United States Nuclear Regulatory Commission

Protecting People and the Environment

NUREG-2176, Vol. 2

Environmental Impact Statement for Combined Licenses (COLs) for Turkey Point Nuclear Plant Units 6 and 7

Final Report

Chapters 7 to 12

U.S. Nuclear Regulatory Commission
Office of New Reactors
Washington, DC 20555-0001

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Final Environmental Impact Statement for the Combined License (COL)
FOR THE TURKEY POINT NUCLEAR PLANT

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ABSTRACT

This environmental impact statement (EIS) has been prepared in response to an application submitted to the U.S. Nuclear Regulatory Commission (NRC) by Florida Power & Light Company (FPL) for two combined construction permits and operating licenses (combined licenses or COLs). The proposed actions related to the FPL application are (1) NRC issuance of COLs for two new power reactor units (Units 6 and 7) at the Turkey Point Nuclear Power Plant site in Miami-Dade County, Florida, and (2) U.S. Army Corps of Engineers (USACE) decision to issue, deny, or issue with modifications a Department of the Army (DA) permit to perform certain dredge and fill activities in waters of the United States and to construct structures in navigable waters of the United States related to the project. The NRC, its contractors, and USACE make up the review team. The National Park Service (NPS) is also a cooperating agency on this EIS but does not now have a request to take any specific regulatory action before it. Due to this unique set of circumstances, impact determinations made in this EIS should only be attributed to the review team. This EIS documents the review team's analysis, which considers and weighs the environmental impacts of constructing and operating two new nuclear units at the Turkey Point site and at alternative sites, including measures potentially available for reducing or avoiding adverse impacts.

The EIS includes an evaluation of the impacts of construction and operation of Turkey Point Units 6 and 7 on waters of the United States pursuant to Section 404 of the Clean Water Act and on navigable waters of the United States pursuant to Section 10 of the Rivers and Harbors Act of 1899. The USACE will base its evaluation of FPL's DA permit application, on the requirements of USACE regulations, the Clean Water Act Section 404(b)(1) Guidelines, and the USACE public interest review process.

After considering the environmental aspects of the proposed action before the NRC, the NRC staff's recommendation to the Commission is that the COLs be issued as proposed. This recommendation is based on (1) the application, including the Environmental Report (ER), submitted by FPL; (2) consultation with Federal, State, Tribal, and local agencies; (3) the review

team's independent review; (4) the consideration of public comments received on the environmental review; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and this EIS.

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EXECUTIVE SUMMARY

This environmental impact statement (EIS) presents the results of a U.S. Nuclear Regulatory Commission (NRC) environmental review of an application for a combined construction permit and operating license (combined license or COL) for two new nuclear reactor units at a proposed Turkey Point site in Miami-Dade County, Florida. The U.S. Army Corps of Engineers (USACE) participated in the preparation of the EIS as a cooperating agency and as a member of the review team, which consisted of the NRC staff, its contractor staff, and the USACE staff. The National Park Service (NPS) participated in the environmental review as a cooperating agency by providing special expertise for the areas in and around the adjacent national parks (Biscayne and Everglades National Parks). The NPS does not have a request to take any specific regulatory actions related to the proposed COLs before it. Due to this unique set of circumstances, all impact determinations made in this EIS should not be attributed to NPS, but only to the NRC and USACE (also referred to as the review team). The NPS's participation in connection with this EIS does not imply NPS concurrence.

Background

On June 30, 2009, the Florida Power & Light Company (FPL) submitted an application to the NRC for a combined construction permit and operating license (combined license or COL) for Turkey Point Units 6 and 7.

Upon acceptance of FPL's application, the NRC review team began the environmental review process by publishing a Notice of Intent to prepare an EIS and conduct scoping in the *Federal Register* on June 15, 2010. As part of this environmental review, the review team did the following:

- conducted public scoping meetings on July 15, 2010 in Homestead, Florida
- conducted a site visit of the proposed Units 6 and 7 plant area on the Turkey Point site in June 2010
- conducted visits to alternative sites in July 2010
- reviewed FPL's Environmental Report (ER)
- consulted with Tribal Nations and other agencies such as the U.S. Fish and Wildlife Service (FWS), Advisory Council on Historic Preservation, Florida Fish and Wildlife Conservation Commission, National Marine Fisheries Service, Miami-Dade Office of Historic and Archaeological Resources, and Florida Division of Historical Resources
- conducted the review following guidance set forth in NUREG-1555:
  - "Standard Review Plans for Environmental Reviews for Nuclear Power Plants
  - Supplement 1: Operating License Renewal"
- considered public comments received during the 60-day scoping process from June 15, 2010 to August 16, 2010

- conducted public meetings on the draft EIS on April 22, 2015, in Miami, Florida, and on April 23, 2015, in Homestead, Florida
- considered public comments received during the comment periods for the draft EIS, which extended from March 5 to May 22 and from May 28 to July 17, 2016.

Proposed Action

FPL initiated the proposed Federal action by submitting an application for Turkey Point Units 6 and 7 to the NRC. The NRC's Federal action is issuance of COLs for two Westinghouse AP1000 reactors at the Turkey Point site near Homestead, Florida.

The USACE is a cooperating agency in preparation of this EIS. The USACE's Federal action is its decision of whether to issue, deny, or issue with modifications a Department of Army (DA) permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 to authorize certain construction activities potentially affecting waters of the United States.[1]

Purpose and Need for Action

The purpose of the proposed NRC action, issuance of the COL, is to provide for additional baseload electric generating capacity for use in the FPL service territory.

The USACE determines both a basic and an overall project purpose pursuant to the Clean Water Act Section 404(b)(1) Guidelines, 33 CFR § 230.10. The basic purpose is to meet the public's need for electric energy. The overall purpose is to meet the public's need for reliable increased electrical baseload generating capacity in FPL's service territory.

Affected Environment

The Turkey Point site is located in southeast Miami-Dade County, Florida, near Homestead (Figure ES-1). Turkey Point Units 6 and 7 would be located on the same site as the existing Turkey Point site, which has five other power plants, including two nuclear power reactors. Turkey Point would be located 25 mi south of Miami and 4.5 and 8 mi east of Homestead and Florida City, respectively. The primary source of cooling water would be reclaimed wastewater and the alternative source would be saltwater supplied from radial collector wells beneath Biscayne Bay. The ultimate heat sink for Turkey Point Units 6 and 7 would be the atmosphere, using three mechanical draft cooling towers per reactor.

(1) Waters of the United States" is used to include both "waters of the United States" as defined by 33 CFR Part 328 (TN1683) defining the extent of USACE geographic jurisdiction pursuant to Section 404 of the Clean Water Act and "navigable waters of the United States" as defined by 33 CFR Part 329 (TN4770) defining the extent of USACE geographic jurisdiction pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403) (TN4768).

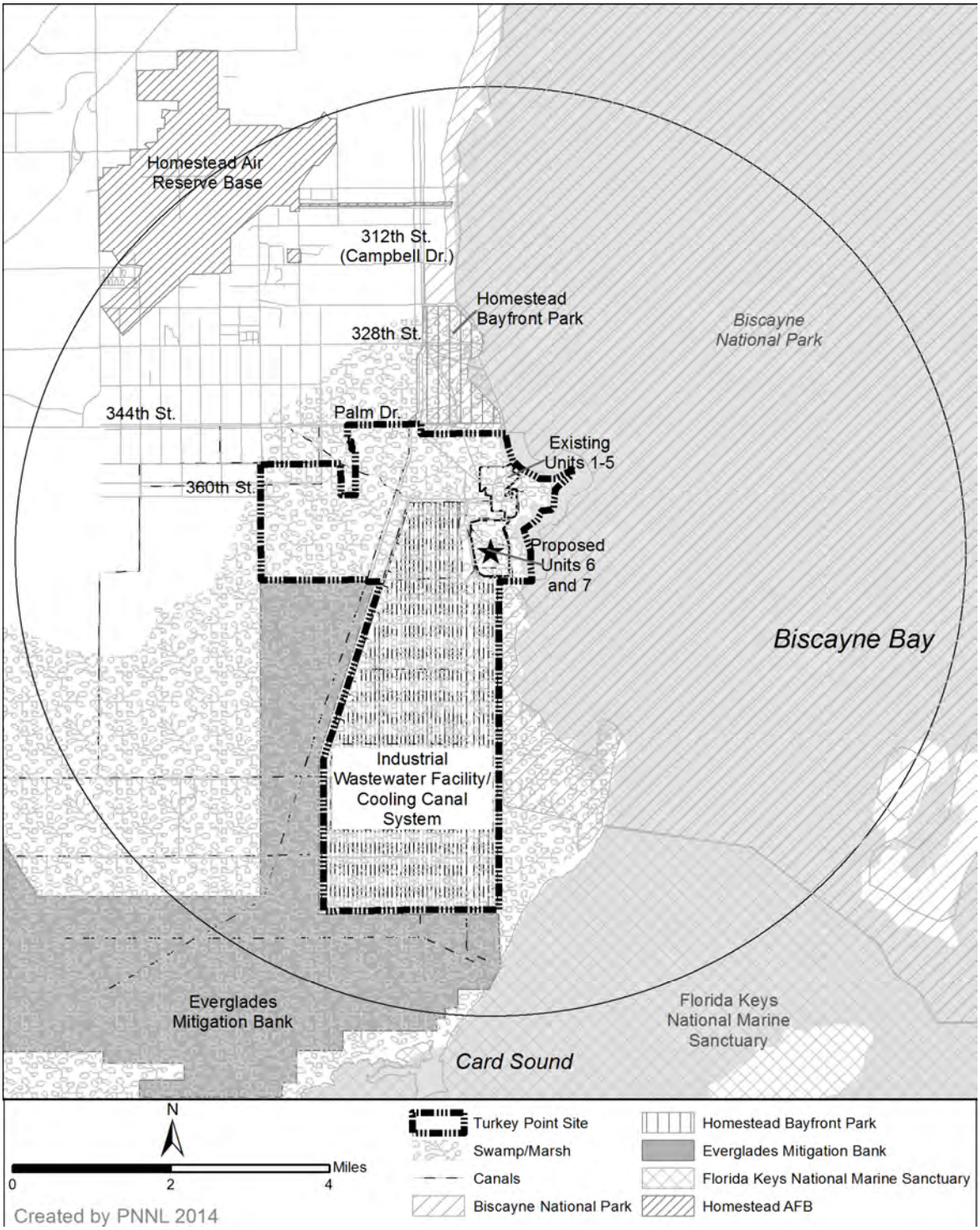

Figure ES-1. The Turkey Point Site and Affected Environment

Evaluation of Environmental Impacts

This EIS evaluates the potential environmental impacts of the construction and operation of the two new nuclear plants proposed for the Turkey Point site related to the following resource areas:

- land use
- air quality
- aquatic ecology
- terrestrial ecology
- surface and groundwater
- waste (radiological and nonradiological)
- human health (radiological and nonradiological)
- socioeconomics
- environmental justice
- cultural resources
- fuel cycle, decommissioning, and transportation

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

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

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

The impacts are designated as SMALL, MODERATE, or LARGE. The incremental impacts related to the construction and operations activities requiring NRC authorization are described and characterized, as are the cumulative impacts resulting from the proposed action when the effects are added to, or interact with, other past, present, and reasonably foreseeable future effects on the same resources. A summary of the construction and operation impacts are outlined in Table ES-1. Table ES-2 summarizes the review team's assessment of cumulative impacts. The review team's detailed analysis which supports the impact assessment of the proposed new units can be found in Chapters 4, 5, and 7, respectively.

Table ES-1. Environmental Impact Levels of the Proposed Turkey Point Units 6 and 7

Resource Category	Preconstruction and Construction	Operation
Land Use	MODERATE (NRC authorized construction impact level is SMALL)	MODERATE
Water-Related		
Water Use – Surface Water	SMALL	SMALL
Water Use – Groundwater Use	SMALL	SMALL
Water Quality – Surface Water	SMALL	SMALL
Water Quality – Groundwater	SMALL	SMALL
Ecology		
Terrestrial Ecosystems	MODERATE (NRC authorized construction impact level is SMALL)	MODERATE
Aquatic Ecosystems	SMALL to MODERATE	SMALL
Socioeconomic		
Physical Impacts	SMALL (adverse) to MODERATE (beneficial)	SMALL (adverse) to MODERATE (beneficial)
Demography	SMALL	SMALL
Economic Impacts on the Community	SMALL	SMALL and beneficial
Infrastructure and Community Services	SMALL to MODERATE	SMALL to MODERATE
Environmental Justice	NONE[(a)]	NONE[(a)]
Historic and Cultural Resources	MODERATE (NRC authorized construction impact level is SMALL)	SMALL
Air Quality	SMALL	SMALL
Nonradiological Health	SMALL	SMALL
Nonradiological Waste	SMALL	SMALL
Radiological Health	SMALL	SMALL
Postulated Accidents	n/a	SMALL
Fuel Cycle, Transportation, and Decommissioning	n/a	SMALL

(a) A determination of "NONE" for Environmental Justice analyses does not mean there are no adverse impacts to minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

Table ES-2. Cumulative Impacts on Environmental Resources, Including the Impacts of Proposed Turkey Point Units 6 and 7

Resource Category	Impact Level
Land Use	MODERATE
Water-Related	
Water Use – Surface Water	SMALL
Water Use – Groundwater Use	SMALL
Water Quality – Surface Water	MODERATE
Water Quality – Groundwater	SMALL
Ecology	
Terrestrial Ecosystems	MODERATE to LARGE
Aquatic Ecosystems	MODERATE
Socioeconomic	
Physical Impacts	SMALL adverse to MODERATE beneficial
Demography	SMALL
Economic Impacts on the Community	SMALL and beneficial
Infrastructure and Community Services	SMALL to MODERATE
Environmental Justice	NONE[(a)]
Historic and Cultural Resources	MODERATE
Air Quality	SMALL to MODERATE for criteria pollutants and MODERATE for GHGs
Nonradiological Health	SMALL
Nonradiological Waste	SMALL
Radiological Health	SMALL
Postulated Accidents	SMALL
Fuel Cycle, Transportation, and Decommissioning	SMALL

(a) A determination of "NONE" for Environmental Justice analyses does not mean there are no adverse impacts to minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

Alternatives

The review team considered the environmental impacts associated with alternatives to issuing a COL for the two new nuclear units proposed by FPL for the Turkey Point site. These alternatives included a no-action alternative (i.e., not issuing the COL) and alternative energy sources, siting locations, and system designs.

