effects to terrestrial biota (NUREG-1437).

Based on the maintenance procedures established by FPL and the analysis of transmission system operation impacts on terrestrial resources the NRC completed for the GEIS (NUREG-1437), potential impacts associated with routine right-of-way maintenance activities on terrestrial resources would be SMALL. However, the presence of known populations of certain threatened and endangered species near these rights-of-way would result in agency consultations and possible mitigation actions, as discussed in Subsection 4.3.1.3.1.

5.6.2 IMPACTS TO AQUATIC RESOURCES

Existing transmission lines generally pass through typical habitats associated with the coastal plain region of southeast Florida. These transmission rights-of-way include wetlands, agricultural fields, pasture/rangeland, and residential/developed lands (Table 2.2-2). The proposed transmission line rights-of-way are described earlier in this section. Impacts to wetland habitats are described in Subsection 5.6.1. Aside from wetlands, several SFWMD canals cross or parallel in the proposed rights-of-way, but these canals would not be impacted by transmission line maintenance. Therefore, impacts would be limited to aquatic resources living in wetland habitats.

Other than the mangrove rivulus addressed later in this section, none of the 13 freshwater fish listed as imperiled by the Florida Fish and Wildlife Conservation Commission (FWC 2008) are known to exist in the project area. The only important aquatic resource, as defined in NUREG-1555, that could potentially exist along the proposed transmission corridors, is the mangrove rivulus. The mangrove rivulus is a state and federal species of special concern. The range of the mangrove rivulus closely parallels that of the red mangrove, which is the preferred habitat of this fish (FMNH 2008). This fish species is not known to exist within the proposed transmission corridors.

In Florida, the mangrove rivulus is locally rare (FMNH 2008). This primarily saltwater or brackish water species has limited existence in freshwater. It can tolerate salinities from 0 to 68 parts per thousand. In the Everglades, this fish exists in stagnant seasonal ponds and sloughs as well as in mosquito ditches in mangrove habitats. Along the east coast of Florida, it exists in elevated marsh habitats above the intertidal zone, often in the burrows of the great land crab (*Cardisoma guanhumi*) (FMNH 2008).

Potential impacts on aquatic resources from transmission line maintenance activities include heating of water bodies from removal of shade trees, siltation and turbidity resulting from increased runoff and erosion, and runoff of defoliants and herbicides (NUREG-1555). Access roads built for transmission maintenance crews may be misused by off-road vehicle enthusiasts, creating erosion and sedimentation challenges. FPL's right-of-way maintenance program is customized for each habitat type within the transmission line right-of-way to minimize impacts to living resources. The exact manner in which maintenance would be performed would depend on location, type of terrain, and the surrounding environment. FPL maintains existing transmission rights-of-way using a combination of trimming, mowing, and herbicide application (NUREG-1437). Safe and reliable operation of the transmission lines sometimes requires that vegetation be trimmed, which can reduce shade and indirectly allow temperatures to increase in nearby water. In wet areas, such as mangrove swamps, FPL trims trees at the 14-foot level to maintain clearances required by safety and reliability standards. Typically, FPL only needs to do this at mid-span (NUREG-1437). Growth regulators and herbicides are selectively used in accordance with federal, state, and local regulations.

FPL uses environmental best management practices during right-of-way maintenance activities to reduce erosion and sedimentation to minimize impacts on aquatic resources. For example, siltation resulting from storm water runoff would be controlled by stacked hay bales and silt curtains. Removal of vegetation can also lead to soil erosion and subsequent sedimentation in wetlands. Therefore, maintenance practices leave roots in place to maintain soil structure.

The NRC analyzed transmission system operation impacts on wetland resources for the GEIS (NUREG-1437) and found that routine maintenance practices had little impact on aquatic resources. The routine maintenance procedures established by FPL, which were designed to minimize ecological impacts along the transmission line rights-of-way, would have a SMALL impact on aquatic resources and not require additional mitigation.

5.6.3 IMPACTS TO MEMBERS OF THE PUBLIC

As described in Subsection 3.7.2, the proposed transmission system for Units 6 & 7 would consist of the following transmission lines:

- One 230 kV line from the Clear Sky substation to Davis substation
- Two 500 kV lines from the Clear Sky substation to the Levee substation
- One 230 kV line from the Clear Sky substation to the Pennsuco substation
- One 230 kV line from the Davis substation to the Miami substation
- One onsite 230 kV line from Clear Sky substation to the Turkey Point substation

The proposed transmission corridors have been situated away from densely populated areas when practical. Potential impacts to members of the public resulting from the operation and maintenance of the transmission lines would be visual changes, electric shock hazards, electromagnetic field exposure, noise impacts, or radio and television interference.

5.6.3.1 Visual Impacts

Transmission tower maintenance, vegetation, and rights-of-way management operations would be carried out as necessary by FPL to comply with the requirements of the National Electrical Safety Code (NESC) and the reliability standards of the North American Electrical Reliability Corporation and of Florida statutes. The exact manner in which maintenance would be performed would depend on the location, type of terrain, and surrounding environment. Vegetation removal would be minimized consistent with safe and reliable operation of the transmission lines. For example, when possible to do so safely, natural vegetation could be allowed to grow up to 14 feet within the transmission line rights-of-way to minimize impacts.

Consequently, the visual impacts of transmission line maintenance would be SMALL.

5.6.3.2 Induced Current

Objects near transmission lines can become electrically charged as a result of their immersion in the lines' electric field. This charge results in an induced current that flows through the object to the ground. The current is called induced because there is no direct connection between the line and the object. The induced current can also flow to the ground through the body of a person who touches the object. An object that is insulated from the ground can actually store an electrical charge, becoming capacitively charged. A person standing on the ground and touching a vehicle or a fence can receive an electrical shock because of the sudden discharge of the capacitive charge through the person's body to the ground. After the initial discharge, a steady-state current can develop, the magnitude of which depends on several factors, including:

- Strength of the electric field which depends on the voltage of the transmission line
- Height and geometry of the individual transmission wires
- Size of the object on the ground
- Extent to which the object is grounded

Analysis of this issue, detailed in the GEIS (NUREG-1437), concludes that "potential electrical shock impacts are of small significance for transmission lines that are operated in adherence with the NESC." The NESC describes how to establish minimum vertical clearances to the ground for electric lines having voltages exceeding 98 kV. The clearance must limit the induced current as a result of electrostatic effects to 5 milliamperes if the largest anticipated truck, vehicle, or equipment were short-circuited to ground (IEEE Aug 2006). By way of comparison, the short-circuit setting of ground fault circuit interrupters (used in residential wiring of special breakers for outside circuits or those with outlets in kitchens and bathrooms) is 4–6 milliamperes. FPL is required by Florida statutes to construct (IEEE Aug 2006) its proposed transmission lines in compliance with NESC, C2-2007.

The proposed lines would be built in compliance with the NESC. In addition, all transmission lines constructed by FPL would conform to standards established by ANSI, NESC, and other applicable codes and standards that are generally accepted by the industry, except as modified by Florida statutes. During construction of the lines, FPL would ground existing fences and gates that cross or parallel the right-of-way to mitigate shock hazards. Therefore, the incidence of induced current impacting the public would be rare, and no mitigation measures would be needed.

During the license renewal process for Units 3 & 4, the existing eight 230 kV circuits that extend from Turkey Point to the Davis and Florida City substations were analyzed. Calculation of the maximum induced current was performed based on the methodology described in the Electric

Power Research Institute guidance and assumed the largest vehicle under the lines would be a semi tractor trailer, 13.5 feet high by 8.5 feet wide by 53 feet long. The maximum induced current for these circuits was determined to be 4.3 milliamperes, which is below the allowable 5 milliamperes. The proposed transmission lines for Units 6 & 7 would display similar induced current results because the proposed lines would be built in compliance with the NESC limit.

The impacts to members of the public of induced current would be SMALL and would not warrant additional mitigation.

5.6.3.3 Electromagnetic Field Exposure

Although studies continue to be conducted and additional information is published regarding the effects of exposure to electric and magnetic fields (e.g., WHO Dec 2005), there continues to be no conclusive evidence of a link between electric and magnetic fields and possible health impacts, including the development of cancer, reproductive disorders, or other abnormalities in humans. Florida established limits on electric and magnetic field exposure from electric facilities in 1989. The Florida legislature granted the FDEP exclusive jurisdiction to regulate electric and magnetic fields associated with electric facilities and required it to establish rules regulating electric and magnetic field exposure from those facilities. FPL facilities comply with the rules established by the FDEP.

Therefore, impacts to members of the public attributable to electric and magnetic field exposure from transmission system operations would be SMALL. No additional mitigation measures or controls are warranted.

5.6.3.4 Noise

High-voltage transmission lines can emit noise when the electric field strength surrounding them is greater than the breakdown threshold of the surrounding air, creating a discharge of energy. This energy loss, known as corona discharge, is affected by ambient weather conditions such as humidity, air density, wind, and precipitation, and by irregularities on the energized surfaces. FPL's proposed transmission lines would be designed with hardware and conductors that have features to minimize corona discharge up to their maximum operating voltage.

Corona-induced noise along the existing transmission lines is very low or inaudible, except directly below the line on a quiet, humid day. Under wet conditions, higher noise levels are experienced than would occur under dry conditions. However, background noise from various sources (inclement weather, traffic, agricultural activity, etc.) has the effect of masking transmission line noise. The GEIS (NUREG-1437) concluded that corona discharge resulting in audible noise, radio and television interference, energy losses, and the production of ozone is generally not an issue with transmission lines below 345 kV.

With respect to the 500 kV transmission lines, during wet conditions, the median A-weighted sound pressure level of the noise from the proposed transmission lines would be up to 55 decibels adjusted at the edge of the right-of-way. The noise levels would decrease as one moves away from the edge of the right-of-way. The EPA reports that the average background noise of quiet undeveloped land is between 20 and 30 decibels adjusted and between 59 and 78 for urban or built-up areas (U.S. EPA Mar 1974 and 1979). The potential noise from the 500 kV lines would be louder than the range for undeveloped land but quieter than urban or built-up areas. Such noise would not pose a risk to humans and would likely be masked by background noise unless a person was directly below the transmission line. Additionally, in wet conditions such as rain, the ambient noise levels would be higher, further masking corona noise.

The GEIS (NUREG-1437) indicated that monitoring of ozone levels for 2 years near a Bonneville Power Administration 1200 kV prototype line revealed no increase in ambient ozone levels caused by the line. Therefore, production of ozone from 500 kV lines would be minimal.

Should complaints related to transmission line noise occur, FPL would investigate the cause and, if necessary, take steps to correct the issue.

Complaints regarding nuisance noise from the proposed transmission lines would not be expected and impacts would be SMALL.

5.6.3.5 Radio and Television Interference

Radio interference and television interference can occur from corona, electrical sparking, and arcing between two pieces of loosely fitting hardware or burrs or edges on hardware. This noise occurs at discrete points and can be minimized with good design and maintenance practices. The effect of corona on radio and television reception depends on the radio/television signal strength, the distance from the transmission line, and the transmission line noise level. As described in Subsection 5.6.3.4, the proposed transmission lines would be designed to minimize corona discharge up to their maximum operating voltage.

Should complaints related to radio and television interference occur, FPL would investigate the cause and, if necessary, take steps to correct the issue.

FPL's transmission lines would have no impact on digital television signals, including cable and satellite television. Television interference occurs only with analog television signals, and as of June 2009, the Federal Communications Commission has mandated the use of digital television signals. Therefore, FPL's transmission lines would cause no television interference.

Complaints regarding radio and television interference from the proposed transmission lines would not be expected and impacts would be SMALL.

Section 5.6 References

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5.7 URANIUM FUEL CYCLE AND TRANSPORTATION IMPACTS

Subsection 5.7.1 addresses the environmental impacts from the uranium fuel cycle for the AP1000. Subsection 5.7.2.1 addresses the conditions in subparagraphs 10 CFR 51.52(a)(1) through (5) regarding use of Table S-4 to characterize the impacts of radioactive materials transportation in this environmental report. Because the AP1000 does not meet all of the conditions set forth in 10 CFR 51.52(a), a further analysis of the transportation effects was performed. Subsection 5.7.2.2 addresses the incident-free transportation of radioactive materials to and from Units 6 & 7. Transportation accidents are described in Section 7.4.

5.7.1 URANIUM FUEL CYCLE IMPACTS

This section describes the environmental impacts from the uranium fuel cycle for the AP1000. The uranium fuel cycle is defined as the total of those operations and processes associated with provision, utilization, and ultimate disposal of fuel for nuclear power reactors.

Table S-3 of 10 CFR 51.51(b) was used to assess environmental impacts resulting from the uranium fuel cycle. Its values are normalized for a reference 1000 MWe light water reactor (LWR) at 80 percent capacity factor. The 10 CFR 51.51(b) Table S-3 values are reproduced as the “Reference Reactor” column in Table 5.7-1. The AP1000 was analyzed with an estimated gross electrical output of 1115 MWe[1] operating at 93 percent capacity factor. The results of this analysis for Units 6 & 7 are also included in Table 5.7-1.

Specific categories of natural resource use are included in Table S-3 (and duplicated in the *Reference Reactor* column of Table 5.7-1). These categories relate to land use, water, and fossil fuel consumption; chemical and thermal effluents; radiological releases; disposal of transuranic, high-level, and low-level wastes; and radiation doses from transportation and occupational exposure. In developing Table S-3, the NRC considered two fuel cycle options that differed in the treatment of spent fuel removed from a reactor. “No recycle” treats all spent fuel as waste to be stored at a federal waste repository; “uranium only recycle” involves reprocessing spent fuel to recover unused uranium and return it to the fuel cycle. Neither cycle involves the recovery of plutonium. The contributions in Table S-3 resulting from reprocessing, waste management, and transportation of wastes are maximized for both of the two fuel cycles (uranium only and no recycle). That is, the identified environmental impacts are based on the cycle that results in the greater impact.

The following assessment of the environmental impacts of the fuel cycle for two AP1000s at Turkey Point is based on the values in Table S-3 and the NRC’s analysis of the radiological

1. Gross electrical output for the AP1000 was used to provide conservatism in the estimates of potential fuel cycle impacts, which are obtained by scaling the values for the reference reactor to reflect the increased electrical output of the AP1000.

impacts from Rn-222 and Tc-99 in NUREG-1437. NUREG-1437 and Addendum 1 to the Generic Environmental Impact Statement (GEIS) for License Renewal provide a detailed analysis of the environmental impacts from the uranium fuel cycle. Although NUREG-1437 is specific to those impacts related to license renewal, the information provided insights to this review because the AP1000 design considered here uses the same type of fuel.

The fuel cycle impacts in Table S-3 are based on a reference 1000 MWe LWR operating at an annual capacity factor of 80 percent for an average electrical output of 800 MWe. The evaluation of the environmental impacts of the fuel cycle for the AP1000, assumed a 1115 MWe (gross) reactor with a capacity factor of 93 percent for an average electrical output of 1037 MWe per unit. The two AP1000 units for Units 6 & 7 would have a combined total of 2,074,074 MWe. The output of Units 6 & 7 is approximately 2.6 times greater than the output used to estimate impact values in Table S-3 (reproduced here as the first column of Table 5.7-1) for the reference reactor. The analyses presented here are scaled from the reference reactor impacts to reflect the output of Units 6 & 7.

Recent changes in the fuel cycle may have some bearing on environmental impacts; however, as described below, the contemporary fuel cycle impacts are bounded by impact values in Table S-3. The NRC calculated the impact values in Table S-3 from industry averages for the performance of each type of facility or operation associated with the fuel cycle. They chose assumptions so the calculated impact values will not be underestimated. This approach was intended to ensure that the actual impact values will be less than the quantities shown in Table S-3 for all LWR nuclear power plants within the widest range of operating conditions. Changes in the fuel cycle and reactor operations have occurred since Table S-3 was promulgated. For example, the estimated quantity of fuel required for a year's operation of a nuclear power plant can now reasonably be calculated assuming a 60-year lifetime (40 years of initial operation plus a 20-year license renewal term). This was done in NUREG-1437 for both BWRs and PWRs, and the highest annual requirement (35 metric tons of uranium [MTU] made into fuel for a BWR) was used in NUREG-1437 as the basis for the reference reactor year. A number of fuel management improvements have been adopted by nuclear power plants to achieve higher performance and to reduce fuel and enrichment requirements, reducing annual fuel requirements. An AP1000 reactor will require approximately 23 MTUs per year, approximately 34 percent less than the BWR refueling requirement evaluated in NUREG-1437, but its electrical output will be approximately 30 percent greater than the reference reactor. Therefore, Table S-3 remains a conservative estimate of the environmental impacts of the fuel cycle fueling nuclear power reactors operating today.

Another change is the elimination of the U.S. restrictions on the importation of foreign uranium. Until recently, the economic conditions of the uranium market favored use of foreign uranium at the expense of the domestic uranium industry. These market conditions forced the closing of most U.S. uranium mines and mills, substantially reducing the environmental impacts in the

United States from these activities. There is renewed interest in uranium mining and milling in the United States. The NRC recently received the first license application for a uranium recovery facility since 1988 (U.S. NRC Oct 2007). The NRC anticipates 20 applications for new facilities—including in-situ operations and conventional uranium mills—through fiscal year 2011. The majority of these applications are expected to be for in-situ leach solution mining that does not produce tailings. (U.S. NRC Aug 2008) Factoring in changes to the fuel cycle suggests that the environmental impacts of mining and milling could drop to levels below those in Table S-3. However, Table S-3 impact estimates have not been reduced for this analysis. Section 6.2.3 of NUREG-1437 describes the sensitivity of these changes in the fuel cycle on the environmental impacts.

5.7.1.1 Land Use

The total annual land requirements for the fuel cycle supporting the two AP1000 Units 6 & 7 would be approximately 300 acres. Approximately 34 acres would be permanently committed land, and 260 acres would be temporarily committed. A “temporary” land commitment is a commitment for the life of the specific fuel cycle plant (e.g., a mill, enrichment plant, or succeeding plants). Following decommissioning, the land could be released for unrestricted use. “Permanent” commitments represent land that may not be released for use after decommissioning because decommissioning does not result in the removal of sufficient radioactive material to meet the limits of 10 CFR Part 20, Subpart E for release of an area for unrestricted use.

In comparison, a coal-fired plant with the same MWe output as two AP1000s using strip-mined coal requires the disturbance of approximately 520 acres per year for fuel alone. Considering common classes of land use in the United States, the fuel cycle impacts on land use would be SMALL and would not warrant mitigation.

5.7.1.2 Water Use

Principal water use for the fuel cycle supporting the two AP1000s would be that required to remove waste heat from the power stations supplying electricity to operate the enrichment process. Scaling the values from Table S-3, of the total annual water use of 2.95E10 gallons for the fuel cycle, approximately 2.87E10 gallons (approximately 97 percent) are required for the removal of waste heat. Evaporative losses from fuel cycle process cooling are approximately 4.15E08 gallons per year and mine drainage accounts for 3.29E08 gallons per year. The NRC estimated the consumptive water use for the uranium fuel cycle to be approximately 2 percent of that from the reference reactor using cooling towers. The maximum consumptive water use (assuming that all plants supplying electrical energy to the nuclear fuel cycle used cooling towers) was estimated to be approximately 6 percent of that for the reference reactor using cooling towers (NUREG-1437). The water consumption attributed to the uranium fuel cycle would be small relative to the water consumption of the two proposed AP1000 units. Impacts on water use would be SMALL and would not warrant mitigation.

5.7.1.3 Fossil Fuel Impacts

Electric energy and process heat are required during various phases of the fuel cycle process. The electric energy is usually produced by the combustion of fossil fuel at conventional power plants. Electric energy associated with the fuel cycle represents approximately 5 percent of the annual electric power production of the reference reactor. Process heat is primarily generated by the combustion of natural gas. This gas consumption, if used to generate electricity, represents less that 0.4 percent of the electrical output of the reference reactor. The direct and indirect consumption of electric energy for fuel cycle operations would be small relative to the power production of the two AP1000s. Therefore, impacts from fossil fuels would be SMALL and would not warrant mitigation.

5.7.1.4 Chemical Effluents

The quantities of liquid, gaseous, and particulate discharges associated with the fuel cycle are given in Table S-3 (Table 5.7-1) for the reference 1000 MWe LWR. The quantities of effluents for two AP1000s would be approximately 2.6 times greater than those in Table S-3 (Table 5.7-1 column 3). The principal effluents are sulfur oxides, nitrogen oxides, and particulates. Based on the EPA's National Air Pollutant Emissions Estimates (U.S. EPA 2006), these emissions constitute less than 0.08 percent of all sulfur dioxide emissions in 2005, and less than 0.02 percent of all nitrogen oxide emissions in 2006.

Liquid chemical effluents produced in the fuel cycle processes are related to fuel enrichment and fabrication and may be released to receiving waters. As stated in Subsection 5.7.1 of NUREG-1555, all liquid discharges into the navigable waters of the United States from plants associated with the fuel cycle operations will be subject to requirements and limitations by an appropriate federal, state, regional, local or affected Native American tribal regulatory agency. Solids are generated during the milling process and are not released in quantities sufficient to have a significant impact on the environment. Impacts from chemical effluents would be SMALL and would not warrant mitigation.

5.7.1.5 Radioactive Effluents

Radioactive gaseous effluents estimated to be released to the environment from waste management activities and certain other phases of the fuel cycle are shown in Table S-3 (Table 5.7-1). Using Table S-3 data, Section 6.2.2.1 of NUREG-1437 estimates the 100-year environmental dose commitment to the U.S. population from the fuel cycle (excluding reactor releases and dose commitments due to Rn-222 and Tc-99) to be approximately 400 person-rem per reference reactor year. The estimated dose commitment to the U.S. population is approximately 1000 person-rem per year of operation for two AP1000s.

Section 6.2.2.1 of NUREG-1437 estimates the additional 100-year whole body dose commitment to the U.S. population from radioactive liquid waste effluents due to all fuel cycle operations (other than reactor operation) to be approximately 200 person-rem per reference reactor year. The estimated dose commitment to the U.S. population is approximately 520 person-rem per year of operation for two AP1000s. Thus, the estimated 100-year dose commitment to the U.S. population from radioactive gaseous and liquid releases from fuel cycle operations would be approximately 1600 person-rem to the whole body per reactor-year for two AP1000s.

The radiological impacts of Rn-222 and Tc-99 releases are not included in Table S-3. Principal radon releases occur during mining and milling operations and as emissions from mill tailings. Principal Tc-99 releases occur as releases from the gaseous diffusion enrichment process. The NRC provided an evaluation of these Rn-222 and Tc-99 releases in NUREG-1437. The NUREG-1437 evaluation was reviewed, it was considered applicable, and has been included as part of the evaluation in this Environmental Report.

Section 6.2 of NUREG-1437 estimates Rn-222 releases from mining and milling operations, and from mill tailings for a year of operation of the reference 1000 MWe LWR. The estimated release of Rn-222 for two AP1000s is 13,500 curies per year. Of this total, approximately 78 percent would be from mining, 15 percent from milling, and 7 percent from inactive tailings before stabilization. Radon releases from stabilized tailings were estimated to be 2.6 curies per year for two AP1000s; that is, approximately 2.6 times greater than the NUREG-1437 estimate for the reference reactor year. The major risks from Rn-222 are from exposure to the bone and lung, although there is a small risk from exposure to the whole body. The organ-specific dose weighting factors from 10 CFR Part 20 were applied to the bone and lung doses to estimate the 100-year dose commitment from Rn-222 to the whole body. The 100-year estimated dose commitment from mining, milling, and tailings before stabilization for two AP1000 units would be approximately 2400 person-rem to the whole body. From stabilized tailing piles, the 100-year estimated dose commitment would be approximately 47 person-rem to the whole body. These values were derived by scaling the reference reactor values provided in the Appendix to Section 5.7.1 of NUREG-1555 to two AP1000s.

NUREG-1437 considered the potential health effects associated with the releases of Tc-99 for the reference reactor. The estimated Tc-99 releases for two AP1000s are 0.018 curies from chemical processing of recycled uranium hexafluoride before it enters the isotope enrichment cascade and 0.013 curies into the groundwater from a high-level waste repository. The major risks from Tc-99 are from exposure of the gastrointestinal tract and kidneys and a small risk from whole-body exposure. Applying the organ-specific dose-weighting factors from 10 CFR Part 20 to the gastrointestinal tract and kidney doses, the total body 100-year dose commitment from Tc-99 was estimated to be 260 person-rem for two AP1000s. This value was derived by scaling the 100-year dose commitment (person-rem per year) for Tc-99 for the reference reactor specified in NUREG-1437 to two AP1000s.

To be conservative, radiation protection experts assume that any amount of radiation may pose some risk of cancer, or a severe hereditary effect, and that higher radiation exposures create higher risks. Therefore, a linear, no-threshold dose response relationship is used to describe the relationship between radiation dose and detrimental effects. Based on this model, risk to the public from radiation exposure can be estimated using the nominal probability coefficient (730 fatal cancers, nonfatal cancers, or severe hereditary effects per 1E06 person-rem) from the International Commission on Radiological Protection Publication 60 (ICRP 1991). This coefficient was multiplied by the sum of the estimated whole-body population doses (from gaseous effluents, liquid effluents, Rn-222, and Tc-99) described above for two AP1000s to estimate that the U.S. population could incur a total of 3.1 fatal cancers, nonfatal cancers, or severe hereditary effects from the annual fuel cycle for two AP1000s. This risk would be small compared to the number of fatal cancers, nonfatal cancers and severe hereditary effects that are estimated to occur in the U.S. population annually from exposure to natural sources of radiation using the same risk estimation methods.

Based on these analyses, the environmental impacts of radioactive effluents from the fuel cycle will be SMALL and will not warrant mitigation.

5.7.1.6 Radioactive Waste

The quantities of radioactive waste (low-level, high-level, and transuranic wastes) associated with fuel cycle processes are presented in Table S-3 (Table 5.7-1). For low-level waste disposal, the NRC notes in 10 CFR 51.51(b) that there will be no significant radioactive releases to the environment. For high-level and transuranic wastes, the NRC notes that these wastes are to be disposed of at a federal repository, such as the candidate repository at Yucca Mountain, Nevada. No release to the environment is expected to be associated with such disposal because it was assumed that all of the gaseous and volatile radionuclides contained in the spent fuel are released to the atmosphere before disposal of the waste.

There is some uncertainty associated with the high-level waste and spent fuel disposal component of the fuel cycle. The regulatory limits for offsite releases of radionuclides for the current candidate repository site were set in September 2008 using a two-tiered approach. The radiation dose for the first 10,000 years has been set to 15 mrem/yr. The radiation dose for the period between 10,000 and 1 million years was set to 100 mrem/yr (Federal Register 73,61256 Oct 2008). These standards would result in doses that are consistent with the 100 mrem /yr or less dose defined in NUREG-1437. Therefore, it is reasonable to conclude that the offsite radiological impacts of spent fuel and high-level waste disposal would not be significant enough to preclude construction of new units at Turkey Point.

If necessary, FPL would take measures to reduce the generation of Class B and C LLW, such as reducing the service run length of resin beds or mixing spent resins to limit radioactivity concentrations. The volume of generated waste would still be bounded by the estimates in Table S-3, and the environmental impacts would likewise be bounded by those shown in Table S-3 (U.S. NRC 2011).

If needed, FPL would also construct additional temporary storage facilities onsite for Class B and C LLW. Such facilities would be designed and operated to meet the guidance in Appendix 11.4-A of the Standard Review Plan, NUREG-0800.

NRC's regulations (10 CFR 50.59) allow licensees operating nuclear power plants to make facility changes, including the construction and operation of certain additional onsite LLW storage facilities, without seeking approval from the NRC, provided licensees evaluate the safety and environmental impacts of such facilities before constructing the facilities. The 10 CFR 50.59 evaluations must be made available to NRC inspectors. Using this regulatory approach, a number of nuclear power plant licensees have constructed and operate such facilities in the United States. Typically, these additional facilities are constructed near the power block inside the security fence on land that has already been disturbed during initial plant construction (U.S. NRC 2011). Therefore, the impacts of constructing the facilities on environmental resources (e.g., land use and aquatic and terrestrial biota) would be SMALL.

All of the NRC (10 CFR Part 20) and EPA (40 CFR Part 190) dose limitations would apply to the additional onsite LLW storage facilities, both for public and occupational radiation exposure. The radiological environmental monitoring programs around nuclear power plants that operate additional onsite LLW facilities show that the increase in radiation dose at the site boundary is not significant; the radiation doses continue to be below 25 mrem/yr, the dose limit of 40 CFR Part 190 (U. S. NRC 2010). The NRC has concluded that doses to members of the public that do not exceed NRC and EPA regulatory limits are SMALL (U.S. NRC 2011). In addition, the NRC in NUREG-1437 assessed the impacts of LLW storage onsite at currently operating nuclear power plants and concluded that the radiation doses to offsite individuals from interim LLW storage are insignificant. The types and amounts of LLW generated by the proposed reactors at Units 6&7 would be similar to those generated by currently operating nuclear power plants and the construction and operation of any additional onsite LLW storage facilities would be similar to the construction and operation of the currently operating facilities. Therefore, the impacts of constructing and operating additional onsite LLW storage facilities would be SMALL.

For the reasons stated above, the environmental impacts of radioactive waste disposal would be SMALL and would not warrant mitigation.

5.7.1.7 Occupational Dose

The estimated occupational dose attributable to all phases of the fuel cycle is approximately 1600 person-rem per year for two AP1000s. This is a scaled value based on a 600 person-rem per year occupational dose estimate attributable to all phases of the fuel cycle for the reference reactor (NUREG-1437). The dose to any individual worker is restricted to the dose limit of 10 CFR Part 20 (5 rem/year). The environmental impacts from this occupational dose would be SMALL.

5.7.1.8 Transportation

The transportation dose to workers and the public is estimated in Table S-3 (Table 5.7-1) to be 2.5 person-rem per year for the reference reactor. This corresponds to a dose of 6.5 person-rem per year for two AP1000s. For comparative purposes, the estimated collective dose from natural background radiation to the population within 50 miles of Units 6 & 7 is 907,000 person-rem per year. On the basis of this comparison, the environmental impacts of transportation from the fuel cycle would be SMALL and would not warrant mitigation.

5.7.1.9 Summary

The environmental impacts of the uranium fuel cycle as given in Table S-3 were evaluated along with the effects of Rn-222 and Tc-99 releases based on the information presented in NUREG-1437. Based on this evaluation, the impacts would be SMALL and mitigation would not be warranted.

5.7.2 TRANSPORTATION OF RADIOACTIVE MATERIALS

Transport of radioactive materials is an important activity associated with operating new reactors at Units 6 & 7. The analysis in this section is based on the AP1000 characteristics described in Section 3.2 and radioactive waste management systems described in Section 3.5. Information regarding preparation and packaging of the radioactive materials for transport offsite can be found in Section 3.8.

5.7.2.1 Transportation Assessment

The NRC evaluated the environmental effects of transportation of fuel and waste for LWRs in *Environmental Survey of Transportation of Radioactive Materials to and From Nuclear Power Plants* (WASH-1238, AEC Dec 1972) and Supplement 1 (NUREG-75/038,) and found the impacts to be SMALL. These NRC analyses provided the basis for Table S-4 in 10 CFR 51.52, which summarizes the environmental impacts of transportation of fuel and radioactive wastes to and from a reference reactor (see Table 5.7-2). The table addresses two categories of environmental considerations: (1) normal conditions of transport, and (2) accidents during transport.

To analyze the impacts of transporting AP1000 fuel and radioactive waste for comparison to Table S-4, the characteristics for the AP1000 were normalized to a reference reactor-year. The reference reactor is an 1100 MWe reactor that has an 80 percent capacity factor, for an electrical output of 880 MWe per year. For Units 6 & 7, two 1000 MWe (net) reactors[1] with a 93 percent capacity factor was assumed. The standard configuration (a single unit) for the AP1000 was used to evaluate transportation impacts relative to the reference reactor.

Subparagraphs 10 CFR 51.52(a)(1) through (5) delineate specific conditions the reactor licensee must meet to use Table S-4 as part of its environmental report. For reactors not meeting all of the conditions in paragraph (a) of 10 CFR 51.52, paragraph (b) of 10 CFR 51.52 requires further analysis of the transportation effects.

The conditions in paragraph (a) of 10 CFR 51.52 establishing the applicability of Table S-4 are reactor core thermal power, fuel form, fuel enrichment, fuel encapsulation, average fuel irradiation, time after discharge of irradiated fuel before shipment, mode of transport for unirradiated fuel, mode of transport for irradiated fuel, radioactive waste form and packaging, and mode of transport for radioactive waste other than irradiated fuel. The following sections describe the characteristics of the AP1000 relative to the conditions of 10 CFR 51.52 for use of Table S-4.

5.7.2.1.1 Reactor Core Thermal Power

Subparagraph 10 CFR 51.52(a) (1) requires that the reactor have a core thermal power level not exceeding 3800 MWt. The AP1000 has a maximum thermal power level of 3400 MWt that meets this condition (WEC 2011).

The core power level was established as a condition because, for the LWRs being licensed when Table S-4 was promulgated, higher power levels indicated the need for more fuel and therefore more fuel shipments. This is not the case for the new LWR designs due to the higher unit capacity factor and higher burnup for these reactors. The annual fuel reloading for the reference reactor analyzed in WASH-1238 was 30 MTU. The annual fuel loading for the AP1000 is approximately 23 metric tons of uranium (MTU). When normalized to equivalent electric output, the annual fuel requirement for the AP1000 is approximately 22 MTU or 73 percent that of the reference LWR.

WASH-1238 states:

1. Net electrical output for the AP1000 was used to provide conservatism in the estimates of normalized transportation impacts for comparison with the reference reactor and Table S-4.

> The analysis is based on shipments of fresh fuel to and irradiated fuel and solid waste from a boiling water reactor or a pressurized water reactor with design ratings of 3000 MWt to 5000 MWt or 1000 MWe to 1500 MWe.

The AP1000 falls within these bounds for thermal rating.

5.7.2.1.2 Fuel Form

Subparagraph 10 CFR 51.52(a)(2) requires that the reactor fuel be in the form of sintered uranium dioxide pellets. The AP1000 uses a sintered uranium dioxide pellet fuel form (WEC 2011) and, therefore, meets this condition.

5.7.2.1.3 Fuel Enrichment

Subparagraph 10 CFR 51.52(a)(2) requires that the reactor fuel have a U-235 enrichment not exceeding 4 percent by weight. For the AP1000, the enrichment of the initial core is 2.35 percent in Region 1, 3.40 percent in Region 2, and 4.45 percent in Region 3 (WEC 2011). The average fuel enrichment for reloads is 4.54 percent. The AP1000 fuel exceeds the 4 percent U-235 enrichment condition for both initial core load and subsequent reloads.

5.7.2.1.4 Fuel Encapsulation

Subparagraph 10 CFR 51.52(a)(2) requires that the reactor fuel pellets be encapsulated in Zircaloy rods. The AP1000 fuel uses ZIRLO^{TM} cladding, which is a special zircaloy material alloyed with niobium, tin, and iron and is a successor of Zircaloy-4 (WEC 2011) and meets this condition.

5.7.2.1.5 Average Fuel Irradiation

Subparagraph 10 CFR 51.52(a)(3) requires that the average burnup not exceed 33,000 MW-days per MTU. For the AP1000, the average burnup after achieving an equilibrium core is 50,553 MW-days per MTU, which exceeds this condition.

5.7.2.1.6 Time After Discharge of Irradiated Fuel Before Shipment

Subparagraph 10 CFR 51.52(a)(3) requires that no irradiated fuel assembly be shipped until at least 90 days after it is discharged from the reactor. The WASH-1238 analysis for Table S-4 assumes 150 days of decay time before shipment of any irradiated fuel assemblies. NUREG/CR-6703 (Ramsdell et al. 2001), which updated this analysis to extend Table S-4 to burnups of up to 62,000 MW-days per MTU, assumes a minimum of 5 years between removal from the reactor and shipment. Five years is the minimum decay time expected before shipment of irradiated fuel assemblies. The NRC specifies 5 years as the minimum cooling period when it issues certificates of compliance for casks used for shipment of power reactor fuel

(NUREG-1437). As described in Section 3.8, the AP1000 units would have storage capacity exceeding that needed to accommodate 5-year cooling of irradiated fuel before transport offsite. This condition is met.

5.7.2.1.7 Transportation of Unirradiated Fuel

Subparagraph 10 CFR 51.52(a)(5) requires that unirradiated fuel be shipped to the reactor site by truck. Typical shipment of fuel from the Westinghouse fuel fabrication facility in Columbia, South Carolina is by truck. Fuel would be received via truck shipments for Units 6 & 7.

Table S-4 includes a condition that the truck shipments will not exceed 73,000 pounds. The fuel shipments would comply with federal or state weight restrictions. These conditions are met.

5.7.2.1.8 Transportation of Irradiated Fuel

Subparagraph 10 CFR 51.52(a)(5) allows for truck, rail, or barge transport of irradiated fuel. This condition would be met for Units 6 & 7. For the impacts analysis described in Subsection 5.7.2.2, all spent fuel shipments were assumed to be made using legal weight trucks. The DOE is responsible for spent fuel transportation from reactor sites to the repository and will make the decision on transport mode.