The no-action alternative would result in the COL not being granted or the USACE not issuing its permit. Upon such a denial, construction and operation of new units at the Turkey Point site would not occur and the predicted environmental impacts would not take place. If no other facility would be built or strategy implemented to take its place, the benefits of the additional electrical capacity and electricity generation to be provided would also not occur and the need for baseload power would not be met.

Based on the NRC staff's review of energy alternatives, the NRC staff concluded that, from an environmental perspective, none of the viable alternatives is environmentally preferable to building a new baseload nuclear power generation plant at the Turkey Point site. The NRC staff eliminated several energy sources (e.g., wind, solar, geothermal, and biomass) from full

consideration because they are not currently capable of meeting the need of this project. None of the viable baseload alternatives (natural gas, coal, or a combination of alternatives) was environmentally preferable to the proposed Turkey Point units.

After comparing the cumulative effects of a new nuclear power plant at the proposed site against those at the alternative sites, the NRC staff concluded that none of the alternative sites would be environmentally preferable to the proposed site for building and operating a new nuclear power plant (Table ES-3). The four alternatives sites selected were as follows (Figure ES-2):

- Glades
- Martin
- Okeechobee 2
- St. Lucie.

Table ES-3. Comparison of Cumulative Impacts at the Turkey Point and Alternative Sites

Resource Category	Turkey Point Site[a]	Glades[b]	Martin[b]	Okeechobee 2[b]	St. Lucie[b]
Land Use	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Water-Related					
Surface-water use	SMALL	MODERATE	MODERATE	MODERATE	SMALL
Groundwater use	SMALL	SMALL	SMALL	SMALL	SMALL
Surface-water quality	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Groundwater quality	SMALL	SMALL	SMALL	SMALL	SMALL
Ecology					
Terrestrial and wetland ecosystems	MODERATE to LARGE	MODERATE	MODERATE	MODERATE	MODERATE
Aquatic ecosystems	MODERATE	MODERATE	MODERATE	MODERATE	SMALL to MODERATE
Socioeconomics					
Physical impacts	SMALL adverse except for MODERATE beneficial impacts on road quality	MODERATE adverse to SMALL beneficial impacts on road quality	MODERATE adverse to MODERATE beneficial impacts on road quality	MODERATE adverse to SMALL beneficial impacts on road quality	LARGE adverse to MODERATE beneficial impacts on road quality
Demography	SMALL	SMALL	SMALL	SMALL	SMALL, except for LARGE residential displacement impacts
Economic impacts on the community	SMALL and beneficial	SMALL and beneficial, except for LARGE and beneficial property tax revenues for Glades County and School District	SMALL and beneficial, except for MODERATE and beneficial property tax revenues for Martin County and School District	SMALL and beneficial, except for LARGE and beneficial property tax revenues for Okeechobee County and School District	SMALL and beneficial

Table ES-3. (contd)

Resource Category	Turkey Point Site[a]	Glades[b]	Martin[b]	Okeechobee 2[b]	St. Lucie[b]
Infrastructure and community services	SMALL except for MODERATE adverse impacts on traffic	SMALL except for MODERATE adverse impacts on traffic	SMALL except for MODERATE adverse impacts on traffic	SMALL except for MODERATE adverse impacts on traffic	SMALL except for MODERATE adverse impacts on traffic
Environmental Justice	None[c]	None[c]	None[c]	None[c]	None[c]
Historic and Cultural Resources	MODERATE	MODERATE	SMALL	MODERATE	SMALL
Air Quality					
Criteria pollutants	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Greenhouse gas emissions	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Nonradiological Health	SMALL	SMALL	SMALL	SMALL	SMALL
Radiological Health	SMALL	SMALL	SMALL	SMALL	SMALL
Postulated Accidents	SMALL	SMALL	SMALL	SMALL	SMALL

(a) Cumulative impact determinations taken from EIS Table 7-3.
(b) Cumulative impact determinations taken from EIS Table 9-28.
(c) A determination of "NONE" for Environmental Justice analyses does not mean there are no adverse impacts on minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

Table ES-3 provides a summary of the cumulative impacts for the proposed and alternative sites. The NRC staff concluded that all of the sites were generally comparable, and it would be difficult to state that one site is preferable to another from an environmental perspective. In such a case, the proposed site prevails because none of the alternatives is environmentally preferable to the proposed site.

Table ES-4 provides a summary of the EIS-derived impacts for a new nuclear power plant in comparison with the energy alternatives. The NRC staff concluded that none of the viable energy alternatives is preferable to construction of a new baseload nuclear power-generating plant located within FPL's region of interest.

The NRC staff considered various alternative systems designs, including seven alternative heat-dissipation systems and multiple alternative intake, discharge, and water-supply systems. The review team identified no alternatives that were environmentally preferable to the proposed Turkey Point Units 6 and 7 systems design.

Figure ES-2. Location of Sites Considered as Alternatives to the Turkey Point Site

Table ES-4. Summary of Environmental Impacts[(a)] of Construction and Operation of New Nuclear, Coal-Fired, and Natural-Gas–Fired Generating Units and a Combination of Alternatives

Impact Category	Nuclear	Coal[(b)]	Natural Gas[(b)]	Combination of Alternatives[(b)]
Land Use	MODERATE	MODERATE	MODERATE	MODERATE
Air Quality	SMALL	MODERATE	SMALL to MODERATE	SMALL to MODERATE
Water Use and Quality	SMALL	SMALL	SMALL	SMALL
Ecology	MODERATE	MODERATE	MODERATE	MODERATE
Waste Management	SMALL	MODERATE	SMALL	SMALL
Socioeconomics	MODERATE Beneficial to MODERATE Adverse	MODERATE Beneficial to MODERATE Adverse	MODERATE Beneficial to SMALL Adverse	MODERATE Beneficial to MODERATE Adverse
Human Health	SMALL	SMALL	SMALL	SMALL
Historic and Cultural Resources	MODERATE	MODERATE	MODERATE	MODERATE
Environmental Justice	NONE[(b)]	NONE[(b)]	NONE[(b)]	NONE[(b)]

(a) Impact levels for all alternatives are for construction and operation but do not reflect cumulative impacts. Thus, the nuclear impacts identified here may differ from those used to compare the proposed site to the alternative sites, which reflect cumulative impacts.
(b) Impacts taken from EIS Table 9-4. These conclusions for energy alternatives should be compared to NRC-authorized activities reflected in Chapters 4, 5, and Sections 6.1, and 6.2.
(c) A determination of "NONE" for Environmental Justice analyses does not mean there are no adverse impacts to minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

Benefits and Costs

The NRC staff compiled and compared the pertinent analytical conclusions reached in the EIS. It gathered all of the expected impacts from building and operating proposed Turkey Point Units 6 and 7 and aggregated them into two final categories: (1) expected environmental costs and (2) expected benefits to be derived from approval of the proposed action. Although the analysis in Section 10.6 is conceptually similar to a purely economic benefit-cost analysis, which determines the net present dollar value of a given project, the purpose of the section is to identify potential societal benefits of the proposed activities and compare them to the potential internal (i.e., private) and external (i.e., societal) costs of the proposed activities. In general, the purpose is to inform the COL process by gathering and reviewing information that demonstrates the likelihood that the benefits of the proposed activities outweigh the aggregate costs.

On the basis of the assessments in this EIS, the building and operation of proposed Turkey Point Units 6 and 7, with mitigation measures identified by the review team, would accrue benefits that most likely would outweigh the economic, environmental, and social costs. For the NRC-proposed action (i.e., NRC-authorized construction and operation), the accrued benefits would also outweigh the costs of preconstruction, construction, and operation of proposed Turkey Point Units 6 and 7.

Public Involvement

A 60-day scoping period was held from June 15, 2010, to August 16, 2010. On July 15, 2010, the NRC held two public scoping meetings in Homestead, Florida. The review team received many oral comments during the public meetings and 32 e-mails and 10 letters throughout the rest of the scoping period on numerous topics including energy alternatives, terrestrial ecology, ground and surface water, and socioeconomics. The review team's response to the in-scope public comments can be found in Appendix D. The Scoping Summary Report (Agencywide Documents Access and Management System (ADAMS) Accession No. ML103130609) contains all of the comments, even those considered out-of-scope (e.g., security, safety issues).

During the initial 75-day comment period on the draft EIS, which began on March 6, 2015, the review team held public meetings in Miami, Florida, on April 22, 2015, and in Homestead, Florida, on April 23, 2015. During the course of the comment period, the NRC received requests from members of the public, a Tribal government, and Federal agencies to extend the comment period. In response to these requests, the NRC reopened the comment period on the draft EIS on May 28, 2015, until July 17, 2015, allowing additional time for public comments. In total, approximately 68 people provided oral comments at the public meetings held in April, and the NRC received approximately 11,300 pieces of correspondence during the original and reopened comment period.

Recommendation

The NRC's recommendation to the Commission related to the environmental aspects of the proposed action is that the COL should be issued.

This recommendation is based on the following:

- the application, including the ER, submitted by FPL
- consultation with Federal, State, Tribes, and local agencies
- site audits and alternative sites audits
- consideration of public comments received during the environmental review
- the review team's independent review and assessment summarized in this EIS.

The NRC's determination is independent of the USACE's determination of whether to issue, deny, or issue with modifications the DA permit application for the Turkey Point Units 6 and 7. The USACE will conclude its Clean Water Act Section 404(b)(1) Guidelines and public interest analyses in its Record of Decision.

ABBREVIATIONS/ACRONYMS

AADT	annual average daily traffic
ac	acre(s)
ACC	averted cleanup and decontamination costs
ac-ft	acre (foot) feet
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
AD	Anno Domini
ADAMS	Agencywide Documents Access and Management System
AERMOD	American Meteorological Society/U.S. Environmental Protection Agency (AMS/EPA) Regulatory Model
AICUZ	Air Installation Compatible Use Zone
ALARA	as low as reasonably achievable
a.m.	ante meridian
AO	Administrative Order
AP-42	EPA's Compilation of Air Pollutant Emission Factors document
APE	Area of Potential Effect
APPZ	Avon Park Permeable (or Producing) Zone
AQCR	Air Quality Control Region
ARNI	Aquatic Resources of National Importance
ARRA	American Recovery and Reinvestment Act of 2009
ASE	advanced safety evaluation
ASR	aquifer storage and recovery (system)
ATC	Atlantic Coastal Ridge
BA	Biological Assessment
BACT	Best Available Control Technologies
BBCW	Biscayne Bay Coastal Wetlands
BC	Before Christ
BEBR	University of Florida's Bureau of Economic and Business Research
BEA	U.S. Bureau of Economic Analysis
BEIR VII	Biological Effects of Ionizing Radiation VII
bgs	below ground surface
BISC	Biscayne Bay
BLS	U.S. Bureau of Labor Statistics
BMP	Best Management Practice
Btu	British thermal unit
°C	degree(s) Celsius
μCi	microcurie(s)

μCi/mL	microcuries per milliliter
CA	Consent Agreement
CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CCD	Colony Collapse Disorder
CCR	coal combustion residuals
CCS	cooling-canal system (also known as IWF)
CDF	core damage frequency
CDMP	Comprehensive Development Master Plan
CDNFRM	cost for decontamination of non-farmland
CEC	chemical/contaminant of emerging concern
CEQ	Council on Environmental Quality
CERP	Comprehensive Everglades Restoration Program (also Project, Plan)
CFR	*Code of Federal Regulations*
cfs	cubic foot/feet per second
cm	centimeter(s)
cm^2	square centimeter(s)
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COL	combined construction permit and operating license
CPI	Consumer Price Index
CPUE	catch per unit effort
CSAPR	Cross-State Air Pollution Rule
CTEMISS	cooling-tower emissions processor
CWA	Clean Water Act (aka Federal Water Pollution Control Act)
CWS	circulating-water system
CZMP	Coastal Zone Management Plan
d	day(s)
D	Directional Distribution Factor
DA	Department of the Army
dB	decibel(s)
dBA	decibel(s) on the A-weighted scale
DBA	design basis accident
DCD	Design Control Document
DEET	*N*,*N*-Diethyl-*meta*-toluamide
DEIS	draft environmental impact statement
DERM	Miami-Dade County Department of Environmental Resources Management
DHS	Department of Homeland Security

DNL	day-night average sound level
DOE	U.S. Department of Energy
DOI	U.S. Department of Interior
DOT	U.S. Department of Transportation
DPS	distinct population segment
DSM	demand-side management
DZMW	dual-zone monitoring well
EAB	exclusion area boundary
EAI	Ecological Associates, Inc.
EC10	effective concentration required to induce a 10% effect
EC50	effective concentration required to induce a 50% effect
ECOTOX	EPA Ecotoxicology
EDR	Florida Legislature's Office of Economic and Demographic Research
EEEA	East Everglades Expansion Area
EEL	Environmentally Endangered Lands (Program)
EFH	essential fish habitat
EIA	Energy Information Administration
EIS	environmental impact statement
EJ	environmental justice
ELF	extremely low frequency
ELF-EMF	extremely low frequency-electromagnetic field
EMB	Everglades Mitigation Bank
EMF	electromagnetic field
ENP	Everglades National Park
EPA	U.S. Environmental Protection Agency
EPOC	emerging pollutant of concern
EPRI	Electric Power Research Institute
ER	Environmental Report
ESA	Endangered Species Act of 1973, as amended
ESOC	emerging substance of concern
ESRP	Environmental Standard Review Plan (NUREG-1555, Supplement 1, Operating License Renewal)
EW	exploratory well
°F	degree(s) Fahrenheit
FAA	Federal Aviation Administration
FAC	Florida Administrative Code or Fla. Admin. Code
FDEP	Florida Department of Environmental Protection
FDHR	Florida Division of Historic Resources
FDOH	Florida Department of Health

FDOT	Florida Department of Transportation
FEC	Florida East Coast (Railway)
FEFP	Florida Education Finance Program
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFWCC	Florida Fish and Wildlife Conservation Commission
FIRM	Flood Insurance Rate Map
FKNMS	Florida Keys National Marine Sanctuary
FLUCFCS	Florida Land Use, Cover, and Forms Classification System
FLUM	Future Land Use Map
FMNH	Florida Museum of Natural History
FMP	fishery management plan
FMSF	Florida Master Site File (form)
FNAI	Florida Natural Areas Inventory
FONSI	Findings of No Significant Impact
FPL	Florida Power & Light Company
fps	foot (feet) per second
FPSC	Florida Public Service Commission
FR	*Federal Register*
FRCC	Florida Reliability Coordinating Council
FSAR	Final Safety Analysis Report
FSER	Final Safety Evaluation Report
ft	foot/feet
ft^2	square foot/feet
ft/d	foot (feet) per day
ft^2/d	square foot (feet) per day
ft^3	cubic foot (feet)
ft^3/d	cubic foot (feet) per day
ft^3/yr	cubic foot (feet) per year
FTE	full-time equivalent
FWPCA	Federal Water Pollution Control Act (also known as the Clean Water Act of 1977)
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
µg	microgram(s)
µg/L	microgram(s) per liter
µGy	microgray(s)
g	gram(s) or gravity of Earth (g-force)
gal	gallon(s)
gal/yr	gallon(s) per year