5.7.2.1.9 Radioactive Waste Form and Packaging

Subparagraph 10 CFR 51.52(a)(4) requires that, with the exception of spent fuel, radioactive waste shipped from the reactor be packaged and in a solid form. As described in Subsection 3.5.3, the low-level radioactive waste generated by the AP1000 units would be solidified and packaged. Additionally, these shipments would comply with the NRC (10 CFR Part 71) and the DOT (49 CFR Parts 173 and 178) packaging and transportation regulations for the shipment of radioactive material. This condition is met.

5.7.2.1.10 Transportation of Radioactive Waste

Subparagraph 10 CFR 51.52(a)(5) requires that the mode of transport of low-level radioactive waste be either truck or rail. Radioactive waste would be shipped from Units 6 & 7 by truck. Table S-4 specifies the following conditions for shipments of radioactive waste: less than 73,000 pounds per truck over 100 tons per cask per rail car. Radioactive waste from Units 6 & 7 would be shipped in compliance with federal or state weight restrictions. This condition is met.

5.7.2.1.11 Number of Truck Shipments

Table S-4 specifies the following conditions for traffic density: less than one truck shipment per day or three rail cars per month. The number of truck shipments that would be required was estimated assuming that all radioactive materials (fuel and waste) are received at the site or transported offsite via truck.

For the AP1000, the initial core load is estimated at 85 MTU per unit and the reload requirements are estimated at 23 MTU per year per unit. This equates to approximately 157 fuel assemblies in the initial core (assuming 0.5383 MTU per fuel assembly) and 43 fuel assemblies per year for refueling. Westinghouse estimates that a transportation container could accommodate up to seven fuel assemblies for the initial core load and nine fuel assemblies for core reloads.

Table 5.7-3 summarizes the number of truck shipments of unirradiated fuel. The table also normalizes the number of shipments to the electrical output for the reference reactor analyzed in WASH-1238. When normalized for electrical output, the number of truck shipments of unirradiated fuel for the AP1000 is less than the number of truck shipments estimated for the reference LWR.

The numbers of spent fuel shipments were estimated as follows. For the reference LWR analyzed in WASH-1238, the NRC assumed that 60 shipments per year will be made, each carrying 0.5 MTU of spent fuel. This amount is equivalent to the annual refueling requirement of 30 MTU per year for the reference LWR. For this transportation analysis, shipments of spent fuel from the AP1000 were assumed to occur at a rate equal to the annual refueling requirement. As stated above, this would require the shipment of approximately 23 MTU per year per unit. The shipping cask capacities used to calculate annual spent fuel shipments were assumed to be the same as those for the reference LWR (0.5 MTU per legal weight truck shipment). This results in 46 shipments per year for one AP1000. After normalizing for the reference LWR electrical output, the number of spent fuel shipments is 44 per year for the AP1000. The normalized spent fuel shipments (44) for the AP1000 would be less than the reference reactor (60) that was the basis for Table S-4.

Table 5.7-4 presents estimates of annual waste volumes and numbers of truck shipments. The values are normalized to the reference LWR analyzed in WASH-1238. The normalized annual waste volumes and waste shipments for the AP1000 will be less than the reference reactor that was the basis for Table S-4.

The total number of truck shipments of fuel and radioactive waste to and from the reactor are estimated to be 72 per year for the AP1000. Thus, these radioactive material shipment estimates are well below the one truck shipment per day condition given in 10 CFR 51.52, Table S-4. The estimated number of truck shipments remains below the one shipment per day condition, if the number was doubled to account for empty truck return shipments.

5.7.2.1.12 Summary

Table 5.7-5 compares the values for the reference conditions in paragraph (a) of 10 CFR 51.52 used in Table S-4 and the values for the AP1000. The AP1000 does not meet the conditions for fuel enrichment or average fuel irradiation. Therefore, Subsection 5.7.2.2 and Section 7.4 present additional analyses of fuel transportation effects for normal conditions and accidents, respectively.

5.7.2.2 Incident-Free Transportation Impacts Analysis

The environmental impacts of radioactive materials transportation were estimated using the most recent version of the RADTRAN 5 computer code (Weiner et al. Dec 2007). RADTRAN is a nationally accepted standard program and code for calculating the risks of transporting radioactive materials. RADTRAN was used in estimating the radiological doses and dose risks to populations and transportation workers resulting from incident-free transportation and to the general population from accident scenarios. For the analysis of incident-free transportation risks, the code used scenarios for people who would share transportation routes with shipments, people who live along the route of travel, and people exposed at stops. For accident risks, RADTRAN was used to evaluate the range of possible accident scenarios from high probability and low consequence to low probability and high consequence. Environmental impacts of incident-free transportation of fuel are described in this section. Transportation accidents are described in Section 7.4.

5.7.2.2.1 Transportation of Unirradiated Fuel

Table S-4 of 10 CFR 51.52 includes conditions related to radiological doses to transport workers and members of the public along transport routes. These doses, based on calculations in WASH-1238, are a function of the radiation dose rate emitted from the unirradiated fuel shipments, the number of exposed individuals and their locations relative to the shipment, the time of transit (including travel and stop times), and the number of shipments to which the individuals are exposed.

One of the key assumptions in WASH-1238 for the reference LWR unirradiated fuel shipments is that the radiation dose rate at 1 meter from the transport vehicle is approximately 0.1 millirem per hour. This assumption was also used by the NRC to analyze advanced LWR unirradiated fuel shipments for ESP sites (e.g., NUREG-1811, Section G.1.2.4). This assumption is reasonable for all of the advanced LWR types because the fuel materials will all be low dose rate uranium radionuclides and will be packaged similarly (inside a metal container that provides little radiation shielding). The per-shipment dose estimates are “generic” (i.e., independent of reactor technology) because they were calculated based on an assumed external radiation dose rate rather than the specific characteristics of the fuel or packaging. Thus, the results can be used to evaluate the impacts for any of the advanced LWR designs. Other input parameters used in the radiation dose analysis for advanced LWR unirradiated fuel shipments are summarized in Table 5.7-6. The RADTRAN results for this "generic" unirradiated fuel shipment are as follows:

Population Component	Dose
Transport workers	0.00171 person-rem per shipment
General public (Onlookers — people at stops and sharing the highway)	0.00292 person-rem per shipment
General public (Along Route — people living near a highway)	0.0000299 person-rem per shipment

Based on the parameters used in the analysis, these per-shipment doses would conservatively estimate the impacts for fuel shipments to Turkey Point or an alternate site in the region of interest. For example, the average shipping distance of 2000 miles used in the NRC analysis is not expected to exceed the shipping distance for fuel deliveries to Units 6 & 7. The fuel shipments would likely originate at the Westinghouse fuel fabrication facility located in Columbia, South Carolina, and travel approximately 690 miles to Units 6 & 7.

The unit dose values were combined with the average annual shipments of unirradiated fuel to calculate annual doses to the public and workers that can be compared to Table S-4 conditions. The numbers of unirradiated fuel shipments were normalized to the reference reactor analyzed in WASH-1238. The numbers of shipments per year were obtained from Table 5.7-3. The results are presented in Table 5.7-7. As shown, the calculated radiation doses for transporting unirradiated fuel to Units 6 & 7 are within the Table S-4 conditions.

As described in Subsection 5.7.1.5, the risk to the public from radiation exposure is estimated using the nominal probability coefficient for total detriment (730 fatal cancers, nonfatal cancers, and severe hereditary effects per million person-rem) from International Commission on Radiation Protection Publication 60 (ICRP 1991). All the public collective doses presented in Table 5.7-7 are less than 0.1 person-rem per year. Therefore, the total detriment estimates associated with these doses would all be less than 1E–04 fatal cancers, nonfatal cancers, and severe hereditary effects per year. These risks are small compared to the fatal cancers, nonfatal cancers, and severe hereditary effects that the same population will incur annually from exposure to natural sources of radiation.

5.7.2.2.2 Transportation of Spent Fuel

This section provides the environmental impacts of transporting spent fuel from Units 6 & 7 to a spent fuel disposal facility, using Yucca Mountain, Nevada, as a possible location for a geologic repository. The impacts of the transportation of spent fuel to a potential repository in Nevada provide a reasonable bounding estimate of the transportation impacts to a monitored retrievable storage facility because of the distances involved and the representative exposure of members of the public in urban, suburban, and rural areas.

Incident-free transportation refers to transportation activities in which the shipments reach their destination without releasing any radioactive cargo to the environment. Impacts from these shipments would be from the low levels of radiation that penetrate the heavily shielded spent fuel shipping cask. Radiation doses would occur to (1) people residing along the transportation corridors between Units 6 & 7 and the proposed repository; (2) people in vehicles passing a spent-fuel shipment; (3) people at vehicle stops for refueling, rest, and vehicle inspections; and (4) transportation crew workers.

This analysis is based on shipment of spent fuel by legal-weight trucks in casks with characteristics similar to casks currently available (i.e., massive, heavily shielded, cylindrical metal pressure vessels). Each shipment is assumed to consist of a single shipping cask loaded on a modified trailer. These assumptions are consistent with assumptions made in evaluating the environmental impacts of spent fuel transportation in Addendum 1 to NUREG-1437. As described in NUREG-1437, these assumptions are conservative because the alternative assumptions involve rail transportation or heavy-haul trucks, which would reduce the overall number of spent fuel shipments.

The environmental impacts of spent fuel transportation were estimated using the most recent version of the RADTRAN 5 computer code (Weiner et al. Dec 2007). This analysis assumed the spent fuel would be transported by legal weight trucks to the potential Yucca Mountain repository over designated highway route-controlled quantity highway route-controlled quantity routes. A transportation route was evaluated that was consistent with highway route-controlled quantity requirements and traveled a total of approximately 3100 miles.

Although shipping casks have not been designed for the advanced LWR fuels, the advanced LWR fuel designs would be similar to the existing LWR designs. Thus, current shipping cask designs were used for analysis.

Radiation doses are a function of many parameters, including vehicle speed, traffic count, dose rate at 1 meter from the vehicle, packaging dimensions, number in the truck crew, stop time, and population density along the route and at stops. The values of the key variables used in this analysis are presented in Table 5.7-8. Most of the variables are extracted from literature and are considered to be standard values used in many RADTRAN applications, including environmental impact statements and regulatory analyses.

The transportation route selected for a shipment determines the total potentially exposed population and the expected frequency of transportation-related accidents. For truck transportation, the route characteristics most important to the risk assessment include the total shipping distance between each origin-destination pair of sites and the population density along the route.

Representative shipment routes for Turkey Point and alternative sites were identified using the TRAGIS (Version 1.5.4) routing model (Johnson and Michelbaugh Apr 2000). The Highway data network in TRAGIS is a computerized road atlas that includes a complete description of the interstate highway system and of all U.S. highways. The TRAGIS database version used was Highway Data Network 4.0. The population densities along a route are derived from 2000 census data from the U.S. Bureau of the Census. This transportation route information is summarized in Table 5.7-9.

Based on the transportation route information shown in Table 5.7-9, the impacts of spent fuel shipments originating at Units 6 & 7 would be similar to the impacts for the alternative sites (St. Lucie, Martin, Glades, and Okeechobee 2). The radiation dose estimates to the transport workers and the public for spent fuel shipments from Turkey Point and alternative sites are as follows:

	Population Dose (person-rem per shipment)		
Site	**Transport workers**	**General public (Onlookers)**	**General public (Along Route)**
Turkey Point	0.228	0.157	0.0165
St. Lucie	0.218	0.154	0.0141
Martin	0.219	0.145	0.0139
Glades	0.220	0.145	0.0140
Okeechobee 2	0.219	0.145	0.0139

These per-shipment dose estimates are independent of reactor technology because they were calculated based on an assumed external radiation dose rate emitted from the cask, which was fixed at the regulatory maximum of 10 millirem per hour at 2 meters. For the purpose of this analysis, the transportation crew consists of two drivers. The numbers of spent fuel shipments for the transportation impacts analysis were derived as described in Subsection 5.7.2.1. The normalized annual shipment values and corresponding population dose estimates per reactor-year are presented in Table 5.7-10. The population doses were calculated by multiplying the number of spent fuel shipments per year by the per-shipment doses. For comparison to Table S-4, the population doses were normalized to the reference LWR analyzed in WASH-1238.

As shown in Table 5.7-10, population doses to the crew and onlookers for both the AP1000 and the reference LWR exceed Table S-4 values. Two key reasons for these higher population doses relative to Table S-4 are the number of spent fuel shipments and the shipping distances assumed for these analyses relative to the assumptions used in WASH-1238.

- The analyses in WASH-1238 used a "typical" distance for a spent fuel shipment of 1000 miles. The shipping distance used in this assessment is approximately 3100 miles.
- The number of spent fuel shipments are based on shipping casks designed to transport shorter-cooled fuel (i.e., 150 days out of the reactor). This analysis assumed that the shipping

cask capacities are 0.5 MTU per legal-weight truck shipment. Newer cask designs are based on longer-cooled spent fuel (i.e., 5 years out of reactor) and have larger capacities. For example, spent fuel shipping cask capacities used in the Yucca Mountain environmental impact statement (U.S. DOE 2002a, Table J-2) were approximately 1.8 MTU per legal-weight truck shipment. Use of the newer shipping cask designs will reduce the number of spent fuel shipments and decrease the associated environmental impacts because the dose rates used in the impacts analysis are fixed at the regulatory limit rather than based on the cask design and contents.

If the population doses in Table S-4 are adjusted for the longer shipping distance and larger shipping cask capacity, the population doses from incident-free spent fuel transportation from the site will fall within Table S-4.

Other conservative assumptions in the spent fuel transportation impacts calculation include:

- Use of the regulatory maximum dose rate (10 millirem per hour at 2 meters) in the RADTRAN five calculations. The shipping casks assumed in the Yucca Mountain environmental impact statement (U.S. DOE Feb 2002a) transportation analyses were designed for spent fuel that has cooled for 5 years. In reality, most spent fuel will have cooled for much longer than 5 years before it is shipped to a possible geologic repository. The NRC developed a probabilistic distribution of dose rates based on fuel cooling times that indicates that approximately three-fourths of the spent fuel to be transported to a possible geologic repository will have dose rates less than half of the regulatory limit (Sprung et al. Mar 2000). Consequently, the estimated population doses in Table 5.7-10 could be divided in half if more realistic dose rate projections are used for spent fuel shipments from Units 6 & 7.

- Use of 30 minutes as the average time at a truck stop in the calculations. Many stops made for actual spent fuel shipments are short duration stops (i.e., 10 minutes) for brief visual inspections of the cargo (checking the cask tie-downs). These stops typically occur in minimally populated areas, such as an overpass or freeway ramp in an unpopulated area. Based on data for actual truck stops, recent NRC transportation analyses (e.g., NUREG-1811, Section 6.2.2.1) concluded that the assumption of a 30-minute stop for every 4 hours of driving time used to evaluate potential early site permit sites will overestimate public doses at stops by at least a factor of two. Consequently, the doses to onlookers given in Table 5.7-10 could be reduced by a factor of two to reflect more realistic truck shipping conditions.

5.7.2.2.3 Transportation of Radioactive Waste

As shown in Table 5.7-4, the transportation of radioactive waste meets the applicable conditions in 10 CFR 51.52(a) and no further analysis is required.

5.7.2.2.4 Maximally Exposed Individual

The incident-free radiation doses to maximally exposed individuals for fuel and waste shipments were also considered. A maximally exposed individual is a person who may receive the highest radiation dose from a shipment to and/or from the site. The radiological doses to the workers who would load casks, drive trucks, and inspect vehicles in transit would be higher than doses to individuals in the general public. Radiological protection programs would manage and limit doses to workers whose jobs would cause them to receive the greatest exposures.

Truck crew members would receive the highest radiation doses because of their proximity to the loaded shipping container for an extended period of time. DOE will take title to the spent fuel at the reactor site. Consequently, the DOE administrative control level of 2 person-rem per year (U.S. DOE Mar 2005) is expected to apply to spent fuel shipments from Turkey Point to a disposal facility. Spent fuel represents the majority of the radioactive materials shipments to and from reactor sites, and comprises those shipments with the highest radiation dose rates. Crew doses from unirradiated fuel and radioactive waste shipments would be lower than the spent fuel shipments.

5.7.2.3 Conclusion

The NRC evaluated the environmental effects of transportation of fuel and waste for LWRs in WASH-1238 (AEC Dec 1972) and Supplement 1 (NUREG-75/038) and found the impacts to be SMALL. These NRC analyses provided the basis for Table S-4 in 10 CFR 51.52. Incident-free transportation of unirradiated and spent fuel to and from Units 6 & 7 was evaluated. The Turkey Point results are consistent with the environmental impacts associated with transportation of radioactive materials from current generation reactors presented in Table S-4 of 10 CFR 51.52. Thus, the impacts of accident-free transportation would be SMALL and would not warrant additional mitigation.

Section 5.7 References

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Table 5.7-1 (Sheet 1 of 2)
Uranium Fuel Cycle Environmental Data[a]

Environmental Considerations	Reference Reactor	2 AP1000 Units
Natural Resource Use		
Land (acres)		
Temporarily committed[b]	100	260
Undisturbed area	79	200
Disturbed area	22	57
Permanently committed	13	34
Overburden moved (millions of MT)	2.8	7.3
Water (millions of gallons)		
Discharged to air	160	420
Discharged to water bodies	11,090	28,700
Discharged to ground	127	330
Total	11,377	29,500
Fossil fuel		
Electrical energy (thousands of MW-hour)	323	840
Equivalent coal (thousands of MT)	118	310
Natural gas (millions of standard cubic feet)	135	350
Effluents — Chemical (MT)		
Gases (including entrainment)[c]		
SO_x	4,400	11,400
NO_x[d]	1,190	3,100
hydrocarbons	14	36
CO	29.6	77
particulates	1,154	3,000
Other gases		
F	0.67	1.7
HCl	0.014	0.036
Liquids		
SO_4^-	9.9	26
NO_3^-	25.8	67
fluoride	12.9	33
Ca^{++}	5.4	14
Cl^-	8.5	22
Na^+	12.1	31
NH_3	10	26
Fe	0.4	1.0
Tailings solutions (thousands of MT)	240	620
Solids	91,000	236,000
Effluents — Radiological (curies)		
Gases (including entrainment)		
^{222}Rn	[e]	[e]
^{226}Ra	0.02	0.052
^{230}Th	0.02	0.052
U	0.034	0.088

Table 5.7-1 (Sheet 2 of 2)
Uranium Fuel Cycle Environmental Data[(a)]

Environmental Considerations	Reference Reactor	2 AP1000 Units
Effluents — Radiological (curies) (Continued)		
^{3}H (thousands)	18.1	47
^{14}C	24	62
^{85}Kr (thousands)	400	1,040
^{106}Ru	0.14	0.36
^{129}I	1.3	3.4
^{131}I	0.83	2.2
^{99}Tc	(e)	(e)
Fission products and TRU	0.203	0.53
Liquids		
U and daughters	2.1	5.4
^{226}Ra	0.0034	0.0088
^{230}Th	0.0015	0.0039
^{234}Th	0.01	0.026
fission and activation products	5.90E06	1.5E05
Solids (buried onsite)		
other than HLW (shallow)	11,300	29,000
TRU and HLW (deep)	1.10E07	2.9E07
Effluents — Thermal (billions of Btu)	4063	10,500
Transportation (person-person-rem)		
exposure of workers and the general public	2.5	6.5
occupational exposure	22.6	59

MT = metric tonnes
TRU = transuranic
HLW = high-level waste

(a) In some cases where no entry appears in Table S-3 it is clear from the background documents that the matter was addressed and that, in effect, the table should be read as if a specific zero entry had been made. However, there are other areas that are not addressed at all in the table. Table S-3 does not include health effects from the effluents described in the table, or estimates of releases of Rn-222 from the uranium fuel cycle or estimates of Tc-99 released from waste management or reprocessing activities. Radiological impacts of these two radionuclides are addressed in NUREG-1437, and it was concluded that the health effects from these two radionuclides posed a small significance. Data supporting Table S-3 are given in the *Environmental Survey of the Uranium Fuel Cycle*, WASH-1248 (AEC 1974); NUREG-0116 (Supplement 1 to WASH-1248); NUREG-0216 (Supplement 2 to WASH-1248); and in the record of final rule making pertaining to *Uranium Fuel Cycle Impacts from Spent Fuel Reprocessing and Radioactive Waste Management*, Docket RM-50-3. The contributions from reprocessing, waste management and transportation of wastes are maximized for either of the two fuel cycles (uranium only and fuel recycle). The contribution from transportation excluded transportation of cold fuel to a reactor and of irradiated fuel and radioactive wastes from a reactor which are considered in Table S-4 of § 51.20(g). The contributions from the other steps of the fuel cycle are given in columns A-E of Table S-3A of WASH-1248.

(b) The contributions to temporarily committed land from reprocessing are not prorated over 30 years, because the complete temporary impact accrues regardless of whether the plant services one reactor for 1 year or 57 reactors for 30 years.

(c) Estimated effluents based on combustion of coal for equivalent power generation.

(d) 1.2 percent from natural gas use and processes.

(e) Radiological impacts of Rn-222 and Tc-99 are addressed in NUREG-1437. The GEIS concluded that the health effects from these two radionuclides pose a small risk.

Table 5.7-2
Summary of Environmental Impacts of Transportation of Fuel and Waste to and from One LWR, Taken from 10 CFR 51.52 Table S-4[a]

Normal Conditions of Transport			
Environmental Impacts			
Heat (per irradiated fuel cask in transit)		250,000 Btu/hr.	
Weight (governed by Federal or State restrictions)		73,000 lbs. per truck; 100 tons per cask per rail car.	
Traffic density:			
Truck		Less than 1 per day	
Rail		Less than 3 per month	
Exposed Population	**Estimated Number of People Exposed**	**Range of Doses to Exposed Individuals[b] (per reactor year)**	**Cumulative Dose to Exposed Population (per reactor year)[c]**
Transportation workers	200	0.01 to 300 millirem	4 person-rem.
General pubic:			
Onlookers	1100	0.003 to 1.3 millirem	3 person-rem.
Along Route	600,000	0.0001 to 0.06 millirem	
Accidents in Transport			
Types of Effects		**Environmental Risk**	
Radiological effects		Small[d]	
Common (nonradiological) causes		1 fatal injury in 100 reactor years; 1 nonfatal injury in 10 reactor years; $475 property damage per reactor year.	

(a) Data supporting this table are given in the Commission's *Environmental Survey of Transportation of Radioactive Materials to and from Nuclear Power Plants,* WASH-1238, December 1972, and Supp. 1 NUREG-75/038, April 1975.
(b) The Federal Radiation Council has recommended that the radiation doses from all sources of radiation other than natural background and medical exposures should be limited to 5000 millirem per year for individuals as a result of occupational exposure and should be limited to 500 millirem per year for individuals in the general population. The dose to individuals due to average natural background radiation is approximately 360 millirem per year (U.S. NRC 2004).
(c) Person-rem is an expression for the summation of whole body doses to individuals in a group. Thus, if each member of a population group of 1000 people were to receive a dose of 0.001 rem (1 millirem), or if 2 people were to receive a dose of 0.5 rem (500 millirem) each, the total person-rem dose in each case will be 1 person-rem.
(d) Although the environmental risk of radiological effects stemming from transportation accidents is currently incapable of being numerically quantified, the risk remains small regardless of whether it is being applied to a single reactor or a multi-reactor site.

Table 5.7-3
Number of Truck Shipments of Unirradiated Fuel

Reactor Type	Number of Shipments per Unit			Unit Electric Generation, MW(e)(d)	Capacity Factor	Normalized Shipments Total(e)	Normalized Shipments Annual(f)
	Initial Core(a)	Annual Reload	Total(c)				
Reference LWR	18(b)	6.0	252	1100	0.8	252	6.3
AP1000	23	4.7	208	1000	0.93	196	4.9

(a) Shipments of the initial core have been rounded up to the next highest whole number.
(b) The initial core load for the reference BWR in WASH-1238 was 150 MTU. The initial core load for the reference PWR was 100 MTU. Both types result in 18 truck shipments of fresh fuel per reactor.
(c) Total shipments of fresh fuel over 40-year plant lifetime (i.e., initial core load plus 39 years of average annual reload quantities).
(d) AP1000 unit net generating capacity from DCD, Rev. 19, Table 1.3-1.
(e) Normalized to electric output for WASH-1238 reference plant (i.e., 1100 MWe at 80 percent or an electrical output of 880 MWe).
(f) Annual average for 40-year plant lifetime.

Table 5.7-4
Number of Radioactive Waste Shipments

Reactor Type	Waste Generation, ft^3 per yr, per unit	Electrical Output, MWe, per unit	Capacity Factor	Normalized Waste Generation Rate, ft^3 per reactor-year(a)	Normalized Shipments per reactor-year(b)
Reference LWR	3800	1100	0.80	3800	46
AP1000	1947	1000	0.93	1842	22.3

(a) Annual waste generation rates normalized to equivalent electrical output of 880 MWe for reference LWR analyzed in WASH-1238.
(b) The number of shipments was calculated assuming the average waste shipment capacity of 82.6 ft^3 per shipment (3800 ft^3 per yr divided by 46 shipments per yr) used in WASH-1238.

Table 5.7-5
AP1000 Comparisons to Table S-4 Reference Conditions

Characteristic	Table S-4 Condition	AP1000
Thermal Power Rating (MWt)	not exceeding 3,800 per reactor	3,400
Fuel Form	sintered uranium dioxide pellets	sintered uranium dioxide pellets
U-235 Enrichment (percent)	Not exceeding 4	Region 1 — 2.35% Region 2 — 3.40% Region 3 — 4.45%
Fuel Rod Cladding	Zircaloy rods; NRC has also accepted ZIRLO per 10 CFR 50.46	ZIRLO
Average fuel irradiation (MWd per MTU)	Not exceeding 33,000	50,553
Unirradiated Fuel (Table 5.7-3)		
Transport Mode	truck	truck
No. of shipments for initial core loading		23
(normalized number)		(25)[a]
No. of reload shipments per year		4.7
(normalized number)		(5)[a]
Irradiated Fuel		
Transport mode	truck, rail or barge	truck, rail
Decay time before shipment	Not less than 90 days is a condition for use of Table S-4; 5 years is per contract with DOE	minimum of 5 years
No. of spent fuel shipments by truck		45.9 per year
(normalized number)		(444 per year)
No. of spent fuel shipments by rail		not analyzed
Radioactive Waste (Table 5.7-4)		
Transport mode	truck or rail	Truck
Waste form	solid	Solid
Packaged	yes	yes
No. of waste shipments by truck		23.6 per year
(normalized number)		(23 per year)
Traffic Density		
Trucks per day	Less than 1	Less than 1
(normalized total)		(72 per year)
Rail cars per month	Less than 3	not analyzed

(a) Total shipments of unirradiated fuel averaged over 40-year plant lifetime (Table 5.7-3) were used to calculate the total traffic density.

Table 5.7-6
RADTRAN 5 Input Parameters for Analysis of Unirradiated Fuel Shipments

Parameter	RADTRAN 5 Input Value	Source
Shipping distance, miles[(a)]	2,000	AEC Dec 1972
Travel Fraction — Rural	0.90	NUREG-0170
Travel Fraction — Suburban	0.05	
Travel Fraction — Urban	0.05	
Population Density — Rural, people per square mile	25.9	U.S. DOE Jul 2002b
Population Density — Suburban, people per square mile	904	
Population Density — Urban, people per square mile	5,850	
Vehicle speed, miles per hour	55	Conservative in transit speed of 55 mph assumed; predominantly interstate highways used.
Traffic count — Rural, vehicles per hour	530	U.S. DOE Jul 2002b
Traffic count — Suburban, vehicles per hour	760	
Traffic count — Urban, vehicles per hour	2,400	
Dose rate at 1 meter from vehicle, person-rem per hour	0.1	AEC Dec 1972
Packaging length, feet	24	Approximate length of two LWR fuel element packages placed on end
Number of truck crew	2	AEC Dec 1972, NUREG-0170, U.S. DOE Feb 2002a, DOE 2002b
Stop time, hour per trip	4.0	Based on one 30-minute stop per 250 miles
Population density at stops, people per square mile	77,700	Sprung et al. Mar 2000
Population density surrounding truck stops, people per square mile	881	Sprung et al. Mar 2000

(a) WASH-1238 had a range of shipping distances between 25 and 3000 miles for unirradiated fuel shipments. A 2000-mile “average” shipping distance was used for this analysis consistent with the assumptions in NRC analyses of early site permit sites.

Table 5.7-7
Radiological Impacts of Transporting Unirradiated Fuel to Units 6 & 7 by Truck

Reactor Type	Normalized Average Annual 0Shipments	Cumulative Annual Dose, person-rem per reference reactor year		
		Transport Workers	General Public - onlookers	General Public - along route
Reference LWR	6.3	0.011	0.018	1.9E–04
AP1000	4.9 (Table 5.7-3)	0.008	0.014	1.5E–04
10 CFR 51.52	365	4	3	3
Table S-4 condition[(a)]	(<1 per day)			

(a) Table S-4 conditions apply to all types of radioactive material transportation. The impacts of unirradiated fuel shipments constitute a small fraction of the overall cumulative annual dose limit.

Table 5.7-8
RADTRAN 5 Incident-free Exposure Parameters for Spent Fuel Shipments

Parameter	RADTRAN 5 Input Value	Source
Vehicle speed — Rural (miles per hour)	55	Based on average speed in rural areas given in U.S. DOE Jul 2002b. Because most travel is on interstate highways, the same vehicle speed is assumed in rural, suburban, and urban areas. No speed reductions were assumed for travel at rush hour.
Vehicle speed — Suburban (miles per hour)	55	
Vehicle speed — Urban (miles per hour)	55	
Traffic count — Rural (vehicles per hour)	530	U.S. DOE Jul 2002b
Traffic count — Suburban (vehicles per hour)	760	
Traffic count — Urban (vehicles per hour)	2,400	
Dose rate at 1 meter from vehicle (mrem per hour)	14	Approximate rate at 1 m that is equivalent to maximum dose rate allowed by federal regulations (i.e., 10 mrem per hr at 2 m from the side of a transport vehicle)
Packaging dimensions, m	Length = 5.2 Diameter = 1.0	U.S. DOE Feb 2002a
Number of truck crew	2	U.S. DOE Jul 2002b
Stop time (hour per trip)	3.5 to 4	Route specific
Population density at Stops (person per square mile)	77,700	Sprung et al. Mar 2000
Minimum/Maximum Radii of Annular Area Surrounding Vehicle at Stops (m)	1 to 10	Sprung et al. Mar 2000
Shielding Factor Applied to Annular Area Surrounding Vehicle at Stops	1 (no shielding)	Sprung et al. Mar 2000
Population Density Surrounding Truck Stops (people per square mile)	880	Sprung et al. Mar 2000
Minimum/Maximum Radii of Annular Area Surrounding Truck Stop (m)	10 to 800	Sprung et al. Mar 2000
Shielding Factor Applied to Annular Area Surrounding Truck Stop	0.2	Sprung et al. Mar 2000

Table 5.7-9
Transportation Route Information for Spent Fuel Shipments to the Potential Yucca Mountain Disposal Facility[(a)]

Reactor Site	One-Way Shipping Distance, miles				Population Density, people per square mile			Stop Time per trip, hr[(b)]
	Total	Rural	Suburban	Urban	Rural	Suburban	Urban	
Turkey Point Units 6 & 7	3115	2349	634	133	26.0	940	6270	6.5
St. Lucie	2967	2318	569	80	25.7	888	5975	6
Martin	2990	2350	562	78	25.4	883	5963	6
Glades	3002	2344	585	73	26.2	856	6015	6
Okeechobee 2	2990	2350	562	78	25.4	883	5963	6

(a) Transportation route information obtained from TRAGIS.
(b) Stop time is based on one 30 minute stop per each 4 hours of driving time.

Table 5.7-10
Population Doses from Spent Fuel Transportation, Normalized to Reference LWR

Exposed Population	Cumulative dose limit specified in Table S-4, person-rem per reactor year	Reactor Type	
		Reference LWR	AP1000
		Normalized Number of Spent Fuel Shipments per year	
		60	44
		Environmental Effects, person-rem per reactor year[(a)]	
Transport Workers	4	13.7	10.0
General Public — onlookers	3	9.4	6.9
General Public — along route	3	0.99	0.73

(a) Doses are the product of the RADTRAN dose results along the TRAGIS generated shipment routes multiplied by the number of shipments per year.

5.8 SOCIOECONOMIC IMPACTS

This section addresses the socioeconomic impacts of the operation of Units 6 & 7 at the Turkey Point plant property in Miami-Dade County, Florida. The evaluation assesses impacts from the operation of Units 6 & 7 and from the demands placed on the region by the workforce. Subsection 5.8.1 describes and presents an assessment of the physical impacts of operations. Subsection 5.8.2 describes the impacts of operations to the region in the areas of demography, economy, taxes, land use, transportation, aesthetics and recreation, housing, public services, and education. Subsection 5.8.3 assesses the operation of Units 6 & 7 with regard to disproportionate adverse impacts to minority and low income populations.

The significance of the impacts as small, moderate, or large, has been identified in accordance with the criteria that U.S. NRC established in 10 CFR Part 51, Appendix B, Table B-1, Footnote 3, as follows:

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

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

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

These impact significance terms (SMALL, MODERATE, LARGE) are assigned to both the county-level and combined city-level analyses.

5.8.1 PHYSICAL IMPACTS OF STATION OPERATION

This section assesses the potential physical impacts as a result of the operation of the new units on the nearby communities or residences. Potential impacts include noise, odors, exhausts, thermal emissions, and visual intrusions. These physical impacts would be managed to comply with applicable federal, state, and local environmental regulations and would not significantly affect the Turkey Point plant property and its vicinity.

As presented in Subsection 2.5.2.4, Miami-Dade County has more than 1946 square miles of land, of which approximately 510 square miles have been developed for urban uses. The predominant existing land uses around the Turkey Point plant property are undeveloped and protected areas. Biscayne Bay and the Atlantic Ocean border the plant property to the east. The closest incorporated communities are Homestead and Florida City. Florida City is located 8 miles west of the plant property and the municipal limits of Homestead is located 4.5 miles west (Subsection 2.2.1.2). Recreational areas in the community include Homestead Bayfront Park, Biscayne National Park, Mangrove Preserve, Everglades National Park and the Homestead Miami Speedway (Subsection 2.5.2.5). There are no residential areas or public roads located within the Turkey Point plant property. Homestead Air Reserve Base is within 6 miles of Units 6 & 7. No significant industrial or commercial facilities other than the Turkey Point units are planned for this area; however, a portion of the former Air Reserve Base (717 acres) is to be set aside for mixed economic uses (commercial, residential, or recreational uses) by Miami-Dade County (Subsection 2.2.1.2).

5.8.1.1 Noise

As described in Subsection 2.7.7, an ambient noise monitoring survey was performed in June 2008 to assess existing ambient noise in areas adjacent to the existing units. The highest recorded noise level for onsite measurements was 68 dBA. From two sampling points located at the Turkey Point plant property boundary (monitoring points S2 and S3), daytime noise level equivalent (Leq) readings ranged from 60 to 68 dBA and nighttime L_{eq} readings ranged from 60 to 67 dBA.

The noise impacts from the operation of Units 6 & 7 were evaluated using the equipment associated with normal operation. The noise level generated by the circulating water system cooling towers would be on the order of 88 dBA at 3 feet from the towers, 73 dBA at 200 feet from the towers, and 65 dBA at 400 feet from the towers, which is within the Units 6 & 7 plant area. In contrast, the nearest distance to the Turkey Point plant property boundary from the cooling towers is 1452 feet. At the plant property boundary the estimated noise level would be approximately 35 dBA. This noise level would be below the range of the existing noise levels at the plant property boundary.

The design of Units 6 & 7 would include components that mitigate noise from being emitted to the surrounding environment. The majority of the noise sources associated with Units 6 & 7 would be steam generators, electric generators, compressors, cooling water pumps, and cooling towers. All, except for the cooling towers, would be located within buildings that mitigate sounds emitted by equipment. The noise from electric transformers would be partially shielded by walls that also mitigate noise. The standby and ancillary diesel generators and diesel fire pumps would operate only 4 hours per month for testing and maintenance. The noise from cooling towers would be mitigated by their inherent design (e.g., splash guards on air inlets to mitigate sounds generated by the falling water, mechanical fans with stacks that direct noise vertically).

As reported in NUREG-1437, and referenced in NUREG-1555, noise levels below 65 dBA are considered of small significance. In addition, there are no applicable state or local environmental noise regulations for unincorporated areas of Miami-Dade County, where Turkey Point is located. Therefore, noise impacts would be SMALL and would not warrant mitigation.

Other noise generated by the operation of Units 6 & 7 would be the noise levels resulting from the transmission system, substation operations, and increase in traffic by the operation workforce on access roadways and onsite roads. The noise generated from the transmission lines and substations, called corona noise, would be affected by weather. During dry conditions, the corona discharge is low and is not distinguishable from background or ambient noise. During wet conditions, a louder corona discharge occurs, however, the corona noise is not readily distinguishable from other background noise such as rain or traffic. Noise generated by the operation of the transmission systems and substations would be in accordance with state and local code requirements and, therefore, would be SMALL and would not warrant mitigation. Good road conditions and appropriate speed limits would minimize the noise level generated by the workforce commuting to the plant property. The access roads would be paved and local traffic would be controlled by speed limits. Impacts from the noise of traffic during operation activities would be SMALL and would not require mitigation.