GC	gas centrifuge
g/cm^3	gram(s) per cubic centimeter
GCRP	U.S. Global Change Research Program
GEIS	Generic Environmental Impact Statement (for License Renewal of Nuclear Plants, NUREG-1437)
GHG	greenhouse gas
GIS	geographic information system
gpd	gallon per day
gpm	gallon per minute
gpm/ft	gallon(s) per minute per foot
g/s	gram(s) per second
GU	Interim District (zone)
GW	gigawatt(s)
GWh	gigawatt hour(s)
ha	hectare(s)
HAP	hazardous air pollutant
HAPC	habitat area of particular concern
HBB	health-based benchmark
HDR	HDR Engineering, Inc.
HEC-RAS	Hydrologic Engineering Centers River Analysis System
hr	hour
HUD	U.S. Department of Housing and Urban Development
Hz	hertz
I	Interstate
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
ID	identification
IGCC	integrated gasification combined-cycle
in.	inch(es)
IRWST	in-containment refueling water storage tank
ISFSI	independent spent fuel storage installation
IUCN	World Conservation Union
IWF	industrial wastewater facility (also known as CCS)
K	Standard Peak Hour Factor
kg	kilogram(s)
kg/d	kilogram(s) per day
kg/L	kilogram(s) per liter
kg/yr	kilogram(s) per year

kg/ha/mo	kilogram(s)/hectare/month
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
km/hr	kilometer(s) per hour
kt	knot(s)
kV	kilovolt(s)
kV/m	kilovolt(s) per meter
kW	kilowatt(s)
kWh	kilowatt-hour(s)
L	liter(s)
lb	pound(s)
lb/yr	pound(s) per year
L_{dn}	day-night average sound level
LEDPA	least environmentally damaging practicable alternative
L_{eq}	noise level equivalent
LFA	Lower Floridan Aquifer
LLC	Limited Liability Company
LLW	low-level waste
LOEC	lowest-observed effect concentration
LOS	level of service
LPZ	low-population zone
LST	local standard time
LWA	Limited Work Authorization
LWR	light water reactor
µmhos/cm	micromhos per centimeter
m	meter(s)
m/s	meter(s) per second
m^2	square meter(s)
m^3	cubic meter(s)
m^3/d	cubic meters per day
m^3/s	cubic meter(s) per second
mA	milliampere(s)
MACCS	MELCOR Accident Consequence Code System
MCU	Middle Confining Unit
MDC	Miami-Dade County
M-DCPS	Miami-Dade County Public School District
MDWASD	Miami-Dade Water and Sewer Department
MEI	maximally exposed individual

mg	milligram(s)
mG	milliGauss
Mgd	million gallon(s) per day
Mgd/yr	million gallon(s) per day per year
Mgm	million gallons per month
Mg/L	milligram(s) per liter
Mg/m^3	milligram(s) per cubic meter
mg N/L	milligrams of nitrate per liter
mg P/L	milligrams of phosphate per liter
mGy	milligray(s)
mGy/d	milligray(s) per day
MFCMA	Magnuson–Stevens Fishery Conservation and Management Act (or Magnuson–Stevens Act)
MHz	megahertz
mi	mile(s)
mi^2	square mile(s)
min	minute(s)
MIT	Massachusetts Institute of Technology
mL	milliliter(s)
MMBtu	one million British thermal units
MMBtu/hr	one million British thermal units per hour
MMBtu/yr	one million British thermal units per year
mo	month(s)
MOU	Memorandum of Understanding
mph	mile(s) per hour
mrad	millirad
mrem	millirem
msl or MSL	mean sea level
mSv	millisievert(s)
MSW	municipal solid waste
MT	metric ton(nes)
MTU	metric ton uranium
MW	megawatt(s)
MWd/MTU	megawatt-days per metric ton of uranium
MW(e)	megawatt(s) electric
MW(t)	megawatt(s) thermal
MWh	megawatt hour(s)
MWh/yr	megawatt hour(s) per year
N	north or nitrogen
NA	not applicable

NAAQS	National Ambient Air Quality Standard
NAD83	North American Datum of 1983
NARUC	National Association of Regulatory Utility Commissioners
NASCAR	National Association for Stock Car Auto Racing
NAVD88	North American Vertical Datum of 1988
NCI	National Cancer Institute
NCRP	National Council on Radiation Protection and Measurements
NEPA	National Environmental Policy Act of 1969, as amended
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NFC	Natural Forest Community
NGCC	natural-gas combined-cycle
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service
NNC	Numerical Nutrient Criteria
NO_2	nitrogen dioxide
NO_3+NO_2	nitrate+nitrite
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOEC	no-observed effect concentration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	U.S. Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NSR	new source review
NUREG	U.S. Nuclear Regulatory Commission technical document
NW	northwest
NWS	National Weather Service
O_2	oxygen
O_3	ozone
ODCM	Offsite Dose Calculation Manual
OFW	Outstanding Florida Water
OIG	Office of the Inspector General
ORV	off-road vehicle
OSHA	Occupational Safety and Health Administration
P	phosphorus
PAH	polycyclic aromatic hydrocarbon

PC	personal computer
PCB	polychlorinated biphenyl
pCi/L	picocurie(s) per Liter
pH	measure of acidity or basicity in solution
PHU	panther habitat units
PHU	panther habitat unit
PFA	Panther Focus Area
P/L	phosphorus per liter
PIR	Public Interest Review or Project Implementation Report
PIRF	Public Interest Review Factor
PK-12	preschool through 12th grade
p.m.	post meridian
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
PPSA	Power Plant Siting Act
ppm	part(s) per million
ppt	parts per thousand
PRA	probabilistic risk assessment
PSA	probabilistic safety assessment
PSD	Prevention of Significant Deterioration (Permit)
psu	practical salinity unit
PWR	pressurized water reactor
rad	radiation absorbed dose
RAI	Request for Additional Information
RCRA	Resource Conservation and Recovery Act of 1976, as amended
RCW	radial collector well
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
RfC	reference concentration
RFI	Request for Information
RHA	Rivers and Harbors Act of 1899
RIMS II	Regional Input-Output Modeling System
RMS	root mean square
Rn-222	radon-222
ROD	Record of Decision
ROI	region of interest
RPHP	Radiation Public Health Project
RRY	reference reactor year
RSICC	(Oak Ridge) Radiation Safety Information Computational Center

RV	recreational vehicle
RWTF	reclaimed water-treatment facility
Ryr	reactor year
s or sec	second(s)
SAFMC	South Atlantic Fisheries Management Council
SAMA	severe accident mitigation alternative
SAMDA	severe accident mitigation design alternative
SAV	submerged aquatic vegetation
SBO	Station Blackout
SCA	Site Certification Application
scf	standard cubic feet
SCR	selective catalytic reduction
SDWWTP	South District Wastewater Treatment Plant
sec	second(s)
SECA	State Energy Conversion Alliance
SER	Safety Evaluation Report
SFRPC	South Florida Regional Planning Council
SFWMD	South Florida Water Management District
SGWEA	Southern Glades Wildlife Environmental Area
SHA	seismic hazard analysis
SHPO	State Historic Preservation Office (or Officer)
s/m^3	seconds per cubic meter
SO_2	sulfur dioxide
SO_x	oxides of sulfur
SOR	Save Our Rivers (Program)
SPCC	Spill Prevention, Control, and Countermeasure (Plan)
SR	State Route
SRP	Standard Review Plan
SSC	Species of Concern
SU	Standard Unit(s)
Sv	sievert(s)
SW	southwest
SWPPP	stormwater pollution prevention plan
SWS	service-water system
T	ton(s) or tonne(s)
T/B	Tug/Barge
TB_q	terrabequerel
TCP	traditional cultural property
T&E	threatened and endangered

TDS	total dissolved solids
TEDE	total effective dose equivalent
THPO	Tribal Historic Preservation Officer
TIMDEC	decontamination time
TKN	total Kjeldahl nitrogen
TLD	thermoluminescent dosimeter
TLF	Treasured Lands Foundation
TN	total nitrogen
TOC	total organic carbon
TP	total phosphorus
TRC	total reportable cases
TVA	Tennessee Valley Authority
UDB	urban development boundary
UF_6	uranium hexafluoride
UIC	underground injection control
UMAM	Uniform Mitigation Assessment Method
UMTRI	University of Michigan Transportation Research Institute
UNESCO	United National Educational, Scientific and Cultural Organization
UO_2	uranium dioxide
US	U.S. (State Highway)
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USCB	U.S. Census Bureau
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USDW	underground source of drinking water
USGS	U.S. Geological Survey
VOC	volatile organic compound
W	west
W.A.T.E.R.	Wetland Assessment Technique for Environmental Review
WCA	water conservation area
Westinghouse	Westinghouse Electric Company, LLC
WHO	World Health Organization
wk	week(s)
WOTUS	waters of the United States
WRDA	Water Resources Development Act
WTP	water treatment plant
WWTP	wastewater treatment plant

χ/Q	atmospheric dispersion factor(s); annual average normalized air concentration value(s)
yd^3	cubic yards
yr	year(s)

7.0 CUMULATIVE IMPACTS

The National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. § 4321 et seq.) (TN661) requires Federal agencies to consider the cumulative impacts of proposals under its review. Cumulative impacts may result when the environmental effects associated with the proposed action are overlaid or added to temporary or permanent effects associated with past, present, and reasonably foreseeable future projects. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. When evaluating the potential impacts of two new nuclear units at the Turkey Point Nuclear Power Plant (Turkey Point) site proposed by Florida Power & Light Company (FPL) in its application for combined construction permits and operating licenses (combined licenses or COLs) (FPL 2009-TN1229), the U.S. Nuclear Regulatory Commission (NRC) staff and the U.S. Army Corps of Engineers (USACE) staff considered potential cumulative impacts on resources that could be affected by the construction, preconstruction, and operation of two Westinghouse Electric Company, LLC (Westinghouse) AP1000 pressurized water reactors at the site (Westinghouse 2011-TN261). Cumulative impacts result when the effects of an action are added to, or interact with, other past, present, and reasonably foreseeable future effects on the same resources. For the purposes of this analysis, past actions are those taken prior to the receipt of the COL application. Present actions are those related to resources from the time of the COL application until the start of NRC-authorized construction of the proposed new units. Future actions are those that are reasonably foreseeable during the building and operating of the proposed Turkey Point Units 6 and 7, including decommissioning. The effect of climate change on the evaluation of environmental impacts is addressed in more detail in Appendix I. The geographic area over which past, present, and reasonably foreseeable future actions could contribute to cumulative impacts is dependent on the type of resource considered and is described below for each resource area.

The approach for evaluating cumulative impacts in this environmental impact statement (EIS) is outlined in the following discussion. To guide its assessment of environmental impacts of a proposed action or alternative actions, the NRC has established a standard of significance for impacts based on guidance developed by the Council on Environmental Quality (Title 40 of the *Code of Federal Regulations* [CFR] 1508.27 [TN428]). The three significance levels established by the NRC—SMALL, MODERATE, or LARGE—are defined 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.
>
> MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
>
> LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The impacts of the proposed action, as described in Chapters 4 and 5, are combined with other past, present, and reasonably foreseeable future actions near the Turkey Point site that would affect the same resources affected by proposed Units 6 and 7, regardless of what agency (Federal or non-Federal) or person undertakes such actions. These combined impacts are

defined by the Council on Environmental Quality as “cumulative” in 40 CFR 1508.7 (TN428) and include individually minor but collectively significant actions taking place over a period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE cumulative impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

The description of the affected environment in Chapter 2 serves as the baseline for the cumulative impacts analysis, including the effects of past actions. The incremental impacts related to the construction activities requiring NRC authorization (10 CFR 50.10(a)) [TN249]) are described and characterized in Chapter 4 and those related to operations are described in Chapter 5. These impacts are summarized for each resource area in the sections that follow. The level of detail is commensurate with the significance of the impact for each resource area.

The specific resources and components that could be affected by the incremental effects of the proposed action and other actions in the same geographic area were assessed. This assessment includes the impacts of construction and operation of the proposed new units as described in Chapters 4 and 5; impacts of preconstruction activities as described in Chapter 4; impacts of fuel cycle, transportation, and decommissioning as described in Chapter 6; and impacts from past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could affect the same resources affected by the proposed actions.

The review team visited the Turkey Point site from June 7 through 11, 2010 (NRC 2010-TN1457). The team then used the information provided in the Environmental Report, responses to requests for additional information, information from other Federal and State agencies, and information gathered during the visits to the Turkey Point site to evaluate the cumulative impacts of building and operating two new nuclear power plants at the site. To inform the cumulative analysis, the review team searched U.S. Environmental Protection Agency (EPA) databases for recent EISs and for permits for water discharges in the geographic area (to identify water-use projects and industrial facilities). In addition, the review team used the www.recovery.gov website to identify projects in the geographic area funded by the American Recovery and Reinvestment Act of 2009 (ARRA) (26 U.S.C. § 1) (TN1250). Other actions and projects identified during this review and considered in the review team’s independent analysis of the potential cumulative effects are described in Table 7-1. Approximate locations are given with respect to the Turkey Point site.