5.8.1.2 Air

The Turkey Point plant property is located in Miami-Dade County, Florida, which is part of the Southeast Florida Intrastate Air Quality Control Region (AQCR). The Clean Air Act establishes National Ambient Air Quality Standards (NAAQS), which include the following criteria pollutants: sulfur dioxide, particulate matter with aerodynamic diameters of 10 microns or less (PM_{10}), particulate matter with aerodynamic diameters of 2.5 microns or less ($PM_{2.5}$), carbon monoxide, nitrogen dioxide, ozone, and lead. Areas of the United States having air quality as good as or better than the NAAQS are designated by EPA as attainment areas. Areas having air quality that is worse than the NAAQS are designated by EPA as non-attainment areas. The entire Southeast Florida Intrastate AQCR is currently classified as an attainment area under the NAAQS criteria (Subsection 2.7.2).

The new units would have standby diesel generators. The diesel generators would be operated periodically on a limited short-term basis and the related emissions would be intermittent. Emissions from these sources are described in Subsection 2.7.2.2. The standby diesel generators would be operated under air permits issued by the state of Florida for cooling tower particulates. The operation of a nuclear power plant involves the emission of some greenhouse gases, primarily carbon dioxide (CO_2). The NRC has conservatively estimated for a 1000 MW(e) nuclear plant that the total carbon footprint for the operation of a plant for 40 years is on the order of 320,000 metric tons of CO_2 equivalent (NRC, 2010). Thus, for two AP1000 reactors, the total carbon footprint would be on the order of 640,000 metric tons (not including uranium fuel cycle). Periodic testing of diesel generators and normal plant operation accounts for about 60 percent of the total or approximately 380,000 metric tons. Workforce transportation accounts for most of the rest or approximately 260,000 metric tons. As a comparison, the total United States annual CO_2 emission rate is 6,000,000,000 metric tons (EPA 2009). Additionally, Subsection 9.2.3.1.1 estimates a yearly CO_2 emission for comparable fossil fuel plants (coal- fired and natural gas-fired) as 14,000,000 metric tons and 5,900,000 metric tons, respectively. Based on the relatively small plant operations carbon footprint compared to the United States annual CO_2 emissions and comparable fossil fuel plants annual CO_2 emissions, the atmospheric impacts of greenhouse gases from plant operation would not be noticeable and therefore impacts would be SMALL. Given the periodic and short-term operation of these pollution sources, the impact from the operation of Units 6 & 7 on air quality would be SMALL and would not warrant mitigation.

The operation of Units 6 & 7 would increase the commuting workforce. Well-maintained access roads and appropriate speed limits would minimize the amount of dust generated by this increase in traffic. As stated in Subsection 5.8.2, approximately 403 new residents, in addition to 403 individuals already residing in, and therefore a part of the area's existing traffic profile, would migrate to the area for the operation of the new units. It is expected that these additional employees would be dispersed into surrounding communities in much the same way as the existing workforce. Because of the size and population of the surrounding areas, the emissions from the small increase in local traffic would not affect the air quality in the area. Air quality impacts from traffic during operation activities would be SMALL and would not require mitigation.

5.8.1.3 Aesthetics

The viewscape from north to south or from south to north would be similar to that of the existing units. However, the viewscape perpendicular to the Turkey Point plant property, that seen by commercial and recreational boating traffic on the eastern side of the plant property, would have a broader view of the entire area of the existing and new units, and would have an open view of Units 6 & 7. However, the viewscape with the new units would be similar to that of the existing plant property. Visual impacts of the new units would be SMALL and would not warrant mitigation.

The visual impacts from the operation of the cooling towers would be the towers themselves and plumes resembling lines of clouds. The plumes from the cooling towers would be seen during the early morning in cool weather generally during the winter months. The average plume lengths and heights would be relatively short. The visible plumes may prevent direct sunlight from reaching the ground, causing shadowing only for a short amount of time in the morning, but dispersing after sunrise. As described in Subsection 5.3.3.1, because of the varying directions and low frequency of the longest plumes and the short average plume lengths, impacts from elevated plumes would be SMALL and would not warrant mitigation.

Outdoor lighting would be necessary to satisfy NRC and Occupational Safety and Health Administration (OSHA) requirements for security, worker, and plant safety, including lighting walkways, parking areas, and various equipment areas. Unconstrained lighting can cause light pollution and light trespass. Light pollution or sky glow is the term used to describe sky brightness caused by scattering of light in the atmosphere. Light trespass is the term used to describe light that strays from its intended purpose and becomes an annoyance.

Light pollution and light trespass would be addressed when designing the outdoor lighting systems. Guidelines specifically addressing potential lighting issues from the Illuminating Engineering Society of North America would be followed. These guidelines would be incorporated into the outdoor lighting design to the extent practicable while meeting NRC and OSHA requirements. Typical features to be incorporated are minimize upward light from luminaries, minimize upward light in general so that light reaches its intended target, turn off lighting not needed for safety and security between 11:00 p.m. and sunrise, contain light within its intended target area by suitable choice of luminaries for light distribution, by selection of mounting height and physical location, and by minimizing glare in the horizontal or vertical directions.

Outdoor light monitoring was conducted in 2008. The monitoring was performed from ten locations surrounding Turkey Point such as the race track, cooling canals, and Biscayne Bay. The results of the outdoor light monitoring indicated that while light from the existing units is visible, the light is localized. Sky glow was observed from the major urban areas such as Homestead and Miami. The use of the Illuminating Engineering Society of North America guidelines to the extent practicable, while meeting NRC and OSHA security and safety requirements, would result in low lighting impacts from Units 6 & 7. Thus, lighting impacts would be SMALL and would not warrant mitigation.

The visual impacts of the eastern transmission line corridors (Clear Sky to Turkey Point, Clear Sky to Davis, and Davis to Miami) would consist of 230 kV lines on 80- to 105-foot-high concrete poles. The Clear Sky to Turkey Point line would be fully contained on the Turkey Point plant property and would be similar to the existing lines between the Turkey Point switchyard and the McGregor switchyard. The Clear Sky to Davis line would be in an established transmission right-of-way that is currently being used for seven other transmission lines. The addition of another single line and new poles collocated within this corridor would be similar to the current linear facilities established. The Davis to Miami line would be collocated in an established transmission line right-of-way that is currently being used for several other transmission lines and collocated with the MetroRail and a major transportation highway. A short section of the proposed Davis-Miami 230-kV transmission line, at the crossing of the Miami River adjacent to the existing Miami substation, would be underground. Therefore, the presence of these new transmission lines would have a SMALL visual impact and would not warrant mitigation.

The visual impacts of the western transmission line facilities (Clear Sky to Levee and Clear Sky to Pennsuco) would consist of two 500 kV lines and a single 230 kV line. These lines would follow an existing right-of-way up to the Everglades National Park (ENP). These lines would then follow a right-of-way in, or adjacent to, the ENP. Then, the two 500 kV lines would terminate at the Levee substation, and the 230 kV line would continue to the Pennsuco substation. The existing right-of-way is currently used by a single 138 kV line. The visual impacts of the additional lines would consist of new 80- to 105-foot-high concrete poles and new galvanized lattice steel or concrete guyed single-circuit structures at heights of 135-150 feet approximately 1000 feet apart. The addition of these new structures would alter and inhibit the viewscape, however, the visibility would be reduced with increased distance. At the present time, most of the views into the park from the Tamiami Trail are obstructed by vegetation growing along the highway. Because opportunities for views into the park from the highway are greatly reduced or eliminated due to the vegetation, the adverse impacts of the transmission lines and structures would be minimal. The 230 kV line that continues past Levee substation to Pennsuco substation would be largely in existing rights-of-way where the transmission line would be collocated with existing transmission lines and would consist of a single line on 80- to 105-foot-high concrete poles through heavily industrial and urban areas. Impacts would be minimized to the natural and built environment to the extent feasible through the selection process, engineering options, and construction techniques used. Therefore, the presence of these new lines would have a MODERATE impact and would warrant mitigation, such as those described above.

5.8.1.4 Traffic

The current road network in the Homestead and Florida City area is detailed in Subsection 2.5.2.2.1. The operation workforce for both units is expected to be 806 persons (Table 5.8-1). The principal arterial roads could accommodate an increase in operation workforce traffic (Table 5.8-10c).

After completion of construction, FPL would remove a portion of the roadway improvements on SW 359th Street and return it to a transmission patrol road. All workforce traffic for Units 1-7, including outage workers, would access the site via SW 344th/Palm Drive. Palm Drive runs east-west. Workers from the west, northwest, north and south can access the west end of SW 344th/ Palm Drive from U.S. Highway 1, Krome Avenue or Florida's Turnpike. Workers from the north can also access Palm Drive by traveling south on SW 137th/Tallahassee Road or SW 117th Avenue, a north-south street east of Tallahassee Road.

SW 328th /North Canal Drive runs east-west several blocks north of SW 344th/Palm Drive, and also can be accessed from Krome Avenue, U.S. Highway 1 or Florida's Turnpike. SW 328th / North Canal Drive intersects with SW 137th/Tallahassee Road, north of SW 137th/Tallahassee Road's intersection with SW 344th/Palm Drive, and therefore provides an alternative access to Turkey Point from the west for part of the commute. Sections of Tallahassee Road, North Canal Drive and Palm Drive would be improved to accommodate construction traffic (Subsection 4.4.2.2.4.2).

Trip distributions and traffic assignments for the new operation workforce traffic were based on the traffic patterns of the existing workforce. Most existing traffic arrives from and departs to the north via SW 137th/Tallahassee Road. The second most traveled access/egress route is SW 344th/Palm Drive to U.S. Highway 1. Most of the remainder of the existing workforce uses SW 328th /North Canal Drive.

5.8.1.5 Conclusion

Physical impacts to the surrounding population as a result of the operation of the proposed units would be SMALL and would not warrant mitigation.

5.8.2 SOCIAL AND ECONOMIC IMPACTS OF STATION OPERATION

This section evaluates the demographic and community impacts to the region as a result of operating Units 6 & 7 in Miami-Dade County, Florida. The evaluation assesses impacts of operation-related activities and of the operation workforce in the region.

The population data in this section was updated to reflect the American Community Survey Estimates for 2005-2009. The population projections in Table 2.5-1 and FSAR Subsection 2.1.3, however, used the 2010 Census dataset in order to be consistent with the base population utilized by the Florida Office of Economic Development and Research for the state projected population growth between 2010 and 2030. The 2010 Census dataset was also used in FSAR Subsection 2.1.3 to calculate the same base growth rate multiplier as the state, so that the population projections would be consistent with those projected by the state through 2030.

The operation of Units 6 & 7 would continue at least 40 years, with the possibility of a 20-year extension, for an operational life of as much as 60 years. The projected operation schedule estimates a commercial operation date of 2022 for Unit 6 and 2023 for Unit 7. A two-unit facility would require approximately 806 onsite employees (Subsection 3.10.3). Refueling outages for each unit would occur every 18 months, last approximately 30 days, and require the addition of approximately 600–1000 temporary workers.

Major factors in determining socioeconomic impacts are the number of workers and family members that relocate to an area and where they settle. Assumptions regarding workforce characteristics, migration, and family characteristics for Units 6 & 7 are presented in Table 5.8-1. Assumptions regarding families, children, and the indirect workforce are described in more detail in Subsection 5.8.2.1. As stated in Subsection 3.10.3, it is assumed that 50 percent of the operation workforce (403 workers) would migrate to Miami-Dade County for this project.

As presented in Table 2.5-3, approximately 83 percent of the 977 current operation workers at Turkey Point reside in Miami-Dade County. Approximately 43 percent or 418 workers reside in the Homestead and Florida City area. For Units 6 & 7, it could be assumed that 83 percent of the in-migrating operation workforce would reside in Miami-Dade County, but the county's population is so large and resources are so plentiful that it can be conservatively assumed that all of the 403 workers would migrate to the county. On a more local level, it could be assumed that, based on the residential distribution of the current operation workforce, approximately 43 percent of the in-migrating workers (172 workers) would reside in the Homestead and Florida City area. Therefore, the impact analyses in Subsection 5.8.2 are based on the socioeconomics of Miami-Dade County, as a whole, and the Homestead and Florida City area, in particular.

In Subsections 2.5.1 and 2.5.2, resource capacity information is presented for Miami-Dade County and the Homestead and Florida City area. The data for Homestead and Florida City was summed to provide a baseline for the Homestead and Florida City area. In Subsection 5.8.2, the incremental increases in resource use caused by the in-migrating workforce for Units 6 & 7 at both the county and combined cities levels are assessed.

5.8.2.1 Demography

Both new units would be operating by 2023 and potentially continue for 60 years, to 2083. The population, as determined by the USCB, within 50 miles of Units 6 & 7 was 3,459,894 in 2010, and is projected to grow to approximately 6,278,881 by 2090 (Table 2.5-1). The population in Miami-Dade County was 2,496,435 in 2010, and is projected to grow to 2,722,889 by 2020 (Table 2.5-4). The 2000 populations of Homestead and Florida City were 31,909 and 7843, respectively (Subsection 2.5.1). The 2005-2009 population for the two cities was 55,036 and 9808, respectively (Subsection 2.5.1). Population projections for the two cities in 2020 are not available.

It is anticipated that 403 workers (Table 5.8-1) would migrate into Miami-Dade County to support the operation of the new units. It is anticipated that 172 (approximately 43 percent) of those workers would migrate to the Homestead and Florida City area.

An in-migration of 403 workers would create additional indirect jobs in the region because of the multiplier effect. Multipliers are used to estimate how much a one-time or sustained increase in economic activity, such as the operation of Units 6 & 7, in a particular region, such as Miami-Dade County, will impact a defined region. Employment multipliers are used to estimate the number of indirect jobs created in a region. Indirect jobs are created when new, directly employed workers spend their earnings and, hence, create a greater demand for goods and services than existed before the new worker wages were introduced to the region. The in-migration of 403 operation workers would create new indirect jobs because of the multiplier effect.

Earnings multipliers are also used to predict the impact of wages spent in the region. The U.S. Department of Commerce's Bureau of Economic Analysis (BEA), Economics and Statistics Division, provides multipliers for jobs and earnings (BEA 2009). Their economic model, RIMS II, incorporates buying and selling linkages among regional industries, and provides multipliers by industry sector to estimate the impacts of changes in that sector to a regional economy. This analysis used the detailed employment and earnings multipliers for the power generation and supply industry to estimate the number of indirect jobs and the impact of Units 6 & 7-related expenditures in Miami-Dade County. Table 5.8-2 provides project-related direct and indirect employment data for Miami-Dade County.

As stated in Subsection 4.4.2.1, for every in-migrating operation worker, an estimated additional 2.1696 jobs would be created in Miami-Dade County (BEA 2009). The influx of 403 operation workers would create approximately 874 indirect jobs in Miami-Dade County, for a total of 1277 new jobs (both direct and indirect) (Table 5.8-2). It is expected that the indirect jobs could be filled by people already residing within Miami-Dade County. As shown inTable 2.5-7, there were 156,562 unemployed individuals in Miami-Dade County in 2011.

To estimate the family characteristics of the operation workforce, the Batelle Memorial Institute (BMI) study, *Migration and Residential Location of Workers at Nuclear Power Plant Construction Sites* (BMI 1981), which was commissioned by the NRC, and U.S. Census Bureau (USCB) data was evaluated. Published in 1981, the BMI study was based on 49,000 observations from 28 surveys at 13 nuclear power plant construction sites. The study sought to improve the accuracy of socioeconomic impact assessments by providing an improved methodology for predicting the number of in-migrating workers and their residential location patterns at future nuclear power plant construction projects. Though the study was an analysis of construction workforce, in general, information about nuclear plant nonconstruction workers (i.e., managers, engineers, supervisors, clerical, security, and medical personnel who were on the site during construction) was also included. Because nonconstruction workers have some similar characteristics to the operation workforce, their data is useful for this analysis. The study is the most current of its nature and there is little evidence that the observations of fundamental worker characteristics and behaviors detailed in the BMI study have changed meaningfully since the study's publication. Therefore, the worker migration patterns and family characteristics described in the 1981 study are considered a valid proxy for assumptions made for nuclear power plant construction and operation workforce today.

As stated previously, it was assumed that all of the 403 in-migrating workers would migrate to Miami-Dade County and would bring families. According to the BMI study, the average family size of a nuclear plant nonconstruction worker was slightly less than 3.25. According to the USCB (USCB 2010b), the average family size in Miami-Dade County in 2010 was 3.33, while the average family size for the state of Florida was 3.01. Therefore, it was assumed that the average family size of 3.25, the value used for the construction workforce in Subsection 4.4.2.1, would also be a reasonable estimate for the operation workforce. Therefore, 403 in-migrating operation workers would bring 907 family members, for a total of 1310 additional people in Miami-Dade County (Table 5.8-1). The 172 workers that would migrate to the Homestead and Florida City area would bring 387 family members, for a total of 559 additional people to that area (Table 5.8-1).

The BMI study reported that, while construction workers averaged 0.8 school-age children per family, nonconstruction workers had an average of 0.6 children per family. However, to provide a more conservative impact estimate, it was estimated that, like the construction worker families, each of the 403 operation worker families would bring 0.8 school-age children, for a total of 322 additional children in Miami-Dade County (Table 5.8-1). Likewise, it was estimated that the 172 operation workers that would settle in the Homestead and Florida City area would bring 138 additional children to that area (Table 5.8-1).

The Units 6 & 7-related population increase in Miami-Dade County during operation would be 1310 people (Table 5.8-1). This represents an increase of 0.05 percent over the 2005-2009 population for Miami-Dade County and 0.05 percent over Miami-Dade County's projected 2020 population (Table 2.5-4). Therefore, Units 6 & 7-related population impacts to Miami-Dade County would be SMALL.

The Units 6 & 7-related population increase in the Homestead and Florida City area during operations would be 559 people (Table 5.8-1). This represents an increase of 1.4 percent over the 2000 populations of the two cities' areas, combined, and 0.9 percent over the 2005-2009 population estimates of the two cities' areas, combined. Therefore, Units 6 & 7-related population impacts to the Homestead and Florida City area would be SMALL.

5.8.2.2 Impacts to the Community

This section evaluates the social, economic, infrastructure, and community impacts to the region of influence (ROI) which is Miami-Dade County, and, specifically, the Homestead and Florida City area, as a result of operating Units 6 & 7. As many as 806 workers, 50 percent of which would migrate into Miami-Dade County, would be employed.

5.8.2.2.1 Economy

The impact of the operation of Units 6 & 7 on the local and regional economy would depend on the region's current and projected economy and population. The economic impacts of a potential 40-year period of operation plus 20 years of a license renewal period are described below.

The employment of the permanent operation workforce for such an extended period of time would have economic impacts throughout Miami-Dade County. The property tax revenues from the new units would be assessed and distributed throughout Miami-Dade County including the Homestead and Florida City area. It was assumed that incoming workers would choose residences in a similar pattern to the existing Turkey Point workforce (i.e., primarily in Miami-Dade County, with approximately 43 percent electing to live in the Homestead and Florida City area), although the residence patterns of the incoming operation workers may vary somewhat, and therefore the location of some impacts cannot be exactly determined. However, the influx of people spending wages, paying taxes, building new houses or occupying existing houses, and using public services and utilities could have a more noticeable impact on the smaller communities in Miami-Dade County, particularly in the Homestead and Florida City area than in the county as a whole because of their smaller populations.

In addition to the permanent operation workforce of 806, workers would be brought in periodically to support refueling outages (Subsection 5.8.2.2). Regular outages would occur approximately every 18 months for each unit, using 600 workers and lasting 30 days. Extended outages would occur every 5 years per unit, using 1000 workers and lasting 45 days. For this analysis, it was assumed that the two units would not experience simultaneous outages, and therefore, one regular outage would occur every 9 months and one extended outage would occur every 2.5 years for Units 6 & 7. These outages would be in addition to those scheduled for Units 3 & 4. It was further assumed that outages for all four nuclear units would be non-concurrent.

Income Impacts from Permanent Operation Workers

As part of the analysis of income impacts to Miami-Dade County, wages for all industry sectors combined, the utilities industry, and the nuclear electric power generation industry were examined. As available, these wages are presented in Table 2.5-12. Nuclear electric power generation information was not disclosed for Florida or Miami-Dade County. Therefore, Florida data from the Bureau of Labor Statistics for annual average wages for nuclear power reactor operators ($81,980) (BLS 2012b) were obtained. While Technicians, along with administrative and support personnel, would comprise the majority of the operation workforce, Nuclear Technician annual wages are not currently available. As such, the nuclear power reactor operator’s wage was used to revise the impacts analysis. Based on the average annual nuclear power reactor operator’s wage of $81,980, the total annual payroll for the in-migrating operation workers was estimated at $33 million (Table 5.8-3).

The in-migrating operation workforce would purchase goods and services, creating an earnings multiplier effect that would result in an increase in business activity, particularly in the retail and service industries. As noted in Subsection 5.8.2, it was assumed that 50 percent of the operation workforce would migrate into Miami-Dade County, and therefore would spend some portion of their worker wages within Miami-Dade County. To estimate these economic impacts, the regional earnings multiplier of 1.7880 for the power generation and supply industry (BEA 2009) is applied to the annual payroll of the in-migrating workers. According to these calculations, the total impact of in-migrating worker wages in Miami-Dade County would be about $59.1 million (Table 5.8-3). This multiplied impact would represent an increase of 0.06 percent over the total personal income in Miami-Dade County in 2009, a SMALL and positive impact. It is likely that personal income in Miami-Dade County will grow between 2009 and the beginning of the operation of Units 6 & 7, resulting in a smaller percentage increase in county personal income. However, the wage impact would remain positive and SMALL.

It is not possible to accurately predict the magnitude of wages spent within the Homestead and Florida City area, because so many opportunities exist to spend earnings within metropolitan Miami-Dade County. However, some wages would be spent in the Homestead and Florida City area and the impacts would be positive, but likely SMALL.

Employment Impacts from Permanent Operation Workers

As stated in Table 5.8-2, an estimated additional 2.1696 indirect jobs would be created for each of the 403 in-migrating workers (BEA 2009a)[1]. These 403 direct jobs would create an additional 874 jobs, for a total of 1277 (403 direct + 874 indirect) jobs.

In 2011, Miami-Dade County had a total employment of 1.15 million (Table 2.5-7). Therefore, the 1277 jobs would represent a 0.1 percent increase over 2011 employment levels (Table 5.8-4). However, by the time the new units and indirect jobs come into existence, it is likely that the total county employment would be greater, and that the new jobs would comprise a smaller percentage of the total. In any case, this would be a SMALL and positive impact to the Miami-Dade County economy.

Many of the 874 indirect jobs would be in retail or services, and not highly specialized. The operation workforce for both units would reach full staffing in 2022. Available workers to fill the indirect jobs could come from local unemployed workers and construction workers or their family members remaining in Miami-Dade County, or others in the region.

In 2011, the annual average unemployment rate in Miami-Dade County was 12.0 percent, representing 156,562 workers. The unemployment rate had increased from 6.1 percent a decade ago (Table 2.5-7). At a rate of 12.0 percent unemployment in 2011, there would be an ample labor force to fill the indirect jobs created by the incoming operation workers.

The creation of direct and indirect jobs, via the multiplier effect, would have a positive impact on the local economy, and to the extent that jobs were filled by unemployed local workers, would reduce unemployment, an additional beneficial impact. Miami-Dade County would experience SMALL beneficial impacts, and mitigation would not be warranted.

1. Workers currently residing in Miami-Dade County have already generated indirect service jobs, so only in-migrating workers were used to calculate new indirect jobs.

Impacts from Temporary Outage Workers

Regular outages would be approximately 30 days in duration and require 600 workers, and would occur approximately every 18 months per unit. Extended outages would be approximately 45 days in duration and require 1000 workers, and would occur approximately every 5 years per unit. For this analysis, it was assumed that all workers would come from outside Miami-Dade County. To estimate the economic impacts of each outage, the average annual wage for nuclear power reactor operators ($81,980), Table 5.8-5 is divided by 250 workdays per year to obtain a daily average wage of $328.

The wage impacts for regular and extended outages are estimated, with wage totals annualized for comparison to annual total personal income for Miami-Dade County. These calculations are provided in Table 5.8-5, which shows that the total annualized payroll for regular outage workers would be $7,870,080. When the earnings multiplier (1.7880) is applied, impacts to the region would be $14.1 million, representing an increase of 0.015 percent of Miami-Dade County's total personal income in 2009. When the earnings multiplier (1.7880) is applied to the annualized of worker wages during an extended outage, impacts to Miami-Dade County would be $10.6 million, representing an increase of 0.012 percent of the Miami-Dade County total personal income in 2009. Some of the regular and extended outage workers' wages would likely be spent in the Homestead and Florida City area.

Because of the short duration of the routine and extended outage periods, it is unlikely that permanent indirect employment impacts would occur in the region of influence as a result of the worker influx. However, there could be temporary and short-term job opportunities for lodging and restaurant workers to serve the outage workforce, along with SMALL and positive impacts to motels, restaurants, retailers, and other businesses patronized by the outage workers.

5.8.2.2.2 Taxes

Several types of taxes would be generated by the operation of Units 6 & 7. Unit 6 would begin operation in 2022, and Unit 7 in 2023. FPL would pay corporate income tax, sales and use taxes, and property (also known as *ad valorem*) taxes based on the value and power generated by Units 6 & 7 and on operating expenditures. Workers and their families would also contribute sales and property tax revenues to the area.

Subsection 4.4.2.2.2 provides a detailed description of the significance categories applicable to tax impacts, which are derived from the analysis in the Generic Environmental Impact Statement (GEIS), NUREG-1437. This methodology was reviewed and it was determined that the significance levels were appropriate to apply to an assessment of tax impacts as a result of the operation of Units 6 & 7. In summary, significance levels are considered SMALL if new tax payments are under 10 percent of the taxing jurisdiction's revenue, MODERATE if payments are 10 to 20 percent, and LARGE if payments represent more than 20 percent of revenue.

Personal and Corporate Income Taxes

As presented in Subsection 2.5.2.3, Florida has no personal income tax, but does levy a corporate income tax on corporations that conduct business in Florida. The tax liability is computed using federal taxable income, modified by certain Florida adjustments, to determine adjusted federal income.

At the present time, FPL is subject to Florida corporate income tax as a result of owning and operating power plants and other properties throughout the state, including the existing Turkey Point generation facility. FPL currently files as a member of a consolidated group for federal and state income tax purposes. At the time when FPL places the units in service, in 2022 for Unit 6 and 2023 for Unit 7, they will be included in the consolidated federal and state income tax filings. Because of the many factors involved in computing the amount of tax liability, it is not possible at this time to estimate an amount by which corporate income taxes may increase, and how much of the total would be attributable to Units 6 & 7. In 2011, the state of Florida collected approximately $1.9 billion in corporate income tax revenues. The expectation is that Turkey Point 6&7 would have a SMALL and positive impact to the state's overall corporate income tax collections.

In addition to direct taxes paid for Units 6 & 7, local operating expenditures as well as purchases by the operation workforce would have a multiplier effect on the local economy, where money would be spent and re-spent within the region (Subsections 4.4.2.2.1 and 5.8.2.2.1). Because of this multiplier effect, Miami-Dade County businesses, particularly retail and service sector firms, could experience revenue increases, and there may be prospects for new startup firms. Existing and new firms could generate additional profits, which would further contribute to increased corporate income taxes, although the exact amount is unknown. Impacts would be positive, and SMALL relative to overall state corporate income tax revenues.

Sales and Use Taxes

The state of Florida and Miami-Dade County would experience an increase in the amount of sales and use taxes collected. The additional taxes would be generated from operating expenditures of Units 6 & 7, and by retail purchases of goods and services by the operation workforce, their families, outage workers, and plant visitors. As described in Subsection 2.5.2.3, Florida imposes a 6 percent sales and use tax, and Miami-Dade County adds a 1 percent discretionary sales tax, bringing the total sales tax in Miami-Dade County to 7 percent. Cities and towns in the county do not levy sales tax.

The primary taxable expenditures by FPL for Units 6 & 7 would be for purchases of labor and services by Miami-Dade County providers (FPL Undated). At the present time, the amount of local operational expenditures associated with Units 6 & 7 is not known. However, to have more than a small impact on local and state sales tax collections, purchases for Units 6 & 7 that would be subject to tax in Miami-Dade County would have to exceed $575.6 million, while purchases subject to Florida state sales tax would have to exceed $32.3 billion (Table 5.8-7). Although sales tax payments to Miami-Dade County and the state of Florida could be large in absolute terms, it is likely that impacts to both entities would be SMALL and positive.

Workers, their family members, and visitors would pay Florida sales or use tax on items purchased within the state (or purchased elsewhere but subject to state use tax), regardless of whether the purchase was made within Miami-Dade County. They would also pay Miami-Dade County sales tax on purchases within the county. In absolute terms, the amount of state sales and use taxes collected from the expenditures of operation-related wages over a potential 60-year operating period could be large, but would provide a SMALL and positive impact when compared to the total amount of taxes collected by Florida and Miami-Dade County.

Other Sales- and Use-Related Taxes

Units 6 & 7 workers who would reside within the state would be subject to the state communications services tax on phone, cable, cellular phone, and related services, and would have to pay the documentary sales tax on deeds and other types of legal documents (Subsection 2.5.2.3.3). If one were to assume conservatively that all workers and their families migrating into Miami-Dade County would come from out of state, the in-migrants would represent an increase of only 0.007 percent over Florida's 2005-2009 population (Table 5.8-8). Therefore, impacts to Florida's tax revenues for the communications services tax and the documentary sales tax would be SMALL but positive.

Property Taxes — Counties and Special Districts

One of the primary sources of economic impact related to the operation of Units 6 & 7 would be property taxes assessed on the facility. In 2007, as shown in Table 5.8-9b, FPL paid real and tangible personal property taxes totaling $4.4 million to Miami-Dade County, representing 0.39 percent of the county's property tax revenues. FPL also pays tangible personal property taxes to four special taxing districts: the Florida Inland Navigation District, the South Florida Water Management District, the Everglades Construction Project, and the Children's Trust Authority. Table 5.8-9a shows FPL's 2010 payments to each tax district, the district's property tax revenues, and the percent FPL contributed to each district. For each of the special taxing entities, FPL's payments represent well under 1.0 percent of the district's property tax revenues. Those payments would increase when Units 6 & 7 go into operation. However, because of the large tax base for each of these districts, the increases would constitute SMALL and positive impacts to each district.

Table 5.8-8 shows that if all incoming worker families were to reside in Miami-Dade County, they would represent an increase of less than 0.1 percent over Miami-Dade County's 2005-2009 population. If, as expected, approximately 43 percent of the in-migrants choose to reside in the Homestead and Florida City area, they would pay property taxes to the county and special districts where they reside. These increases would have a positive and SMALL impact on tax revenues.

In smaller communities such as Homestead or Florida City, it is unlikely that the percentage of tax revenue increase would be as much as the projected population increase associated with the operation of Units 6 & 7, because much of any jurisdiction's tax base consists of higher-valued industrial or commercial property rather than residences. Therefore, the property tax impacts from new residents would be SMALL but positive.

Property Taxes — Independent School Districts

As described in Subsection 2.5.2.3.5, FPL, the current owner of the Turkey Point units, pays taxes collected by the Miami-Dade county tax collector on behalf on the Miami-Dade County School District. FPL paid $6.6 million in tangible personal property taxes to Miami-Dade schools in 2010 and 2011. However, because of this school district's large tax base (total revenues of $3.5 billion in 2010) (Table 2.5-21), FPL's payments represented less than 0.1 percent of the district's total revenues. In addition, FPL's payment of $6.6 million represents 0.35 percent of the district's locally-sourced tax revenues ($1.9 billion in 2010) (Table 2.5-21). Although property tax payments would increase with the operation of Units 6 & 7, impacts to Miami-Dade County schools would be SMALL but positive.

Summary of Tax Impacts

The overall potential beneficial impacts of taxes collected during the operational period of Units 6 & 7 would be positive and SMALL in Miami-Dade County and the state of Florida. The impacts would also be positive and SMALL in the Homestead and Florida City area. Mitigation would not be warranted.

5.8.2.2.3 Land Use

In the GEIS, the NRC provides the methodology for defining the impact significance of land use during refurbishment (i.e., construction activities) and license renewal (i.e., operations). This methodology was reviewed and it was determined that the significance levels were appropriate to apply to an assessment of land use impacts as a result of operation. Miami-Dade County was the focus of the land use analysis because the new units would be built in Miami-Dade County and it was assumed that all of the workforce during operation would reside in the county. Impacts to land use would be confined to Miami-Dade County. These impacts would be based on:

- The size of plant-related population growth compared to the area's total population
- The size of the plant's tax payments relative to the community's total revenue
- The nature of the community's existing land use pattern
- The extent to which the community already has public services in place to support and guide development

In NUREG-1437, the NRC concluded that land use changes during refurbishment at nuclear plants would be:

- SMALL — If population growth results in very little new residential or commercial development compared with existing conditions and if the limited development results only in minimal changes in the area's basic land use pattern.
- MODERATE — If plant-related population growth results in considerable new residential and commercial development and the development results in some changes to an area's basic land use pattern.
- LARGE — If population growth results in large-scale new residential or commercial development and the development results in major changes in an area's basic land-use pattern.

Further, the NRC defined the magnitude of population changes as follows:

- SMALL — If plant-related population growth is less than 5 percent of the study area's total population, especially if the study area has established patterns of residential and commercial development, a population density of at least 60 people per square mile, and at least one urban area with a population of 100,000 or more within 50 miles.
- MODERATE — If plant-related growth is between 5 percent and 20 percent of the study area's total population, especially if the study area has established patterns of residential and commercial development, a population density of 30 to 60 people per square mile, and one urban area within 50 miles.
- LARGE — If plant-related population growth is greater than 20 percent of the area's total population and density is less than 30 people per square mile.

Land Use

All or parts of four Florida counties are within 50 miles of Turkey Point: Broward, Collier, Miami-Dade, and Monroe. The 50-mile radius encompasses over 3168 square miles. However, impacts to land would be confined to Miami-Dade County. As described in Subsection 2.2.3, most of the land use and land cover in the 50-mile region consists of wetlands (69 percent) and urban or built-up (18 percent) (Figure 2.2-6 and Table 2.2-8).

As stated in Subsection 2.5.2.4, Miami-Dade County and the municipalities of Homestead and Florida City use comprehensive land use planning to guide residential and commercial development. There are 35 incorporated cities in Miami-Dade County. Only two of the 35 incorporated communities are within 10 miles of Units 6 & 7—Homestead and Florida City.

From the land use perspective, Miami-Dade County and the Homestead and Florida City area are likely to continue to urbanize as the projected population increases. The population related increases (1310 people) associated with the operation of Units 6 & 7 would create an increase in commercial and residential activity. Should the population influx result in new construction, both Miami-Dade County and the Homestead and Florida City area have some undeveloped land currently zoned for residential and commercial uses (Subsection 2.5.2.4). However, the present housing inventory in Miami-Dade County and in the Homestead and Florida City area can support all of the in-migrating workers and their families without the addition of new housing units (Subsection 5.8.2.2.6). Miami-Dade County had 135,004 total vacant housing units in 2005-2009 (Table 2.5-31). The Homestead and Florida City area had 4046 vacant units in 2005-2009 (Table 2.5-32). Because both Miami-Dade County in general, and the Homestead and Florida City area in particular, have well-established residential and commercial districts, little land use conversion from undeveloped to residential or commercial use or residential to commercial, would be expected from the operation–related population increase in the area. Any conversion that did occur would be within the areas that are already well-defined and identified in the applicable comprehensive land use plans.

Using the NRC's NUREG-1437 guidance presented above, it is concluded that impacts to land as a result of Turkey Point related population increases that would cause land use conversions in Miami-Dade County would be SMALL and not warrant mitigation since the population influx would result in very little new residential or commercial development compared with existing conditions, and there would be minimal changes in the area's basic land use pattern.

Operation-Related Population Growth

The 2010 population of Miami-Dade County was 2,496,435, with a population density of 1316 people per square mile (USCB 2012). The 2000 population of the Homestead and Florida City area was 39,752 (Table 2.5-3) and the area had a population density of 2311 people per square mile. The population for the area in 2010 was 76,757 or 3402 people per square mile (USCB 2012) (Subsection 4.4.2.2.3.2). As a point of reference based on the 2010 census data, the population per square mile in the USA is 87.4 people per square mile (Subsection 4.4.2.2), approximately 1/15th (6.66 percent) of the density of Miami-Dade County.

Operations-related population growth in Miami-Dade County would consist of 1310 people, (Subsection 5.8.2.1), which equates to less than 0.1 percent of the 2005-2009 population. Assuming that approximately 43 percent of the in-migrating operation workers would reside in Homestead and Florida City area, the increase in population would represent 0.9 percent of the total 2005-2009 population. Because the population in 2020 in Miami-Dade County (including population in the Homestead and Florida City area) is expected to be greater than in 2005-2009, the operations-related population growth would be an even smaller percentage by the start of the operation of Units 6 & 7.

Using NUREG-1437 guidance, land use impacts attributed to operation workforce population growth in Miami-Dade County, would be SMALL since the county has established patterns of residential and commercial development, there is a population density of at least 60 people per square mile, and there is at least one urban area with a population of 100,000 or more within 50 miles. The Homestead and Florida City area meets the NRC criteria for a SMALL land use impact because the population increase would be small and the area has established patterns of residential and commercial development. The area also has a population density of at least 60 people per square mile and at least one urban area with a population of 100,000 or more within 50 miles.

Conclusion

Overall, impacts to land use in Miami-Dade County in general, and in the Homestead and Florida City area in particular, would be SMALL. There would be very little new residential or commercial development and basic land use patterns would remain in place. Existing comprehensive plans would guide development. Project-related population increases would represent 0.1 percent of the 2005-2009 population base and not meaningfully alter land use densities or use.

Therefore, overall land use impacts would be SMALL. To mitigate the potential impacts, FPL would maintain communication with local and regional governmental and nongovernmental organizations, including but not limited to the Department of Planning and Zoning and Department of Community and Economic Development, to disseminate project information in a timely manner. This would allow these organizations to be given the opportunity to plan accordingly.

5.8.2.2.4 Transportation

The effect of the operation of Units 6 & 7 was assessed for impacts on transportation infrastructure and traffic from commuting workers. The analysis focuses on the commuting routes east of the major arterials. FPL believes that the excess capacity of U.S. Highway 1 and Florida's Turnpike is adequate to accommodate additional operational traffic (Table 5.8-10a).

FPL commissioned a traffic study to determine impacts of the additional operation workforce, including temporary outage staff on local traffic (FPL 2010). Numbers of trips generated by the new workforce were estimated from traffic counts at the site entrance of the existing workforce during one week during the peak season. During the traffic counts, the plant had 940 workers. Peak daily traffic volume was 3077 trips, and average daily traffic volume was approximately 2800 vehicles. The peak hour volume occurred during the afternoon commute with peak hour traffic volume of 451 and a peak hour average traffic volume of approximately 400 vehicles. (FPL 2010)

Trip distributions and traffic assignments for operation traffic were based on the traffic patterns of the existing workforce. Most existing traffic arrives from and departs to the north via 137th/ Tallahassee Road. The second most traveled access/egress route is SW 344th/Palm Drive to U.S. Highway 1. Most of the remainder of the existing workforce uses North Canal Drive.

5.8.2.2.4.1 Workers Commuting to the Turkey Point Site

Although not all 806 workers would be present every day, the analysis considered that 806 was 86 percent of the 940 existing unit staff on site during the traffic counts, and considered an increased traffic volume of 86 percent as a good estimate of future traffic generated by Units 6 & 7 commuters.

As provided in Table 5.8-10a, FPL believes that the main arterials have adequate surplus capacity to support additional operations traffic. Therefore the traffic study focused on the streets east of these arterials, and the intersections that will be most impacted by operations traffic. The analysis considered existing intersection counts and seasonal adjustments (FPL 2010).

The analysis concluded that, in general, the roadways between the plant and the major arterials have adequate capacity to support new operation workforce-generated trips, based on a link analysis of the roadways which are part of the Miami-Dade Concurrency Management System (Table 5.8-10b).

The two most critical intersections were evaluated for impacts of the normal operation of Units 6 & 7 (Table 5.8-10c).

The analysis assumed that most improvements to the intersections would remain in place. However, improvements associated with the extension of SW 117th Avenue are not required for the normal operation of Units 6 & 7.

Traffic associated with the Homestead Miami Speedway during one of its major events could further impact traffic on the same routes traveled by Turkey Point workers. However, the peak hours for commuting and visitors arriving at the speedway would not overlap and the Speedway uses a detailed traffic management plan including contra-flow lanes during major events.

5.8.2.2.4.2 Workers Commuting to the Turkey Point Site - Outage

The traffic analysis assumed a maximum temporary outage workforce of 2000 for Units 6 & 7, or an increase of 213 percent over the 940 staff on site during the traffic counts on which this analysis is based. Elsewhere in this document, the number of outage workers is assumed to be 600 for regular outages and 1000 for extended outages. Because 2000 is larger than 1000, the traffic analysis is more conservative and bounds the study. The analysis assumes that access/egress patterns of the outage workforce would be similar to those of the operations workforce. In addition, the normal workforce for Units 1-5 would be estimated to be 1476. The workforce at Units 6 & 7 is estimated to be 806. The total workforce accessing Turkey Point during a regular outage would be 2882 and for an extended outage would be 3282.

The analysis concluded that, in general, the roadways between the plant and the major arterials have adequate capacity to support outage plus new operation workforce-generated trips, based on a link analysis of the roadways which are part of the Miami-Dade Concurrency Management System (Table 5.8-10d). The two most critical intersections were evaluated for impacts of Units 6 & 7 outage operations (Table 5.8-10e).

The trips generated by the Units 6 & 7 workforce and outage workforce meet Miami-Dade County's traffic concurrency standards. With the roadway improvements implemented for construction, the most affected intersections will operate adequately during normal operation and outages.

5.8.2.2.4.3 Roads Miami-Dade County

As stated in Subsection 2.5.2.2, Miami-Dade County has a well-developed road and transportation infrastructure. The population increase of 403 workers to Miami-Dade County (Subsection 5.8.2) and accompanying licensed drivers (403) could add 806 drivers in Miami-Dade County; however, the Miami-Dade County roads support a driving age population in excess of 1.3 million people and the traffic generated by 806 additional drivers represents an increase of less than 1 percent of the adult population, and would be dispersed throughout the county.

5.8.2.2.4.4 Miami-Dade County Public Transportation

Miami-Dade County operates public transportation services including rail, express bus, and buses that have multiple stops (Subsection 2.5.2.2.2) with a daily ridership of 300,000 (MDC 2008). The population increase of 1310 as a result of the in-migrating workers and their families could increase public transportation usage. However, an increase of as many as 1310 passengers daily represents less than 1 percent of the current ridership.

5.8.2.2.4.5 Evacuation Routes

The severe weather evacuation routes of the Florida City and Homestead area are shown in Figure 2.5-8a. The in-migrating families would add 806 vehicles to an evacuation of Miami-Dade County if each in-migrating family evacuated in two vehicles. Approximately forty-three percent (172 families) of the in-migrating operation workforce would live in the Homestead and Florida City area, for a total of 344 maximum additional vehicles evacuating from this area.

5.8.2.2.4.6 Summary

Based on the traffic engineering study, traffic related to the operation of Units 6 & 7 would result in SMALL impacts to all aspects of traffic in the region of interest and no mitigation beyond that provided for construction traffic, and described in this section, would be warranted.

5.8.2.2.5 Aesthetics and Recreation

This subsection describes the impacts to aesthetics and use of recreational opportunities from the operation of Units 6 & 7 and its associated facilities in the 6-mile vicinity and 50-mile region. Subsection 2.5.2.5 presents basic information on recreation in the vicinity and 50-mile region. Section 3.1 details the plant layout and external appearance. Subsection 5.8.1.3 analyzes the aesthetic impacts of the Turkey Point units and associated facilities.

As stated in Section 2.2, the major land uses within 6 miles are wetland and forestland. The topography of the region and the Turkey Point plant property is relatively flat. As stated in Section 3.9, when completed, the tallest building of Units 6 & 7 would be the containment building reaching a height of 229 feet above finished plant grade. The reactor containment buildings for Units 3 & 4 are 210 feet tall. The grade elevation of the Units 6 & 7 power blocks would be 25.5 feet NAVD 88 and slope at a 0.5 percent grade at the perimeter. The aesthetic impact of new Units 6 & 7 would be similar to Units 3 & 4. Therefore, the aesthetic impacts from the operation of Units 6 & 7 would be SMALL.

In addition to the physical structures and infrastructure of the units, operational activities would produce visual and other physical impacts. The operation of Units 6 & 7 would result in visible plumes from the cooling towers (Subsection 5.3.3.1.1). The plumes from the cooling towers would be seen during the early morning in cool weather, generally the winter months. The average plume lengths and heights would be relatively short. The visible plumes may prevent direct sunlight from reaching the ground, causing shadowing only for a short amount of time in the morning. The operation of the cooling towers would produce limited fogging and salt deposits within the Units 6 & 7 plant area. Fogging from the operation of the cooling tower would occur for approximately 5 hours per year on the eastern perimeter of the plant area.

Aesthetic Impacts to Recreation

Aesthetic impacts can be visual, auditory, and/or tactile (vibratory, etc). With respect to aesthetic impacts to recreation, these impacts can be experienced by humans directly (e.g., visually) and/or indirectly by affecting the flora and fauna used by humans in the pursuit of recreation (e.g., frightening animals from viewing stations).

Changes to the viewscape that would result from the new power block structure heights, elevation gradient changes, and land cover changes, could be seen from approximately 10 miles away since the area is relatively flat; however, trees and vegetation to the west and north screen the view.

The visual impact of the new unit structures would be minimized through use of topography, design, materials, and color. People boating on Biscayne Bay are accustomed to seeing the structures of Units 1 through 5. The additional structures associated with Units 6 & 7 would not appreciably alter the plant's appearance as viewed from Biscayne Bay. Individuals in the recreational facilities that are not adjacent to the Turkey Point plant property boundary would be unable to distinguish the noise from Units 6 & 7 from urban and traffic noise.

The private and public recreational facilities within 6 miles are Biscayne National Park, Homestead Bayfront Park, Mangrove Preserve, and Homestead Miami Speedway. Therefore, these are the recreational opportunities that are analyzed for aesthetic impacts.

Property boundaries of Biscayne National Park and Homestead Bayfront Park are located within 1 mile of the Turkey Point plant property boundary along the western shore of Biscayne Bay. Recreational users would be able to see the taller structures on the property; however, recreational users are accustomed to seeing Units 1 through 5. It is also possible that the recreational users would be able to see the cooling tower plumes. Recreational users would not experience auditory, olfactory, or tactile impacts. Therefore, aesthetic impacts to these resources would be SMALL and would not warrant mitigation.

Only a small portion of the Mangrove Preserve is located within 6 miles. Recreational users of the preserve would not be able to see Units 6 & 7 through the mangroves. With only a portion of the preserve located approximately 6 miles from the Units 6 & 7 power blocks, recreational users would experience no auditory or tactile impacts. Therefore, aesthetic impacts to this resource would be SMALL and would not warrant mitigation.

As stated in Subsection 2.5.2.5, Homestead Miami Speedway is a privately owned auto-racing track located approximately 5 miles northwest of Units 6 & 7. Subsection 5.8.2.2.4 describes the transportation impacts for Homestead Miami Speedway from Units 6 & 7 traffic. There would be no visual impact to recreational users because trees and vegetation would shield the units from the speedway. Recreational users would not be able to discern the auditory impacts from Units 6 & 7 from Units 1 through 5 and from the racing vehicles. There would be no plant-induced tactile impacts. Therefore, aesthetic impacts to this resource would be SMALL and would not warrant mitigation.

Use Impacts to Recreation

While aesthetic impacts to recreation are driven by the recreation user’s proximity to Turkey Point, use impacts to recreation are driven by the proximity of recreational facilities and events to the user’s residence. Operation workers and their families would be expected to use recreational facilities near their residences rather than near their place of work (i.e., the Turkey Point plant property). Some recreational opportunities would be sought out because of their uniqueness, a particular national park for example, independently of the recreation area’s proximity to the worker's residence.

The influx of workers during operations could affect the use of recreational areas and participation in recreational events in the 50-mile region. Use impacts to recreation would be the result of the Turkey Point plant-related population growth in Miami-Dade County, and, therefore, increased use of recreational facilities and events. Residential distribution of the in-migrating workers in Miami-Dade County is the most important determinant of recreational facility use.

The in-migrating operation workforce would result in a 0.05 percent increase over the 2005-2009 Miami-Dade County’s population. Use of recreational facilities and areas would be expected to increase by a similar percentage. For the purpose of this analysis, the recreational facilities were broadly classified into three groups: (1) wildlife management areas, national wildlife refuges, and preserves, (2) state parks, and (3) privately owned recreational facilities expected to be impacted by the operation of Units 6 & 7. Tables 2.5-29 and 2.5-30 present information about these facilities and, where available, information about the current use rates and capacities of those facilities. Subsection 2.5.2.5.2 discusses these facilities and recreational events in the region.

The wildlife management areas, national wildlife refuges, and preserves could be impacted by the Turkey Point-related population increase. There are eight wildlife management areas, national wildlife refuges, and preserves in the region that are open to the public (Table 2.5-29). Generally, agencies managing these properties do not tabulate the number of annual visitors or determine capacity information. All 1310 residents of the project-induced population increase in the region could use the areas, refuges, and preserves. Because the wildlife management areas, national wildlife refuges, and preserves are so large and have open and wooded lands appropriate for multiple uses (snorkeling/scuba diving, nature walks, picnics, camping, fishing), they can accommodate a large number of people. Impacts to wildlife management areas, national wildlife refuges, and preserves from the in-migrating operation workforce would be SMALL and would not warrant mitigation.

The state park system could be impacted by the Turkey Point-related population increase. The 11 state parks in the region (Table 2.5-30) have a total annual visitors count of 2,739,696 in July 2007 to June 2008 and a total daily capacity of 29,147 visitors, or approximately 10,638,655 annually. Therefore, the 11 state parks within 50 miles could accommodate an additional 21,641 daily visitors. The operations-related population increase of 1310 people represents approximately 6 percent of the available daily capacity. Because the state park system has open and wooded lands appropriate for multiple uses (snorkeling, nature walks, picnics, camping, fishing), the state park system can accommodate additional use more readily than local park systems, which often specialize in dedicated use opportunities (tennis, swimming pools, baseball fields). Impacts to state parks from the in-migrating operation workforce would be SMALL and would not warrant mitigation.

The privately owned Homestead Miami Speedway may be impacted by the operation of the new units. The commuter traffic to Turkey Point is not expected to interrupt traffic flow during the Speedway's main racing events. Subsection 5.8.2.2.4 provides more details. The in-migrating population would not affect the capacity of Homestead Miami Speedway. Recreational impacts would be SMALL and would not warrant mitigation.

The privately owned Mangrove Preserve is not open to the public. Impacts to the preserve were not determined.

Increased use of community, municipal, and neighborhood parks would likely reflect the same rate of project-induced population increase.

In summary, during operation, some employees and their families would use the regional recreational facilities. However, the increase attributable to plant operation would be small compared to overall use of these facilities. Impacts of facility operation on recreation would be SMALL and would not warrant mitigation.

5.8.2.2.6 Housing

Impacts on housing from the operation of Units 6 & 7 would depend on the number of operation workers that would relocate from outside Miami-Dade County and the type and location of housing those workers would desire. As previously described, indirect workers are expected to already reside in the county, so no indirect worker would require additional housing. Therefore, it was conservatively assumed that a maximum of 403 workers would migrate into Miami-Dade County and require housing as a result of the operation of Units 6 & 7.

Forecasting residential distribution patterns in a large geographical area is inherently problematic because workers' preferred housing is driven by many individual variables. Housing options are varied: owner versus rental occupancy; detached versus attached units; single-unit versus multiple-unit complexes; permanent units versus mobile units (mobile homes), and the need for short-term (motel/hotel) accommodations versus more permanent solutions. To present a more realistic analysis, the impacts to housing during the operation of Units 6 & 7 for Miami-Dade County in general were analyzed as well as the Homestead and Florida City area.

The housing required by the operation workforce would be different than the housing required by the construction workforce for the following reasons: the operation workforce is much smaller than the construction workforce; the operation workers would be permanent residents of the county and therefore require permanent housing (as opposed to temporary housing, as required by the construction workers); and the wages of operation workers are estimated to be higher than construction workers and wages are a proxy for type and location of housing sought.

Permanent housing is generally comprised of single-family units that are frequently owner-occupied. Permanent housing represents a long and large financial commitment. Therefore, operation workers may select housing based on its proximity to family-friendly amenities and on lifestyle choices. Operation workers would likely choose to purchase existing housing, in part, because the urbanized character of Miami-Dade County, particularly that portion of the county with convenient access to transportation infrastructure accessing Turkey Point. Little vacant land exists in those areas that could be converted to new housing. As described in Subsection 5.8.2, little land conversion in the county, in general, would be expected to be the result of in-migrating operation workers. The county has well-defined residential neighborhoods and residential and commercial districts.

Housing choices are determined, in part, by occupant wages. The average annual wage of the Units 6 & 7 operation workforce is expected to be higher than the current mean or average wage in the county. As described in Subsection 4.4.2.2.1, the average annual wage of a nuclear reactor power operator, who would be expected to be employed at Units 6 & 7, is $81,980 (Table 5.8-3). The average annual wage for all industries in Miami-Dade County is $44,042 (Table 2.5-12). Because wages are a proxy for the type, price, and location of housing sought, operation workers could seek some of the county's more expensive priced housing. The median price of an owner-occupied house in the county in 2005-2009 was $277,200.Table 2.5-31 displays Miami-Dade County housing data. Should workers elect to erect new residential units, construction location and standards would be guided by the adopted, applicable comprehensive plans described in Subsections 2.5.2.4 and 5.8.2.

Although there are uncertainties in the Florida and Miami-Dade County housing market, prices of existing higher-priced, single-family and multifamily housing could rise as a result of the increased demand from operation workers. The county and local governments in the county would benefit from an increase in taxable value if housing values rose. Conversely, price pressure on owner-occupied units and higher-priced rental units could change the patterns of residency options for families with lower incomes. Subsection 5.8.3 presents impacts to low-income populations. However, given the abundance of rental units and modestly priced owner-occupied housing in the county, rental housing rates and modestly priced owner-occupied units would likely experience little upward pressure on prices.

Subsection 2.5.2.6 presents data about the existing housing conditions in Miami-Dade County and the Homestead and Florida City area. Subsection 4.4.2.2.6 describes housing conditions during the construction period. The sources for all data presented in this section are Subsections 2.5.2.6 and 4.4.2.2.6, except where cited.

Miami-Dade County (ROI)

As described in Subsection 2.5.2.6, Miami-Dade County had 135,004 total vacant housing units in 2005-2009. In Miami-Dade County, an additional 110,657 housing units were added to the total inventory for between 2000 and 2005-2009, increasing the 2000 housing inventory by an additional 13 percent (Table 2.5-31). Permanent and rental housing could accommodate the entire in-migrating operation workforce.

If the 403 in-migrating operation workers elected to make Miami-Dade County their home, readily available housing could accommodate them. Miami-Dade County could accommodate the entire operation workforce, based on the vacancy of housing units of all types. The entire in-migrating workforce could be accommodated in vacant permanent housing units and the entire in-migrating workforce could be accommodated in vacant rental units. Should workers elect to build new housing, comprehensive plans are in place to guide development (Subsection 2.5.2.4).

Refueling outages would occur at least annually, and sometimes semiannually, when Units 3, 4, 6, & 7 are all operational. It is estimated that the maximum increase in workforce would be 1000 for extended outages. These workers would need temporary (45 days) housing (Table 5.8-5). Most of the outage workers would stay in local extended stay hotels, rent rooms in local homes, or bring their own housing in the form of campers and mobile homes. The outage workforce would not affect the permanent housing market in the region.

The current housing inventory would be sufficient to accommodate all of in the in-migrating workforce. Impacts to housing in the ROI would be SMALL.

Homestead and Florida City Area

As stated in Subsection 5.8.2, approximately 43 percent of Turkey Point's current workforce resides in the Homestead and Florida City area. For this analysis, it was assumed that approximately 172 operation workers could settle in the Homestead and Florida City area.

As described in Subsection 2.5.2.6, Homestead and Florida City area had 4096 total vacant housing units in 2005-2009. If 172 workers and their families moved into the area, as would be expected, the required 172 housing units would represent 4.3 percent of the area's vacant units in 2005-2009, if workers' requirements for type, size, price, condition, or other characteristics were met. However, of the 4096 total vacant housing units, 175 units are considered to be for seasonal, recreational, or occasional use and were assumed to be unavailable to operation workers. The Homestead and Florida City area issued 12,637 single-family building permits between 2001 and 2010, nearly doubling the area's 2000 total housing inventory (Table 2.5-38), which suggests that the area is experiencing and anticipating residential growth. This increase in available housing provides more options for the operation workers to live in the Homestead and Florida City area. As described in Subsection 5.8.2, there is some undeveloped land in the Homestead and Florida City area which is zoned for residential development. Areas already developed include well-defined residential neighborhoods and commercial areas. Should operation workers elect to construct new homes in the area, the applicable comprehensive plan would provide guidance.

The current housing inventory would be sufficient to accommodate all of in the in-migrating workforce. Impacts to the housing in the Homestead and Florida City area would be SMALL.

Conclusion

Miami-Dade County has ample existing housing to accommodate the entire in-migrating operation workers. In addition, the issuance of building permits for new homes suggests that the inventory has continued to grow since 2000. The existing inventory includes a wide range of housing choice by type, location, and by price. The Homestead and Florida City area has enough housing to accommodate all the in-migrating workers. Comprehensive plans are in place to guide development should new housing result from the proposed project. Employment resulting from the operation of Units 6 & 7, beginning with the initial arrival of operation workers during the construction period, would increase gradually, allowing market forces to accommodate the new arrivals.

Also, county and local governments in Miami-Dade County, including Homestead and Florida City, would benefit from the increased taxable value of existing housing and from any new residential construction. It is concluded that Miami-Dade County and the Homestead and Florida City area would benefit from positive tax impacts. Therefore, impacts to the Miami-Dade County and the Homestead and Florida City areas housing markets would be SMALL and mitigation would not be warranted.

To minimize any potential impacts to housing availability, FPL could initiate early communications with local and regional governmental organizations, including the Miami-Dade Planning and Zoning Department and the Greater Homestead and Florida City Chamber of Commerce, to disseminate information related to Units 6 & 7, such as the schedule of expected worker influx. County and regional planning organizations, and, ultimately, developers and real estate agencies, could factor the details of the emerging housing market into their decision-making and plan accordingly.

Impacts to the housing in Miami-Dade County and the Homestead and Florida City areas would be SMALL and no mitigation would be warranted.

5.8.2.2.7 Public Services

5.8.2.2.7.1 Water Supply Facilities

The impacts of both operation demand and population increases during the operation of Units 6 & 7 on local public water resources have been considered. Operations-related impacts are primarily based on the population increase caused by the number of workers and their families migrating into Miami-Dade County. This in-migrating population is estimated to be 1310 people (Table 5.8-1).

The South Florida Water Management District (SFWMD) is the regional governmental agency that oversees the water resources in the southern half of Florida. SFWMD covers 16 counties, including Miami-Dade County and serves 7.5 million residents. The SFWMD serves local governments by supporting efforts to safeguard existing natural resources and meet future water demands through one of the four water supply planning areas. The four water supply planning areas are the Upper East Coast, the Lower East Coast, the Lower West Coast, and the Kissimmee Basin. The planning areas are generally defined by the drainage divides of major surface water systems in South Florida. The Lower East Coast (LEC) Planning Area of the SFWMD encompasses approximately 6100 square miles and includes Miami-Dade County (SFWMD 2005).

The largest water supplier within Miami-Dade County is the Miami-Dade Water and Sewer Department (MDWASD). MDWASD provides drinking water to approximately two million customers in Miami-Dade County (Table 5.8-11) and, currently, draws drinking water from the Biscayne aquifer. The MDWASD water service area contains interconnected systems and thus, for the most part, functions as a single service area. The MDWASD service area can be broken down into three subareas by water treatment facilities: the Hialeah-Preston Water and Sewer Department (WASD), serving the northern part of Miami-Dade County, the Alexander Orr, Jr.

WASD, serving the central and portions of the southern part of Miami-Dade County and the South Dade WASD, serving the southern part of Miami-Dade County. The MDWASD has a 20 year water use permit issued by the SFWMD which limits its annual allocation to 149,106 million gallons and its monthly maximum allocation to 13,047 million gallons. These allocations are further limited by a wellfield operational plan, described in Limiting Condition 27 of the water use permit. (MDWASD 2008)

In addition to MDWASD, there are four other water suppliers within Miami-Dade County that provide water to parts of unincorporated Miami-Dade County and within their respective municipal boundaries: city of North Miami, city of North Miami Beach, city of Homestead, and Florida City. The city of North Miami and the city of North Miami Beach supply water within their municipal boundary as well as outside of their municipal boundary to certain northern parts of unincorporated Miami-Dade County. The city of North Miami Beach supplies water within its municipal boundary as well as outside its municipal boundaries to certain northern parts of unincorporated Miami-Dade County. The city of Homestead provides water within its municipal boundary and for a portion of unincorporated Miami-Dade County, including the Redavo development, from 6 city-owned withdrawal wells. The city of Homestead also has an agreement with the MDWASD to provide some water service within portions of Homestead municipal boundary. Florida City provides water service within its incorporated boundaries from 4 production wells (MDWASD 2008) and also provides water to portions of unincorporated Miami-Dade County as a water supplier.

Currently, several of the water suppliers in Miami-Dade County have projects being either proposed, initiated, or under construction to increase drinking water capacity. MDWASD has proposed alternative water supply projects to meet MDWASD's anticipated increased water demands through 2030. Projects include: expanding disinfection systems in the aquifer storage recovery system; constructing a reverse osmosis (RO) water treatment plants to treat Floridan aquifer water, hence providing additional capacity; and adding water reclamation plants to the north, south and west districts. These projects are part of MDWASD's commitment to provide a total of 170 mgd of reuse water in accordance with the county's existing 20 year water use permit. MDWASD is also constructing a new water treatment plant (WTP) in south Miami-Dade County, the South Miami Heights (WTP) and wellfield should be complete by 2012 (MDWASD 2008).

Two other projects involve the city of North Miami Beach and the city of Homestead. The city of North Miami Beach is planning for a future expansion, by 2015, to further increase the capacity of the WTP to a total of 42 mgd and the city of Homestead is considering upgrading the existing well pumping capacity or installing additional wells to supply water to the city owned WTP. Additionally, Florida City plans to increase the city owned WTP capacity by installing additional wells and withdrawing water from the Floridan aquifer, which require further treatment and possible RO facility prior to distribution (MDWASD 2008).

Miami-Dade County (ROI)

As described in Section 3.3, water from the Miami-Dade Water and Sewer Department (MDWASD), which is part of the Miami-Dade County's public water system, would be used to provide the necessary water for potable onsite uses during operation for drinking water, sanitary uses, and fire protection.

It is estimated that Units 6 & 7 would utilize 1.35 mgd of water for normal onsite operational use and a maximum of 3.68 mgd of water for periods of short duration (Table 3.3-1). By the start of the operation of Unit 6 in 2022, the MDWASD system, based on 2007 service area population, should be operating at about 73.95 percent capacity when the 20 mgd South Miami Heights Water Treatment Plant comes online in 2012 (MDWASD 2008). The MDWASD system excess capacity would be reduced by approximately 0.29 percent with normal onsite operations use 0.78 percent under maximum onsite operational demand, for an estimated usage of 74.23 percent (normal operation) to 74.73 percent (maximum use operation) of capacity. The increased use would not stress the public water supplies or infrastructure. Therefore, the impacts would be SMALL and would not warrant mitigation.

As indicated in Table 5.8-1, the operation of Units 6 & 7 could bring as many as 1310 new workers and family members to Miami-Dade County. As described in Subsection 2.5.2.7, municipal water suppliers in the county have excess capacity. The impact to the local water supply systems from operations-related population growth was estimated by calculating the amount of water that would be required by the in-migrating operations-related population and comparing it to the publicly available resources. People in the United States use an average of 100 gpd for all uses (EPA Aug 2008). The increase of 1310 people could increase consumption by 131,000 gpd (0.131 mgd) in Miami-Dade County. The increased use would not stress public water supplies or infrastructure.

Collectively, the major public water suppliers in Miami-Dade County in 2007 are operating at 74.74 percent capacity (Table 5.8-11). If all 1310 operation-related individuals relocated to Miami-Dade County, the service area population would increase by 0.05 percent. The additional demand of approximately 0.1310 mgd would increase the operating capacity to 75.02 percent. The increased use would not stress public water supplies or infrastructure. Impacts to Miami-Dade County would be SMALL and would not warrant mitigation.

Homestead and Florida City Area

The impact to the Homestead and Florida City area, which is a likely area for some of the operation workers to relocate, was estimated by adding the assumed in-migrating operation-related population to the current population in the area. The increased population would represent approximately 43 percent of the total operation workforce, or 559 people, into the Homestead and Florida City area. This population increase would, in turn, increase demand on the public water infrastructure for Homestead and Florida City systems collectively, from 70.79 percent capacity usage to 71.05 percent capacity usage (Table 5.8-11).

Therefore, the increased demand from the estimated increase in population as a result of the operation-related workforce would not exceed the available capacity of the municipal water supplies within Miami-Dade County. Also, the approximately 43 percent population distribution within the Homestead and Florida City area would not exceed the available capacity of the combined water supplies of the Homestead and Florida City area. Therefore, the impacts in Miami-Dade County and to the Homestead and Florida City area would be SMALL and would not require additional mitigation.

Conclusion

Currently, several of the major water suppliers in Miami-Dade County have projects being either proposed, initiated, or under construction to increase drinking water capacity. MDWASD has proposed alternative water supply projects to meet MDWASD's anticipated increased water demands through 2030. Projects include: expanding disinfection systems in the aquifer storage recovery system; constructing a reverse osmosis (RO) water treatment plants to treat Floridan aquifer water, hence providing additional capacity; and adding water reclamation plants to the north, south and west districts. These projects are part of MDWASD's commitment to provide a total of 170 mgd of reuse water in accordance with the county's existing 20 year water use permit. MDWASD is also constructing a new water treatment plant (WTP) in south Miami-Dade County, the South Miami Heights (WTP) and wellfield should be complete by 2012 (MDWASD 2008).

The city of North Miami Beach is planning for a future expansion, by 2015, to further increase the capacity of the WTP to a total of 42 mgd. The city of Homestead is considering upgrading the existing well pumping capacity or installing additional wells to supply water to the city owned WTP. Florida City plans to increase the city owned WTP capacity by installing additional wells and withdrawing water from the Floridan aquifer, which require further treatment and possible RO facility prior to distribution (MDWASD 2008).

The public water infrastructures in Miami-Dade County would not be stressed from the population related increase in the area and the operational demand of Units 6 & 7. The major suppliers are currently using about 74.74 percent of their capacity. With the combined demand from the additional population and the on-site use, the capacity utilization rate will rise to about 75.02 percent (Table 5.8-11), including the South Miami Heights WTP, but excluding planned improvements resulting in capacity expansion likely to be in place prior to Unit 6 startup in 2022 and Unit 7 start in 2023.

5.8.2.2.7.2 Wastewater Treatment Facilities

Sanitary treatment would be provided by a packaged sanitary treatment plant located on the Units 6 & 7 plant area. The sanitary treatment plant would be designed to process sanitary effluent from Units 1 through 7. Therefore, onsite operation for Units 6 & 7 would have a SMALL impact on public wastewater services.

Subsection 2.5.2.7 describes the public wastewater treatment systems in Miami-Dade County, their plan-designed average flows, and monthly average wastewater processed. Wastewater treatment facilities in Miami-Dade County have at least 15 percent available capacity with the exception of the City of Homestead (Table 2.5-38).

Reclaimed water from the MDWASD South District Wastewater Treatment Plant would be used as the primary source of makeup water to the Units 6 & 7 circulating water system. The reclaimed water would be further treated in the FPL reclaimed water treatment facility.

Impacts to local wastewater treatment systems would occur as the population increases as a result of the in-migration of the operation-related workers and their families. The magnitude of the impact can be conservatively estimated by assuming all of the water used by this population would go to a wastewater treatment facility. As previously described, the operations-related population increase could require 0.1310 mgd of drinking water and, by extension, 0.1310 mgd additional wastewater treatment capacity. As described in the following paragraphs, the in-migration of the maximum operations-related workforce and their families would increase the current wastewater treatment system use for Miami-Dade County from approximately 79.85 to 79.88 percent (Table 5.8-12).

Miami-Dade County (ROI)

Subsection 2.5.2.7 describes the public wastewater treatment systems in Miami-Dade County, their plant-designed average flows, and monthly average wastewater processed. Yearly average wastewater processed in Miami-Dade County is 298.62 mgd, with a systems capacity of 374.00 mgd. If an additional 0.1310 mgd were processed in the county, the average daily flow of wastewater to be processed would increase by 0.04 percent, which would increase the capacity use rate by 79.88 percent, in the Miami-Dade County's total capacity (Table 5.8-12). Therefore, impacts to wastewater treatment capacity within Miami-Dade County would be SMALL and would not require mitigation.

Homestead and Florida City Area

The Homestead wastewater treatment facilities (WWTF) are currently operating at approximately 102.20 percent (Table 5.8-12) of capacity; however, the city of Homestead's WWTF use the Miami-Dade Water and Sewer Department (MDWASD) system as backup and excess flows are diverted to the county wastewater treatment facilities. These excess flows are included in the MDWASD South District Wastewater Treatment Plant (SDWWTP) flow reports. The wastewater generated in Florida City falls under the jurisdiction of the SDWWTP. The SDWWTP was operating at 78.54 percent of its capacity in 2009 (Table 5.8-12). If the estimated distribution of operations-related workers (559 people) settled in the area of Homestead and Florida City, the overall capacity could accommodate the increase in population, using both the Homestead WWTF and the SDWWTP due to the remaining capacity at the SDWWTP. Therefore, impacts on wastewater treatment facilities due to operation-induced population increases for Homestead and the SDWWTP would be SMALL and would not require mitigation.

To mitigate any potential impacts, FPL could initiate early communication with local and regional governmental organizations, including planning commissions and local and regional economic development agencies, such as the MDWASD, the Miami-Dade Department of Environmental Resources Management, or the Florida Department of Environmental Protection, to disseminate Unit 6 & 7-related information. Local governments and planning groups would have time to plan for the influx. Infrastructure upgrades and expansions could be funded, at least in part, by Unit 6 & 7-related property and sales and use tax payments.

5.8.2.2.7.3 Law Enforcement, Fire Protection, and Medical Services

Law Enforcement

With respect to onsite law enforcement, FPL would employ its own security force. Security services and emergency response are addressed in the Emergency Plan contained in Part 5 of this COL Application.

Miami-Dade County (ROI)

Residents-to-law enforcement officer ratios for Miami-Dade County are presented in Table 5.8-13. Currently, the ratio of residents-to-law enforcement officer is 825 to 1.

With respect to the influx of workers and their families for operation of Units 6 & 7, 1310 people would move into Miami-Dade County (Table 5.8-1), and this population increase would increase the residents-to-law enforcement officer ratio in the county by 0.05 percent, creating a SMALL impact.

Assuming the county is already near or at its capacity to provide law enforcement protection, maintenance of the current residents-to-law enforcement officer ratio would be desirable. Therefore, to accommodate the additional population caused by Units 6 & 7, two additional law enforcement officers (and associated equipment) would be needed in Miami-Dade County during the operation period to maintain the current ratio.

Homestead and Florida City Area

Residents-to-law enforcement officer ratio for the Homestead and Florida City area is presented in Table 5.8-13. Currently, the Homestead and Florida City area ratio of residents-to-law enforcement officers is 480 to 1. With respect to the influx of workers and their families during operation, approximately 43 percent, or 559 people, would increase the 2007 residents-to-law enforcement officer ratio by 0.86 percent, creating a SMALL impact.

This conclusion and its mitigations are based, in part, on a NRC analysis of nuclear plant refurbishment impacts sustained during original plant construction presented in NUREG-1437. The NRC selected seven case study plants whose characteristics resembled the spectrum of nuclear plants in the United States today. The NRC reported that

> "**…** no serious disruption of public safety services occurred as a result of original construction at the seven case study sites. Most communities showed a steady increase in expenditures connected with public safety departments. Tax contributions from the plant often enabled expansion of public safety services in the purchase of new buildings and equipment and the acquisition of additional staff."

This impact could be mitigated by the use of the increased property and sales/use tax revenues that would be generated by operation of the new units. However, expanding law enforcement services, including the hiring of additional personnel, would likely begin before a sufficient amount of these tax revenues would be available to local governments. Therefore, local governments could access other funding sources or issue bonds until the tax revenues would become available. Also, the full operation workforce would not be in place until approximately month 80 of construction activities (Table 4.4-7), giving local governments time to plan and budget accordingly. Additionally, FPL could communicate regularly with local and regional governmental officials about Units 6 & 7 and its schedules, allowing local and regional officials opportunity to plan for the population influx.

During the peak construction period, in order to maintain pre-Units 6 & 7 construction ratios, six additional law enforcement officers would be required in the ROI (Subsection 4.4.2.2.7.3). The operation workforce would not be in place until approximately month 80 of construction, well after the construction peak (Figure 4.4-1). During the period of operation, two additional law enforcement officers from the current level and associated equipment would be required in the

Miami-Dade County (Table 5.8-13). Therefore, assuming that six additional law enforcement officers were hired in the county during peak construction period, only two of those officers would be required by the end of construction (when the number of workers would drop to 806, Figure 3.10-1) to serve the operations-related population increase. This could cause an overstaffing of four officers and an overstock of equipment. In order to reduce ratios to pre-construction of Units 6 & 7 levels, officers could be attritioned from their duties. Alternatively, officers could be retained to supplement the general provision of law enforcement services in Miami-Dade County, thereby reducing the ratios. Units 6 & 7-related tax payments, including both property taxes and sales and use taxes made by the Units 6 & 7 and its employees, could continue to assist in funding these services.