Table 7-1. Past, Present, and Reasonably Foreseeable Projects and Other Actions Considered in the Cumulative Analysis in the Vicinity of the Turkey Point Site

Project Name	Summary of Project	Location	Status
Everglades Ecosystem Restoration and/or Comprehensive Everglades Restoration Plan Projects (DOI 2016-TN4589)			
Everglades Ecosystem Restoration Project	A major restoration initiative that will restore the quantity, quality, timing, and distribution of fresh water in an effort to reverse decades of unintended environmental decline.	Throughout region	Ongoing (USACE 2016-TN4588; DOI 2016-TN4589)
Comprehensive Everglades Restoration Plan (CERP)	Associated with the Everglades Ecosystem Restoration Project, this effort is made up of numerous projects (e.g., Biscayne Wetlands Restoration Project) in the region. The projects in and around the region are discussed in Section 2.3.1.1.	Throughout region	Made up of numerous project elements in various stages of completion from those that have been proposed to those that have been completed (DOA and DOI 2016-TN4580).
Energy Projects			
Turkey Point Units 1-5	Two 720 MW nuclear and three oil/gas 2,900 MW plants	Adjacent	Operational, Units 3 and 4 underwent license renewal in 2002 (NRC 2012-TN1298; NRC 2012-TN1299) and uprate in 2012 (NRC 2012-TN1438)
Turkey Point Units 3 and 4	General Licensed Independent Spent Fuel Storage Installation	Adjacent	Operational
Conversion of Turkey Point Units 1 and 2 to use as synchronous condensers		Adjacent	Unit 2 converted; Unit 1 will be converted in December 2016 (FPL 2016-TN4579)
Freshening of the water in the cooling canals of the industrial waste water facility	The Florida Department of Environmental Protection issued an Administrative Order requiring FPL to submit to the Department a salinity management plan that would describe how FPL would reduce and maintain the average annual salinity in the cooling-canal system at 34 psu.	Adjacent	Freshening has been underway since summer of 2014 using water from the L-31E Canal, Biscayne aquifer, and Upper Floridan aquifer
Homestead Power Plant	53 MW oil/gas-power–generation plant	9 mi northwest of the Turkey Point site	Operational (EPA 2012-TN1082)

Table 7-1. (contd)

Project Name	Summary of Project	Location	Status
Remediation of hypersalinity plume	FPL and Miami-Dade County entered into a Consent Agreement on October 6, 2015, identifying the steps FPL will take to remediate the hypersaline plume in groundwater such that groundwater with a concentration greater than 19,000 mg/L chloride would be limited to the area within the FPL property boundary.	Adjacent	FPL is developing a plan in response to the Consent Agreement.
Resources Recovery Facility	77 MW waste-to-energy plant	28 mi north of the Turkey Point site	Operational (Miami-Dade County 2012-TN1077)
Medley Landfill	9.6 MW landfill gas power-generation plant	30 mi north of the Turkey Point site	Proposed, Prevention of Significant Deterioration Permit application submitted 2010 (Waste Management 2010-TN1079)
South Dade Landfill	Two 2 MW co-generation gas power-generation project	8.1 mi north of the Turkey Point site	Approved (DOE 2010-TN1476)
Lauderdale Power Plant	Two 884 MW oil/gas-power–generation plants	45 mi north of the Turkey Point site	Operational (FPL 2013-TN2630)
Port Everglades Power Plant	420 MW oil/gas-power–generation plant	47 mi north of the Turkey Point site	Proposed upgrade to existing plant to natural-gas units. Construction to begin 2014 (FPL 2012-TN1081)
Homestead City Utilities – Gordon W. Ivey Power Plant	60 MW oil-power–generation plant	9 mi northwest of the Turkey Point site	Operational (FDEP 2012-TN1083)
Wheelabrator South Broward, Inc. – Waste-to-Energy Facility	67 MW waste-to-power plant	45 mi northeast of the Turkey Point site	Operational (Wheelabrator 2012-TN1086)
Mining Projects			
Florida Rock and Sand – Card	Rock and sand	7 mi west of the Turkey Point site	Operational (EPA 2012-TN1110)
Rinker Materials of Florida, Inc.	Crushed and broken limestone	21 mi northwest of the Turkey Point site	Operational (EPA 2012-TN1111)

Table 7-1. (contd)

Project Name	Summary of Project	Location	Status
Custom Crushing & Material	Nonmetallic minerals	25 mi northwest of the Turkey Point site	Operational (EPA 2012-TN1112)
Florida Rock Industries	Concrete block and brick	26 mi northwest of the Turkey Point site	Operational (EPA 2012-TN1113)
White Rock Quarries	Crushed and broken limestone	28 mi northwest of the Turkey Point site	Operational (EPA 2012-TN1114)
Florida Rock Industries/Sawgrass	Concrete block and brick	36 mi northwest of the Turkey Point site	Operational (EPA 2012-TN1115)
Transportation Projects			
Various Transportation Projects	Road, traffic, pedestrian projects	Throughout region	Ongoing (FDOT 2012-TN1132)
Parks and Aquaculture Facilities			
Biscayne National Park	Biscayne fishery management plan	Adjacent	Proposed, Draft EIS released 2012 (NPS 2012-TN1116)
Florida Keys National Marine Sanctuary	Wildlife areas	Throughout region	Proposed, marine zoning and regulatory review Draft EIS planned for 2014 (NOAA 2012-TN1117)
Crocodile Lake National Wildlife Refuge	Refuge closed to the public	9 to 17 mi south of the Turkey Point site	Development unlikely in this park (FWS 2012-TN706)
Dangy Johnson Key Largo Hammock Botanical State Park	Activities include picnicking, biking, wildlife viewing, and hiking	10 mi south of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1119)
The Barnacle Historic State Park	Activities include picnicking, wildlife viewing, and hiking	21 mi north of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1120)
Bill Baggs Cape Florida State Park	Activities include picnicking, boating, swimming, camping, fishing, wildlife viewing, and hiking	20 mi northeast of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1121)

Table 7-1. (contd)

Project Name	Summary of Project	Location	Status
John Pennekamp Coral Reef State Park	Activities include picnicking, boating, swimming, camping, fishing, wildlife viewing, and hiking	18 to 23 mi southwest of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1122)
Lignumvitae Key Botanical State Park	Activities include boating, swimming, fishing, and wildlife viewing	43 mi southwest of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1123)
Long Key State Park	Activities include picnicking, boating, swimming, camping, fishing, wildlife viewing, and hiking	50 mi southwest of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1124)
San Pedro Underwater Archaeological Preserve State Park	Activities include scuba, boating, and swimming	44 mi southwest of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1125)
Indian Key Historic State Park	Activities include boating, scuba, swimming, fishing, hiking, and wildlife viewing	43 mi southwest of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1126)
Windley Key Fossil Reef Geological State Park	Activities include hiking, picnicking, and wildlife viewing	36 mi southwest of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1127)
Oleta River State Park	Activities include picnicking, swimming, camping, fishing, wildlife viewing, and hiking	36 mi north of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1128)
John U. Lloyd Beach State Park	Activities include boating, scuba, swimming, fishing, hiking, and wildlife viewing	46 mi north of the Turkey Point site	Development unlikely in this park (Florida State Parks 2012-TN1129)
Everglades National Park	Activities include picnicking, swimming, camping, fishing, wildlife viewing, and hiking	15+ mi west of the Turkey Point site	Development unlikely in this park (NPS 2012-TN1130)
Big Cypress National Preserve	Activities include picnicking, hunting, camping, fishing, wildlife viewing, and hiking	35+ mi northwest of the Turkey Point site	Development unlikely in this park (NPS 2012-TN1131)
Other Actions/Projects			
Tampa–Orlando–Miami High-Speed Intercity Passenger Rail	High-speed rail from Tampa to Miami (through Orlando)	26 mi northeast of the Turkey Point site	Proposed; Phase 1 (Tampa- Orlando corridor) is ongoing. Project development for Phase 2 (Orlando-Miami corridor) began in May 2010 (FRA 2012-TN1297)

Table 7-1. (contd)

Project Name	Summary of Project	Location	Status
Various wastewater treatment plants	Sewage treatment	Throughout region	Operational
Various hospitals using nuclear material	Medical and other industrial isotopes	Throughout region	Ongoing
Various water/flood management projects	Construction of levees, floodwalls, closure structures, and interior drainage structures	Throughout region	Ongoing (USACE 2012-TN1133)
Contender Boats Incorporated	Boat building and repair	6 mi northwest of the Turkey Point site	Operational (EPA 2012-TN1092)
CEMEX Miami	Cement manufacturing	25 mi northwest of the Turkey Point site	Operational (EPA 2012-TN1093)
Aero Kool Corp.	Aircraft equipment	27 mi north of the Turkey Point site	Operational (EPA 2012-TN1094)
Flexible Foam Products, Inc.	Plastics foam products	31 mi north of the Turkey Point site	Operational (EPA 2012-TN1095)
Dyplast Products, LLC	Plastics foam products	32 mi north of the Turkey Point site	Operational (EPA 2012-TN1096)
Exteria Building Products	Plastics products	35 mi north of the Turkey Point site	Operational (EPA 2012-TN1097)
AAR Landing Gear Center	Repair and rebuild aircraft landing gears and brakes	30 mi north of the Turkey Point site	Operational (EPA 2012-TN1098)
American Whirlpool Products Corporation	Acrylic and fiberglass bath and spa manufacturer	43 mi northeast of the Turkey Point site	Operational (EPA 2012-TN1099)
Angler Boat Corporation	Fiberglass boat manufacturer	29 mi northeast of the Turkey Point site	Operational (EPA 2012-TN1100)
Benada Aluminum of Florida, Inc.	Extruded aluminum products manufacturer	29 mi northeast of the Turkey Point site	Operational (EPA 2012-TN1101)
Bertram Yacht, Inc.	Fiberglass boat manufacturer	26 mi northeast of the Turkey Point site	Operational (EPA 2012-TN1102)

Table 7-1. (contd)

Project Name	Summary of Project	Location	Status
Blumberg Industries – Fine Art Lamps	Lamp manufacturer	33 mi north of the Turkey Point site	Operational (EPA 2012-TN1103)
DM Industries, Ltd	Acrylic and fiberglass bath and spa manufacturer	33 mi northeast of the Turkey Point site	Operational (EPA 2012-TN1104)
Dusky Marine, Inc.	Fiberglass boat manufacturer	45 mi northeast of the Turkey Point site	Operational (EPA 2012-TN1105)
Eastern Aero Marine, Inc.	Inflatable vest and raft manufacturer	28 mi northeast of the Turkey Point site	Operational (EPA 2012-TN1106)
Englehard Hex Core	Nomex honeycomb board, and fiberglass honeycomb board and rotor manufacturer	28 mi northeast of the Turkey Point site	Operational (EPA 2012-TN1107)
US Foundry & Manufacturing Corporation	Gray iron foundry and cast iron products manufacturer	30 mi northwest of the Turkey Point site	Operational (EPA 2012-TN1108)
Homestead Air Reserve Base	Military activities	5 mi northwest of the Turkey Point site	Operational (EPA 2012-TN1109)
SR836/Dolphin Expressway Southwest Extension	Transportation infrastructure	14 mi northwest of the Turkey Point site	Proposed (MDX 2013-TN3728)
Future urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; construction of water and/or wastewater treatment and distribution facilities and associated pipelines, as described in local land-use planning documents	Throughout region	Construction would occur in the future, as described in State and local land-use planning documents

7.1 Land-Use Impacts

The description of the affected environment in Section 2.2 serves as a baseline for the following cumulative impacts assessment of land-use impacts. As described in Section 4.1, the NRC staff concludes that the impacts of NRC-authorized construction on land use would be SMALL and no further mitigation would be warranted. The combined impacts from construction and preconstruction were described in Section 4.1 and determined to be MODERATE. As described

in Section 5.1, the review team concludes that the impacts of operations on land use would be MODERATE, but that no further mitigation beyond that required of FPL by State agencies would be warranted.

In addition to land-use impacts from construction, preconstruction, and operation of the proposed Units 6 and 7, the following cumulative impacts analysis also considers other past, present, and reasonably foreseeable future actions that could cumulatively contribute to land-use impacts. For this cumulative analysis, the geographic area of interest comprises land areas extending outward from the 218 ac plant area for a distance of 10 mi, plus lands encompassed by transmission line or pipeline corridors that extend beyond 10 mi. All such lands are part of Miami-Dade County. This geographic area of interest includes the land areas that could be substantially affected by proposed Turkey Point Units 6 and 7. Other past, present, and reasonably foreseeable actions whose impacts might cumulatively interact with those of the proposed Units 6 and 7 are presented in Table 7-1. Distances listed in Table 7-1 are from the Units 6 and 7 plant area unless otherwise noted.

Because the Miami-Dade County 2015–2025 Comprehensive Development Plan designates the unincorporated land in the immediate vicinity of the Turkey Point site as protected land, open land, parkland, or agricultural land, future urban development of this land is not likely to occur. The cities of Homestead and Florida City do designate areas for development, but these areas do not directly adjoin the project site (Miami-Dade County 2012-TN1150).

The geographic area of interest has been substantially altered by a history of agricultural and urban development, as well as by development of Units 1 through 5 on FPL's Turkey Point site. The present and reasonably foreseeable projects noted in Table 7-1 with the greatest potential to influence the cumulative land-use impacts in the geographic area of interest include the following:

- FPL – continued operation and decommissioning of the existing Turkey Point power plant units (Units 1 through 5);
- South Dade Landfill – landfill gas-power–generation project, an approved facility approximately 8.1 mi north from the plant area;
- Contender Boats Incorporated – a boat manufacturing plant in Homestead approximately 6 mi northwest of the plant area;
- Homestead Air Reserve Base, 5 mi northwest of the plant area; and
- continued operations of existing limestone mines in the vicinity.

Other than the proposed action, the only reasonably foreseeable major future action known to the review team to directly involve land on the FPL Turkey Point site is the continued operation and possible decommissioning of Units 1 through 5 (two nuclear and three oil/gas electricity generation plants) and associated support facilities. No major land-use changes would result from operation of these existing facilities, although decommissioning could free up land presently dedicated to energy generation to other purposes. Minor infrastructure improvement projects (e.g., road widening) supporting these facilities as well as Units 6 and 7 and other FPL activities are possible. Routine land-management practices and minor projects for purposes of

conservation by FPL are also possible. These might include stabilization of shorelines, construction and operation of stormwater management facilities, landscaping and landscape management, and removal of exotic or invasive vegetation.

The South Dade Landfill gas-power–generation plant would be built on land used as part of an existing landfill, and would therefore not be expected to result in noticeable land-use impacts. The U.S. Department of Energy (DOE) NEPA determination for this project concluded that there would be no extraordinary impacts or land-use changes, and that the project was categorically excluded from NEPA (DOE 2010-TN1476).

Contender Boats is an existing manufacturing facility located in an industrial area of Homestead. It has been in operation for a substantial period of time, and is consistent with the surrounding land uses. For this reason, its continued operation will not result in land-use changes.

Similarly, the continued operation of the Homestead Air Reserve Base is not expected to result in noticeable land-use changes, and surrounding uses are currently subjected to restrictions related to their location near the base (HAFRC 2007-TN1427). The consistency of land uses between proposed offsite facilities associated with Units 6 and 7 is discussed in Sections 4.1 and 5.1.