Fire Protection Services

Fire protection services and emergency response are addressed in the Emergency Plan contained in Part 5 of this COL Application.

Miami-Dade County (ROI)

Residents-to-active firefighter ratios for Miami-Dade County are presented in Table 5.8-14. Currently, the residents-per-active firefighter ratio in the county is 702 to 1. If the number of active firefighters in Miami-Dade County remained at this level, the additional population of 1310 would increase the residents-to-active firefighter ratios in the county by 0.05 percent, creating a SMALL impact. To accommodate the additional population, two additional active firefighters (and associated equipment) would be needed in Miami-Dade County during operation of Units 6 & 7.

Homestead and Florida City Area

As noted in Subsection 2.5.2.7.2, Miami-Dade County Fire and Rescue provides fire protection services for the Homestead and Florida City area. Because the population in the Miami-Dade County Fire and Rescue service area cannot be accurately determined, it is not possible to calculate the current residents-to-active firefighter ratio. However, if the Homestead and Florida City area experiences a population increase of 559 people, or 0.86 percent of the 2005-2009 population, the ratio of residents-to-active firefighters in the Miami-Dade Fire and Rescue service area would increase by less than 1 percent (because the service area would have a larger population base), creating a SMALL impact.

This impact could be mitigated by the use of the increased property and sales/use tax revenues that would be generated by operation of the new units. However, expanding fire suppression services, including the hiring of additional personnel, would likely begin before a sufficient amount of these tax revenues would be available to local governments. Therefore, local governments could access other funding sources or issue bonds until the tax revenues would become available. Also, the operation workforce would not be completely in place until approximately month 80 of construction activities, giving local governments time to plan and budget accordingly. Additionally, FPL could communicate regularly with local and regional governmental officials about Units 6 & 7 and its schedules, allowing local and regional officials opportunity to plan for the population influx.

As with the analysis of the adequacy of law enforcement, this conclusion and its mitigations are also based, in part, on the NRC's nuclear plant refurbishment impact conclusions presented in NUREG-1437.

During the peak construction period, in order to maintain pre-Units 6 & 7 construction ratios, seven additional active firefighters would be required in Miami-Dade County. The operation workforce would reach its peak in month 80 of construction (Table 4.4-7), well after the peak construction period (Figure 4.4-1). During the period of operation, two additional active firefighters and associated equipment would be required in Miami-Dade County to maintain preconstruction ratios (Table 5.8-14). Therefore, assuming that within Miami-Dade County, seven additional active firefighters were hired during the peak construction period (Table 4.4-20), only two of those firefighters would be required by the end of construction (when the number of workers would drop to 403) to serve the operations-related population increase (Figure 3.10-1). This could cause an overstaffing of five firefighters and an overstock of equipment. In order to reduce ratios to preconstruction of Units 6 & 7 levels, firefighters could be attritioned from their duties. Alternatively, firefighters could be retained to supplement the general provision of fire protection services in Miami-Dade County, thereby reducing the ratios. Units 6 & 7-related tax payments, including both property taxes and sales and use taxes made by the Units 6 & 7 and its employees, could continue to assist in funding these services.

Medical Services

Detailed information concerning the medical services in Miami-Dade County is provided in Subsection 2.5.2.7.3.

Medical services and emergency response are addressed in the Emergency Plan contained in Part 5 of this COL Application. Minor injuries to operation workers would be assessed and treated by medical personnel onsite. Other injuries would be treated at hospitals in Miami-Dade County, depending on the severity of the injury. Agreements are in place with some local medical providers to support emergencies.

The opportunities for medical care in Miami-Dade County are provided in Table 2.5-41. According to Table 2.5-41, in 2006, there were 8420 staffed hospital beds in the county. As indicated in Table 2.5-3, the 2005-2009 population of Miami-Dade County was 2,457,044. Adding 1310 residents to the county population would increase the 2005-2009 population by 0.05 percent (Subsection 5.8.2.1). The 0.05 percent increase in the annual admissions and the annual outpatient visits would not be noticeable or burden existing medical service capacity. Therefore, the potential impacts due to the operation of Units 6 & 7 on medical services would be SMALL and mitigation would not be warranted.

5.8.2.2.8 Education

It is estimated that approximately 322 school-aged children would be part of the operations-related in-migration (Table 5.8-1). Since the Miami-Dade County Public Schools District (M-DCPS) covers the entire county, it was assumed that all of the school-aged children would reside in Miami-Dade County. This subsection describes the public and private school systems and accredited post-secondary institutions in Miami-Dade County. The sources for the data presented are Subsections 2.5.2.8 and 4.4.2.2.8, except where cited.

5.8.2.2.8.1 Miami-Dade County Public School District

It is assumed that each in-migrating operation worker would have 0.8 school-age children. Therefore, an in-migrating operation workforce of 403 persons would bring approximately 322 school-aged children. This analysis conservatively assumed that all school-aged children would attend public schools.

As shown in Table 2.5-42, the new and expanded public primary and secondary facilities would provide capacity for an additional 13,746 students. Since the capacity is greater than the estimated number of in-migrating students, the education system within the county could accommodate all students that would accompany the in-migrating operation workers. The school-aged children would increase Miami-Dade County Public School District's 2010-2011 enrollment by 0.09 percent.

5.8.2.2.8.2 Homestead and Florida City Area

As stated in Subsection 2.5.2.8, the Homestead and Florida City area is part of District IX of the Miami-Dade County public school system. The student population in the Homestead and Florida City area could increase by 138 students (Table 5.8-1). The number of school-aged children likely to locate in the Miami-Dade County Public School system, District IX region, but outside of the immediate Homestead and Florida City area, was not determined. Therefore, the percentage impact to the District IX region could not be specifically determined. However, District IX had 55,860 students enrolled in the 2010-2011 school year. Therefore, the impact would be less than 1 percent even if all 322 children in-migrating to Miami-Dade County were to locate in the District IX region. Hence, the impacts to public schools in the Homestead and Florida City area would be SMALL.

5.8.2.2.8.3 Private Schools — Pre-Kindergarten through 12

Miami-Dade County

The assumption was made that the same percentage of in-migrating school-age children would attend private school as those who currently attended private school (15 percent). Of the 322 in-migrating children (Table 5.8-1), approximately 48 may attend private school. As mentioned in Subsection 2.5.2.8.2, there was a total enrollment of 61,161 students in Miami-Dade County private schools. The 48 new students represent less than 0.1 percent of the total private school enrollment. Impacts to private education in the region of influence would be SMALL and not warrant mitigation.

Homestead and Florida City

The assumption was made that the same percentage of in-migrating school-aged children could attend private schools in the Homestead and Florida City area as school-aged children attending private schools in Miami-Dade County (15 percent). Therefore, of the 138 in-migrating school-aged children, 21 may attend private schools. There was a total private school enrollment of 2263 students in the Homestead and Florida City area. The 21 new students represent less than 1.0 percent of the total enrollment. Impacts to private education in the Homestead and Florida City area would be SMALL and not warrant mitigation.

5.8.2.2.8.4 Conclusion

Increased property tax revenues as a result of the increased population, and property taxes on Units 6 & 7, could fund any needed additional teachers and facilities. The Florida Education Finance Program and equalized funding legislation would ensure that the Miami-Dade County Public School District would receive funding to support additional educational services. However, it also means that the property taxes may not go directly to the Miami-Dade County Public School District (Subsections 2.5.2.3 and 5.8.2.2.2). FPL could provide the local communities with information regarding the Units 6 & 7 construction and subsequent operation schedule, giving the school district, particularly Regional District IX, time to make accommodations for the additional influx of students. It is concluded that impacts to Miami-Dade County and Homestead and Florida City area would be SMALL and would not warrant mitigation. Impacts to the private school system would also be SMALL.

5.8.2.2.8.5 Post-Secondary Institutions

Subsection 2.5.2.8.3 describes post-secondary institutions, colleges and universities, vocational schools, and technical colleges within Miami-Dade County and 50-mile radius. The peak operation workforce would not be reached until 2022. FPL could provide the local education institutions, including post-secondary institutions, with information regarding the Units 6 & 7 construction and subsequent operation schedule, giving the institutions time to make accommodations for the influx of operation workers or worker family members that may seek additional post-secondary education or training. The institutions could also modify curriculum offerings and/or contract with FPL to provide onsite and offsite academic courses and job-specific training.

5.8.3 ENVIRONMENTAL JUSTICE IMPACTS

Environmental justice refers to a federal policy under which each federal agency identifies and addresses, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations. The NRC has a policy on the treatment of environmental justice matters in licensing actions (69 FR 52040). The USCB 2010 data at the block group level was used to identify concentrations of minority and of low-income populations. Subsection 2.5.4 defines minority and low-income populations. Figures 2.5-24 through 2.5-30 (Subsection 2.5.4) identify minority and low-income populations within 50 miles. There are 1627 census block groups that are at least partially within 50 miles, 1222 of which are wholly in Miami-Dade County. It was assumed that all of the in-migrating workforce would settle within Miami-Dade County; therefore, the health and environmental impacts and socioeconomic impacts evaluated in this environmental justice analysis are focused on Miami-Dade County. Of the 1222 block groups in Miami-Dade County, 319 have significant Black Race populations, 335 have significant racial aggregate populations, and 783 have significant Hispanic ethnic populations. The Turkey Point plant property is located in a block group meeting the Other race, the aggregate of races, and the Hispanic ethnicity criteria. Two-hundred-twelve block groups in Miami-Dade County contain a significant percentage of low-income households. The closest low-income block group to the proposed site is approximately 4.7 miles north of the plant property.

For the environmental justice analysis, two types of impacts were evaluated: health and environmental impacts and socioeconomic impacts. The following paragraphs summarize the magnitude of each type of impact to the general population and then describe whether minority or low-income populations would experience disproportionately high and adverse impacts. The most likely pathways by which adverse environmental impacts associated with operations could affect human populations were identified, the level of significance of the impact was determined, and the characteristics of the minority or low-income populations would result in disproportionately high and adverse impacts to those populations were assessed. Several socioeconomic resources were also evaluated to determine if operations-related activities could disproportionately, in a high and adverse manner, impact minority or low-income populations. If the impacts to the general population were found to be SMALL, and there were no cultural practices, subsistence living activities, or pre-existing health conditions that would change the significance level of the impact, it was concluded there would be no disproportionately high and adverse impact on low-income or minority populations.

5.8.3.1 Health and Environmental Impacts

There are three primary pathways for health and environmental impacts: soil, water, and air.

Operation activities would not affect soils at Units 6 & 7. There would be no impacts to nearby residents, and, therefore, no disproportionately high and adverse impacts on minority or low-income populations. Impacts to soils from Units 6 & 7 would be SMALL and would not require mitigation.

As described in Section 3.3, operational activities for Units 6 & 7 would use approximately 55 mgd (100 percent reclaimed water) to 124.4 mgd (100 percent radial collector wells) of makeup water for cooling.

As described in Subsection 5.2.2.1, the makeup water for cooling Units 6 & 7 would be provided by the MDWASD SDWWTP from reclaimed water. Currently, SDWWTP disposes of treated wastewater by injection into the Boulder Zone of the lower Floridan aquifer. Use of reclaimed water is addressed by the water use permit for the Miami-Dade consolidated public water supply, issued by the South Florida Water Management District (November 1, 2010). The permit contains several limiting conditions (Numbers 39–43) that apply to the reuse of reclaimed water. Presented in Exhibit 14 and Limiting Condition 41 of the permit is the requirement that MDWASD work with FPL to provide up to 70 mgd of reclaimed water for nuclear projects and 14 mgd for Unit 5 (a combined cycle unit). There are other projects anticipated to make use of SDWWTP wastewater (Exhibit 14). These other water reuse projects listed in Exhibit 14 for the SDWWTP could use a total of 188 mgd of reclaimed water. The largest of the reuse projects planned for the SDWWTP are: (1) furnishing 75.7 mgd of reclaimed water for the Biscayne Bay Coastal Wetlands Project, a component of the Comprehensive Everglades Restoration Plan, scheduled for implementation in 2022, and (2) a proposed wellfield mitigation project that is projected to need 18.6 mgd of reclaimed water. When reclaimed water cannot supply the quantity and/or quality of water needed for the circulating water system, a second source for makeup water would consist of radial collector wells that would withdraw saltwater from under Biscayne Bay.

Four well caissons would be located on the Turkey Point peninsula, east of the existing units. Each radial collector well would consist of a central reinforced concrete caisson extending below the ground level with laterals projecting from the caisson. The well laterals would be advanced horizontally a distance of up to 900 feet and installed at a depth of approximately 25 to 40 feet below the bottom of Biscayne Bay.

The four radial collector wells would provide up to approximately 86,400 gpm (124.4 million gallons per day [mgd]) to supplement the reclaimed water source for cooling water makeup for Units 6 & 7 (Table 3.3-2). Based on groundwater modeling described in Subsection 5.2.1, the radial collector wells would be recharged at a rate ranging from approximately 95 to 99 percent

(118.2 mgd to 123.2 mgd) from Biscayne Bay. This would be predominately localized in the area of the radial collector wells. The remaining recharge would be from groundwater beneath the plant property. The amount of saltwater used (up to a maximum of approximately 123.2 mgd saltwater recharge) compared to the size of the saltwater resource available would be insignificant. Impacts to Biscayne Bay surface waters would be SMALL, and minority and low-income populations would not experience disproportionately high and adverse impacts.

The total liquid and gaseous effluent doses from Units 6 & 7 would be well within the regulatory limits of 40 CFR Part 190. Radiological impacts to members of the public would be SMALL (Subsection 5.4.3). Minority and low-income populations would not experience disproportionately high and adverse impacts.

The operation of Units 6 & 7 would produce noise from the operation of pumps, cooling towers, transformers, turbines, generators, switchyard equipment, and loudspeakers, with the highest level of noise being associated with the operation of the mechanical draft cooling towers. Any noise generated would be attenuated by the distance to the Turkey Point plant property (1452 feet at a minimum) and would be consistent with existing background noise levels. Impacts as a result of noise would be SMALL and would not warrant mitigation (Subsection 5.8.1.1). Minority and low-income populations would not experience disproportionately high and adverse impacts.

Units 6 & 7 would have standby diesel generators that would operate under air permits issued by the state of Florida. This equipment would be operated periodically on a short-term basis; therefore, related emissions would be intermittent. The mechanical draft cooling towers would be equipped with high efficiency drift or mist eliminators to minimize emissions of particulate matter to 0.0005 percent of the circulating water, this is over 99.99 percent control of potential drift emissions based on the circulating water flow. The operation of a nuclear power plant involves the emission of some greenhouse gases, primarily carbon dioxide (CO_2). It is estimated that the total carbon footprint for operation of two AP1000 reactors would be about 640,000 metric tons over the life of the plant. The impact of these emissions on air quality would be SMALL and would not warrant mitigation (Subsection 5.8.1.2). There would be no disproportionately high and adverse impacts to minority or low-income populations.

Health and environmental impacts to the general population from operation of Units 6 & 7 via the three pathways would be SMALL. Therefore, it is concluded that there would be no disproportionately high and adverse impacts to minority or low-income populations within 50 miles via soil, water, or air pathways that would affect the health and environment of populations studied in this environmental justice analysis.

5.8.3.2 Socioeconomic Impacts

Employment as a result from the operation of Units 6 & 7, beginning with the initial arrival of operation workers during the construction period, would increase gradually, allowing market forces to accommodate the new arrivals. Because the in-migrating operation workforce would be much smaller than that of the construction workforce, it is unlikely that the operation workforce would be able to use the entire housing inventory vacated by the construction workforce. As described in Subsection 5.8.2.2.6, it is concluded that the Miami-Dade County could accommodate the entire in-migrating operation workforce and local governments would benefit from positive tax impacts. Therefore, the impact to the region's housing market would be SMALL and mitigation would not be warranted. Minority and low-income block groups are located throughout Miami-Dade County. Low-income block groups are concentrated in the Miami metropolitan area and along U.S. Highway 1 and Florida's Turnpike near Homestead and Florida City. These are also the areas where the current Turkey Point employees reside (Table 2.5-3) and at least a portion of the construction workforce would reside. The excess lower-cost, temporary housing vacated by the construction workforce would come onto the market, driving prices and rents down. The reduction in prices and rents could enable low-income residents displaced by the construction workforce to afford a higher standard of living. Housing for minority and low-income residents in Miami-Dade County would not be adversely or disproportionately impacted by operation of Units 6 & 7.

As presented in Subsection 5.8.2, it is assumed that 322 school-aged children would accompany the in-migrating operation workforce. The public education system within Miami-Dade County will soon have the capacity to seat an additional 13,746 students. Since the capacity is greater than the estimated number of in-migrating students, the education system within the county could accommodate all students that would accompany the operation workers. The school-aged children would increase Miami-Dade County public school's total enrollment by 0.09 percent. As stated in Subsection 2.5.2.8, the Homestead and Florida City area is part of District IX of the Miami-Dade County public school system. The student population in the Homestead and Florida City area could increase by 138 students (Table 5.8-1). The number of school-aged children likely to locate in the Miami-Dade County public school system, District IX region, but outside of the immediate Homestead and Florida City area, was not determined. Therefore, the percentage impact to the District IX region could not be specifically determined. However, District IX had 55,860 students enrolled in the 2010-2011 school year. Therefore, the impact would be less than 1 percent even if all 322 children in-migrating to Miami-Dade County were to locate in the District IX region. Hence, the impacts to public schools in the Homestead and Florida City area would be SMALL and there would be no disproportionately high and adverse impacts to minority or low-income populations.

As described in Subsection 5.8.2.2.3, offsite land use impacts would be concentrated in Miami-Dade County. Impacts would be SMALL within the county because there would be minimal land conversion needed for new housing because the operation workforce and their families would represent less than 0.1 percent of the 2005-2009 population. The Homestead and Florida City area would also experience SMALL impacts for the same reason; population increases in these areas would represent 0.9 percent of the 2005-2009 population. The SMALL impact to offsite land use would not result in disproportionately high and adverse impacts to minority or low-income populations.

The Units 6 & 7 operation workforce would increase traffic on area roadways. As discussed in Subsection 5.8.2.2.4 and provided in Table 5.8-10a, FPL believes that the main arterials have adequate surplus capacity to support additional operations traffic. In general, the roadways between the plant and the major arterials have adequate capacity to support new operation workforce-generated trips, including outage workforce-generated trips, based on a link analysis of the roadways which are part of the Miami-Dade Concurrency Management System (Tables 5.8-10b and 5.8-10d). The two most critical intersections were evaluated for impacts of the normal operation of Units 6 & 7 (Table 5.8-10c). Because portions of these commuting routes are located within minority/low-income areas, these populations would be impacted by increased traffic from normal operation and scheduled outages. In particular, Black Races, Other Races, Hispanic Ethnicity, and Aggregate block groups are located along SW 328th Street/N. Canal Drive, SW 344th Street/Palm Drive, SW 117th Avenue, and SW 137th Avenue/Tallahassee Road. As described in Subsection 5.8.2.2, FPL could implement mitigation measures, such as staggering arrival and departure times, to minimize the impact to transportation. Because of the location of affected roads, some minority block groups would be affected by the traffic congestion. However, these impacts would be at the significance level characterized above and mitigation measures could be implemented.

As presented in Subsection 5.8.2.2.1, the operation of Unit 6 & 7 would result in the creation of direct jobs and 874 indirect jobs, for a total of 1277 new jobs (Subsection 5.8.2). The increase in employment opportunities would be a positive and SMALL impact to Miami-Dade County's economy and could be a beneficial impact to area residents including minority or low-income populations because of the creation of indirect jobs which are often in the retail and service sectors (Subsection 5.8.2.2.1).

The potential impacts from the operation of Units 6 & 7 on public services in Miami-Dade County (Subsection 5.8.2.2.7) were also assessed. Potable water from the Miami-Dade County public water supply would be used for the operation of Units 6 & 7. The Miami-Dade County public water system has excess capacity; current use is at 74.74 percent of capacity. Units 6 & 7 potable water demand would require 0.39 to 1.06 percent of the current Miami-Dade public water supply, which would not stress the system. Likewise, the Homestead and Florida City area, which is a likely candidate for some of the operation workers to relocate, would have enough excess municipal water supply capacity to accommodate the in-migrating operation workforce. Impacts to municipal water suppliers for Miami-Dade County, including the Homestead and Florida City area, would be SMALL (Subsection 5.8.2.2.7.1), and would not disproportionately impact minority or low-income communities.

Onsite sanitary treatment would be provided by a packaged sanitary treatment plant located on the Units 6 & 7 plant area. The sanitary treatment plant would be designed to process sanitary effluent from Units 1 through 7. Therefore, there would be no impact to public wastewater facilities. The increased population in Miami-Dade County from in-migration of the operation workers would impact local wastewater treatment systems. As a whole, the Miami-Dade County wastewater facilities have the total capacity to absorb the increase in population, and county-wide impacts would be SMALL. The Homestead wastewater treatment facility is currently operating at above capacity, but are using the MDWASD SDWWTP as backup because that supplier is operating at approximately 78.54 percent capacity and can assist Homestead. Florida City is served by the MDWASD SDWWTP, and it has enough excess capacity to accommodate the in-migrating operation workforce. Impacts to water supply and wastewater treatment facilities in Miami-Dade County would be SMALL (Subsection 5.8.2.2.7.2). There would be no disproportionately high and adverse impacts to minority or low-income population.

Impacts to law enforcement, fire protection services, and medical facilities would also be SMALL within Miami-Dade County (Subsection 5.8.2.2.7.3). There would be no disproportionately high and adverse impacts to minority or low-income populations.

Local government officials, staff of social welfare agencies, and the Miccosukee Indian Tribe were contacted concerning unusual resource dependencies or practices or health conditions that could result in disproportionately high and adverse impacts to minority and low-income populations.

Many agencies had no information concerning activities and health issues of minority populations. Interviews were conducted with the Community Action Agency, Miami-Dade Office of Community Advocacy, Miami-Dade County Community and Economic Development, Countywide Healthcare Planning, Metro Miami Action Plan Trust, and the Miami-Dade Black Advisory Board. No agency reported dependencies or practices, such as subsistence agriculture, hunting, or fishing, or preexisting health conditions through which minority populations could experience disproportionately high or adverse impacts from the proposed project. Several agencies alluded to the extreme urban nature of the study area and implied that there was no possibility of any subsistence activity on the part of any group.

Contact with the Miccosukee Indian Tribe reported that the tribe member residing on the reservation within the 50-mile radius do not depend on hunting, fishing, or gardening for subsistence. The Miccosukee Tribe does lease land from the SFWMD for hunting, fishing, frogging, agriculture, and to carry on the traditional Miccosukee way of life. However, most tribe members rely on modern means to meet their food needs.

Operation and outage activities would increase traffic along the main routes to the Turkey Point plant property. These routes are located in predominantly Black Races, Other Races and Hispanic Ethnicity, Aggregate, and low-income population areas. Improvements would be made to increase capacities, as described in Subsection 5.8.2.2.4. In summary, it is concluded that impacts from operations-related activities to minority or low-income populations would, with the exception of transportation, reflect impacts to the general population. The disproportionate impacts from operations traffic are location-dependent, rather than occurring through a unique pathway.

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Table 5.8-1
Assumptions for Workforce Migration and Family Composition During the Operation of Units 6 & 7

	Operations
Workforce Characterization	
Peak number of operation workers on-site	806
Workforce migration	
Percent of workforce that would migrate into Miami-Dade County during operations	50%
Total number of workers that would migrate into Miami-Dade County during operations	403
Percent of in-migrating workforce that would migrate into Homestead and Florida City area during operations[(a)]	42.78%
Number of workers that would migrate into Homestead and Florida City area during operations	172
Families	
Percent of workers who would bring families[(b)]	100%
Number of workers who would bring families into Miami-Dade County	403
Average worker family size (worker, spouse, children)[(b), (c)]	3.25
Total workers plus family members that would migrate into Miami-Dade County (= population increase in Miami-Dade County)	1310
Number of workers who would bring families into Homestead and Florida City area	172
Average worker family size (worker, spouse, children)[(b), (c)]	3.25
Total workers plus family members that would migrate into the Homestead and Florida City area (= population increase in Homestead and Florida City area)[(d)]	559
School-age children	
Number of school-age children per family[(b)]	0.8
Total number of school-age children that would migrate into Miami-Dade County (0.8 per family)	322
Total number of school-age children that would migrate into Homestead and Florida City area (0.8 per family)	138

(a) Based on residential distribution of current operation workforce.
(b) Source: BMI 1981
(c) According to the USCB Profile of the General Population and Housing Characteristics: 2010, (USCB 2010b): average family size in Miami-Dade County in 2010 was 3.33. The average family size in Florida was 3.01. Therefore, FPL assumes that an average family size of 3.25 for the construction workforce, as presented in the Battelle Memorial Institute Study (BMI 1981), would also be a reasonable estimate for the operation workforce.
(d) Note: Presented values may not total component values due to rounding.

Table 5.8-2
Direct and Indirect Employment Created During the Operation of Units 6 & 7

Employment	
Direct jobs — In-migrating operation workforce (50% migrating into Miami-Dade County)	403
Employment multiplier for power generation and supply workers in Miami-Dade County (indirect portion only)[(a)]	2.1696
Indirect jobs resulting from in-migration of operation workers (403 x 2.1696)	874
Total number of new, project-related jobs in Miami-Dade County (direct plus indirect)	1,277

(a) Source: BEA 2009a.

Table 5.8-3
Analysis of Annual Impacts to Miami-Dade County from In-migrating Operation Worker Wages

Average annual operation worker wages[(a)]	$81,980
Number of in-migrating operation workers[(b)]	403
Estimated annual payroll from in-migrating workers	$33,037,940
Earnings multiplier for Power Generation and Supply Sector[(c)]	1.7880
Total economic impact to Miami-Dade County (earnings multiplier applied)	$59,071,837
Total personal income in Miami-Dade County, 2009[(d)]	$90,915,774,000
Annual average in-migrating operation worker wages as percent of 2009 personal income in Miami-Dade County	0.06%

(a) BLS 2012a. Average annual wage for a Nuclear Power Operator (51-8011)
(b) The operation workforce achieves full staffing as of construction month 80 (near the end of year 10) of the construction period (Table 3.10-2)
(c) BEA 2009a (Table 4.4-8)
(d) BEA 2011 (Table 4.4-5)

Table 5.8-4
Operation Workforce and Indirect Workers as Percentage in Miami-Dade County

Workforce Characterization, 40-Year Operation Period Plus 20-Year License Renewal Period	Operation Workforce	Indirect Workers	Total
Operation workers	806	—	—
Percentage of workers assumed to migrate into Miami-Dade County	50%	—	—
Number of workers assumed to migrate into Miami-Dade County	403	—	—
Employment multiplier for Power Generation and Supply sector (indirect portion only)[a]	2.1696	—	—
Indirect workers (2.1696 x 403)	—	874	—
TOTAL New project related jobs (direct and indirect)	—	—	1,277
Miami-Dade County employment, 2011[b]	—	—	1,146,823
In-migrating operation workers and indirect workers as percentage of Miami-Dade County labor force, 2011	—	—	0.1%
Number of unemployed persons, Miami-Dade County, 2011[b]	—	156,562	—
Indirect jobs as percent of number of unemployed individuals, Miami-Dade County, 2011	—	—	0.6%

(a) Source: BEA 2009
(b) Source: BLS 2012c (Table 2.5-7)

Table 5.8-5
Analysis of Annual Impacts to Miami-Dade County from Outage Worker Wages[(a)]

Average annual outage worker wages[(b)]	$81,980	
Estimated daily wages (annual wage ÷ 250)	$328	
	Regular Outage	**Extended Outage**
Estimated length of outage in days	30	45
Estimated number of outage workers per unit[(f)]	600	1,000
Estimated annualized payroll, outage workers[(c)]	$7,870,080	$5,902,560
Earnings multiplier for power generation and supply sector[(d)]	1.7880	
Personal income in Miami-Dade County, 2009[(e)]	$90,915,774,000	
Estimated annualized payroll (earnings multiplier applied), outage workers as percent of personal income in Miami-Dade County, 2009	0.015%	0.012%
Economic impact to Miami-Dade County (earnings multiplier applied)	$14,071,703	$10,553,777

(a) To assess potential impacts, the outage workforce is estimated at 600 workers per unit for each regular outage (30 days) and 1000 workers for extended outages (45 days).
(b) BLS 2012b
(c) FPL assumes that regular outages for Units 6 & 7 would occur at 18-month intervals and last for 30 days. It is assumed for this analysis that outages would not occur simultaneously for the two units, and therefore one outage would occur every 9 months. To compare outage worker wages to annual personal income for Miami-Dade County, outage worker wages were divided by 0.75 to achieve an annualized amount (i.e. to increase a 9-month amount to a 12-month amount for purposes of comparison). FPL states that extended outages would occur at 5-year intervals and last for 45 days. It is assumed for this analysis that outages would not occur simultaneously for the two units, and therefore one outage would occur every 2.5 years (30 months). To compare outage wages to annual total income for Miami-Dade County, the outage worker wages were divided by 2.5 to achieve an annualized amount (i.e. to decrease a 30-month amount to a 12-month amount for purposes of comparison).
(d) BEA 2009 (Table 5.8-3)
(e) BEA 2011 (Table 5.8-3)
(f) Assumes 100% of outage workforce migrates into Miami-Dade County

Table 5.8-6 (Deleted)

Table 5.8-7
Estimated Sales Tax Impacts, the Operation of Units 6 & 7 Compared to 2007 Tax Revenue, Miami-Dade County and Florida

	Miami-Dade County	Florida
Year 2011 — Actual Sales Tax Revenues[(a)(b)]	$57,559,000	$19,352,980,000
5% of total	$2,877,950	$967,649,000
10% of total	$5,755,900	$1,935,298,000
20% of total	$11,511,800	$3,870,596,000
Tax rate [(c)(d)]	1.0%	6.0%
Expenditures Required to Exceed Projected Collections by Specified Percentage		
by 5%	$287,795,000	$16,127,483,333
by 10%	$575,590,000	$32,254,966,667
by 20%	$1,151,180,000	$64,509,933,333

(a) Source: MDC 2012 (Table 4.4-14)
(b) Source: FDOR 2011 (Table 4.4-14)
(c) Source: FDOR 2012a (Table 4.4-14)
(d) Source: FDOR 2012b (Table 4.4-14)

Table 5.8-8
Population Increases from Units 6 & 7 Operation Workers over 2005-2009 Populations, Florida, Miami-Dade County, and the Homestead and Florida City Area

Florida population, 2005-2009[(a)]	18,222,420
Percent increase from in-migrating operation workers and families (1310 people[(b)])	0.01%
Miami-Dade County population, 2005-2009[(a)]	2,457,044
Percent increase from in-migrating operation workers and families (1310 people[(b)])	0.05%
Homestead and Florida City area population, 2005-2009[(a)]	64,844
Percent increase from in-migrating operation workers and families (559 people[(b)])	0.86%

(a) Source: USCB 2010a (Table 4.4-15)
(b) Source: Table 5.8-1

Table 5.8-9a
FPL Tangible Personal Property (TPP) Taxes for all Miami-Dade County Properties

Taxing Entity	TPP Taxes Paid by FPL [(a)]	Percent of FPL Payments	Taxing Entity's Total Property Tax Revenue	FPL Payments as Percent of Taxing Entity's Total Property Tax Revenues
Miami-Dade County School District[(b)]	6,594,526	40.3%	1,890,151,904	0.35%
Miami-Dade County[(c)]	8,833,578	54.0%	976,737,000	0.90%
State and Others	—	—	—	—
Florida Inland Navigation District[(d)]	27,580	0.2%	23,948,384	0.12%
South Florida Water Management District[(e)]	427,377	2.6%	442,168,909	0.10%
Everglades Construction Project[(f)]	71,469	0.4%	5,087,359	1.40%
Children's Trust Authority[(g)]	399,717	2.4%	104,402,410	0.38%
Subtotal	926,144	5.7%	575,607,062	0.16%
Total	16,354,248	—	—	—

(a) Source: Table 2.5-19
(b) Source: FDOE 2011 (Table 2.5-21) Revenues for Miami-Dade County School District includes all “local funds” and, thus, includes revenues other than property taxes
(c) Source: MDC 2012
(d) Source: FIND 2010
(e) Source: SFWMD 2010
(f) Source: SFWMD 2011
(g) Source: TCT 2010

Table 5.8-9b
FPL Real and Tangible Personal Property (TPP) Taxes for the Turkey Point Plant, 2007

Taxing Entity	Taxes (Real and TPP) Paid by FPL [(a)]	Percent of FPL Payments	Taxing Entity's Total Property Tax Revenues	FPL Payments as Percent of Taxing Entity's Total Property Tax Revenues
Miami-Dade School District [(b)]	$3,316,641	42.8%	$3,742,281,604	0.09%
Miami-Dade County [(c)]	$4,431,612	57.2%	$1,128,076,000	0.39%
Total	**$7,748,253**	100.0%	**$4,870,357,604**	0.16%

(a) Source: FPL 2008
(b) Source: FDOE May 2008. Revenues for the Miami-Dade County School District includes funds from federal, state, and local governments, and thus include revenues other than property taxes.
(c) Source: MDC Dec 2007

Table 5.8-10a
Existing Traffic Conditions (Peak Hour) for U.S. Highway 1 and Florida's Turnpike

Roadway	Existing Traffic	Capacity	Reserved Trips
Florida's Turnpike	2,893	4,068	1,175
U.S. Highway 1	3,967	6,500	2,533

Source: FPL 2009.
The capacity of U.S. Highway 1 was obtained from Miami-Dade County's Concurrency Management System.
The capacity of Florida's Turnpike was obtained from FDOT's generalized tables.

Table 5.8-10b
Additional Workforce Peak Hour Link Analysis

Miami-Dade County Traffic Count Station	Location	Previous Peak Hour Available Capacity[(a)]	Unit 6 & 7 Trips During Peak Hour[(b)]	New Available Peak Hour Capacity
9956	Palm Dr W of Tallahassee Road	2,799	126	2,673
9952	N. Canal St W of Tallahassee Road	2,346	18	2,328
9944	Campbell Dr E of Florida's Turnpike	1,289	36	1,253

(a) See Table 2.5-16.
(b) FPL 2009, based on traffic patterns of existing workforce.

Table 5.8-10c
Level of Service Achieved at Affected Intersections with Additional Workforce, with Improvements

Intersection	Existing Conditions Level of Service AM peak hour (PM peak hour)	With Units 6 & 7 and Improvements Made to Support Construction Traffic AM peak hour (PM peak hour)	Improvements
Palm Drive / SW 117th Avenue	A (C)	B (B)	• No signal or police control (if the traffic signal remains, it should be set to "Flashing") • One eastbound left-turn lane • One westbound right-turn lane • One southbound left-turn lane
North Canal Drive / SW 117th Avenue	A (B)	A (B)	• No signal or police control (if the traffic signal remains, it should be set to "Flashing") • One separate northbound left-turn lane • One eastbound right-turn lane

Source: FPL 2009, based on traffic patterns of existing workforce.

Table 5.8-10d
Units 6 & 7 Outage Peak Link Analysis

Miami-Dade County Traffic Count Station	Location	Previous Peak Hour Available Capacity[(a)]	Unit 6 & 7 Trips During Peak Hour[(b)]	New Available Peak Hour Capacity
9956	Palm Dr W of Tallahassee Road	2,673	310	2,363
9952	N. Canal St W of Tallahassee Road	2,328	45	2,283
9944	Campbell Dr E of Florida's Turnpike	1,253	89	1,164

(a) See Table 2.5-17.
(b) FPL 2009, based on traffic patterns of existing workforce.

Table 5.8-10e
Level of Service Achieved at Affected Intersections with Outage Workforce, with Improvements

Intersection	Existing Conditions Level of Service AM peak hour (PM peak hour)	With Units 6 & 7 and Improvements Made to Support Construction Traffic AM peak hour (PM peak hour)	Improvements
Palm Drive / SW 117th Avenue	B (B)	B (B)	• Signal or police control (if the traffic signal remains, it should be set to “normal”) • One eastbound left-turn lane • One westbound right-turn lane • One southbound left-turn lane
North Canal Drive / SW 117th Avenue	A (B)	C (B)	• Signal or police control (if the traffic signal remains, it should be set to “normal”) • One separate northbound left-turn lane • One eastbound right-turn lane

Source: FPL 2009, based on traffic patterns of existing workforce.

Table 5.8-11
Public Water — Miami-Dade County: Demand and Capacity with Adjusted Population Increases and Onsite Use

Major Suppliers	Service Area Population, 2007	2007 Daily Average Demand (MGD)	Available Facility Capacity (MGD) [(a)]	Daily Demand as Percent of Capacity, 2007	Adjusted Population during Operations	Daily Average Annual Demand with Adjusted Population and Onsite Use	Demand as Percent of Capacity during Operations	Percent Increase, Demand of Capacity, Current vs Operations
Public Water: Miami-Dade County: Demand and Capacity with Population Increase (1310 people) and On-site Operations								
Total from major suppliers, Miami-Dade County	2,621,700	398.03	532.55	74.74%	2,623,010	399.51	75.02%	1.48
Miami-Dade County Water and Sewer Department (WASD)[(a)(b)]	2,250,944	347.81	470.35	73.95%	—	—	—	—
Florida City[(c)]	15,000	2.33	4.00	58.13%	—	—	—	—
Homestead (c)	71,252	12.47	16.90	73.78%	—	—	—	—
North Miami (c)	97,504	8.50	9.30	91.40%	—	—	—	—
North Miami Beach (c)	187,000	26.93	32.00	84.15%	—	—	—	—
Public Water: Homestead and Florida City Area: Demand and Capacity with Population Increase (559 people)								
Major Suppliers	**Service Area Population, 2007**	**2007 Daily Average Demand (MGD)**	**Available Facility Capacity (MGD)**	**Daily Demand as Percent of Capacity, 2007**	**Adjusted Population during Operations**	**Daily Average Annual Demand with Adjusted Population and On-site Use**	**Demand as Percent of Capacity during Operations**	**Absolute Percent Increase, Demand of Capacity, Current vs Operations**
Homestead and Florida City Area	86,252	14.79	20.90	70.79%	86,811	14.85	71.05%	0.27%
Florida City (b)	15,000	2.33	4.00	58.13%	—	—	—	—
Homestead (b)	71,252	12.47	16.90	73.39%	—	—	—	—

(a) Includes 20 mgd for South Miami Heights water treatment plant scheduled to come online in 2012: SFWMD 2010a.
(b) Source: MDWASD 2008, Table 5-4
(c) Source: MDWASD 2008, Chapter 2.6 and footnote to Exhibit C-4.

Table 5.8-12
Public Wastewater — Miami-Dade County: Demand and Capacity with Adjusted Population Increase

System Name (Facility ID Number)	Permitted Capacity (MGD)	Annual Average Flow (MGD)[(a)]	Current Flow as Percent of Capacity	Flow as Percent of Capacity, Adjusted Population, Operations	Percent difference Current vs. Operations
Total, Miami-Dade County	**374.00**	**298.62**	**79.85%**	**79.88%**	**0.04%**
City of Homestead (FLA013609)	6	6.13	102.20%	—	—
MDWASD South District WWTP (FLA042137)	112.5	88.36	78.54%	—	—
MDWASD North District WWTP (FLA032182)	112.5	87.63	77.89%	—	—
MDWASD Central District WWTP (FLA024805)	143	116.5	81.47%	—	—

(a) Average for running 12-month period
Source: MDWASD 2009

Table 5.8-13
Law Enforcement Protection in the Miami-Dade County and the Homestead and Florida City Area, Adjusted for the Operation Workforce and Associated Population Increase

Area	Population 2005-2009[a]	Population Adjusted for Peak Operations Period[b]	Law Enforcement Officers (2010)[c][d]	Ratio of Residents per Law Enforcement Officer, Pre-Construction	Law Enforcement Officers Needed During Peak Operation	Additional Law Enforcement Officers Needed
Miami-Dade County	2,457,044	2,458,354	2,980	825	2,982	2
Homestead and Florida City Area	64,844	65,403	135	480	136	1

(a) Source: USCB 2010a (Table 5.8-8)
(b) Source: USCB 2010a (Tables 5.8-1 and 5.8-8)
(c) Source: FBI 2010a and FBI 2010b (Table 2.5-39)
(d) Source: Miami-Dade County number of law enforcement officers includes officers employed by municipalities within the county.

Table 5.8-14
Fire Protection in the Miami-Dade County and the Homestead and Florida City Area, Adjusted for the Operation Workforce and Associated Population Increase

Area	Population 2005-2009 [a]	Population Adjusted for Operations Peak[b]	Active Firefighters (2010)[c]	Ratio of Residents per Active Firefighters, Pre-Construction	Active Firefighters Needed During Peak Operations	Additional Active Firefighters Needed
Miami-Dade County	2,457,044	2,458,354	3,500	702	3,502	2
Homestead and Florida City Area[d]	64,844	65,403	2,070	N/A	N/A	N/A

(a) Source: USCB 2010a (Table 5.8-13)
(b) Source: USCB 2010a (Table 5.8-13)
(c) Source: USFA 2010 (Table 4.4-20)
(d) Source: The Homestead and Florida City area is served by the Miami-Dade Fire Rescue Department; service area population is not available
N/A — Not Available

5.9 DECOMMISSIONING

The NRC defines decommissioning (10 CFR Part 52) as the safe removal of a nuclear facility from service and the reduction of residual radioactivity to a level that permits release of the property for unrestricted use or for use under restricted conditions, and termination of the license. NRC regulation 10 CFR 52.110 specifies the regulatory actions that NRC and a licensee must take to decommission a nuclear power facility. 10 CFR Part 20, Subpart E identifies the radiological criteria that must be met for license termination. These requirements apply to the existing fleet of power reactors and to advanced reactors such as the AP1000.

Decommissioning must occur because NRC regulations do not permit a power reactor licensee to abandon a facility after ending operations. The NRC prohibits licensees from performing decommissioning activities that result in significant environmental impacts not previously reviewed under 10 CFR 52.110. Therefore, the NRC has indicated that licensees for existing reactors can rely on the information in the 2002 Final Generic Environmental Impact Statement (2002 Decommissioning GEIS) on Decommissioning of Nuclear Facilities to determine the environmental impacts of decommissioning for the existing fleet of domestic nuclear power reactors as documented in Supplement 1 to NUREG-0586.

Further, 10 CFR 50.75 delineates the financial requirements for decommissioning. This regulation establishes the requirements for providing reasonable assurance that adequate funds for performing decommissioning are available at the end of plant operations. The DOE funded a study that compares activities and costs required to decommission existing reactors to those required for advanced reactors, including the AP1000 (U.S. DOE May 2004). In addition, the decommissioning cost for Units 6 & 7 has been estimated by calculating the formula in accordance with the provisions of 10 CFR 50.75(c) and the guidance provided in NUREG-1307, Rev. 15 using the DECON alternative.

It is concluded that the generic environmental impacts identified in Supplement 1 to NUREG-0586 bound the impacts that can be reasonably expected from decommissioning the AP1000. The following sections summarize the environmental impacts related to decommissioning, the DOE-funded study on decommissioning costs, general advanced reactor plant design features that would affect eventual decommissioning, the cost estimate for decommissioning, and conclusions regarding the decommissioning of Units 6 & 7 based on this review.

5.9.1 ENVIRONMENTAL IMPACTS RELATED TO DECOMMISSIONING

10 CFR 52.110 specifies the regulatory actions that both the NRC and the licensee must take to decommission a nuclear power facility. These actions include the following:

1. Once the licensee decides to permanently cease operations, it must submit, within 30 days, a written certification to the NRC.

2. The licensee must permanently remove all fuel from the reactor and submit a written certification to the NRC confirming completion of fuel removal.

3. In addition to the certifications, the licensee must submit a post-shutdown decommissioning activities report (PSDAR) to the NRC no later than two years after the date of permanent cessation of operations.

4. The decommissioning process continues until the licensee requests termination of the license and demonstrates that radioactive material has been removed to the levels that permit termination of the license.

NUREG-0586 Supplement 1 was reviewed to determine the environmental impacts during decommissioning. The NRC's stated purpose in developing the 2002 Final Decommissioning generic environmental impact statement (GEIS) was to provide an analysis of environmental impacts from decommissioning activities that can be treated generically so that decommissioning activities for commercial nuclear power reactors conducted at specific sites will be bounded, to the extent practicable, by this and appropriate previously issued environmental impact statements. The 2002 Final Decommissioning GEIS also identifies the decommissioning activities and associated environmental issues that will likely require site-specific analysis before performing a decommissioning activity.

This Supplement incorporated the technological advances in decommissioning operations, experience gained by licensees, and changes made to the NRC regulations since the 1988 Final GEIS on Decommissioning of Nuclear Facilities. In evaluating the environmental impacts arising from those activities included in the scope of the 2002 Final Decommissioning GEIS, the environmental impacts of the following three decommissioning methods were evaluated:

- DECON — The equipment, structures, and portions of the facility and site that contain radioactive contaminants are removed or decontaminated to a level that permits termination of the license shortly after cessation of operations.

- SAFSTOR — The facility is placed in a safe stable condition and maintained in that state (safe storage) until it is subsequently decontaminated and dismantled to levels that permit license termination. During SAFSTOR, a facility is left intact, but the fuel is removed from the reactor vessel and radioactive liquids are drained from systems and components and then processed. Radioactive decay occurs during the SAFSTOR period, thus reducing the quantity of contaminated and radioactive material that must be disposed of during the decontamination and dismantlement of the facility at the end of the storage period.

- ENTOMB — This alternative involves encasing radioactive structures, systems, and components (SSCs) in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license.

The scope of the 2002 Final Decommissioning GEIS is based on the decommissioning activities performed to remove radioactive materials from the SSCs from the time that the licensee certifies that it has permanently ceased power operations until the license is terminated. Except for decommissioning planning, the activities performed before permanent cessation of operations, including certification that fuel has been removed from the reactor, and impacts related to the decision to permanently cease operations were outside the scope of the 2002 Final Decommissioning GEIS. Further, any potential radiological impacts following license termination that are related to activities performed during decommissioning were also not considered in the 2002 Final Decommissioning GEIS.

The activities and impacts that NRC considered to be within the scope of the 2002 Decommissioning GEIS include:

- Activities performed to remove the facility from service once the licensee certifies that the facility has permanently ceased operations.
- Activities performed in support of radiological decommissioning, including decontamination and dismantlement of radioactive SSCs and any activities required to support the decontamination and dismantlement process.
- Activities performed in support of dismantlement of nonradiological SSCs, such as diesel generator buildings and cooling towers.
- Activities performed up to license termination and their resulting impacts as provided by the definition of decommissioning.
- Activities related to release of the facility or preparation for facility entombment.
- Human health impacts from radiological and nonradiological decommissioning activities.

Each environmental issue within the scope of the 2002 Final Decommissioning GEIS was evaluated to determine whether each issue was considered generic or site-specific. If the issue was considered generic, a significance level of SMALL, MODERATE, or LARGE was assigned. Of the identified environmental issues assessed, the impacts are generic and SMALL for all plants regardless of the activities and identified variables (Table 5.9-1). For activities within the operational area, only two issues were determined to be site-specific—threatened and endangered species and environmental justice. The operational area is defined as the portion of the plant site where most or all of the site activities occur, such as reactor operation, materials and equipment storage, parking, substation operation, facility service, and maintenance. This includes areas within the protected area fences, the intake, discharge, cooling, and associated structures as well as surrounding paved, graveled, maintained landscape, or other maintained areas.

Various activities related to decommissioning that were not considered within the scope of the 2002 Final Decommissioning GEIS are regulated by the NRC or are reviewed by the NRC under other regulatory responsibilities. These activities include:

- Spent fuel storage and maintenance. The NRC has independently made a finding that there is reasonable assurance that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised license) of that reactor at its spent fuel storage basin, or at either onsite or offsite independent spent fuel storage installations. This finding is codified in the NRC's regulations in 10 CFR 51.23(a).

- Spent fuel transport and disposal away from the reactor location is governed by regulations in 10 CFR Part 71.

- Low-level waste (LLW) disposal at a licensed LLW site or treatment of LLW at compactor facilities. Regulations related to LLW disposal are in 10 CFR Part 61 and 10 CFR Part 20, Subpart K. A final GEIS supporting the regulations in 10 CFR Part 61, *Final Generic Environmental Impact Statement for 10 CFR Part 61,* was published as NUREG-0945.

- Radiological impacts following license termination. This impact is covered by the Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities, NUREG-1496.

Definitive plans for decommissioning are required by the NRC after a decision has been made to cease operations. There are three points during the decommissioning process when the licensee performs an evaluation of environmental impacts—during submittal of the PSDAR and during submittal of the license termination plan, and during performance of the final status survey to verify compliance with the license termination plan. When the licensee must submit a PSDAR to the NRC (within two years following permanent cessation of operation), the PSDAR must include a discussion that provides the reasons for concluding that the environmental impacts associated with the licensee's planned site-specific decommissioning activities will be bounded by an appropriate previously issued environmental assessment, including the 2002 Final Decommissioning GEIS. If the licensee identifies environmental impacts that are not bounded by a previous NRC environmental assessment, the licensee must address the impacts in a request for a license amendment regarding the activities and submit a supplement to its environmental report that describes and evaluates the additional impacts. The license termination plan must be a supplement to the FSAR and must include a supplement to the environmental report that describes any new information or significant environmental change associated with the licensee's proposed termination activities.

In summary, the decommissioning of a nuclear facility that has reached the end of its useful life generally has a positive environmental impact. In many instances, the environmental impacts resulting from the activities associated with decommissioning are expected to be substantially smaller than those of power plant construction or operation because the level of activity and the impacts to the environment are expected to be smaller during decommissioning than during construction and operation.

5.9.2 DOE-FUNDED STUDY ON DECOMMISSIONING COSTS

The total cost of decommissioning depends on many factors, including the sequence and timing of the various stages of the program, location of the facility, current radioactive waste burial costs, and plans for spent fuel storage. To ensure that a lack of funds does not result in delays or in improper conduct of decommissioning that may adversely affect public health and safety, 10 CFR 50.75 requires that operating license applicants and licensees provide reasonable assurance that adequate funds for performing decommissioning will be available at the end of operation. To provide this assurance, the regulation requires that two factors be considered: (1) the amount of funds needed for decommissioning, and (2) the method used to provide financial assurance. At its discretion, an applicant may submit a certification based either on the formulas provided in 10 CFR 50.75 or, when a higher funding level is desired, on a facility-specific cost estimate that is equal to or greater than that calculated using the formula in 10 CFR 50.75, consistent with guidance provided by RG 1.159.

To support development of advanced reactors for production of electric power and to establish the requirements for providing reasonable assurance that adequate funds for performing decommissioning will be available at the end of plant operations, a study was commissioned by DOE (U.S. DOE May 2004). The study presents estimates of the costs to decommission the advanced reactor designs following a scheduled cessation of plant operations. Four reactor types were evaluated in this report: the advanced boiling water reactor (ABWR), the economic simplified boiling water reactor (ESBWR), the advanced passive pressurized water reactor (AP1000), and the advanced CANDU reactor (ACR-700). The cost analysis described in the study is based on the prompt decommissioning alternative, or DECON, as defined in NUREG-0586. The DECON alternative is also the basis for the NRC funding regulations in 10 CFR 50.75.

DECON comprises four distinct periods of effort:

1. Pre-shutdown planning/engineering

2. Plant deactivation and transition (no activities are conducted during this period that will affect the safe operation of the spent fuel pool)

3. Decontamination and dismantlement with concurrent operations in the spent fuel pool until the pool inventory is zero

4. License termination

Because of the delays in development of the federal waste management system, it may be necessary to continue operation of a dry fuel storage facility on the reactor site after the reactor systems have been dismantled and the reactor operating license terminated. However, these latter storage costs are considered operational costs and are not considered part of decommissioning.

The cost estimates described in the DOE study were developed using the same cost estimating methodology used by NRC and consider the typical features of a generic site located in the southeast, including the nuclear steam supply systems, power generation systems, support services, site buildings, and ancillary facilities. This is considered to be a valid approach for Units 6 & 7. The estimates are based on numerous fundamental assumptions, including labor costs, low-level radioactive waste disposal costs and practices, contaminated tools and equipment present at the end of operations, regulatory requirements, and project contingencies. The primary cost contributors identified in the study are either labor-related or associated with the management and disposition of the radioactive waste.

Advanced reactors have several design features that will impact the ultimate cost of decommissioning (U.S. DOE May 2004). These principal cost influences include:

- Quantity of plant equipment — The quantity of plant equipment requiring disposition has been reduced in the advanced reactor designs. This reduction will have a noticeable impact on the decommissioning cost, including reduced labor costs associated with removal and radiation protection, reduced decommissioning equipment and material costs, reduced waste processing and disposal costs, as well as reduced equipment survey costs.

- Level of contamination or activation — The advanced reactor designs are expected to have improved material selection and water chemistry resulting in reduced radiation levels during plant operation.

- Extent of building contamination — The level of effort to decontaminate the advanced reactor buildings as part of the decommissioning scope is expected to be less than contemporary reactor designs and is believed to be principally due to plant layout.

Overall, the DOE study concluded that with consistent operating and management assumptions, the total decommissioning costs projected for the advanced reactor designs are comparable to those projected by NRC for operating reactors with appropriate reductions in costs due to reduced physical plant inventories (U.S. DOE May 2004).

5.9.3 UNITS 6 & 7 DECOMMISSIONING COST ESTIMATE

A decommissioning cost estimate has been performed for each of the AP1000 units in order to assess the financial obligations pertaining to the eventual decommissioning of the two units. Part 1 of this COL Application describes the plans for providing financial assurance for the decommissioning of the two units and includes a certification regarding the cost estimate for each unit. The cost estimate or "formula amount" for the minimum certification is calculated in accordance with the provisions of 10 CFR 50.75(c) and the guidance provided in NUREG-1307, Rev. 15, which assumes the DECON decommissioning alternative. The estimate assumes the removal of all contaminated and activated plant components and structural materials such that the owner may then have unrestricted use of the site with no further requirements for an operating license. Similar to the DOE study, the primary cost contributors identified are labor-related or associated with the management and disposition of the radioactive waste.

The projected cost to decommission two AP1000s is estimated to be approximately $1.034 billion, reported in year 2013 dollars. This minimum certification amount for each unit was calculated using the formula delineated in 10 CFR 50.75(c) (1) and appropriate escalation indices, including the waste burial factor provided in NUREG-1307, Rev. 15, for the vendor waste processing option.

5.9.4 CONCLUSIONS

The generic environmental impacts associated with decommissioning the existing fleet of domestic nuclear power reactors presented in the 2002 Final Decommissioning GEIS were analyzed along with the expected decommissioning activities for the AP1000. It was determined that the scope of the activities is the same. Projected physical plant inventories associated with advanced reactor designs will generally be less than those for currently operating power reactors due to advances in technology that simplify maintenance and benefit decommissioning. Based on this comparison, it was concluded that the environmental impacts identified in the 2002 Decommissioning GEIS bound the impacts that can be reasonably expected from decommissioning the AP1000.

A total decommissioning cost estimate using the NRC's formula amount in accordance with 10 CFR 50.75(c) (1) has been projected. The cost projected to decommission two AP1000s using the DECON alternative is estimated to be $1.034 billion, reported in year 2013 dollars.

Section 5.9 References

U.S. DOE May 2004. *Study of Construction Technologies and Schedules, O&M Staffing and Cost, Decommissioning Costs and Funding Requirements for Advanced Reactor Designs*, Volume 1, U. S. Department of Energy, May 27, 2004.

Table 5.9-1
Summary of the Environmental Impacts from Decommissioning Nuclear Power Facilities

Issue	Generic	Impact
Onsite/Offsite Land Use		
- Onsite land use activities	Yes	SMALL
- Offsite land use activities	No	Site-specific
Water Use	Yes	SMALL
Water Quality		
- Surface Water	Yes	SMALL
- Groundwater	Yes	SMALL
Air Quality	Yes	SMALL
Aquatic Ecology		
- Activities within the operational area	Yes	SMALL
- Activities beyond the operational area	No	Site-specific
Terrestrial Ecology		
- Activities within the operational area	Yes	SMALL
- Activities beyond the operational area	No	Site-specific
Threatened and Endangered Species	No	Site-specific
Radiological		
- Activities resulting in occupational dose to workers	Yes	SMALL
- Activities resulting in dose to the public	Yes	SMALL
Radiological Accidents	Yes	SMALL
Occupational Issues	Yes	SMALL
Socioeconomic	Yes	SMALL
Environmental Justice	No	Site-specific
Cultural and Historic Resource Impacts		
- Activities within the operational area	Yes	SMALL
- Activities beyond the operational area	No	Site-specific
Aesthetics	Yes	SMALL
Noise	Yes	SMALL
Transportation	Yes	SMALL
Irretrievable Resources	Yes	SMALL

Source: NUREG-0586.

5.10 MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS DURING OPERATIONS

Sections 5.1 through 5.9 describe potential environmental impacts that could result from construction of Units 6 & 7. Such adverse environmental impacts would be reduced or eliminated through implementation of measures and controls such as:

- Compliance with applicable local, state, and federal ordinances, laws, and regulations
- Compliance with environmental requirements compelled by permits and licenses
- Compliance with site procedures, plans, and programs

In Table 5.10-1, the environmental impacts and corresponding measures and controls described in previous sections of Chapter 5 are summarized along with the significance of potential impacts (i.e., SMALL, MODERATE, or LARGE).

Table 5.10-1 (Sheet 1 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[a]	Planned Control Program
5.1 Land Use Impacts			
5.1.1 The Site and Vicinity	Land would be permanently dedicated to Units 6 & 7 infrastructure on the Turkey Point Plant property until decommissioning.	S	No mitigation would be required.
	Potential impacts from salt deposition affecting vegetation and critical habitat for the American crocodile.	S	No mitigation would be required.
	Potential impacts from the reclaimed and potable water pipelines and transmission corridors, located primarily offsite. (Land within the right-of-way would be permanently dedicated until decommissioning, but would be compatible with many uses. In addition, the radial collector wells would be emplaced under Biscayne Bay.)	S	Existing corridors would be used to the extent practical.
5.1.2 Transmission Corridors and Offsite Area	Potential impacts from maintenance practices including mowing and application of herbicides and growth-regulating chemicals for transmission corridors, water pipelines, and access roadways.	S	The right-of-ways would be maintained with management plans designed to protect the land use of contiguous properties. The exact manner in which maintenance would be performed would depend on the location, type of terrain, and surrounding environment. An example of a possible management plan includes cultivation and grazing where compatible.
	Potential impacts to offsite land disposal facilities from disposal of radioactive (low-level radioactive waste and spent nuclear fuel) and nonradioactive wastes that would be generated as a result of operation of Units 6 & 7. (Cooling system blowdown and process wastewaters would be disposed of in deep injection wells.)	S	Disposal area(s) for nonradioactive and low-level radioactive waste would be at a permitted waste disposal facilities with a land use designated for such activities. Disposal area for spent nuclear fuel would be a U.S. Department of Energy facility that is licensed by NRC.

Table 5.10-1 (Sheet 2 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.1.3 Historic Properties and Cultural Resources	Potential impacts from operational activities, including maintenance activities (e.g. repair/ replacement of underground piping), in areas that were previously disturbed during construction of Units 6 & 7. (It is unlikely that plant operations would uncover historical properties that were not discovered and properly processed during plant construction.)	No Impact	The unanticipated finds plan implemented during construction would be slightly modified for operational activities and included in the operational procedures for Units 6 & 7.
5.2 Water-Related Impacts			
5.2.1 Hydrologic Alterations and Plant Water Supply	Potential impacts from the operation of the principal structures of Units 6 & 7 (power blocks, makeup water reservoir and cooling towers, switchyard, and other infrastructure) and associated facilities (security facility). (The groundwater hydrologic flow in the vicinity of these structures may be slightly altered.)	S	No mitigation would be required.
	Potential impacts from the spoils areas. (The proposed spoils areas would be bermed to direct drainage from the spoils piles to the cooling canals/industrial wastewater treatment facility.)	S	No mitigation would be required.
	Potential impacts from the access roads maintenance, heavy haul road, and equipment barge unloading area. (The roads maintenance would use sedimentation control for surface water control.) (The surface water and groundwater hydrologic flow could be temporarily altered.)	S	Water from the dewatering process would be handled by environmental best management practices. Any areas of disturbed soils would be recontoured and reestablished, if necessary, in a timely manner which would reduce the potential for erosion through surface water runoff. Soil retention techniques such as silt barriers would be used to reduce impacts in accordance with best management practices developed for Units 6 & 7.

Table 5.10-1 (Sheet 3 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.2.1 Hydrologic Alterations and Plant Water Supply (cont.)	Potential impacts from operational utilities maintenance (water and sanitary treatment facilities, reclaimed water pipeline and potable water pipeline.) (The surface water and groundwater hydrologic flow could be temporarily altered.)	S	Water from the dewatering process would be handled by environmental best management practices. Soil retention techniques such as silt barriers would be used to reduce impacts in accordance with best management practices developed for Turkey Point Units 6 & 7.
	Potential impacts from the operation and maintenance of the radial collector wells. (Activities could be necessary that would require drawdown of surface water and screen cleaning of the radials under Biscayne Bay.) (The surface water and groundwater hydrologic flow could be altered.)	S	Water from the localized dewatering process would be handled by environmental best management practices and directed to the industrial wastewater facility.
	Potential impacts from the operation and maintenance of the deep injection wells. (Deep injection wells would be operated according to agency regulations.) (The surface water and groundwater hydrologic flow could be altered.)	S	A monitoring program would be utilized to detect vertical migration of injected fluids into the Upper Floridan aquifer through the confining layer overlying the Boulder Zone.
	Potential impacts from transmission right-of-way, potable and reclaimed water pipelines right-of-way maintenance activities. (Activities could be necessary that would require excavation and dewatering. The dewatering activity would create temporary drawdown of the water table. The disturbance of surface soils during maintenance activities could result in impacts.)	S	Water from the dewatering process would be handled by environmental best management practices. Soil retention techniques such as silt barriers would be used to reduce impacts in accordance with best management practices developed for Turkey Point Units 6 & 7.
	Potential impacts associated with vehicular traffic from right-of-way maintenance activities. (Activities could result in the rutting of access roads along the rights-of-way, which could impact surface flow in the vicinity of the disturbance.)	S	Any areas of disturbed soils would be recontoured and reestablished, if necessary, in a timely manner which would reduce the potential for erosion through surface water runoff.

Table 5.10-1 (Sheet 4 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
	Potential impacts from FPL-owned fill source. (The proposed fill areas could be bermed to stabilize surface water flow.) (The surface water and groundwater hydrologic flow could be temporarily altered.)	S	Water from the excavation process would be handled by environmental best management practices and groundwater levels would stabilize after storm events end, no further mitigation would be required.
5.2.2 Water Use Impacts	Potential impacts from diverting public water for other beneficial uses. Potable water in the amount of 936 gpm (1.35 mgd) to 2553 gpm (3.68 mgd) would be supplied to the site by Miami-Dade County.	S	No mitigation would be required.
	Potential impacts from the withdrawal of groundwater from Biscayne aquifer and Biscayne Bay.	S	A monitoring well system would be installed near the location of the radial collector well caissons that would be used to monitor the groundwater elevation and quality during operation of the radial collector wells.
5.2.3 Water Quality Impacts	Potential impacts from operational maintenance activities along the transmission rights-of-way, the reclaimed water pipelines, and potable water pipelines. (Maintenance activities could result in impacts to surface water quality. These impacts could result from surface water runoff, which could include the transport of chemical releases (e.g., spills of hydraulic fluid) to the environment or from the transport of sediment to nearby surface water features.)	S	The use of environmental best management practices along with a spill prevention plan would prevent or minimize the potential impacts of sediment transport or releases to the environment.
	Potential impacts from operation of radial collector wells. (Operation of radial collector wells installed beneath Biscayne Bay would have minimal impact the water quality of the bay. A small percentage of recharge water would come from points under the plant property. The aquifer is not used as a potable water supply near the Turkey Point property.	S	Monitoring wells could be installed and used to monitor the groundwater level and water quality inshore of the radial collector well locations.

**Table 5.10-1 (Sheet 5 of 17)
Summary of Potentially Adverse Impacts of Operation**

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.2.3 Water Quality Impacts (cont.)	Potential impacts to water quality from operations. (Any contaminants (e.g., diesel fuel, hydraulic fluid, antifreeze, lubricants, or other pollutant) spilled during operations, and not contained or remediated, could seep, over time, into the water table, affecting the water table if significant in quantity, aquifer and could ultimately over a long period of time move to Biscayne Bay.)	S	Environmental best management practices and a spill prevention plan would be used to minimize and prevent impacts. Any minor spills of diesel fuel, hydraulic fluid, lubricants, or other pollutants would be cleaned up quickly to prevent them from moving into the groundwater.
5.3 Cooling System Impacts			
5.3.1 Intake System	Potential impact from the operation of the radial collector wells.	S – wetlands	Continue FPL crocodile program that mitigates the impacts to American crocodile.
5.3.2 Impacts of Cooling System Discharge System on Aquatic Ecosystems	Potential impacts from the deep injection wells. (Discharge would be via underground injection into the Boulder Zone, which would not afford a pathway for the discharge water to reach surficial aquifers or surface waters.)	S	The FDEP permitting process for the deep injection well permits including monitoring requirements for groundwater quality and groundwater elevation data in overlying aquifers would be adhered to.
5.3.3 Heat Discharge System	Potential impacts from the heat discharge system—mechanical draft cooling towers. (Use of cooling towers would lead to creation of plumes. Plumes have the potential for shadowing, fogging, and increasing humidity and precipitation.)	S	No mitigation would be required.

Table 5.10-1 (Sheet 6 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.3.3 Heat Discharge System (cont.)	Salt deposition was estimated locally at the southern end of the plant area. Salt deposition of 10 Kg/Ha/month is generally confined to the plant property and at the cooling canals, with the exception of the eastern and southeastern perimeters of the site. The terrestrial habitats receiving highest deposits would include the cooling canals of the industrial wastewater facility, industrial/ developed lands, and a narrow band of mangroves along the Biscayne Bay shore immediately east of the facility. The salt deposition to the cooling canals, which are critical habitat for the federally-threatened American crocodile would not impact salinity level significantly to impact existing crocodile growth and/or survival rate.	S	No mitigation would be required beyond the existing crocodile management program that mitigates the impacts to American crocodile hatchlings from the existing elevated salinity levels.
	Potential impacts from the heat discharge system—mechanical draft cooling towers. (Noise from the Units 6 & 7 cooling towers could possibly impact wildlife. Noise from cooling towers would be less than the level the NRC considers of small significance.)	S	No mitigation would be required.
	Potential impacts from the heat discharge system—mechanical draft cooling towers. (The mechanical draft cooling towers would be shorter, 70 feet above grade, than the taller natural draft cooling towers that have been associated with bird kills.)	S	No mitigation would be required.

Table 5.10-1 (Sheet 7 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[a]	Planned Control Program
5.3.4 Impacts to Members of the Public	Potential health impact to workers from contact with human disease-causing thermophilic microorganisms in the makeup water reservoir.	S	Personnel would be strictly controlled by administrative controls and security patrols. The makeup water reservoir would be located within the plant area boundary, precluding access by members of the public. Workers would be subject to the worker protection plan, which would provide for personnel protective measures such as personal protective equipment and personnel monitoring.
	Potential impact to members of the public from noise emitted by Units 6 & 7 cooling towers. (Noise levels at 400 feet from the cooling towers are estimated to be on the order of 65 dBA, a level characterized by the NRC in NUREG-1437 as of small significance.)	S	No mitigation would be required.
5.4 Radiological Impacts of Normal Operation			
5.4.3 Impacts to Members of the Public	Potential health impacts to members of the public from exposure to radiological releases. (Modeling using the design and operational parameters of Units 6 & 7 results in estimated doses to the public that are within the design objectives of 10 CFR Part 50 Appendix I and within regulatory limits of 40 CFR Part 190.) Since the dose limits for members of the public in 40 CFR Part 190 are more restrictive than those in 10 CFR 20.1301, demonstration of compliance with the limits of 40 CFR Part 190 is also considered to be a demonstration of compliance with the 0.1 rem limit of 10 CFR 20.1301.	S	Monitor radiological releases as required by radiological monitoring program. Should adverse conditions be indicated, appropriate Units 6 & 7 operating control procedures would be implemented.

Table 5.10-1 (Sheet 8 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[a]	Planned Control Program
5.4.4 Impacts to Biota Other than Members of the Public	Potential impacts to terrestrial and aquatic ecosystems from chronic radiation exposure caused by the small discharges of radioactive liquids and gases from the operation of Units 6 & 7. (The calculated dose rate to biota species, 0.14 mrad/day, is much less than the 100 mrad/day criteria—the level at which the International Atomic Energy Agency concludes there are no harmful effects to plants and animals.)	S	Monitor radiological releases as required by radiological monitoring program. Should adverse conditions be indicated, appropriate Units 6 & 7 operating control procedures would be implemented.
5.4.5 Occupational Doses	Potential health impacts to workers from radiation exposure of an annual maximum of dose of 67 person-rem per unit.	S	Monitor radiological releases as required by radiological monitoring program. Should adverse conditions be indicated, appropriate Units 6 & 7 operating control procedures would be implemented.
5.5 Environmental Impacts of Waste			
5.5.1 Nonradioactive Waste System Impacts	Potential impacts to land and groundwater due to the disposal of solid waste.	S	Recycling and waste minimization programs would be employed at Units 6 & 7. Nonradioactive solid waste would be reused or recycled to the extent possible. Solid wastes appropriate for recycling would be managed through use of approved and appropriately licensed commercial waste disposal facilities. Additionally, applicable Florida requirements and standards would be met with regard to the handling, transporting, and disposal of solid wastes offsite. Any onsite waste disposal (e.g., uncontaminated sediment, dredge material) is not under a state regulated program, but the material would be stockpiled in areas with appropriate engineering controls to limit surface water runoff and comply with U.S. Army Corps of Engineers permit.
	Potential impacts to groundwater quality from discharges from the Units 6 & 7 makeup water reservoir. (Treated wastewater and sanitary waste treatment effluent would be disposed through use of the deep injection wells.)	S	Modify the existing Industrial Wastewater Facility Permit for stormwater releases. Obtain the UIC Permit and comply with its permit limits and monitoring requirements.

Table 5.10-1 (Sheet 9 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.5.1 Nonradioactive Waste System Impacts (cont.)	Potential impacts to water quality of surface water due to increased volume of storm water resulting from new impervious surfaces.	S	Environmental best management practices initiated through the IWW permit would be used.
	Potential impacts to air quality from emissions of auxiliary systems operated on an infrequent basis.	S	Comply with the state of Florida PSD permit limits and regulations for operating air emission sources.
5.5.2 Mixed Waste Impacts	Potential impacts to workers health and environment from the handling and disposal of mixed waste generated as a result of the operation of Units 6 & 7.	S	Appropriate hazardous chemical control and radiological control measures would be applied during testing, handling, and storage of mixed wastes. A waste minimization program would be developed and implemented.
5.6 Environmental Impacts of Transmission Systems			
5.6.1 Impacts to Terrestrial Resources	Potential impacts to vegetation and wildlife habitat within the transmission line rights of way from routine maintenance of woody vegetative growth by manual and mechanical methods and herbicides.	S	Maintenance procedures have previously been established. Consultations would be held with appropriate federal, state, and local agencies about mitigation actions for the known populations of multiple threatened and endangered species, as needed.
5.6.2 Impacts to Aquatic Resources	Potential water quality impacts and subsequent impacts to populations of important aquatic species from maintenance activities in transmission corridors that lie at or near water bodies, wetlands, and SFWMD canals.	S	Environmental best management practices would be used to reduce soil erosion and sedimentation to minimize impacts to all aquatic resources, including mangrove rivulus species, a State and Federal species of special concern. Corridor vegetation management and line maintenance programs and procedures have been established to minimize impacts. The same procedures establish strict guidelines for use of herbicides application according to federal, state, and local regulations. In addition, environmental best management practices would be used to reduce soil erosion and sedimentation vegetation management in forested wetlands would be in full compliance with Florida Statute 403.814 General Permits.

Table 5.10-1 (Sheet 10 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[a]	Planned Control Program
5.6.3 Impacts to Members of the Public	Potential effects to members of the public resulting from the operation and maintenance of the transmission system. (Impacts may occur as visual impacts, electric shock hazards, electromagnetic field exposure, noise impacts, or radio and television interference.)	S	No mitigation would be required. Transmission lines would conform to standards established by the American National Standards Institute, The National Electrical Safety Code, and such other applicable codes and standards that are generally accepted by the industry, except as modified by Florida statutes.
5.7 Uranium Fuel Cycle and Transportation Impacts			
5.7.1.1 Land Use	Potential impacts to land use from fuel cycle. (Total annual land requirements for fuel cycle support would be approximately 300 acres, 34 acres of which would be permanently committed.)	S	Mitigation would not be required.
5.7.1.2 Water Use	Potential impacts to water resources from fuel cycle. (Total annual water use for the fuel cycle would be 2.95E10 gallons.)	S	No mitigation would be required.
5.7.1.3 Fossil Fuel Impacts	Potential impacts to fossil fuel resources from fuel cycle. (Electric energy needs for fuel cycle would be approximately 5% of the output of one of the proposed units. Natural gas consumption for fuel cycle support if used instead to generate electricity would yield less than 0.4% of the energy output of one of the proposed units.)	S	No mitigation would be required.
5.7.1.4 Chemical Effluents	Potential impacts to air and water quality from fuel cycle. (Gaseous effluents would be less than 0.08% of all 2005 US SO_2 emissions and less than 0.02% of all 2006 US NO_x emissions. Milling process chemical effluents are not released in quantities sufficient to have significant impacts on the environment.)	S	All chemical discharges released into the environment are subject to requirements and limitations set by an appropriate federal, state, local, or Native American tribal regulatory agency.