The Homestead-Miami Speedway improvement project as proposed includes a change in the land-use designation applied by the City of Homestead to the 120 ac project site from "agriculture" to "business and office." While this project would increase the permitted capacity of the speedway, it would not constitute a substantial change in land use because the site of the expansion is not used for agriculture, rather for overflow parking during speedway events.

Continued operation of existing limestone mines in the vicinity, especially as they supply materials for Units 6 and 7 and for other anticipated urban development in the area, could contribute to land-use impacts related to hauling. Additional lands presently supporting natural vegetation or agriculture could be used for future limestone mining.

The review team expects that the other projects described in Table 7-1 would have little or no impact on land use within the geographic area of interest around the FPL Turkey Point site. The Miami-Dade Expressway Authority, in coordination with the Florida Department of Transportation, is conducting a Project Development and Environment Study to evaluate the feasibility of a southwest extension of SR 836/Dolphin Expressway from its current terminus at NW 137th Avenue in the vicinity of NW 12th Street to SW 136th Street or some point to the north of SW 136th Street. Potential routes for this project could be located very near one or more of the transmission line corridors. Construction and operation of the SR 836/Dolphin Expressway could increase cumulative impacts in this area. Because the Miami-Dade Comprehensive Development Master Plan designates most of the undeveloped land near the Turkey Point site for conservation or open space purposes (see Section 5.1), substantially increased urban development close to the site is unlikely. The review team does however recognize that urban development will likely increase in the agricultural landscape north and east of the geographic area of interest. Lastly, the review team acknowledges the presence of the Turkey Point site to areas addressed by the CERP, but as noted in Section 4.1.1, building

and operating the proposed facilities would not adversely conflict with the CERP and the associated mitigation would beneficially further the objectives of CERP's.

The incremental land-use impacts associated with development and maintenance of the proposed transmission line corridors for the project in combination with the construction and operation of Units 6 and 7 at the Turkey Point site are the principal contributors to the project land-use impacts. The proposed new transmission line corridors pass through agricultural lands; undisturbed lands, including wetlands and some lands in or close to Everglades National Park and Biscayne National Park; and urbanized lands where the local jurisdictions, including Miami-Dade County and the local cities, have expressed concerns that the proposed transmission line improvements would be incompatible with existing and planned land uses. Local agencies, the National Park Service (NPS), and the State of Florida have identified mitigation measures to be taken. Most of the mitigation focuses on reducing impacts on wetlands and other ecological resources and is discussed in detail in Section 4.3.1.6.

The review team concludes that the cumulative effect of the proposed action on land use, added to effects associated with past, present, or reasonably foreseeable future projects, is MODERATE. This conclusion primarily reflects a history of agricultural and urban development in portions of the geographical area of interest, and possible land-use conflicts resulting from development of new facilities near two national parks and building new transmission lines through urban areas. The incremental contribution of NRC authorized activities associated with the overall Units 6 and 7 project (which would exclude building the transmission lines and certain other facilities) would be a significant contributor to the cumulative impact.

7.2 Water-Use and Water-Quality Impacts

This section analyzes the cumulative impacts of the proposed Turkey Point Units 6 and 7, and other past, present, and reasonably foreseeable projects, on water use and water quality. As described below, the review team identified no hydrological alterations during either the building or operation periods for the proposed plant that would interfere with either the Administrative Order (AO; FDEP 2014-TN4144) or the Consent Agreement (CA; Miami Dade County v. Florida Power & Light 2015-TN4505) activities associated with controlling the industrial wastewater facility (IWF) salinity and mitigating the hypersaline plume that has extended beyond the Turkey Point site. The review team considered a range of future conditions for both the construction and operation reviews to be plausible. Although the exact design of the systems for the AO and CA are not completely specified at this time, the review team has sufficient understanding of plausible designs to make a determination. For instance, pumping and deep-well injection are both mature technologies.

7.2.1 Water-Use Impacts

The cumulative water-use impacts from construction, preconstruction, and operations of proposed Turkey Point Units 6 and 7, and other past, present, and reasonably foreseeable projects, are related to the use of surface water and groundwater.

7.2.1.1 Surface-Water–Use Impacts

The description of the affected environment in Section 2.3 serves as a baseline for the cumulative impacts assessments in this resource area. As described in Section 4.2, the impacts from NRC-authorized construction on surface-water use would be SMALL, and no further mitigation would be warranted beyond the conditions imposed on FPL by the State of Florida final Conditions of Certification. As described in Section 5.2, the review team concludes that the impacts of operations on surface-water use would also be SMALL, and no further mitigation would be warranted beyond the conditions imposed on FPL by the State of Florida final Conditions of Certification (State of Florida 2014-TN3637).

The combined surface-water–use impacts from construction and preconstruction are described in Section 4.2.2 and were determined to be SMALL. In addition to the impacts from construction, preconstruction, and operations, the cumulative impacts analysis considers other past, present, and reasonably foreseeable future actions that could affect surface-water use, as discussed below.

The primary surface-water–use plan that could potentially be affected by Turkey Point Units 6 and 7 is the Comprehensive Everglades Restoration Program (CERP; USACE 2010-TN113; DOA and DOI 2016-TN4580) and its component Biscayne Bay Wetlands Restoration Project (USACE/SFWMD 2011-TN1038). At present, CERP has restoration plans extending to 2020, including several projects located in the region around Turkey Point. These projects are discussed in Section 2.3.1.1.

For this analysis, the geographic area of interest is strongly influenced by the site's proximity to Biscayne Bay. Because the primary water supply for cooling purposes is from reclaimed water, the impacts of surface-water use are limited to the potential for use of Biscayne Bay saltwater as a backup water supply obtained via radial collector wells (RCWs). However, based on discussions with the reclaimed water supply provider about their past operating experience and the incentive of greater cycles of concentration to FPL, the review team determined that any disruption of reclaimed water that would result in use of the backup water supply would likely be infrequent and only for short durations. Consequently, the effect on Biscayne Bay from the use of the RCWs would be minimal.

In accordance with the Florida Department of Environmental Protection (FDEP) AO (FDEP 2014-TN4144), as part of operation of Units 3 and 4, water may be withdrawn from the L-31E Canal to freshen the IWF. This withdrawal would only be allowed during periods of excess flow. Other than the ecological use identified, there are no other identified water users beyond the withdrawal location before the water enters Biscayne Bay. As pointed out earlier, Units 6 and 7 would not use surface-water supplies from the affected environment.

The NRC staff determined that the consumptive use of water from the operation of proposed Turkey Point Units 6 and 7 and all other consumptive uses (existing or likely future uses) would not alter the volume of water in Biscayne Bay. Because of the use of reclaimed water and the limited use of the RCWs, there would be no noticeable alteration of the surface-water resources due to building and operating Units 6 and 7. Based on its evaluation, the NRC staff concludes that the cumulative impacts on surface-water use from construction, preconstruction, and

operations of two new nuclear units and other past, present, and reasonably foreseeable future activities would be SMALL, and likely, no mitigation would be warranted.

7.2.1.2 Groundwater-Use Impacts

The description of the affected environment in Section 2.3 of this EIS serves as a baseline for the cumulative impacts assessments in this resource area. As described in Section 4.2, the impacts from NRC-authorized construction on groundwater use would be SMALL, and no further mitigation would be warranted beyond the conditions imposed by the State of Florida final Conditions of Certification (State of Florida 2014-TN3637). As described in Section 5.2, the review team concludes that the impacts of operations on groundwater use would also be SMALL, and no further mitigation would be warranted beyond the conditions imposed on FPL by the State of Florida final Conditions of Certification.

The combined groundwater-use impacts from construction and preconstruction are described in Section 4.2 and were determined to be SMALL. In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis considers other past, present, and reasonably foreseeable future actions that could affect groundwater use. For this analysis, the geographic area of interest related to groundwater-use impacts is the area in which measureable effects of excavation dewatering or RCW operation are reasonably expected. Potential impacts on groundwater use from preconstruction, construction, and operation of the proposed plants are primarily related to the following:

- preconstruction dewatering of plant excavations involving pumping groundwater from excavations to the IWF cooling canals;
- limited dewatering related to construction and maintenance of facilities, including the reclaimed water treatment facility, pipelines, ancillary buildings, roads, transmission towers, temporary utilities, cooling towers, and wastewater-injection wells; and
- removal of groundwater from the Biscayne aquifer during operation of the RCWs as a backup cooling-water supply and for well maintenance.

As discussed in Section 2.3, groundwater from the Biscayne aquifer provides practically all of the freshwater for Miami-Dade County including the geographic area of interest. This area is located within the South Florida Water Management District (SFWMD), which monitors groundwater resources within the district. Continued development and increasing use of groundwater in the areas west of the Turkey Point site could have a cumulative effect of lowering groundwater levels in the aquifer, which could cause inland movement of the interface between saltwater and freshwater in the aquifer. The review team's determination that the proposed limited operation of the RCWs would have minor impacts on groundwater users is based on the reliability of the reclaimed water supply. Based on discussions with the reclaimed water supply provider about their past operating experience and the incentive of greater cycles of concentration to FPL, the review team determined that any disruption of reclaimed water that would result in use of the backup water supply would likely be infrequent and only for short durations.

The water-surface elevation in the cooling canals would increase as a result of adding water for freshening as required by the AO (FDEP 2014-TN4144). This increase in water-surface elevation would result in increased piezometric heads beneath the IWF. As a result, any eastward groundwater movement from inland would tend to be diverted to the north around the north end of the IWF and to the south away from the south end of the IWF. Also, a decrease in piezometric head may result from pumping from the hypersaline plume in the area around the IWF associated with the CA (Miami Dade County v. Florida Power & Light 2015-TN4505). Pumping for remediation likely would focus on the bottom of the Biscayne aquifer, allowing the density of the hypersaline water to drive itself toward the well screens; whereas, the freshening activities would dominate more in the upper part of the Biscayne aquifer and very near the site. The fraction of the water that enters the RCWs from sources other than Biscayne Bay would likely increase and would be increasingly from the IWF-induced inflow. Model analyses discussed in Appendix G support this assessment.

The review team determined that the consumptive use of water from the operation of Turkey Point Units 6 and 7 would not result in a noticeable alteration of the available groundwater resources within the geographic area of interest for groundwater-use impacts. Based on its evaluation, the review team concludes that the cumulative impacts on groundwater from construction, preconstruction, and operations of two new nuclear units and other past, present, and reasonably foreseeable future activities would be SMALL, and no mitigation would be warranted beyond the conditions imposed on FPL by the State of Florida final Conditions of Certification (State of Florida 2014-TN3637).

7.2.2 Water-Quality Impacts

This section describes cumulative water-quality impacts from construction, preconstruction, and operations of proposed Turkey Point Units 6 and 7, and other past, present, and reasonably foreseeable projects.

7.2.2.1 Surface-Water-Quality Impacts

The description of the affected environment in Section 2.3 of this EIS serves as a baseline for the cumulative impacts assessments in this resource area. As described in Section 4.2, the impacts from NRC-authorized construction on surface-water quality would be SMALL, and no further mitigation would be warranted beyond the conditions imposed on FPL by the State of Florida final Conditions of Certification (State of Florida 2014-TN3637). As described in Section 5.2, the review team concludes that the impacts of operations on surface-water quality would also be SMALL, and no further mitigation would be warranted beyond the conditions imposed on FPL by the State of Florida final Conditions of Certification.

As stated in Section 2.3.3.1 of this EIS, some waterbodies near the Turkey Point site are listed on the State's 303(d) list of impaired waterbodies (FDEP 2010-TN1253). Historical point and non-point-source discharges have affected the water quality of streams and rivers near the Turkey Point site. Portions of the estuary and streams along the southeast Atlantic coast to Biscayne Bay appear on the final 2010 303(d) list as impaired waterbodies because of the presence of copper, fecal coliforms, mercury, and nutrients (FDEP 2010-TN1253). The State of Florida has a Total Maximum Daily Loads program to help protect and restore the quality of

waters. In addition, the State of Florida also designates waterbodies as Outstanding Florida Waters and special waters to which pollutant discharges are generally prohibited. The waters of Biscayne National Park near the Turkey Point site are designated as an Outstanding Florida Waterbody (Fla. Admin. Code 62-302-TN776). Turkey Point Units 6 and 7 have no discharge to Biscayne Bay or to any surface water. All effluent is disposed of via deep-well injection under the Underground Injection Control (UIC) program. As stated above, the State of Florida, under the Total Maximum Daily Loads program, helps protect and restore the quality of impaired waters. Therefore, the review team determined that the cumulative impacts from existing, proposed and reasonably foreseeable future action on these waterbodies would be noticeable but not destabilizing.

Other present and reasonably foreseeable future actions in the geographic area of interest that could contribute to cumulative impacts on surface-water quality include the impact of the uprates of FPL's Units 3 and 4 at Turkey Point, the conversion of Unit 2 to synchronous condenser mode and the planned conversion of Unit 1 to the same, and the potential use of reclaimed water for cooling purposes at Turkey Point Unit 5 (FPL 2015-TN4148). The uprate of Turkey Point Units 3 and 4 has increased the discharge temperature from the two units. The IWF has also recently experienced localized increases in the temperature of the cooling-canal water. Also the conversion of Units 1 and 2 to synchronous condenser mode would reduce flow in the IWF (NRC 2012-TN1438). The staff considered the potential use of reclaimed water for cooling of Turkey Point Unit 5 and the resulting release of contaminants from the cooling-tower drift with subsequent deposition in the surrounding environments. However, based on the review team's analysis of drift deposition from proposed Turkey Point Units 6 and 7, the loading of contaminants to the surrounding environment would be negligible.

As noted in 2.3, recently an algal bloom occurred in the IWF. The IWF also experienced increased water temperatures, increases in concentrations in salinity and nutrients and a decrease in precipitation which may have caused or contributed to the algal bloom. These anomalous conditions in the IWF are not associated with either the construction or operation of the proposed units, since no activity has begun yet. Furthermore, no cooling water from operation of Units 6 and 7 are proposed to be discharged to the IWF. Based on the analysis discussed in Sections 4.2 and 5.2, the review team determined that the construction and operation of the proposed units would have a negligible effect on the IWF and that the conditions in the IWF would not be altered significantly as a consequence of the proposed action.

In accordance with the AO (FDEP 2014-TN4144), water may be removed from L-31E Canal or taken from the Upper Floridan aquifer to freshen the cooling canals. Withdrawal from the L-31E Canal is limited to periods of excess flow to minimize the impact on Biscayne Bay. Units 6 and 7 would not discharge into the IWF. Therefore, building and operation of Units 6 and 7 would not result in greater demand for freshening water withdrawals.