Table 5.10-1 (Sheet 11 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.7.1.5 Radioactive Effluents	Potential health impacts to members of the public from radioactive effluents from the fuel cycle. The estimated whole-body population dose commitment to the U.S. population would be approximately 4200 person-rem per year, an estimate that correlates with 3.1 fatal cancers, non-fatal cancers, or severe hereditary effects per year to the U.S. population.	S	No mitigation would be required.
5.7.1.6 Radioactive Waste	Potential environmental impacts from disposal of radioactive wastes generated as a result of the fuel cycle. (No significant radioactive releases to the environment are expected from radioactive waste disposal.)	S	No mitigation would be required.
5.7.1.7 Occupational Dose	Potential health impacts to fuel cycle workers caused by radiation exposure. (The estimated occupational dose, attributable to all phases of the fuel cycle, is approximately 1600 person-rem per year for two AP1000 Units.)	S	The dose to any individual would be maintained within the occupational dose limit of 10 CFR Part 20.
5.7.1.8 Transportation	Potential health impacts to transportation workers and members of the public caused by radiation exposure resulting from the loading, unloading, and transport of radioactive materials associated with the fuel cycle. (The estimated dose to workers and the public from transportation associated with the fuel cycle is 6.5 person-rem per year. For comparative purposes, the estimated collective dose from natural background radiation to the population within 50 miles of Units 6 & 7 is 907,000 person-rem per year.)	S	No mitigation would be required.

Table 5.10-1 (Sheet 12 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.7.2 Transportation of Radioactive Materials	Potential health impacts to the public and workers caused by exposure to radiation emitted during incident-free transportation of radiological materials. (Shipments would be less than the one per day condition of 10 CFR 51.52, Table S-4.)	S	Radiological protection programs would manage and limit doses to workers whose jobs would cause them to receive the greatest exposures.
5.8 Socioeconomic Impacts			
5.8.1 Physical Impacts of Station Operation	Potential noise impacts due to the operation of plant systems. The highest levels of noise would be associated with the operation of the mechanical draft cooling towers. (Noise levels at 400 feet from the cooling towers are estimated to be on the order of 65 dBA, a level characterized by the NRC in NUREG-1437 as of small significance.)	S	No mitigation would be required.
	Potential impacts from the increase in traffic noise from the commuting workforce.	S	Noise levels would be minimized by road improvements, including paving the access roads and controlling speed limits.
	Potential impacts to air quality from emissions of auxiliary systems operated on an intermittent basis.	S	Comply with the state of Florida PSD permit limits and regulations for operating air emission sources.
	Potential impacts to greenhouse gases from emissions during operations.	S	No mitigation would be required.
	Potential impacts to air quality from workforce traffic during operations.	S	No mitigation would be required.
	Potential visual impacts to landscape from reactor buildings, cooling towers, and associated plumes.	S	No mitigation would be required.
	Potential impact to area roads from the increase of commuter traffic.	S	No mitigation beyond road improvements installed during construction would be required.

Table 5.10-1 (Sheet 13 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.8.2 Social and Economic Impacts of Station Operation	Potential impacts from the increase in population related to plant operations.	S (Miami-Dade County) S (Homestead and Florida City)	No mitigation would be required.
	Potential impacts from workers' wages on the local economy related to plant operations.	S, positive (Miami-Dade County) S, positive (Homestead and Florida City)	No mitigation would be required.
	Potential impacts related to indirect jobs from plant operation. (This will reduce the unemployment in the ROI.)	S, positive	No mitigation would be required.
	Potential impacts from temporary outage workers impact to the local economy.	S, positive	No mitigation would be required.
	Potential impacts from taxes collected during plant operation.	S, positive (Miami-Dade County) S, positive (Homestead and Florida City)	No mitigation would be required.
	Potential impacts on land use from plant operations. (There would be very little new residential or commercial development and basic land use patterns would remain in place.)	S (Miami-Dade County) S (Homestead and Florida City)	Communication with local and regional governmental and nongovernmental organizations would be maintained, including but not limited to the Department of Planning and Zoning and Department of Community and Economic Development, to disseminate project information. This would allow these organizations to be given the opportunity to plan accordingly.
	Potential impacts from increased traffic on area roadways due to plant operations.	S	No mitigation beyond road improvements installed during construction would be required.
	Potential impacts from increased traffic on area roadways due to outage workers commuting to Turkey Point.	S	No mitigation beyond road improvements installed during construction would be required.

Table 5.10-1 (Sheet 14 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.8.2 Social and Economic Impacts of Station Operation (cont.)	Potential aesthetic impacts from plant operations. (Physical structures and infrastructure of Turkey Point onsite as well as operational activities would produce visual and physical impacts for recreational facilities in the vicinity.)	S	No mitigation would be required.
	Potential aesthetic impacts to recreation from plant operations.	S	No mitigation would be required.
	Potential impacts from increased use of recreational facilities within a 50-mile radius.	S (Miami-Dade County) S (Homestead and Florida City)	No mitigation would be required.
	Potential impacts to housing market affecting prices and rents.	S (Miami-Dade County) S (Homestead and Florida City)	Early communications with local and regional governmental organizations, including the Miami-Dade Planning and Zoning Department and the Greater Homestead and Florida City Chamber of Commerce, could be initiated to disseminate information related to Units 6 & 7, such as the schedule of expected worker influx. County and regional planning organizations, and, ultimately, developers and real estate agencies, could factor the details of the emerging housing market into their decision-making and plan accordingly.
	Potential impacts from the increased water demand due to plant operations-related population increase. (It is estimated that the excess capacity in public water supply will be reduced slightly.)	S (Miami-Dade County) S (Homestead and Florida City)	Communication would be held with local and regional governmental planning organizations such as the Miami-Dade County Department of Planning and Zoning, the Miami-Dade County Water and Sewer Department (MDWASD), and the South Florida Water Management District. FPL could share information such as project activity scheduling, and projected workforce in-migration, thus giving these organizations ample time to prepare for demands on services due to the increased population as a result of Units 6 & 7 operations.

Table 5.10-1 (Sheet 15 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.8.2 Social and Economic Impacts of Station Operation (cont.)	Potential impacts from an increase in wastewater requiring treatment due to operations-related population increase. (It is estimated that the increase in water usage would reduce excess treatment capacity by a small amount.)	S (Miami-Dade County) S (Homestead and Florida City)	Early communication with local and regional governmental organizations, including planning commissions and local and regional economic development agencies, such as the MDWASD, the Miami-Dade Department of Environmental Resources Management (DERM), or the Florida Department of Environmental Protection would be initiated, to disseminate Unit 6 & 7-related information. Local governments and planning groups would have time to plan for the influx. Infrastructure upgrades and expansions could be funded, at least in part, by Unit 6 & 7-related property and sales and use tax payments.
	Potential impacts to police and fire department services due to small increases in the ratio of persons to police and firefighters over pre-construction levels. (The ratio would be less than that during the construction period, which could lead to the dismissal of officers and firefighters hired to provide services at that higher population time.)	S (Miami-Dade County) S (Homestead and Florida City)	Turkey Point-related tax payments, including both property taxes and sales and use taxes made by Turkey Point and its employees, could continue to assist in funding these services.
	Potential impacts to medical services due to medical service needs of operations-related population increase. (This increase remains within current medical service capacity.)	S (Miami-Dade County) S (Homestead and Florida City)	No mitigation would be required.

Table 5.10-1 (Sheet 16 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[(a)]	Planned Control Program
5.8.2 Social and Economic Impacts of Station Operation (cont.)	Potential impacts to schools due to the increase in population from the plant operations workforce resulting in an increase in the student population.	S (Miami-Dade County) S (Homestead and Florida City)	Increased property tax revenues as a result of the increased population, and property taxes on Units 6 & 7, could fund any needed additional teachers and facilities. Florida Education Finance Program and equalized funding legislation would ensure that the M-DCPS receiving the students would receive additional funding to support the educational services; however it also means that the property taxes may not go directly to the M-DCPS. FPL would provide the local communities with timely information regarding the proposed activities at the Turkey Point Plant, giving the school district several years to make accommodations for the additional influx of students.
5.8.3 Environmental Justice Impacts	Potential health and environmental impacts to minority or low-income populations resulting from plant operations. (There would be no disproportionately high and adverse health and environmental impacts to minority or low-income populations within 50 miles via soil, water, or air pathways.)	N/A	No mitigation would be required.
	Potential socioeconomic impacts to minority or low-income populations resulting from plant operations. (There would be no disproportionately high and adverse socioeconomic impacts to minority or low-income populations from operations-related activities. Because portions of commuting routes are located within minority/low-income areas, these populations would experience increased traffic from normal operations and scheduled outages.)	N/A	No mitigation beyond road improvements installed during construction would be required.

Table 5.10-1 (Sheet 17 of 17)
Summary of Potentially Adverse Impacts of Operation

Reference Section	Description of Potential Impact	Significance of Impact[a]	Planned Control Program
5.9 Decommissioning			
	Potential impacts from decommissioning the plant. (The decommissioning of a nuclear facility generally has a positive environmental impact, relative to the impacts occurring during operations. In many instances, the environmental impacts resulting from the activities associated with decommissioning are expected to be substantially smaller than those of power plant construction or operation.)	S	Mitigation measures from the operations phase that are applicable to decommissioning would be applied (e.g., radiological control practices).
5.12 Nonradiological Health Impacts			
	Potential nonradiological health impacts from plant operations. (The estimated cases of recordable occupational injuries and illnesses for the onsite worker population of Units 6 & 7 based on U.S., Florida, and Units 3 & 4 incident rates are 25, 31, and 4, respectively.)	[b]	Implement existing Turkey Point industrial safety program at Units 6 & 7.

(a) The assigned significance levels ([S]mall, [M]oderate, or [L]arge) are based on the assumption that for each impact, the associated proposed mitigation measures and controls (or equivalents) would be implemented (10 CFR Part 51, Appendix B, Table B-1, Footnote 3.) Note, for those categories where there is no potential impact and thus no significance of impact, none, is assigned as the significance level.
(b) Impact is potential and estimates are based on national and Florida rates; therefore, impact severity was not assigned.

IWW = Industrial Wastewater
N/A = Not applicable
SWPPP = Stormwater Pollution Prevention Plan
USACE = United States Army Corp of Engineers

5.11 CUMULATIVE IMPACTS RELATED TO STATION OPERATION

This section describes cumulative adverse impacts to the region's environment that could result from the operation of Units 6 & 7. A cumulative impact is defined in Council of Environmental Quality regulations (40 CFR 1508.7) as an "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

To determine cumulative impacts, the impacts of the operation of Units 6 & 7, as described in Chapter 5, were combined with other past, present, and reasonably foreseeable future actions at and near Turkey Point that would affect the same resources, regardless of what agency (federal or nonfederal) or person undertakes such other actions. The cumulative impacts described in this section are those expected to overlap with the impacts of operation of the new units as a result of timing and geographic area. The geographic area that was used when considering cumulative impacts for the various resource areas is found in Table 5.11-1. Not all the impacts of operation of the new units would be cumulative with other past, present, and reasonably foreseeable actions. In addition, the impacts of operation of the new units were based on existing environmental conditions, so the operations impact analyses have already accounted for present actions when the existing state of the resource is used as a comparison for impacts. For example, impacts analysis for water quality and aquatic ecology resources use existing conditions as the baseline for determining impacts. The baseline accounts for the discharges to surface and groundwater from the past as well as the present since discharges directly influence water quality parameters. The aquatic ecology resources baseline would account for past and present actions that play a role in the vitality of aquatic populations and their habitat's ability to sustain a viable population.

With regard to the timing consideration for cumulative impacts from operations, this analysis considers operations impacts from 2022 to the foreseeable future since the time frame for cumulative impacts analysis for construction (Section 4.7) extends to the end of construction activities at Unit 7 in 2022.

During the process of identifying potential projects that could contribute cumulative impacts, a detailed search was conducted for all federal, non-federal and private actions within a 50-mile radius of Turkey Point Units 6 & 7 that had requested either an air or water permit/license or had an environmental impact statement completed. The search was accomplished by searching federal (e.g. USCOE, USGS), state (e.g. FDEP, FDOT), and local (e.g. M-D DERM) websites. The list was refined to projects that were within a 6-mile radius of Turkey Point Units 6 & 7, then within the required timeframe of operation activities of Turkey Point Units 6 & 7, excluding all brownfield and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites.

The timeframe for potential projects that could contribute to cumulative impacts was 2022 to 2063. This timeframe was determined from the schedule for Unit 6 operation activities beginning in the second quarter of 2022 through the initial 40 years license for Units 6 & 7, which would end in 2062 and 2063 respectively. Therefore, the time frame for on-going and future projects to be considered cumulative to those impacts from Units 6 & 7 operation activities is 2022 to 2063.

Other projects in the area considered for cumulative impacts but not retained for analysis are described in Table 5.11-2. Distances listed in Table 5.11-2 are from the Units 6 & 7 plant area unless otherwise noted.

A review of the adopted 2015–2025 Comprehensive Development Plan for Miami-Dade County indicates that land in the 6-mile vicinity, in unincorporated Miami-Dade County, would remain protected land, open land, park land, or agricultural and would not be subject to development. Land farther to the west in the urban areas of Homestead and Florida City had land use designations that would allow development in accordance with local zoning restrictions (MDC Oct 2009). However, given that the time frame for this cumulative impacts analysis is more than 10 years in the future, any information or plans for development in the urban areas would be too speculative for analysis.

5.11.1 LAND USE

As described in Subsection 2.2.1.2, current land use within 6 miles of Units 6 & 7 is described in Table 2.2-2. The vicinity includes areas that have the Land Use Designation “Environmental Protection” and “Open Land” in the Miami-Dade County Comprehensive Development Master Plan (CDMP). Biscayne National Park is northeast of the Turkey Point plant property. The city of Homestead’s Bayfront Park is adjacent to Biscayne National Park.

Most facilities associated with the operation of Units 6 & 7 would be contained in the Turkey Point plant property boundaries except for the reclaimed and potable water pipelines, the portion of the radial collector wells extending under Biscayne Bay, transmission corridors and substation modifications, and the roads improved for use during construction. The potable water and reclaimed water pipelines would follow existing rights-of-way except for areas near the Miami-Dade Water and Sewer Department South District Wastewater Treatment Plant and on the Turkey Point plant property near the FPL reclaimed water treatment facility. New transmission lines would follow existing power transmission corridors to the extent practicable. The laterals for the radial collector wells would be drilled horizontally from the plant property to positions below Biscayne Bay. These features are further described in Subsection 5.1.2. The radial collector wells and portions of the potable water pipelines, reclaimed water pipelines, and transmission corridors are in the 6-mile vicinity. The improved access road, SW 359th Street, would lie within an existing transmission right-of-way and the road improvements, SW 137th Avenue/Tallahassee Road and SW 117th Avenue, would be to existing roads to link to the access road.

Land would be permanently dedicated for Units 6 & 7 and associated infrastructure on the Turkey Point plant property. Additional land would be permanently dedicated for the right-of-ways for new transmission lines, substation modifications, and the reclaimed water and potable water pipelines. The new transmission lines, expanded substations, and the reclaimed water and potable water pipelines would use existing right-of-ways and disturbed areas to the extent practical and right-of-ways are compatible with many agricultural uses. The land use impact for the operation of Units 6 & 7 is described as SMALL in Section 5.1.

As indicated in Table 5.11-3, projects in the vicinity of Homestead and Florida City were considered for cumulative land use impacts. These projects include the continued operation of Units 1 through 5, the Units 3 & 4 Independent Spent Fuel Storage Facility (ISFSI), the Everglades Mitigation Bank (EMB), the INGENCO Resource Recovery Facility, the Homestead-Miami Speedway Improvement project, and the Comprehensive Everglades Restoration Plan (CERP) projects. None of these projects involve a change in land use or acreage during the operation of Units 6 & 7. Future urbanization in the area could contribute to additional decreases in open areas, forests, and wetlands and would generally result in some increase in residential and industrialized areas. Local land-use planning documents describe future construction of residential and commercial buildings (MDC Oct 2009). These urban development projects would have limited impacts on land use because a small incremental amount of land would be converted to a new land use. Overall, the cumulative impact from operation of Units 6 & 7 in conjunction with the projects described above would be SMALL.

Cumulative impacts to historical properties from these projects were also considered. The operation of these projects may potentially involve earth moving activities during maintenance. FPL will develop procedures addressing the inadvertent discovery of historical, cultural, or archaeological resources (Subsection 5.1.3). The operations activities for the CERP projects are overseeing and maintaining pump stations and stormwater treatment impoundments. These operations would likely employ few workers and operations activities are unlikely to impact historical properties outside of the Biscayne Bay Coastal Wetlands (BBCW) project's (Phase 1) objective of positively impacting the Deering Estate by restoring wetlands on this historical property (URS Sep 2006). No impact to historical properties from operation of Units 6 & 7 is anticipated. (Subsection 5.1.3). Given that the other projects considered for cumulative impacts are unlikely to have a significant impact to historical properties, no cumulative impact to historical properties is anticipated.

5.11.2 HYDROLOGY AND WATER USE

5.11.2.1 Surface Water

As described in Section 5.2, Units 6 & 7 would have two sources of makeup water for plant operations and receive potable water from Miami-Dade County for domestic uses. The sources of makeup water for plant operations would be reclaimed water from Miami-Dade County, via reclaimed water pipelines that would be installed during the construction phase, and water collected in the radial collector wells under Biscayne Bay, where groundwater and the waters of Biscayne Bay are hydrologically connected. Cumulative impacts of using Miami-Dade public water supplies for domestic uses at Units 6 & 7 are considered as a component of overall socioeconomic impacts (Subsection 5.11.4).

Operation of the radial collector wells installed beneath Biscayne Bay would cause a SMALL impact on local hydrology and water use. Based on groundwater modeling, the radial collector wells would be recharged at a rate ranging from approximately 95 to 99 percent (118.2 mgd to 123.2 mgd) from Biscayne Bay. This would be predominately localized in the area of the radial collector wells. The remaining recharge would be from groundwater beneath the plant property. The amount of saltwater used (up to 124.4 mgd if 100 percent saltwater) compared to the size of the saltwater resource available would be insignificant. Impacts to Biscayne Bay surface waters would be SMALL and would not require mitigation. A minimal change in water level elevation would occur.

Operation of Units 6 & 7 would involve cooling towers. The cooling canals of the industrial wastewater facility would be impacted by salt deposition from operation of the Units 6 & 7 cooling towers as described in Subsection 5.3.3. However, the cooling canals already have a high salinity level. Impacts on the American crocodile in the industrial wastewater facility would be mitigated through the existing management/conservation plan that implements measures to protect hatchlings that are more vulnerable to the salinity level. The uprated Units 3 & 4 would have an increased thermal discharge into the cooling canals of a maximum of 2.5°F and would increase salinity by 6 percent. However, the increased temperature and salinity would not adversely impact the thriving American crocodile population. With continued implementation of the management/conservation plan, the cumulative impact on the cooling canals of the industrial wastewater facility would be SMALL.

Cumulative impacts on Biscayne Bay from operation of the radial collector wells and the other projects in the immediate vicinity were considered. The CERP projects would rehydrate wetlands that provide water flow into Biscayne Bay, positively impacting Biscayne Bay. EMB also positively impacts Biscayne Bay by preserving wetlands that provide water flow into Biscayne Bay. Other projects identified in Table 5.11-2 would have no impact on Biscayne Bay. The impact on Biscayne Bay from operation of the radial collector wells would be SMALL (Section 5.1). Therefore, the cumulative impact on Biscayne Bay would be SMALL.

5.11.2.2 Groundwater

As stated above, the operation of Units 6 & 7 would use radial collector wells installed under Biscayne Bay as a makeup water source. Water withdrawals would be a maximum of 86,400 gpm (Section 3.3). The impact of this water withdrawal would be SMALL.

Operation of Units 6 & 7 would also involve injection of plant cooling water and process wastewater into the Boulder Zone of the lower Floridan aquifer via deep injection wells. The operation of these wells is presented in Section 5.2.

Cooling water for Unit 5 and process water for Units 1, 2, and 5 is obtained from the Upper Floridan aquifer (Subsection 2.3.2.2.2.1). The Biscayne aquifer is currently being used for disposal of treated domestic wastewater from the Units 3 & 4 wastewater treatment plant (Subsection 2.3.2.2.2.1). For the new units, sanitary treatment would be provided by a packaged sanitary treatment plant located on the Units 6 & 7 plant area. The sanitary treatment plant would be designed to process sanitary effluent from Units 1 through 7. Units 6 & 7 operations would not lead to cumulative impacts to groundwater resources associated with the existing units, because the uses do not overlap.

The projects described in Table 5.11-3 were considered for cumulative impacts to groundwater. The EMB and CERP projects would not withdraw groundwater and would not have wastewater injection wells. However, the wetland preservation/restoration activities that are included in these projects would likely have a positive impact on groundwater resources since they would promote recharge to groundwater rather than runoff. Other projects identified in Table 5.11-2 would have little to no impact on groundwater resources.

Considering the impact from the radial collector wells and the impacts to groundwater resources from the projects described in Table 5.11-3, the cumulative impact to groundwater resources would be SMALL.

5.11.2.3 Water Quality

Subsection 5.2.3 describes water quality impacts from the operation of Units 6 & 7. The use of environmental best management practices along with a spill prevention plan would prevent or minimize the potential impacts of any releases to the environment. Surface water flow for the existing and new units would primarily be to the cooling canals of the industrial wastewater facility, which would limit impacts to offsite areas. The cumulative impacts to the cooling canals of the industrial wastewater facility are described in Subsection 5.11.2.1.

The non-Turkey Point projects considered for cumulative impacts, CERP projects and EMB, would not withdraw water from surface water or groundwater sources. The CERP projects would provide stormwater treatment to minimize negative impacts to waters ultimately receiving the treated stormwater, such as the Biscayne Bay and underlying groundwater. Therefore, adverse impacts to surface water or groundwater resources from these projects are not expected. With the determination that the non-Turkey Point projects would not contribute to cumulative impacts to surface water quality, the cumulative impact to surface water quality would stem from the cumulative impacts to the cooling canals of the industrial wastewater facility. The cumulative impact would be SMALL.

As a result of the encroachment of saltwater into the aquifer approximately 6 to 8 miles landward from the coast, groundwater in the vicinity of the Turkey Point plant property is not used as a source of drinking water (Subsection 2.3.1). Impacts to groundwater resources with respect to water quality resulting from the operation of the radial collector well laterals installed beneath Biscayne Bay are described in Subsection 5.2.3.2.3 as SMALL.

Wastewater from the operation of Units 6 & 7, including blowdown, would be injected into the Boulder Zone of the Floridan aquifer via deep injection wells. The FDEP permitting process for injection well permits would be followed, including monitoring requirements for groundwater quality and groundwater elevation data in overlying aquifers. The impact to groundwater resources from this wastewater injection was characterized as SMALL (Subsection 5.2.1.1.9).

Considering that the existing units use of groundwater does not overlap with the uses for operation of Units 6 & 7 (Subsection 5.11.2.2) and that the non-Turkey Point projects would have positive impacts to water quality, cumulative impacts to groundwater quality would not result.

5.11.3 ECOLOGY (TERRESTRIAL AND AQUATIC)

5.11.3.1 Terrestrial

The projects described in Table 5.11-2 that are in the immediate vicinity of the Turkey Point site were considered for cumulative impacts to terrestrial resources. The CERP projects and EMB have positive impacts to terrestrial ecology by restoring and maintaining wetlands allowing plants and animals that depend on wetlands to thrive. Similarly, additional land acquisition and continued conservation activities at the various nature preserves and parks in the area would have positive impacts to terrestrial ecology by preserving natural habitats. Operation of the existing Turkey Point facilities (additional description of Units 3 & 4 uprate below) are subject to management/conservation plans designed to protect important species with particular focus on the threatened American crocodile (Subsection 2.4.1). As described in Subsection 2.4.1, Turkey Point's conservation efforts have contributed to the increase in population of the American crocodile. In addition, other species of special concern are protected with project-specific management plans (Section 4.3). For example, U.S. Fish and Wildlife Service guidelines for the protection of the Eastern indigo snake during construction projects were incorporated into the conservation/management plan for the Unit 5 Expansion Project.

As presented in Subsection 5.11.2.1, the cooling canals of the industrial wastewater facility would experience a cumulative impact from salt deposition from operation of the Units 6 & 7 cooling towers and discharges from the uprated Units 3 & 4 that would increase temperature and saline levels. However, the increased temperature and salinity attributable to the uprated Units 3 & 4 are not anticipated to adversely impact the thriving American crocodile population and salt deposits from the Units 6 & 7 cooling towers into the cooling canals also would not impact salinity levels sufficiently to impact existing crocodile growth and/or survival rates (Subsection 5.3.3).

The impacts to terrestrial ecological resources from operation of the Units 6 & 7 cooling water system and operation and maintenance of the transmission line and pipeline corridors are characterized as SMALL, and SMALL to MODERATE. The impacts to terrestrial resources from the projects considered for cumulative impacts would have a SMALL adverse contribution to cumulative impacts or have a beneficial impact. The overall cumulative impact would be SMALL to MODERATE.

5.11.3.2 Aquatic

The impact to aquatic resources from the operation of Units 6 & 7 was characterized as SMALL in Section 5.3. This SMALL impact along with the projects described above was considered for cumulative impacts to aquatic ecological resources. The CERP projects and EMB would have positive impacts to aquatic ecology by restoring and maintaining wetlands allowing plants and aquatic organisms that depend on wetlands to thrive. As presented above in Subsection 5.11.3.1, the cooling canals of the industrial wastewater facility could experience a cumulative impact from Units 6 & 7 and the uprated Units 3 & 4. As stated in Subsection 5.3.1.2, the fish and aquatic invertebrate species that occur in the cooling canals of the industrial wastewater facility are ubiquitous pioneer species with broad physiological tolerances for salinity and temperature extremes. However, this cumulative impact to the cooling canals of the industrial wastewater facility would have a negligible impact on aquatic biota and would not adversely impact the thriving American crocodile population. The cumulative impacts to aquatic resources would be SMALL.

5.11.4 SOCIOECONOMIC RESOURCES

Impacts to socioeconomic resources stem from the demands placed on the region by the workforce. The facilities and projects described in Table 5.11-2 were considered for their potential to result in cumulative socioeconomic impacts. Because the socioeconomic analysis presented in Subsection 5.8.2 uses existing socioeconomic conditions and forecasts based on existing conditions as a baseline, the impacts of the existing facilities (with the exception of outages) have already been accounted for in the operational impact analysis which concluded that impacts would be SMALL with the exception of transportation, which would be MODERATE.

The projects described in Table 5.11-3 would have no or few workers, which would have a negligible socioeconomic impact. The Units 3 & 4 uprate would lead to greater revenues as a result of the sale of the additional electricity and thus lead to increased corporate taxes. As described in Subsection 5.8.2.2, for every $1 million of net taxable revenues, FPL may pay $55,000 in corporate income tax, which represents an increase of 0.002 percent more than Florida's 2007 corporate income tax revenues. The restored and preserved wetlands of the CERP projects and the EMB would have socioeconomic benefits to the area that are difficult to quantify. The more tangible socioeconomic benefits would include any taxes paid by FPL and other property owners on the compensation paid to the few employees that perform maintenance and monitoring.

In addition to normal operations at the existing units, the nuclear-generating units, Units 3 & 4, would also have periodic outages. With outages occurring at all four nuclear units, the frequency of the temporary impacts from outages would increase. These additional workers (approximately 600 workers for Units 6 & 7) could temporarily increase traffic and housing demand. In addition, there could be temporary and short-term job opportunities for lodging and restaurant workers to serve the outage workforce, along with SMALL and positive impacts to motels, restaurants, retailers, and other businesses patronized by the outage workers.

Given the socioeconomic impacts from the operation of Units 6 & 7 and the other projects considered for cumulative impacts, the cumulative impact to socioeconomic resources would be SMALL with the exception of transportation which would be MODERATE.

An assessment of environmental justice impacts for the operation of Units 6 & 7 concluded that impacts from operations-related activities to minority or low-income populations would, with the exception of transportation, reflect impacts to the general population. Operations and outage activities could cause traffic congestion along several of the main routes to the Turkey Point plant property. These routes travel through minority and/or low-income areas. As stated above, the traffic congestion assessment accounted for the existing units. The outage workforce for Units 3 & 4 averages 600 to 900 workers and would not be concurrent. The potentially larger outage workforce (600 workers for Units 6 & 7 and up to 900 for Units 3 & 4) could increase the traffic on outage days. Therefore, the cumulative impacts to transportation would be MODERATE and cumulative impacts to environmental justice with regard to transportation would also be MODERATE.

5.11.5 ATMOSPHERIC AND METEOROLOGICAL

Impacts to air quality would result from equipment associated with plant auxiliary systems (e.g., diesel generators, diesel-driven fire pumps). Emissions of criteria pollutants from Units 6 & 7 would be from fossil-fired equipment, as presented in Subsection 5.5.1.3. Because such equipment would be operated infrequently and usually for short periods of time, they would have a SMALL impact to air quality.

As described in Subsection 2.7.2.2, the impact of existing unit operations on air quality conditions at the nearby Florida Everglades Class I Area can be gauged on the basis of air quality monitoring data collected by the National Park Service at the Florida Everglades air quality monitoring station. The National Park Service reported that, based on data collected during the period 1996 through 2005, the trend in National Ambient Air Quality Standards pollutant concentrations during the period was that of a steady-state (Subsection 2.7.2.2).

The uprate project for Units 3 & 4 and Units 3 & 4 ISFSI would not lead to an increase in air pollutants, and the CERP projects and EMB would not have air release, except possibly from the occasional maintenance vehicle. Operation of the INGENCO Resource Recovery Facility would result in criteria pollutant emissions. However, the Florida Department of Environmental Protection (FDEP) concluded that emissions from the INGENCO Resource Recovery Facility would not significantly contribute to, or cause a violation of, any state or federal ambient air quality standards and the INGENCO Resource Recovery Facility's impact on the Everglades Class I area is less than significant (M-D DERM Mar 2010). Therefore, the air pollutants that would be attributable to these projects would have a SMALL impact to air quality and the cumulative impact to air quality would be SMALL.

Operation of the Units 6 & 7 cooling towers would result in plumes, salt deposition, and noise that would have a SMALL impact to atmospheric conditions. The plumes would remain primarily on the Turkey Point plant property. The shadowing and precipitation associated with the plumes would take place primarily onsite (Subsection 5.3.3.1). Modeling predicts maximum salt deposits (105 kg/ha/month) near the makeup water reservoir of the Units 6 & 7 plant area, and salt deposition of 10 kg/ha/month would generally be confined to the Turkey Point plant property and the industrial wastewater facility, with the exception of the southeastern perimeter of the plant property. Additionally, the estimated noise level associated with the Units 6 & 7 cooling towers would drop below 60 to 65 dBA, the level the NRC considers of SMALL significance, at a distance of 500 feet from the cooling towers as a result of attenuation (Subsection 5.3.3). The uprate project for Units 3 & 4, Units 3 & 4 ISFSI, CERP projects and EMB would not have an impact on atmospheric conditions. The Unit 5 cooling tower has plumes that remain primarily on the Turkey Point plant property with shadowing, precipitation, and fogging also staying primarily on the plant property. The salt deposits from the Unit 5 cooling tower would be a maximum average of 6.34 kg/ha/month at 200 meters. Therefore, the cumulative impact to atmospheric conditions would be SMALL.

5.11.6 RADIOLOGICAL

For the purposes of this analysis, the region of interest is the area within the 50-mile radius of the Turkey Point site. The region of interest includes the existing Units 3 & 4, the Units 3 & 4 ISFSI, and a number of hospitals and industrial facilities that use radioactive materials. There are no other new nuclear facilities planned within 50 miles of the site. Because the analysis of radiological impacts presented in Subsection 5.4 uses existing conditions as a baseline, the impacts of the existing facilities have already been accounted for in the operational impact analysis.

Units 6 & 7 would release small quantities of radioactivity to the environment through both permissible liquid and gaseous releases. The permissible liquid releases would be released into deep injection wells approximately 2900 feet underground. Based on a receptor analysis and liquid exposure dose modeling, the predicted doses from radioactive liquid effluent disposal would be negligible. The existing nuclear units, Units 3 & 4, release small quantities of radioactivity. A small radiological dose would be attributable to the Units 3 & 4 ISFSI. Table 5.4-4 shows that the maximum exposed individual doses are within the design objectives of 10 CFR Part 50, Appendix I. Table 5.4-5 shows that the total site doses from the two new units as well as the two existing nuclear units are within the regulatory limits of 40 CFR Part 190. Table 5.4-6 shows that collective doses from the new units to the population within 50 miles of the plant are extremely low compared to collective doses from natural background radiation.

The fuel cycle specific to Units 6 & 7 would contribute to the cumulative impacts of fuel production, storage, and disposal for nuclear units in the United States, but the impacts of the fuel cycle for Units 6 & 7 would be SMALL and the addition of the impacts of Units 6 & 7 would be a SMALL contribution to the cumulative impacts from the nation’s nuclear units. Fuel and waste transportation impacts from Units 6 & 7 would also be SMALL, and would be a minor increase to the cumulative impacts of transportation of nuclear reactor fuel.

5.11.7 WASTE

Units 6 & 7 would generate radioactive and nonradioactive wastes as described in Sections 3.5, 3.6, and 5.5 and implement waste minimization programs and recycling opportunities whenever feasible. The waste management impacts of Units 6 & 7 wastes were characterized as SMALL. The existing units generate nonradioactive wastes that would be disposed of in waste management facilities. In addition, Units 3 & 4 also generate radioactive wastes. Other projects identified in Table 5.11-2 would only generate small quantities of nonradioactive wastes.

Miami-Dade County operates one of the nation's largest integrated solid waste disposal systems, consisting of the Resources Recovery waste-to-energy facility, the North Dade Landfill (a trash-only facility), and the South Dade Landfill (a garbage and trash facility) (MDC 2008). The County managed 3.8 million tons of solid waste in 2008 (FDEP Aug 2010a). The cumulative waste management impact to the waste management facilities in the area would be SMALL.

The radioactive waste generated by Units 6 & 7 as well as Units 3 & 4 would be disposed of in a permitted disposal facility such as a facility in Clive, Utah, that accepts waste from all states. This facility accepts low-level and mixed radioactive wastes. The facility disposed of 3.9 million cubic feet of low-level waste in 2005 (NRC Mar 2007) and the mixed LLW disposal area is 963,020 cubic yards with additional land for development of future mixed LLW disposal cells (UDEQ May 2005). The cumulative impact from management of low-level and mixed radioactive wastes would be SMALL.

5.11.8 HUMAN HEALTH

The potential impacts to human health from the operation of Units 6 & 7 concern etiological agents promoted by thermal discharge (Subsection 5.3.4), electric shock hazards posed by transmission lines (Subsection 5.6.3), and occupational health hazards (Section 5.12). The potential impacts from these sources were SMALL. The existing units also pose risks to human health. The risk posed by exposure to etiological agents at the existing units is SMALL. The occupational hazards are applicable to workers and not the public. Occupational injury rates at Turkey Point are well below the state and national rates (Section 5.12). Activities associated with operation of projects identified in Table 5.11-3 would also carry a small occupational risk. The potential impact to human health as a result of electrical shock from transmission lines to the public is SMALL. The cumulative potential impact to human health would be SMALL.

5.11.9 SUMMARY

Cumulative impacts associated with land use, hydrology and water use, ecology, socioeconomics, air quality, radiological release, waste, and human health from the operation of Units 6 & 7 along with operation of the existing units, the Units 3 & 4 uprate, the Units 3 & 4 ISFSI, EMB, and CERP projects were assessed. The adverse cumulative impacts are summarized in Table 5.11-3.

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Table 5.11-1
Geographic Areas Used in Cumulative Analysis

Resource/Impact	Geographic Area
Land Use	Homestead and Florida City area
Hydrology & Water Use	Surface Water: Surface water at, adjacent to, or downstream of the Turkey Point plant property and offsite areas Groundwater: Biscayne aquifer underlying south Miami-Dade County and the Floridan aquifer
Ecology	Terrestrial: immediate surrounding area Aquatic: Surface water to the north of the Turkey Point plant property encompassing the reclaimed water and potable water pipelines and to the west to U.S. Highway 1 and the downstream points from the Turkey Point plant property (i.e., Biscayne Bay and Card Sound)
Socioeconomics	Local: Homestead and Florida City area Regional: within a 50-mile radius of the Units 6 & 7 project area
Atmospheric and Meteorological	Within a 50-mile radius of the Units 6 & 7 project area
Radiological	Members of the public within a 50-mile radius of the Units 6 & 7 project area
Waste	Nonradiological: Miami-Dade County Radiological: United States
Human Health	Workers and public within a 50-mile radius of the Units 6 & 7 project area

Table 5.11-2 (Sheet 1 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Energy Projects					
FPL - Cutler Power Plant	Two-unit, 205-MW gas- and oil-fired plant	14 miles northeast of Turkey Point site	Operational	M-D DERM Feb 2009	No
FPL - Lauderdale Power Plant	Two-unit, 884-MW gas- and oil-fired plant	45 miles northeast of Turkey Point site	Operational	BCEPGMD Jan 2009	No
FPL - Port Everglades Power Plant	Four-unit, 1205-MW oil- and gas-fired plant	47 miles northeast of Turkey Point site	Operational	BCEPGMD Feb 2010	No
FPL - Turkey Point Power Plant	Five-unit, 3,220-MW power plant. Units 1 & 2 are oil- and gas-fired, Units 3 & 4 are nuclear, Unit 5 is gas-fired.	Turkey Point site	Operational	M-D DERM Mar 2009a	Yes
FPL - Turkey Point Power Plant Units 3 & 4 Uprate	The project will increase the net electrical generation for Units 3 & 4 by 104-MW each.	Turkey Point site	Proposed. Site Certification Application approved by FPSC in October 2008. Application to NRC submitted in 2010. Project completion expected 2nd quarter 2012.	FPL Jan 2008	Yes
Homestead City Utilities - Gordon W. Ivey Power Plant	16-unit, 60-MW oil-fired plant	9 miles northwest of Turkey Point site	Operational	M-D DERM May 2009a	No
INGENCO Resource Recovery Facility	24-unit, 8-MW landfill gas-fired power plant	6 miles northwest of Turkey Point site	Proposed. Draft Air Construction Permit issued March 2010	M-D DERM Mar 2010	Yes
Miami-Dade County Resource Recovery Facility	Four-unit 77-MW municipal solid waste-fired power plant	28 miles northwest of Turkey Point site	Operational	M-D DERM Mar 2008a	No
Wheelabrator South Broward, Inc. - Waste to Energy Facility	Three-unit 67.6-MW municipal solid waste-fired power plant	45 miles northeast of Turkey Point site	Operational	BCEPGMD Dec 2009a	No
Florida Gas Transmission Company Phase VIII Expansion Project	The FGT pipeline will be 6.5 miles long and parallel existing FGT pipelines and FPL transmission lines.	The pipeline will be installed along SW 97 Avenue north of Turkey Point and travel south toward Turkey Point site.	Proposed. The pipeline is planned to be in service in 2010 to 2011	FGT Sep 2008	No

Table 5.11-2 (Sheet 2 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Transportation Projects					
Dade-Collier Training and Transition Airport	Precision instrument landing and training facility for commercial and general aviation.	46 miles northwest of Turkey Point site	Operational. Future development unlikely.	FDOT 2009	No
Fort Lauderdale/ Hollywood International Airport	Full service airport - commercial airlines, air cargo, and general aviation	46 miles northeast of Turkey Point site	Operational. Expansion and construction would occur in the future, as described in state and local planning documents.	FDOT 2009	No
Homestead Air Reserve Base Airport	Military airfield that is the home station to F-16C and F-15A aircraft.	5 miles northwest of Turkey Point site	Operational. Limited development is likely within property.	DOD Oct 2007	No
Homestead General Aviation Airport	General aviation airport.	15 miles northwest of Turkey Point site	Operational. Limited expansion would occur in the future, as described in planning documents.	FDOT 2009	No
Kendall-Tamiami Executive Airport	General aviation airport.	17 miles northwest of Turkey Point site	Operational. Limited expansion would occur in the future, as described in planning documents.	FDOT 2009	No
Miami International Airport	Full service airport - commercial airlines, air cargo, and general aviation. Third busiest international passenger airport in the U.S.	26 miles north of Turkey Point site	Operational. Completion of the $6.2 Billion Miami Intermodal Center capital improvement program expected in 2011.	FDOT 2009	No
North Perry Airport	General aviation airport.	40 miles north of Turkey Point site	Operational. Expansion and construction would occur in the future, as described in state and local planning documents.	FDOT 2009	No
Opa Locka Executive Airport	General aviation and reliever airport for Miami International. The airport is also home to a U.S. Coast Guard Air/ Sea Rescue Station.	33 miles north of Turkey Point site	Operational. Limited expansion would occur in the future, as described in state and local planning documents.	FDOT 2009	No

Table 5.11-2 (Sheet 3 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Port Everglades	Large full-service deepwater seaport. Florida's main seaport for receiving petroleum products. Current annual throughput of 21.2 million tons of cargo and 128.8 million barrels of petroleum products. Cruise terminal serves 3.1 million passengers annually.	48 miles northeast of Turkey Point site	Operational. Port expansion, dredging, and construction would occur in the future, as described in state and local planning documents.	FSTEDC Mar 2010	No
Port of Miami	Large full-service deepwater seaport. Current annual cargo throughput of 6.8 million tons. Cruise terminal serves 4.1 million passengers annually.	26 miles northeast of Turkey Point site	Operational. Port expansion, dredging, and construction would occur in the future, as described in state and local planning documents.	FSTEDC Mar 2010	No
Port of Miami Tunnel & Access Improvement Project	The project will improve access to and from the Port of Miami, serving as a dedicated roadway connector linking the Port with the MacArthur Causeway (SR A1A) and I-395. The project consists of three primary components: widening of the MacArthur Causeway Bridge; tunnel connections between Watson Island and Dodge Island (the Port of Miami); and connections to the Port of Miami roadway system.	26 miles northeast of Turkey Point site	Planned. Construction began in July 2010 and the project could be operational by 2014.	FHWA Undated, Wallis Jul 2010	No
SR826/SR836 Interchange Reconstruction	The project involves a major upgrade to the interchange. Capacity improvements include the reconstruction and widening along both SR826 (Palmetto Expressway) and SR836 (Dolphin Expressway), construction of a four-level interchange, and modifications of the Flagler Street/SR826 and the Milam Dairy Road/NW 72nd Avenue/SR836 interchanges.	26 miles north of Turkey Point site	Planned. Construction began in October 2009 and is scheduled to be completed by late 2014	FHWA Undated	No

Table 5.11-2 (Sheet 4 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Tampa – Orlando – Miami High-Speed Intercity Passenger Rail	This project would provide high-speed rail service from Tampa to Miami (through Orlando) with stops in West Palm Beach and Ft. Lauderdale. The termini for Orlando -Miami corridor are the Orlando International Airport (OIA) and the Miami Intermodal Center at the Miami Airport (MIA).	26 miles north of Turkey Point site	Proposed. Phase 1 (Tampa-Orlando corridor) is ongoing. Project development for Phase 2 (Orlando-Miami corridor) began in May 2010.	FDOT May 2010	No
Parks and Nature Preserve Facilities					
Big Cypress National Preserve	Over 729,000 acres of valuable habitat for a variety of threatened and endangered species, including the Florida panther, West Indian manatee, red cockaded woodpecker, and wood storks. Public recreational activities include bird watching, camping, canoeing, bicycling, off road vehicles, hunting, hiking, and wildlife observation.	44 miles northeast of Turkey Point site	Development limited within property.	NPS Jun 2009	No
Bill Baggs Cape Florida State Park	The upland areas of Cape Florida have undergone a phenomenal transformation since Hurricane Andrew in 1992. Native plant communities have been recreated through continuous staff and volunteer efforts of planting and exotic plant eradication and control. About three miles beach and shoreline are the main attraction for the majority of the park visitors and provides opportunities for picnicking, swimming, bicycling, fishing, primitive camping and nature appreciation.	20 miles north of Turkey Point site	Development limited within property.	FDEP Mar 2001	No

Table 5.11-2 (Sheet 5 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Biscayne National Park	A meld of four distinct ecosystems (mangrove forests, Biscayne Bay, Florida Keys islands, and coral reefs) supporting diverse wildlife including threatened and endangered species such as the West Indian manatee, eastern indigo snake, piping plover, American crocodile, peregrine falcon, Schaus' swallowtail butterfly, least tern, and five species of sea turtle. Public recreational activities include picnicking, hiking, wildlife watching, snorkeling, scuba diving, canoe/ kayaking, and fishing.	Adjacent to eastern edge of Turkey Point site	Development likely limited within property.	NPS Jul 2010a	No
Crocodile Lake National Wildlife Refuge	The Refuge covers 6,700 acres of land, including 650 acres of open water. It contains a mosaic of habitat types, such as tropical hardwood hammock, mangrove forest, and salt marsh. These habitats are vital for hundreds of plants and animals including six federally listed species. The refuge is closed to the public however there is an interpretive butterfly garden adjacent.	12 miles south of Turkey Point site	Additional land acquisition is planned. Development likely limited within property.	USFWS Feb 2006	No
Curry Hammock State Park	The 970 acres represents the remaining example of the natural communities of the Middle Florida Keys and contains tropical hardwood hammocks, salt marshes, and mangrove wetlands. Public recreation activities include swimming, hiking, canoeing/kayaking, and camping.	26 miles southwest of Turkey Point site	Additional 23 acre land acquisition is planned Development likely limited within property.	FDEP Feb 2005	No

Table 5.11-2 (Sheet 6 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Dagny Johnson Key Largo Hammock Botanical State Park	The 2,454 acres of park contain the largest intact West Indian hardwood hammock in the US harboring an extensive list of threatened and endangered plants and animals. In addition a very rare coastal rock barren community, a shoreline dominated by marine tidal swamps, and significant wetland habitat. Public recreation activities include hiking, picnicking, guided nature walks, and educational programs.	12 miles south of Turkey Point site	Development likely limited within property.	FDEP Sep 2004a	No
Everglades National Park	Primarily comprised of internationally important wetlands that cover 1,508,533 acres and are home to rare and endangered species such as the American crocodile, Florida panther, and West Indian manatee.	29 miles west of Turkey Point site	181,000 acres of additional land acquisition is proposed. Development likely limited within property.	NPS Jul 2010b, FNAI 2008, Thomas Reuters 2009	No
Florida Keys Wildlife and Environmental Area	An archipelago of small sites totaling 3,089 acres containing some of the best examples of tropical hardwood hammocks remaining in Florida. These sites protect native plants and animals, many of which are found nowhere else in the US. Recreational facilities or trails have are not developed in order to protect the sites' sensitive natural resources.	31 miles southeast of Turkey Point site	Development of facilities for public use is constrained by the presence of many unique plant and animal species.	USFWS Undated	No
Indian Key Historic State Park	The 110 acre property consists mostly of wetland and water areas that attract boaters for snorkeling and fishing activities. The ruins of the historic settlement on the island are available to the public via guided or self-guided tours.	43 miles southwest of Turkey Point site	Development of facilities for public use limited within property.	FDEP Jun 2000a	No

Table 5.11-2 (Sheet 7 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
John Pennekamp Coral Reef State Park	Submerged land covers over 98% of the 63,836 acres of the park. The water area contains the only living coral reef in the US and the land area consists of over 80,000 linear feet of shoreline with beaches and tropical hammocks. Public recreation activities include swimming, snorkeling, scuba diving, fishing, canoeing, glass bottom boat tours, hiking, camping, and nature appreciation.	17 miles south of Turkey Point site	Additional land acquisition is proposed. Development of facilities for public use limited within property.	FDEP Sep 2004b	No
John U. Lloyd Beach State Park	The park contains 311 acres on the Atlantic Ocean and Intercoastal Waterway and contains natural communities such as beach dunes, coastal strands, maritime hammocks, and tidal swamps. These provide habitat for 11 imperiled plant species and 20 imperiled animals. Public recreation facilities include two large beach use areas, seven large picnic pavilions, a two-lane boat ramp, a pavilion that provides nature study and environmental education opportunities, and a concession stand that provides; food services, and rentals.	47 miles north of Turkey Point site	Development of facilities for public use limited within property.	FDEP May 2001	No

Table 5.11-2 (Sheet 8 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Lignumvitae Key Botanical State Park	Lignumvitae Key is the only Florida Key that is still in its natural state and was chosen as the state's first botanical park. Its rare and delicate ecosystem primarily consists of subtropical hardwood hammock. The smaller island Shell Key is primarily a mangrove island and has been left undisturbed. Islands accessible only by private boat. Public recreation activities include boating, fishing, snorkeling, and diving.	42 miles southwest of Turkey Point site	Development of facilities for public use limited within property.	FDEP Dec 2000	No
Mary Krome Bird Refuge	2.5 acre preserve is bordered on two sides by avocado groves. Public recreation activities include bird and butterfly watching	10 miles northwest of Turkey Point site	Development unlikely in the future.	NABA Undated	No
Oleta River State Park	The park's 1.7 miles of the Oleta River and its associated mangrove wetlands are important habitat for many species The West Indian manatee and golden leather fern are among the 40 designated plant and animal species found in the 1033 acre park. Public recreation activities include picnicking, swimming, canoeing, fishing, bicycling/jogging, and primitive camping.	36 miles north of Turkey Point site	Development of facilities for public use limited within property.	FDEP Dec 2008	No
San Pedro Underwater Archaeological Preserve State Park	The 644 acre preserve consists of the 1733 shipwreck “San Pedro” surrounded by a ring of sandy substrate and seagrass beds. Public recreation activities include snorkeling, scuba diving, and glass bottom boat tours.	45 miles southwest of Turkey Point site	Development unlikely in the future.	FDEP Jun 2000b	No

Table 5.11-2 (Sheet 9 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
The Barnacle Historic State Park	The historic structures in this 9 acre park were built in the late 1800s and include a boat house, carriage house, and the Barnacle house which was originally built as a wooden bungalow four feet off the ground on pilings. About half of the surrounding land supports a tropical hardwood hammock. The primary public activity on the site is visiting the historic home and touring the grounds.	21 miles north of Turkey Point site	Development unlikely in the future.	FDEP Aug 2003	No
Windley Key Fossil Reef Geological State Park	While the upland area at the 32 acre park contains one of the finest hardwood hammocks in the Florida Keys, the park's main attraction is the fossil coral reef exposed by the keystone quarry operations. Public recreation activities include education and interpretation programs, hiking, and nature appreciation.	36 miles southwest of Turkey Point site	Development unlikely in the future.	FDEP May 2003	No
Everglades Mitigation Bank (EMB)	The EMB is a 13,249 acre site permitted by the state of Florida and the Army Corps of Engineers. The EMB consists of land located between U.S. Highway 1 and Card Sound Road and east of Card Sound Road extending to Card Sound, then north along the L-31E Canal. EMB activities would be in accordance with permit conditions.	Just southwest of the Turkey Point site and east of U.S. Highway 1.	Development unlikely in the future.	FDEP Oct 1996, FDEP Oct 2003, USACE and SFWMD Aug 2002	Yes

Table 5.11-2 (Sheet 10 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Comprehensive Everglades Restoration Plan (CERP) Projects					
Biscayne Bay Coastal Wetlands Project - Phase 1	The project would expand and restore wetlands adjacent to Biscayne Bay, and enhance the ecological health of Biscayne National Park. Phase 1 incorporates most of the Deering Estate features, including a spreader canal, culverts, and canal improvements. The Cutler Wetlands features include culverts, a canal and restoration of the Lennar Flow-way. The L-31E Flow-way/ North Canal Flow-way features include a spreader canal and several culverts.	1.5 miles west of Turkey Point site	Proposed. Design and permitting of Phase 1 completed. Construction of L-31E culverts and Deering Estates Flow-way began in 2010. Construction of Cutler Wetlands scheduled to begin in 2011.	SFWMD Jun 2010, USACE Jun 2010	Yes
Broward County Water Preserve Areas	Project serves as a seepage control buffer between developed urban areas and the Everglades. Components include: Water Conservation Areas 3A/3B Levee Seepage Management, C-11 Impoundment, and C-9 Impoundment.	37 miles north of Turkey Point site	Proposed. Basis of Design Report completed. Construction of C-11 Impoundment scheduled to begin in 2012.	SFWMD Jun 2010, USACE Nov 2009	No
C-111 Spreader Canal Western Project	The project would establish more natural water flows in Taylor Slough to improve the timing, distribution and quantity of fresh water flowing into Florida Bay.	6 miles southwest of Turkey Point site	Proposed. Design testing completed. Construction began in 2010.	SFWMD Jun 2010, USACE May 2009	Yes
Central Lake Belt Storage Area	The project would store excess water from Water Conservation Areas 2 and 3 and provide environmental water supply deliveries to Northeast Shark River Slough, Water Conservation Area 3B, and to Biscayne Bay.	30 miles north of Turkey Point site	Proposed. Currently in preconstruction design.	USACE Undated	No

Table 5.11-2 (Sheet 11 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Everglades National Park Seepage Management Project	Project to improve water deliveries to Northeast Shark River Slough and restore wetland in Everglades National Park by reducing levee and groundwater seepage and increasing sheetflow. There are three components: L-31N Levee Improvements for Seepage Management, S-356 Structure Relocation and Bird Drive Recharge.	22 miles northwest of Turkey Point site	Proposed. Construction scheduled to begin in 2014.	USACE Mar 2006, USACE Nov 2009	No
L-31N (L-30) Seepage Management Pilot Project	Project evaluates the uncertainty and constructability of seepage management technology for possible full-scale use along Everglades National Park.	19 miles northwest of Turkey Point site	Proposed. Project activities expected to be completed in 2012.	USACE Nov 2009	No
Melaleuca Eradication and other Exotic Plants	Project enhances efforts to control invasive exotic species in south Florida through mass clearing and controlled release of biological agents.	Throughout the region	Proposed. Project is scheduled to begin in 2011.	USACE Nov 2009	No
Miccosukee Tribe Water Management Plan	Project includes providing water storage capacity and water quality enhancement for Miccosukee Tribe's reservation discharge waters and conversion of 900 acres of tribally owned cattle pasture into a managed wetland retention/detention area.	45 miles northwest of Turkey Point site	Proposed. Currently in preconstruction design.	USACE Undated	No
North Lake Belt Storage Area	Project will include an in-ground storage reservoir with a total capacity of approximately 90,000 acre feet and associated canals, pumps, and water control structures. It will store a portion of the stormwater runoff from the C-6, C-11, and C-9 basins.	34 miles north of Turkey Point site	Proposed. Currently in preconstruction design.	USACE Undated	No

Table 5.11-2 (Sheet 12 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Restoration of Pineland and Hardwood Hammocks in C-111 Basin	This project includes restoring south Florida slash pine and hardwood hammock species on a 200-foot wide strip on each side of two miles (approximately 50 acres) of Florida SR 9336 and the establishment of two, one acre hammocks alongside the road. The project will provide water quality treatment for runoff passing through the hammocks and demonstrate techniques required to re-establish native conifer and hardwood forests.	14 miles west of Turkey Point site	Proposed. Currently in preconstruction design.	USACE Undated	No
South Miami-Dade Reuse	Project will include an expansion in the existing South District Wastewater Treatment Plant to provide additional water supply to the South Biscayne Bay and Coastal Wetlands Enhancement Project at sufficient quantity and water quality to meet the ecological goals and objectives of Biscayne Bay. This will require construction of a pretreatment and membrane treatment system.	6 miles north of Turkey Point site	Proposed. Currently in preconstruction design.	USACE Undated	Yes
Water Conservation Area 2B Flows to Everglades National Park	The project purpose is to store excess water from Water Conservation Area 2 in the Central Lake Belt Storage Area through control structures and conveyance features. Additionally, the project will supplement environmental water supply deliveries to North Shark River Slough, Water Conservation Area 3B and Biscayne Bay.	30 miles north of Turkey Point site	Proposed. Currently in preconstruction design.	USACE Undated	No

Table 5.11-2 (Sheet 13 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Water Conservation Area 3 Decompartmentalization and Sheetflow Enhancement Project	Construction of new water control structures and modification or removal of levees, canals, and water control structures in Water Conservation Areas 3A and 3B for reestablishment of the ecological and hydrologic connection with Everglades National Park.	25 miles northwest of Turkey Point site	Proposed. EIS currently being drafted.	USACE Nov 2009	No
West Miami-Dade Reuse	The project includes a wastewater treatment plant expansion of a future West Miami-Dade Wastewater Treatment Plant to meet water demands from the Bird Drive Recharge Area, South Dade Conveyance System, and Northeast Shark River Slough.	21 miles northwest of Turkey Point site	Proposed. Currently in pre-construction design.	USACE Undated	No
Modified Water Deliveries to Everglades National Park	Project restores the natural hydrologic conditions in Everglades National Park, which were altered by the construction of roads, levees, and canals. The project includes four major components: an 8.5 mile area flood mitigation, Tamiami trail modifications, conveyance and seepage control features, and a combined operation plan.	22 miles northwest of Turkey Point site	Proposed. Construction underway. Project Completion anticipated in 2013.	USACE Nov 2009	No
C-111 South Dade Project	Project enhances freshwater wetlands and improves freshwater flows in the Southern Glades and in southern Miami-Dade County. It improves the hydrology of the coastal marshlands of northeastern Florida Bay.	6 miles southwest of Turkey Point site	Proposed. Preliminary design of initial Phase completed. Project completion anticipated in 2014.	USACE Nov 2009	Yes

Table 5.11-2 (Sheet 14 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Mining Projects					
Card Sound Quarry	Crushed limestone mine	8 miles southwest of Turkey Point site	Operational	USGS 2005	No
Continental Florida Materials Pit #1	Crushed limestone mine	28 miles north of Turkey Point site	Operational	USGS 2005	No
F.E.C. Quarry	Crushed limestone mine	32 miles northwest of Turkey Point site	Operational	USGS 2005	No
Krome Quarry	Crushed limestone mine	21 miles northwest of Turkey Point site	Operational	USGS 2005	No
Lake 6 Quarry	Crushed limestone mine	33 miles north of Turkey Point site	Operational	USGS 2005	No
Miami Quarry	Crushed limestone mine	26 miles north of Turkey Point site	Operational	USGS 2005	No
Pennsuco Quarry	Crushed limestone mine	32 miles north of Turkey Point site	Operational	USGS 2005	No
S.C.L. Quarry	Crushed limestone mine	25 miles northwest of Turkey Point site	Operational	USGS 2005	No
Sawgrass Quarry	Crushed limestone mine	37 miles northwest of Turkey Point site	Operational	USGS 2005	No
Sunshine Rock Quarry	Crushed limestone mine	25 miles northwest of Turkey Point site	Operational	USGS 2005	No
White Rock Quarry	Crushed limestone mine	36 miles north of Turkey Point site	Operational	USGS 2005	No

Table 5.11-2 (Sheet 15 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Other Actions/Projects					
Central and Southern Florida Flood Control Project	The C&SF Flood Control Project was intended to provide flood control, water supply, prevention of saltwater intrusion, and protection of fish and wildlife resources. Today the CS&F project includes 1000 miles of canals, 720 miles of levees, and almost 200 water control structures. It covers 16 counties over an 18,000-square-mile area. The existing project provides water supply, flood protection, water management and other benefits to South Florida. The project has had unintended negative effects on the Everglades and the entire south Florida ecosystem.	Throughout the region.	Operational	HRA Jun 2006	No
Independent Spent Fuel Storage Facility for Turkey Point Power Plant Units 3 & 4	The Units 3 & 4 ISFSI will be a dry storage facility for spent nuclear fuel that would not have a liquid discharge and would only have limited operational activities.	Co-located on the Turkey Point site	Proposed. Facility currently under construction. Loading expected in 2011.	FDEP Jun 2009 FPL Nov 2010	Yes
AAR Landing Gear Center	Repair and rebuild aircraft landing gears and brakes.	30 miles northwest of Turkey Point site	Operational	M-D DERM Jul 2009	No
Aero Kool Corporation	Overhaul aircraft air cycle equipment and heat exchangers and operation of degreaser baths and paint booths	27 miles northeast of Turkey Point site	Operational	M-D DERM Feb 2006	No
American Whirlpool Products Corporation	Acrylic and fiberglass bath and spa manufacturer	43 miles northeast of Turkey Point site	Operational	BCEPGMD Dec 2003	No
Angler Boat Corporation	Fiberglass boat manufacturer	29 miles northeast of Turkey Point site	Operational	M-D DERM Dec 2006	No
Benada Aluminum of Florida Inc	Extruded aluminum products manufacturer	29 miles northeast of Turkey Point site	Operational	M-D DERM Mar 2006	No
Bertram Yacht Inc	Fiberglass boat manufacturer	26 miles northeast of Turkey Point site	Operational	M-D DERM Sep 2009	No
Blumberg Industries -Fine Art Lamps	Lamp manufacturer	33 miles northeast of Turkey Point site	Operational	M-D DERM Nov 2008	No

Table 5.11-2 (Sheet 16 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
CEMEX Miami	Cement kiln	25 miles northeast of Turkey Point site	Operational	M-D DERM Mar 2008b	No
Cigarette Racing Team LLC	Fiberglass boat manufacturer	32 miles northeast of Turkey Point site	Operational	M-D DERM Feb 2010	No
Contender Boats Inc	Fiberglass boat manufacturer	6 miles northeast of Turkey Point site	Operational	M-D DERM Aug 2008	No
DM Industries Ltd	Acrylic and fiberglass bath and spa manufacturer	34 miles northeast of Turkey Point site	Operational	M-D DERM Dec 2008	No
Dusky Marine Inc.	Fiberglass boat manufacturer	45 miles northeast of Turkey Point site	Operational	BCEPGMD Jun 2008	No
Dyplast Products, LLC	Polystyrene and polyurethane products manufacturer	32 miles northeast of Turkey Point site	Operational	M-D DERM Aug 2007	No
Eastern Aero Marine, Inc.	Inflatable vest and raft manufacturer	28 miles northeast of Turkey Point site	Operational	M-D DERM Jan 2010	No
Englehard Hex Core	Nomex honeycomb board, and fiberglass honeycomb board and rotor manufacturer	28 miles northeast of Turkey Point site	Operational	M-D DERM Sep 1999	No
Exteria Building Products, LLC.	Polypropylene siding manufacturer	35 miles northeast of Turkey Point site	Operational	M-D DERM Oct 2008, M-D DERM May 2009b	No
Flowers Baking Company of Miami	Commercial bread bakery	36 miles northeast of Turkey Point site	Operational	M-D DERM Mar 2009b	No
Goodrich Corporation Landing Systems Services	Landing gear refurbishing facility	35 miles northeast of Turkey Point site	Operational	M-D DERM May 2010	No
Homestead-Miami Speedway	The 1087 acre speedway hosts a wide variety of national, regional and local motorsport events, including the final races for all three NASCAR national championship series and two Indy Car championship series. The facility has seating capacity for 67,612 spectators.	5 miles northwest of Turkey Point site	Operational	HMS 2010	No

Table 5.11-2 (Sheet 17 of 17)
Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Turkey Point Site During the Construction Period (2022-2063)

Project Name	Summary of Project	Location	Status	Reference	Retained
Homestead-Miami Speedway Improvements.	This project would expand the spectator area to include 120 acres currently used for overflow parking add 12,000 spectator seats.	5 miles northwest of Turkey Point site	Proposed. If approved the project is scheduled to be completed in 2013.	HMS 2010	Yes
Media Printing Corporation	Commercial printer	29 miles northeast of Turkey Point site	Operational	BCEPGMD Dec 2009b	No
Miami Seaquarium	The 38-acre marine park is an entertainment venue that is dedicated to education, wildlife conservation and community involvement.	23 miles northeast of Turkey Point site	Operational	Miami Seaquarium 2009	No
Miami-Dade Water and Sewer Department - Alexander Orr Water Treatment Plant	Water treatment plant also operates a 150 tpd rotary lime kiln	19 miles northwest of Turkey Point site	Operational	M-D DERM Jul 2008	No
Miami-Dade Water and Sewer Department - Hialeah/ Preston Water Treatment Plant	Water treatment plant also operates a 120 tpd rotary lime kiln and 64 air stripping towers	28 miles northeast of Turkey Point site	Operational	M-D DERM Jan 2006	No
Midnight Express Powerboats	Fiberglass boat manufacturer	46 miles northeast of Turkey Point site	Operational	BCEPGMD Jun 2009	No
Ram Investments of South Florida - Sea Enterprise Adventures	Fiberglass boat manufacturer	28 miles northeast of Turkey Point site	Operational	M-D DERM Jun 2006	No
Titan America, LLC - Pennsuco Cement	Cement kiln	31 miles northwest of Turkey Point site	Operational	M-D DERM Sep 2008	No
US Foundry & Manufacturing Company	Gray iron foundry and cast iron products manufacturer	30 miles northwest of Turkey Point site	Operational	M-D DERM Apr 2010	No
Water Reclamation and Wastewater Treatment Plants	Numerous plants	Within 50 miles of Turkey Point site	Operational	FDEP Aug 2010a, FDEP Aug 2010b	No
Future Urbanization	Construction of housing units and associated commercial buildings; road, bridges, and rail; construction of water and/or wastewater treatment facilities and associated pipelines.	Throughout the region.	Construction would occur in the future, as described in state and local land-use planning documents.	MDC Nov 2007	No

Note: All the projects listed in the table would have impacts on land use, water use, ecology, and socioeconomics within the 50-mile radius of the Turkey Point Units 6 & 7 project.

Table 5.11-3 (Sheet 1 of 4)
Summary of Adverse Cumulative Impacts

Category	Description of Cumulative Impact	Potential Cumulative Impacts Significance
Land Use	1. Units 6 & 7 – land permanently dedicated 2. Existing units – none 3. Units 3 & 4 Uprate – none 4. Units 3 & 4 ISFSI – none 5. EMB – none 6. CERP Projects – none 7. INGENCO Resource Recovery Facility - none 8. Homestead-Miami Speedway Improvement Project - none	None
Historic Properties	1. Units 6 & 7 - none 2. Existing units – none 3. Units 3 & 4 Uprate – none 4. Units 3 & 4 ISFSI – none 5. EMB – none 6. CERP Projects – positive impact on Deering Estate 7. INGENCO Resource Recovery Facility - none 8. Homestead-Miami Speedway Improvement Project - none	None
Hydrology & Water Use	Surface water: 1. Existing units – cooling canals of the industrial wastewater facility 2. Units 3 & 4 Uprate – none 3. Units 3 & 4 ISFSI – none 4. EMB – none 5. CERP Projects – none Groundwater: 1. Units 6 & 7 – use of radial collector wells would be SMALL 2. Existing units – groundwater well withdrawals for non-potable water and single injection well, does not use same sources as new units 3. Units 3 & 4 Uprate – none 4. Units 3 & 4 ISFSI – none 5. EMB – none 6. CERP Projects – none	Surface water: SMALL Groundwater: SMALL

Table 5.11-3 (Sheet 2 of 4)
Summary of Adverse Cumulative Impacts

Category	Description of Cumulative Impact	Potential Cumulative Impacts Significance
Water quality	Surface water: 1. Units 6 & 7 – surface water runoff to cooling canals of the industrial wastewater facility, use of environmental best management practices, and spill prevention plan 2. Existing units – use of cooling canals of the industrial wastewater facility, use of environmental best management practices, and spill prevention plan 3. Units 3 & 4 Uprate – increase in temperature and salinity level in discharge 4. Units 3 & 4 ISFSI – none 5. EMB – none 6. CERP Projects – none	Surface water: SMALL
	Groundwater: 1. Units 6 & 7 – surface water runoff to cooling canals of the industrial wastewater facility, use of environmental best management practices, spill prevention plan, use of radial collector wells on groundwater resources would have a SMALL impact. 2. Existing units –use of environmental best management practices and spill prevention plan 3. Units 3 & 4 Uprate – none 4. Units 3 & 4 ISFSI – none 5. EMB – none 6. CERP Projects – none	Groundwater: SMALL
Terrestrial Ecology	1. Units 6 & 7 – potential impacts to cooling canals of the industrial wastewater facility from use of radial collector wells and salt deposition by cooling towers 2. Existing units – operate under management/conservation plans 3. Units 3 & 4 Uprate – increased thermal and salinity level content discharge to cooling canals of the industrial wastewater facility 4. Units 3 & 4 ISFSI – none 5. EMB – none 6. CERP Projects – positive	SMALL/MODERATE

Table 5.11-3 (Sheet 3 of 4)
Summary of Adverse Cumulative Impacts

Category	Description of Cumulative Impact	Potential Cumulative Impacts Significance
Aquatic Ecology	1. Units 6 & 7 – potential impacts to cooling canals of the industrial wastewater facility from use of radial collector wells and salt deposition by cooling towers 2. Existing units – none 3. Units 3 & 4 Uprate – increased thermal and salinity level content discharge to cooling canals of the industrial wastewater facility 4. Units 3 & 4 ISFSI – none 5. EMB – none 6. CERP Projects – positive	SMALL
Socioeconomic	1. Units 6 & 7 – operations workforce 806 2. Existing units – 600–900 outage workers 3. Units 3 & 4 Uprate – no workers, increased tax payments 4. Units 3 & 4 ISFSI – none 5. EMB – positive 6. CERP Projects - positive	SMALL to MODERATE Environmental Justice: None
Atmospheric and Meteorological	1. Units 6 & 7 – intermittent air pollutant releases from emergency equipment, plumes from cooling towers 2. Existing units – small air quality impact and plumes from Unit 5 cooling tower 3. Units 3 & 4 Uprate – none 4. Units 3 & 4 ISFSI – none 5. EMB – none 6. CERP Projects – none 7. INGENCO Resource Recovery Facility - small air quality impact from air pollutant releases during operation	SMALL
Radiological	1. Units 6 & 7 – releases to air within limits, water release only in deep injection wells 2. Existing units – within limits 3. Units 3 & 4 Uprate – none 4. Units 3 & 4 ISFSI – within limits 5. EMB – none 6. CERP Projects – none	SMALL
Waste	1. Units 6 & 7 – radiological and nonradiological solid waste 2. Existing units – radiological and nonradiological solid waste 3. Units 3 & 4 Uprate – none 4. Units 3 & 4 ISFSI – none 5. EMB – none 6. CERP Projects – none	SMALL

Table 5.11-3 (Sheet 4 of 4)
Summary of Adverse Cumulative Impacts

Category	Description of Cumulative Impact	Potential Cumulative Impacts Significance
Human Health	1. Units 6 & 7 – occupational risk 2. Existing units – occupational risk, injury rate below national and state rates 3. Units 3 & 4 Uprate – included with existing units 4. Units 3 & 4 ISFSI – included with existing units 5. EMB – occupational 6. CERP Projects – occupational	SMALL

CERP = Comprehensive Everglades Restoration Plan
EMB = Everglades Mitigation Bank
ISFSI = Independent Spent Fuel Storage Installation

5.12 NONRADIOLOGICAL HEALTH IMPACTS

5.12.1 PUBLIC HEALTH

Public health impacts from the operation of Units 6 & 7 are presented in Subsection 5.6.3 (from transmission line operation) and Subsection 5.8.1.

5.12.2 OCCUPATIONAL HEALTH

Units 3 & 4 have an industrial safety program and safety personnel to promote safe work practices and respond to occupational injuries and illnesses. The program addresses hearing protection, confined space entry, personal protective equipment, electrical safety, ladders, chemical handling, storage and use, and other industrial hazards. At Units 3 & 4, the training manager is responsible for ensuring workers are trained on these safety procedures. The effectiveness of this industrial safety program is reflected in a statistic known as total recordable cases (TRC). TRCs include work-related injuries or illnesses that include death, days away from work, restricted work activity, medical treatment beyond first aid, and other criteria. The average TRC incidence rate for the Units 3 & 4 workforce for 2004 through 2008 was 0.4 cases per 100 workers. This compares favorably to the nationwide rate for nonfatal occupational injuries and illnesses for electrical power generation workers of 2.7 per 100 workers (BLS 2008a) and to the rate of 2.8 per 100 workers for Florida for electrical power generation, transmission, and distribution (BLS 2008b).

To protect workers during operation of Units 6 & 7, an industrial safety program would be instituted that meets applicable federal and state safety requirements. It is estimated that 806 onsite workers would be needed to operate Units 6 & 7 (see Subsection 3.10.3). In addition, the number of outage workers is assumed to be approximately 600 per outage. Using the number of workers and TRC incidence rates, the number of TRCs per year for Units 6 & 7 can be estimated. The estimated TRC incidences are presented in Table 5.12-1. As indicated in Table 5.12-1, the annual estimate for injuries and illnesses at Units 6 & 7 is 3.1, well under the number that would be expected at an electric power generation facility based on national and state incident rates. The nationwide 2007 fatality rate for workers employed in the utility industry of 3.9 per 100,000 workers (BLS 2008c) was used to estimate fatalities at Units 6 & 7. The annual fatality estimate is 0.03 fatalities using the national rate. The TRC incidences occurring in the Units 3 & 4 workforce for 2004 through 2008 (the records used to estimate TRCs for Units 6 & 7) were all nonfatal. The industrial safety program instituted for Units 6 & 7 would be equally effective.

Section 5.12 References

BLS 2008a. Bureau of Labor Statistics, *Table 1. Incidence rates of nonfatal occupational injuries and illnesses, 2007*. Available at http://www.bls.gov/iif/home.htm, accessed March 27, 2009.

BLS 2008b. *Table 6. Incidence rates of nonfatal occupational injuries and illnesses by industry and case types, 2007, Florida*. Available at http://www.bls.gov/iif/home.htm, accessed March 26, 2009.

BLS 2008c. *Fatal Occupational Injuries, Employment, and Rates of Fatal Occupational Injuries by Selected Worker Characteristics, Occupation, and Industries*, 2007. Available at http://www.bls.gov/iif/home.htm, accessed March 27, 2009.

Table 5.12-1
Estimated Total Recordable Cases per Year

Number of Workers	TRC Incidence at US Rate	TRC Incidence at Florida Rate	TRC Incidence at Turkey Point Rate
Operations: 806	22	23	3.1
Outage: 600	1.3[(a)]	1.4[(a)]	0.19

a) Outage estimates are per 30-day outage.