The review team determined that the cumulative impacts from existing, proposed, and reasonably foreseeable future action on these waterbodies would be MODERATE and the incremental impacts from NRC-authorized activities for Turkey Point Units 6 and 7 would be SMALL, and no further mitigation beyond that described in Chapters 4 and 5 would be warranted.

7.2.2.2 Groundwater-Quality Impacts

The description of the affected environment in Section 2.3 of this document serves as a baseline for the cumulative impacts assessments in this resource area. As described in Section 4.2, the impacts from NRC-authorized construction and preconstruction on groundwater quality would be SMALL, and no further mitigation would be warranted beyond the conditions imposed by the State of Florida final Conditions of Certification (State of Florida 2014-TN3637). As described in Section 5.2, the review team concludes that the impacts of operations on groundwater quality would also be SMALL, and no further mitigation would be warranted beyond the conditions imposed by the State of Florida final Conditions of Certification and UIC permits.

In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis considers other past, present, and reasonably foreseeable future actions that could affect groundwater quality. For this analysis, the geographic area of interest is the expected area of migration of wastewater injected into the Boulder Zone of the Lower Floridan aquifer, and the area in the Biscayne aquifer potentially affected by the migration of hypersaline water from the IWF. This distance also encompasses the area in which measureable effects of excavation dewatering, and RCW operation are reasonably expected and, therefore, it is sufficiently large enough to characterize potential cumulative groundwater-quality impacts.

The potential groundwater-quality impacts from dewatering and RCW pumping are based on the risk of increasing saltwater intrusion of the Biscayne aquifer described in Section 2.3.3.2 of this EIS and potential cumulative impacts related to saltwater intrusion in this aquifer. Local and Federal agencies are working to enhance freshwater recharge of the Biscayne aquifer in this area as part of the Biscayne Bay Coastal Wetlands Project of the CERP (USACE/SFWMD 2011-TN1038). In the dry season, the SFWMD uses the canal system to import water from the northwest to increase groundwater elevation and reduce saltwater intrusion. These actions and others planned under the CERP are projected to partially restore the previous natural environment in the area including enhanced freshwater recharge of the aquifer and sheet flow of some of the excess surface water now carried by canals. The review team has determined that future actions implemented under the CERP would not have a negative impact on the Biscayne aquifer, but would potentially have a positive impact by increasing the recharge of freshwater to the Biscayne aquifer and reducing the possibility for westward movement of the saltwater-freshwater interface. Hypersaline water in the IWF cooling canals interacts with groundwater in the Biscayne aquifer. Therefore, changes to the IWF, such as the recent temperature and salinity variations, and the proposed freshening of the IWF cooling canals by adding water pumped from the Upper Floridan aquifer (Tetra Tech 2014-TN4126) may have cumulative impacts on groundwater quality of the Biscayne aquifer. The uprate coincided with temperature and salinity increases within portions of the cooling-canal system (NRC 2012-TN3579). Adding additional brackish water from the Upper Floridan aquifer would likely reduce the temperature, salinity, and concentration of other constituents in the IWF water; which would result in lower concentrations in water seeping into the underlying aquifer. FPL determined that adding 14 mgd of brackish water would increase the water level of the IWF canals by about 0.25 ft (Tetra Tech 2014-TN4126) and eventually reduce salinity to approximately that of Biscayne Bay. The higher water levels would create a slightly greater hydraulic gradient into the

underlying aquifer. However, if a project is implemented to freshen the IWF water, potential impacts on the Biscayne aquifer would be reduced compared to the existing impacts.

Other potential cumulative impacts on groundwater quality are related to the injection of wastewater into the Boulder Zone and include other wastewater-injection well operations, and any potential use of saline groundwater from this aquifer. There are more than 180 active Class 1 injection wells that inject wastewater into the Boulder Zone and 13 of these wells are located at the Miami-Dade South District Wastewater Treatment Plant (SDWWTP) wastewater-injection site approximately 9 mi north of the proposed FPL UIC wells. All Boulder Zone UIC wells must be permitted and monitored by the FDEP UIC program, which is responsible for protecting underground sources of drinking water (USDWs) within Florida. Upward migration of treated municipal waste wastewater injected into the Boulder Zone has been observed at the Miami-Dade SDWWTP (Maliva et al. 2007-TN1483; Starr et al. 2001-TN1251; EPA 2003-TN3658), and has resulted in injected wastewater moving upward into the middle Floridan confining unit. As mentioned in Section 2.3, previous studies reported that injectate had migrated into the Upper Floridan aquifer at the SDWWTP site (Starr et al. 2001-TN1251; EPA 2003-TN3658). However, Walsh and Price (2010-TN3656) report that upwelling has not migrated above the APPZ of the MCU at the SDWWTP. Reese and Richardson (2008-TN3436) provided an explanation for this by recognizing, “the Avon Park Permeable Zone has been identified in previous studies as the…lower part of the Upper Floridan Aquifer in…the southern part of southeastern Florida.” The cause of the observed migration of contaminants has been attributed (McNeill 2000-TN4572; McNeill 2002-TN4571) to a lack of adequate geologic confinement, or a well construction problem. However, Starr et al. (2001-TN1251) conclude that “The vertical and spatial distribution of contamination in the Upper Floridan and Lower Floridan aquifers shows a pattern more consistent with point-source contamination, such as leaking wells, than from widespread upward migration through a leaking confining layer.”

Variable density modeling of the potential transport of wastewater in the Boulder Zone from the proposed Units 6 and 7 UIC wells (FPL 2014-TN4069) indicate that it is not likely that the injected wastewater may reach the location of the Miami-Dade SDWWTP UIC wells within the operational period of Units 6 and 7. Pressure within the Boulder Zone from continued injection at the SDWWTP would deter movement of injection from the proposed site in that direction and prevent significant commingling of the two injection plumes. As explained in Section 5.2, if this transport did occur, dilution and dispersion would reduce the concentrations within the effluent plume over the transport distance. The FDEP UIC permit for the Miami-Dade SDWWTP UIC wells requires that concentrations of potential contaminants are monitored in the USDW aquifer and in the confining zone separating the injection zone from the USDW aquifer. Remedial action would be taken to protect the USDW if contaminants were detected. The review team concludes that cumulative impacts resulting from operation of both UIC systems are unlikely and would have insignificant effects on water in the Boulder Zone. If transported contaminants migrated upward near the SDWWTP, they would be detected by the monitoring program required by FDEP. These geologic characteristics, fate and transport processes, and monitoring requirements would adequately protect the Upper Floridan aquifer from degradation resulting from cumulative effects of wastewater injection at Units 6 and 7 and the Miami-Dade SDWWTP site. Therefore, the review team determined that the cumulative impact of injecting wastewater in the Boulder Zone would be minor.

Cumulative impacts could also result from the mining of fill needed to build the proposed plants. The mining of fill material in the region of interest creates open ponds that may create a cumulative impact on groundwater quality because of the evaporation of groundwater from the pond surface, or from mixing of groundwater from different depths. Evaporation could result in the increased salinity of water in the ponds that could move into the aquifer intersected by the mine excavation. The annual evaporation rate in Florida is approximately equal to the annual precipitation rate (Shih 1981-TN4070). However, increases in salinity of fill-mine ponds occurs during the dry season. The effect of fill mines on groundwater mixing from different depths in the Biscayne aquifer was studied as part of an investigation conducted for Everglades National Park (Solo-Gabriele and Wilcox 2000-TN4110). Mixing of groundwater from separate permeable layers within the mine pond was observed based on the analysis of stable isotopes of oxygen. The FDEP and SFWMD have developed a proactive groundwater-management program to preserve and manage groundwater resources including groundwater quality (Fla. Admin. Code 62-520-TN1252). The review team determined that State and local regulation of fill-mine operations would be adequate to protect groundwater quality and the cumulative impacts on groundwater quality from fill mining would be minor.

Adding water for freshening as required by the AO (FDEP 2014-TN4144) would increase the water-surface elevation in the cooling canals. This increase in water-surface elevation would result in increased piezometric heads beneath the IWF. As a result, any eastward groundwater movement from inland would tend to be diverted to the north around the north end of the IWF and to the south away from the south end of the IWF. The fraction of the water that enters the RCWs laterals from sources other than Biscayne Bay would likely increase. The increased fraction would be increasingly from the IWF-induced inflow. Because the target for the freshening is an average annual concentration of 34 psu (similar to Biscayne Bay water), the change in salinity in the water recovered in the RCW is not expected to change noticeably. Model analyses discussed in Appendix G support this assessment.

In summary, the evaluation of cumulative impacts performed by the review team analyzed the impacts of enhanced recharge to the Biscayne aquifer from activities related to CERP and freshening of the IWF at the current operating site, evaluated the potential cumulative impact of deep-well injection into the Boulder Zone by the applicant and other wastewater-injection operations and reviewed the impacts of fill mining on water quality. Based on its evaluation, the review team concludes that due to the hydrologic characteristics of the affected aquifers, fate and transport processes, and the monitoring and management programs required by the State of Florida the cumulative impacts on groundwater quality from construction, preconstruction, and operations of two new nuclear units and other past, present, and reasonably foreseeable future activities would be SMALL, and no mitigation would be warranted.

7.3 Ecological Impacts

This section addresses the cumulative impacts on terrestrial, wetlands, and aquatic ecological resources as a result of activities associated with the proposed Turkey Point project and other past, present, and reasonably foreseeable future activities within the geographic area of interest for each resource.

7.3.1 Terrestrial Ecosystem Impacts

The description of the affected environment in Section 2.4.1 provides the baseline for the cumulative impacts assessments for terrestrial ecological resources, including wetlands and important species. As described in Section 4.3.1, the review team concludes that impacts from NRC-authorized construction on terrestrial resources would be SMALL, and additional mitigation beyond that already proposed by the applicant would not be warranted. As described in Section 5.3.1, the impacts of operations on terrestrial resources would be MODERATE. This conclusion accounts for multiple impacts, especially those related to wetlands, increased vehicular collision mortality of wildlife, vegetation control on listed plants, and transmission system operation on listed avian species, especially the Federally threatened wood stork. The combined impacts from construction and preconstruction were described in Section 4.3.1 and determined to be MODERATE. This conclusion accounts for the impacts on wetlands, wildlife, and Federally and State-listed plant and animal species.

In addition to the impacts from construction, preconstruction, and operations, the following cumulative analysis considers other past, present, and future actions that could affect terrestrial resources. For the cumulative analysis of terrestrial ecology, the geographic area of interest is considered to be the 50 mi vicinity for the Turkey Point site and the existing and proposed corridors associated with the transmission, potable water, and reclaimed water systems (as described in Chapter 4). This area is expected to encompass the ecologically relevant landscape features and species potentially affected by the proposed Units 6 and 7.

7.3.1.1 Past, Present, and Reasonably Foreseeable Future Actions Affecting Terrestrial Ecology

Past land practices have had a great influence on the current ecology of South Florida. Because of South Florida's low elevation, relatively flat topography, and wet climate, wetlands are the dominant natural terrestrial landscape feature. Lands of higher elevation have always been limited in extent and also have been more desirable for agriculture and urban development. The result has been a substantial loss of the shallow-soiled pinelands (pine rocklands) that formerly dominated the uplands. Also lost is the diversity of plants and animals that once thrived there as indicated by the number of listed species that occur only in pine rocklands (Tables 2-15 and 2-16). Alteration of surface-water flow during the last 100 years, especially the digging of canals to divert water to supply farms and cities and to build highways across wetlands, has altered hydrologic function and resulted in the substantial loss and degradation of wetlands and wetland function. This habitat loss and degradation caused biota populations that evolved to thrive in this environment to subsequently decline. For example, populations of many wading bird species have drastically decreased from historic levels (USACE/SFWMD 1999-TN116; Bancroft 1989-TN3571).

Specific past, present, and reasonably foreseeable projects and actions that have affected or could affect terrestrial and wetland ecology in the vicinity of Turkey Point are listed in Table 7-1. This list includes a variety of urban development, energy production, mining, manufacturing, transportation and infrastructure development, and other miscellaneous activities that could affect terrestrial and wetland resources. Current efforts, including the CERP and the Southern Glades Addition Restoration that restore ecological integrity to the region, also affect terrestrial

and wetland resources in a beneficial way. The following sections describe the cumulative impacts of past as well as present and reasonably foreseeable future actions on terrestrial and wetland ecology within the geographical region of interest, including those that may be environmentally beneficial.

Habitats and Wildlife

The principal cause of terrestrial habitat degradation and loss of wetland function within the region is related to land use and water management, and it is likely that pressure on land and water managers will continue to increase as the local human population in South Florida continues to grow and coastal habitats are developed further. Development that occurred during the construction of proposed Turkey Point Units 1−5 and the IWF has permanently altered most of the habitat in the immediate vicinity. Mangroves have been cleared for development, leaving scattered remnants in the remaining patches of wetlands. Upland areas have been created by filling and upland vegetation, including specimens of invasive species such as Australian pine, has become established. Natural wetlands have been replaced by canals and spoils within the 2 mi by 5 mi IWF. Hypersaline water released during operation of these units has likely influenced the distribution, abundance, and species composition of vegetation currently present.

Land-management planners in the region have begun to account for increased human habitation when developing and using conceptual ecological models (Ogden et al. 2005-TN196). Formerly, planning efforts had failed to account for an unpredictably large increase in the human population, resulting in unintended ecological consequences (Ogden et al. 2005-TN197). Continued growth of the human population in South Florida could result in more land development, decreased habitat, more hydrological alterations to remaining habitat, and reduced connectivity and ecological function of the remaining habitats. An increase in the amount of impervious surfaces could increase runoff during storm events. Building of more roads and levees could funnel runoff rather than allowing natural sheet flow, thereby affecting area wetlands and the biota that thrive in them. The Comprehensive Development Master Plan for Miami-Dade County and the Coastal Zone Management Program could help minimize these ecological impacts (Miami-Dade County 2012-TN1150; NOAA 2007-TN1244).

The CERP was approved under the Water Resources Development Act of 2000 (33 U.S.C. § 2201 et seq.) (TN1037) and is intended to provide a framework for restoration, protection, and preservation of water resources in central and southern Florida. The primary goals of the CERP are to capture freshwater that now flows into nearshore coastal areas as point sources and redirect it to promote more natural hydrologic conditions and enhance environmental connectivity (CERP 2012-TN1035). As noted by the National Research Council (2008 TN666), the CERP is an extremely complex, long-term restoration program with 68 separate subprojects that require sophisticated scientific knowledge of ecosystem function and dynamics, and the development of new approaches and technologies to support water management. One project within the CERP that could affect resources within the geographic area of interest is the Biscayne Bay Coastal Wetland project (USACE/SFWMD 2011-TN1038). This project is designed to restore wetlands adjacent to Biscayne Bay and Biscayne National Park through the redistribution of sheet flow away from canals to replicate natural runoff processes. Removal of water from the L-31E Canal during periods of excess flow to freshen the IWF, in accordance

with the AO (FDEP 2014-TN4144), could result in less availability for freshwater for the Biscayne Bay Coastal Wetland restoration. The West Preferred Corridor along the eastern boundary of the Everglades National Park could be counterproductive to the future CERP goals because of its presence near the eastern portion of Everglades National Park. The West Transmission Line Corridors (Preferred or Consensus corridors) may require an engineering review by USACE pursuant to Section 14 of the Rivers and Harbors Act of 1899 (33 USC 408) to assess consistency with CERP goals.

Another related CERP project that could affect local resources is the modification of the Tamiami Trail (US Highway 41) roadway to increase water flow into the Everglades National Park. The USACE constructed a 1 mi bridge along Tamiami Trail and raised the elevation of the roadbed elsewhere. This allows for higher water levels in Water Management Area 3A north of the road to flow into Water Management Area 3B south of the road and was constructed done in part to improve Everglade snail kite habitat (USACE 2013-TN2468). The project was completed on December 23, 2014.

The Model Lands Basin and Southern Glades Addition projects represent an effort to manage lands immediately south and west of the Turkey Point site and represent a collaborative effort by the Environmentally Endangered Lands Program of Miami-Dade County and the Save Our Rivers Program of the SFWMD. Programmatic goals include improving the overall condition of about 34,000 ac of freshwater and coastal wetlands through removal of exotic plants, improving access control to sensitive areas, implementing a prescribed fire program, and restoring wetland function through removal of physical barriers to overland flow (SFWMD 2005-TN217). FPL has specifically agreed to raise water elevations within the Everglades Mitigation Bank and fill portions of the Model Lands North Canal as part of the effort to manage hypersaline groundwater coming from the IWF (Miami Dade County v. Florida Power & Light 2015-TN4505). All of these activities would benefit the terrestrial ecology and wetlands of South Florida.

As stated in Section 4.3, building Units 6 and 7 would result in permanent loss of approximately 585 ac of terrestrial and wetland habitats within the Turkey Point site boundary, involving the loss of approximately 307 ac of wetlands, including mostly non-vegetated mudflat and mangrove. An additional 45 ac of undeveloped habitat would be affected by the installation of the reclaimed water-supply systems, including approximately 43 ac of offsite wetlands. Proposed transmission line corridors built or upgraded to support proposed Units 6 and 7 contain more than 3,200 ac composed mostly of wetlands and agricultural lands. Only a portion of these lands, estimated to be less than 10 percent of lands within the corridor, would be permanently occupied by pads and roads (FPL 2015-TN4442). Vegetation maintenance within the corridors would permanently affect forested habitats and could affect additional acreage immediately outside of the rights-of-way. Land-cover classes that would be affected by transmission line corridor development include mangrove swamp, freshwater marsh, mixed wetland hardwoods, shrub and brushland, and herbaceous prairie. Proposed Units 6 and 7 would therefore further contribute noticeably to the regional loss, fragmentation, and degradation of wetland and upland habitats in South Florida.

Important Species and Habitats

Biota listed as Federally endangered, threatened, or candidates for listing as endangered or threatened would also be affected. As discussed in Section 4.3.1.3, three listed plant species, the sand flax (proposed endangered; *Linum arenicola*), Florida brickell-bush (endangered; *Brickellia eupatorioides (mosieri) var. floridana*), and the pineland sandmat (candidate; *Chamaesyce deltoidea ssp. pinetorum*) have been observed growing within proposed transmission line corridors that would support proposed Units 6 and 7 and may be affected. Surveys have not yet been conducted throughout the proposed corridors, and areas not yet surveyed may harbor other listed species. Listed wildlife that could likely be affected by building proposed Units 6 and 7 facilities include the eastern indigo snake (threatened; *Drymarchon corais couperi*), Florida panther (endangered; *Puma (=Felis) concolor coryi*), piping plover (threatened; *Charadrius melodus*), red knot (threatened; *Calidris canutus*), Everglade snail kite (endangered; *Rostrhamus sociabilis plumbeus*), and the wood stork (threatened; *Mycteria americana*). Although one of two known occurrences of the Miami tiger beetle lies in a pine rockland complex immediately adjacent the East transmission right-of-way, it would not be affected by building and maintenance of the right-of-way, which would pass adjacent to but not actually encroach into the pine rockland complex.

Numerous plant and animal species listed by the State of Florida as endangered or threatened could also be affected. Most of the State-listed plants are associated with pine rockland and marl prairie habitats, both of which occur within the preferred western transmission line corridor and either within or alongside the eastern corridor. The distribution and abundance of State-listed species is unknown. Past development has resulted in the loss of approximately 99 percent of pine rockland habitat outside of Everglades National Park. Pine rockland species are threatened by a multitude of issues exacerbated by continued urbanization of South Florida, and are sensitive to the loss of small losses of remaining habitat and even to the loss of individual organisms. Incremental impacts on pine rockland habitat and respective species from the proposed Units 6 and 7 are expected to be minimal because very little pine rockland habitat would be affected and BMPs described in Sections 4.3.1 and 5.3.1 of this EIS would limit the type and extent of impact. In addition the Florida Fish and Wildlife Conservation Commission (FFWCC) has required FPL to conduct pre-clearing and post-construction surveys for all State-listed species in coordination with the FFWCC (FFWCC 2012-TN520). Federally listed species are also State-listed species in Florida (Table 2-12). FPL has stated that it will follow FFWCC-approved survey protocols, conduct regular reporting of results, and implement management actions for specific species or resources as required by FFWCC (FFWCC 2012-TN520).

The Turkey Point site currently contains five power-generating plants. Cooling canals of the closed-loop IWF cool the water for Units 1–4. Prior to 2014, these canals provided habitat and forage for many wading birds. Water within the cooling canals does not directly discharge via surface flow into other bodies of surface water and is hypersaline. An uprate for Units 3 and 4 was approved by the NRC in 2012 (77 FR 20059) (TN1001), increasing the capacity to 823 MW(e). FPL predicted this increase in capacity would increase water temperatures within the cooling canals by 2°F and increase salinity 2–3 ppt (FPL 2014-TN4058). Aquatic species found within the cooling canals are subtropical or tropical and would not likely be affected by the predicted increases in water temperature or salinity from the uprate (77 FR 20059) (TN1001). However, record high salinity and temperature levels along with algal blooms during the

summer of 2014 changed the ecology of the IWF. Although subsequent actions to freshen water within the IWF have returned salinity and temperatures to pre-summer 2014 levels, the ecological functions would likely remain substantially altered. Consequently, terrestrial species that forage on these aquatic species have likely already been affected and the rate of recovery of the IWF to a more normal ecological state is unknown. Unit 5 uses mechanical draft cooling towers to dissipate heat. The current cooling-water source for Unit 5 is groundwater (FPL 2014-TN4058). The deposition of salt from Unit 5 cooling-tower drift would be minimal; the combined salt deposition from Units 5, 6, and 7 would not be expected to exceed ecological threshold levels that could be harmful to area wetlands and biota. It is possible reclaimed water could replace groundwater as the primary coolant in the future. As with proposed Units 6 and 7, use of reclaimed water for cooling Unit 5 would also result in the deposition of chemicals of emerging concern (CECs) in the environment from cooling-tower drift. However, CEC deposition levels from all three units would still not be expected to reach levels that could adversely affect terrestrial or wetland species.

7.3.1.2 Summary of Terrestrial and Wetland Ecology Impacts

Existing terrestrial and wetland ecosystem conditions within the geographic area of interest are a function of past land-use practices. Land development and alteration of surface-water flow has degraded and fragmented much of the terrestrial habitat within the region. Regional planning efforts designed to reverse habitat degradation resulting from past land-use and water-management practices are under way. The CERP is a comprehensive project that could result in substantial long-term landscape-scale benefits to terrestrial and wetland ecosystems in the region. The Model Lands Basin and Southern Glades Addition Restoration projects could also benefit terrestrial and wetland ecosystem function in the Everglades National Park, Biscayne National Park, and other lands in the immediate vicinity of the Turkey Point site. However, the ecological complexity of the south Florida landscape may prevent full recovery of the ecosystem and these planned beneficial activities could at least temporarily exacerbate current ecological conditions.

Development related to human population growth in South Florida is expected to continue, placing increased demand on limited resources that would continue to degrade ecological function. Building the proposed Turkey Point Units 6 and 7 and associated facilities would affect substantial areas of naturally vegetated wetlands and uplands. Many species listed by the U.S. Fish and Wildlife Service (FWS) as endangered, threatened, or candidates and by the State of Florida as endangered or threatened are also likely to be affected. Cumulative effects related to anticipated regional development and population growth would depend on the success of current and future planning efforts to manage growth and development.

The NRC staff concludes that the overall cumulative impacts on terrestrial resources in the geographic area of interest from the past, present, and reasonably foreseeable future actions described above would be MODERATE to LARGE. A range is provided because of the review team's uncertainty about the possible effects from the complex interplay of habitat losses from ongoing development in the area combined with building proposed Units 6 and 7 facilities; habitat loss and degradation from past, ongoing, and anticipated regional land development; the sensitivity of terrestrial habitats in the region to hydrological changes; the number and distribution of Federally and State-listed species present in the region; the presence of two

national parks and numerous other conservation lands in the area. Considering the wetland mitigation proposed for impacts from building the proposed Units 6 and 7 facilities, as well as mitigation measures that FPL proposes to develop with FWS to address possible avian impacts from the new transmission lines, the NRC staff concludes that the possible incremental effects of construction, preconstruction, and operation of the proposed Turkey Point Units 6 and 7 project would be MODERATE, with noticeable but not destabilizing effects on the regional ecology.

The NRC staff concludes that the incremental contribution to cumulative impacts from NRC-authorized construction and operation of the proposed Units 6 and 7 (which excludes site preparation activities and building certain non-safety related buildings associated with the project) would still be MODERATE. Operating the power blocks and maintaining various facilities associated with Units 6 and 7 could still noticeably affect terrestrial habitats in many sensitive terrestrial habitats in the region.

7.3.2 Cumulative Effects for Aquatic Ecology

The description of the affected environment in Section 2.4.2 serves as a baseline for the cumulative impacts assessment in this resource area. As described in Section 4.3.2, the NRC staff concludes that preconstruction, and construction, of Units 6 and 7 would result in SMALL impacts on aquatic resources, except MODERATE impacts on the threatened American crocodile (*Crocodylus acutus*) from preconstruction activities. As described in Section 5.3.2, the NRC staff concludes that the impacts of operations on aquatic resources would be SMALL.

In addition to the impacts from building and operation, the cumulative analysis considers other past, present, and reasonably foreseeable future actions that could affect aquatic ecology. For this analysis, the geographic area of interest includes all aquatic resources in southeastern Florida which includes the Turkey Point site, Biscayne National Park, Florida Keys National Marine Sanctuary north of mile marker 106 in Key Largo, the eastern portion of Everglades National Park, and canal systems (e.g., Card Sound, Mowry, L-31 N, and L-31 E Canals). The geographic area of interest for the proposed transmission line and pipeline corridors is described in Section 3.2.2.3. Surface-water areas within and outside the Turkey Point site provide habitat to ecologically, recreationally, and commercially important species; are hydrologically connected to some extent; and have experienced adverse and beneficial changes from anthropogenic and natural activities that have occurred in the past, and that could occur in the future.

7.3.2.1 Description of Past, Present, and Reasonably Foreseeable Future Actions

Historical Context

Prior to drainage and development activities, the wetland and aquatic ecosystems of southern Florida encompassed approximately 8.9 million acres, and included ridge and slough landscapes, sawgrass plains, cypress and mangrove swamps, and coastal lagoons and bays (USACE/SFWMD 1999-TN116). Ogden et al. (2005-TN196) characterized this pre-drainage condition as a “hydrologically interconnected, slow flowing system that extended from the Kissimmee River and Lake Okeechobee southward over low-gradient lands to the estuaries of

Biscayne Bay, Ten Thousand Islands, and Florida Bay, and eastward and westward to the northern estuaries." Browder et al. (2005-TN151) noted that prior to development, Biscayne Bay possessed both marine and estuarine habitat and fauna, and that construction of major canals and subsequent water drainage affected the salinity gradients and ecotones from the Everglades through coastal wetlands and tidal creeks into Biscayne Bay. Historical accounts suggest that prior to inlet and navigational dredging and related development, the northern and central portions of Biscayne Bay had much lower salinity conditions, low nutrient concentrations, and low turbidity/high light transmittance that promoted the presence of extensive seagrass meadows on the bay bottom (USACE/SFWMD 1999-TN116).

During the late 1800s and early 1900s, flood control was recognized as the principal impediment to development in South Florida. Land was drained to support urban and agricultural development and a series of canals were constructed to support flood control, irrigation, and transportation. In 1948, Congress authorized the creation of the Central and Southern Florida Flood Control Project—one of the largest water-management systems in the world (Ogden et al. 2005-TN196). As a result of this and other projects, a substantial portion of the original wetland system in South Florida was lost or converted to support agriculture, urban development, and related infrastructure. These changes have dramatically reduced sheet flow, and have created point-source discharge of freshwater into estuarine and coastal wetland areas that have substantially changed the dynamics of the system and aquatic species compositions. The effects of these practices have included the creation of deeper water habitats within canal systems, which has contributed to the spread of exotic and nuisance species, the creation of unnatural habitats for predatory fishes and alligators, and unnatural reversals in wet and dry patterns (Ogden et al. 2005-TN197).

Existing Turkey Point Units

The existing Turkey Point site described in Chapter 3 encompasses 11,000 ac and currently contains five power-generating plants. Units 1 and 2 are natural-gas/oil steam electrical generating units that each produce 400 MW(e). Unit 1 has been in service since 1967 and Unit 2 has been in service since 1968. In January 2013, Unit 2 was converted to operate in synchronous condenser mode to provide voltage support for the transmission system in southeastern Florida. In this mode, it no longer generates power. FPL also expects to convert Unit 1 to a similar purpose in December 2016 (FPL 2016-TN4579). Two pressurized water reactors each producing 700 MW(e) and associated facilities (Units 3 and 4) are also located on the site. Unit 3 has been in service since 1972 and Unit 4 has been in service since 1973. Both units received operating license renewals, allowing operation of Unit 3 until 2032 Unit 4 until 2033 (NRC 2012-TN1298; NRC 2012-TN1299). Both Units 3 and 4 received extended power uprates on June 15, 2012 (NRC 2012-TN1438). Unit 5 is a natural-gas combined-cycle unit that began operating in 2007 and is rated to produce 1,150 MW(e). These existing units occupy approximately 195 ac. Units 1 through 4 on the Turkey Point site rely on a system of canals that occupy approximately 5,900 ac on the Turkey Point site to provide cooling water. The canals are used as a closed-loop cooling system, and they are permitted as an IWF. Mechanical draft cooling towers are used to dissipate heat from Unit 5. Water from the Upper Floridan aquifer is withdrawn to provide makeup water to Unit 5. Blowdown from the Unit 5 cooling towers is sent to the cooling canals of the IWF (FPL 2014-TN4058).

Because the existing Units 1–5 have limited connection to Biscayne Bay, Card Sound, the cumulative effects of their operation will likely be confined to species inhabiting the IWF. The operation of the cooling systems for Units 1, 3, 4, and 5 would continue to result in impacts on aquatic resources in the IWF, including impingement, entrainment, and chemical, thermal, and high-salinity discharges. For Units 3 and 4, the NRC has previously assessed the environmental impacts of the 2002 license renewal and of the 2012 extended power uprate. The NRC (2002-TN2605) determined that the impacts of license renewal on aquatic resources in the IWF, Biscayne Bay, and Card Sound would be SMALL. The NRC (2012-TN3579) determined that the extended power uprate would result in additional temperature and salinity increases within the cooling-canal system but that these changes would not result in significant long-term impacts on aquatic resources.

Increases in temperature, salinity, and nutrient levels observed during the summer of 2014, including an extensive algal bloom, had a significant impact on aquatic biota in the IWF. The significance of these events and their potential to affect the water quality of the IWF are discussed in Sections 2.3 and 7.2. American crocodile nesting in the IWF area noticeably decreased during the nesting season in 2015; the decrease appeared to be linked to ongoing changes in IWF water quality and lack of foraging opportunities because of the reduction in quality of the localized ecosystem. However, nesting was observed to have increased in other adjacent habitats outside the IWF, and overall numbers of nests within designated critical habitat throughout South Florida were not reduced (PNNL 2015-TN4446). The presence of the existing units may also require additional protection from sea-level rise, as discussed below that could further affect existing hydrology, and potentially reduce the potential for species introduction into the IWF via storm surge.

Model Lands Basin and Southern Glades Addition Restoration

The Model Lands Basin and Southern Glades Addition projects are located south and west of the Turkey Point site, and represent a collaborative effort by the Environmentally Endangered Lands Program of Miami-Dade County and the Save Our Rivers Program of the SFWMD. The restoration area encompasses about 34,000 ac of freshwater and coastal wetlands, and serves as a key area for freshwater flow to Florida Bay, Biscayne Bay, Card Sound, and Barnes Sound (SFWMD 2005-TN217). Programmatic goals include improving the overall condition of wetlands through removal of exotic plants, improving access control to sensitive areas, implementing a prescribed fire program, and restoring wetland function through removal of physical barriers to overland flow. Although many of the restoration actions do not specifically involve aquatic resources, the overall program will benefit aquatic species by restoring historic flow patterns into Biscayne Bay, Card Sound, and Biscayne National Park, and limiting future impacts through programmatic planning. If successful, these projects could result in ecosystem connection and function that more closely resemble what was present before industrialization and urbanization occurred in South Florida. Unfortunately, detectable changes in aquatic environments may not be evident for many years after project implementation.

Biscayne National Park Fishery Management Plan

In 2014, the NPS finalized a fishery management plan to protect and restore Biscayne National Park's existing fisheries. The plan was intended to ensure that fishing activities were conducted in a sustainable manner and to comply with the NPS mandate to provide inspiration, education,

and enjoyment to future generations (NPS 2014-TN4073). The plan includes the following five alternatives related to future conditions within Biscayne National Park:

1. Maintain status quo: no-action alternative with regard to regulations.
2. Maintain Biscayne National Park fisheries resources at or above current levels: potentially change minimum harvest sizes, bag limits, seasonal closures.
3. Improve conditions over current levels: increase the abundance and size of fishery target species resources by 10 percent compared to existing conditions.
4. Rebuild and conserve park fishery resources: increase the abundance and size of fishery target species resources by 20 percent compared to existing conditions.
5. Restore park fishery resources: increase the abundance and size of fishery target species resources to within 20 percent of their estimated historic (pre-exploitation) levels.

Comprehensive Everglades Restoration Program

The CERP was approved under the Water Resources Development Act of 2000 (33 U.S.C. § 2201 et seq.) (TN1037) and is intended to provide a framework for restoration, protection, and preservation of water resources in central and southern Florida. The program encompasses 16 counties and more than 180,000 mi^2, and is expected to take more than 30 years to complete at a cost of nearly $12 billion in 2007 dollars. The primary goals of the CERP are to capture freshwater that now flows into nearshore coastal areas as point sources and redirect it to promote more natural hydrologic conditions and enhance environmental connectivity (CERP 2012-TN1035; DOA and DOI 2016-TN4580).

One of the key CERP projects that will affect aquatic resources in the vicinity of the Turkey Point site is the Biscayne Bay Coastal Wetlands Phase 1 Project (USACE/SFWMD 2011-TN1038). The lead agency for this project is the USACE Jacksonville District; the SFWMD serves as the non-Federal cost-sharing partner. The overall goal of the project is to rehydrate coastal wetlands and reduce point-source discharge of freshwater into Biscayne Bay by redirecting the water to spreaders in coastal wetlands that are currently bypassed by the canal systems. This is intended to improve nearshore substrate and fish habitat that are affected by high salinity during the dry season, and to reduce excessive freshwater outflow during the rainy season. As designed, the project will divert an average of 59 percent of the freshwater discharged into Biscayne Bay from coastal structures into freshwater and saltwater wetlands (USACE/SFWMD 2011-TN1038). If this program meets its intended goals, it should result in detectable improvements in nearshore habitats and reductions in salinity in Biscayne Bay.

As noted by the National Research Council (2008-TN666), CERP is an extremely complex, long-term restoration program with 68 separate subprojects that require sophisticated scientific knowledge of ecosystem function and dynamics, and the development of new approaches and technologies to support water management. In its second biennial review of CERP progress, the Committee on Independent Scientific Review of Everglades Restoration Progress (National Research Council 2008-TN666) concluded CERP was "…bogged down in budgeting, planning, and procedural matters and is making only scant progress toward achieving restoration goals." The Committee went on to state that the ecosystems CERP is intended to save remain in peril while rising construction costs and ongoing population growth and development make

restoration challenges more difficult (National Research Council 2008-TN666). Unfortunately, in its third biennial review, the National Research Council concluded that natural system restoration progress from the CERP remained slow noted that “continued declines in some aspects of the ecosystem coupled with environmental and societal changes make accelerated progress in Everglades restoration even more important" (National Research Council 2010-TN1036). A similar finding was reached in 2012 (National Research Council 2012-TN2685), and in 2014 (National Research Council 2014-TN4608). Thus, it is difficult to predict whether CERP-related restoration actions, or those funded by other sources, will meet their intended goals and result in a detectable beneficial change to affected aquatic resources in South Florida.

Florida Keys National Marine Sanctuary

Because improved water quality and habitat may positively influence Card Sound and Biscayne Bay, the past, present, and future activities associated with the Florida Keys National Marine Sanctuary (FKNMS) may influence cumulative effects. In 2011, the National Oceanographic and Atmospheric Administration released a report about the condition of FKNMS that summarized the state of the resources with respect to water, habitat, living resources, and maritime archaeological resources (NOAA 2011-TN1847). The conclusions related to water suggested that although some management actions have reduced impacts on water quality, conditions were either declining or had not appreciably changed. A similar conclusion was reached for metrics associated with habitat and living resources. In response to this report, the FKNMS has indicated it will continue implementation of its water-quality protection program in conjunction with the EPA and FDEP to reduce point and nonpoint-source pollution and work collaboratively with State and Federal agencies to provide enforcement of existing laws. The FKNMS will also continue to implement its marine zoning and permitting program to reduce habitat loss and destruction within sanctuary boundaries. These actions are expected to benefit both FKNMS and surrounding waterbodies, including open-ocean environments adjacent to the sanctuary and Card Sound and Biscayne Bay to the north.

Population Growth and Coastal Development

Increased population growth and coastal development have been cited as serious ecological concerns by many Federal and State resource agencies, nongovernmental groups, and researchers studying South Florida ecosystems. For instance, the National Research Council, in its 2008 review of CERP (National Research Council 2008-TN666), noted that an expanding population in South Florida would create competition with ecosystem restoration for finite resources, and that planned restoration efforts could be in conflict with agriculture when farmed areas interrupt intended water flow for rehydration and restoration. Environmental effects related to historical and current population growth have also been incorporated into ecosystem conceptual models for South Florida (Ogden et al. 2005-TN196; Ogden et al. 2005-TN197) and identified as a major threat to Biscayne National Park (Robles et al. 2005-TN198). A similar concern was stated in the Final Integrated Project Implementation Report and EIS for the Biscayne Bay Coastal Wetland Phase 1 Project (USACE/SFWMD 2011-TN1038), which indicated that without the Phase 1 project, further development and creation of impervious surfaces would lead to increased runoff and larger point-source freshwater discharges into nearshore areas. USACE/SFWMD also indicated that if the plan was not implemented, much of

the study area for the project would likely be developed, resulting in increased stormwater runoff and pollution, and additional use of chemicals to reduce mosquito populations and support agricultural development (USACE/SFWMD 2011-TN1038).

7.3.2.2 Summary of Aquatic Ecology Impacts

Clearly, many factors will contribute to the cumulative ecological effects experienced by aquatic communities at or near the Turkey Point site over the next 40 years. Increased development and overpopulation, historic alterations to waterbodies for flood control and agriculture, subsequent destruction of wetlands, introduction of exotics, and habitat degradation have adversely affected aquatic resources in southern Florida. These effects, unrelated to the construction and operation of Units 6 and 7 are observable. Although the effects of construction and operation of proposed Units 6 and 7 may contribute to the overall cumulative impacts experienced by aquatic communities at or near the Turkey Point site, the largest source of uncertainty related to future conditions appears to be the success or failure of existing and pending restoration activities, and the magnitude of hydrological alterations as a result of climate change as discussed in Appendix I, along with State and Federal agency response to climate change impacts. Although the construction and operation of the proposed Turkey Point Units 6 and 7 could contribute to cumulative effects on aquatic resources, including those within Biscayne National Park, it is likely the impacts of construction and operation of these units would be minor compared to (1) the success (or failure) of existing or planned restoration activities and (2) the effect of continued urbanization in South Florida. The NRC staff concludes that the contribution to cumulative impacts on aquatic resources from authorized NRC activities for proposed Units 6 and 7, within the geographic area of interest would likely be SMALL. However, overall, cumulative impacts on aquatic resources in the geographic area of interest would be MODERATE, primarily based on historic alterations to aquatic resources.

7.4 Socioeconomic and Environmental Justice Impacts

The evaluation of cumulative impacts on socioeconomics and environmental justice is described in the following sections.

7.4.1 Socioeconomics

The description of the affected environment in Section 2.5 serves as a baseline for the cumulative impacts assessment in this resource area. As described in Section 4.4, the NRC staff assessed the physical impacts of the NRC-authorized construction on the activities related to building proposed Turkey Point Units 6 and 7 and concluded that physical impacts on workers and the general public, including impacts on existing buildings, roads, waterways, aesthetics, noise levels, and air quality would be SMALL and no further mitigation would be warranted. The NRC staff also concludes that impacts of NRC-authorized construction on demographics, recreation, housing, public services, and education would be SMALL, with MODERATE impacts on traffic in the vicinity of the proposed site for Units 6 and 7. Impacts from NRC-authorized construction on the economy and tax revenues at the State and local levels would be SMALL and beneficial.

The combined impacts from construction and preconstruction are described in Section 4.4 and were determined to be SMALL and adverse with the exception of SMALL and beneficial impacts to the economies of Miami-Dade County, Homestead, and Florida City; MODERATE and beneficial impacts on roads; and MODERATE adverse impacts from traffic in the vicinity of the proposed site for Units 6 and 7. In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could have socioeconomic impacts. For this cumulative analysis, the primary geographic area of interest is Miami-Dade County because it is the principal area where Turkey Point site workers would live, where the economy, tax base, and infrastructure would most likely be affected, and therefore where socioeconomic impacts would occur. However, the geographic area of interest was modified as appropriate for specific impact analyses; for example, specific taxation jurisdictions were considered when appropriate.

As described in Section 2.5, Miami-Dade County is the most populous county in Florida. Its population doubled between 1970 and 2010 but its population growth rate has slowed. In 1992 it was hit by Hurricane Andrew and an estimated 40,000 residents left the area and did not return. The Homestead Air Force Base, an important employer in the South Miami-Dade County, was destroyed by the hurricane and today supports contingency and training operations (HARB 2012-TN3551).

The socioeconomic impact analyses in Chapters 4 and 5 of this EIS are cumulative by nature. Past and current economic impacts already have been considered as part of the socioeconomic baseline presented in Section 2.5. For example, the economic impacts of existing enterprises are part of the base used for establishing the Regional Input-Output Model System II multipliers (BEA 2012-TN1569). Regional planning efforts and associated demographic projections formed the basis for the review team's assessment of reasonably foreseeable future impacts. State and County plans along with modeled demographic projections like those used in Sections 2.5, 4.4, and 5.4 include forecasts of future development and population increases. Thus, cumulative impacts associated with general growth in Miami-Dade County construction, preconstruction, and operation of proposed Units 6 and 7 are evaluated in Chapters 4 and 5.

Future foreseeable specific projects that are not part of general growth in the region include the following (Table 7-1; FPL 2014-TN4058):

- Decommissioning of current Turkey Point units would reduce the use of roads in the vicinity of the proposed site, and would remove a local source of employment and tax revenues.
- The independent spent fuel storage installation for Turkey Point Units 3 and 4 is collocated on the Turkey Point site. It would be operational during construction of Units 6 and 7, but no additional workers are expected to be needed for its operations.
- Several CERP (USACE 2010-TN113) initiatives would involve construction within a 30 mi radius of the proposed Units 6 and 7 plant area. Some of these projects are under way and others are still on paper. They would bring additional workers to Miami-Dade County, but information about numbers and dates is still uncertain.
- The INGENCO Resource Recovery Facility is a proposed 8 MW landfill gas-fired power plant to be built 6 mi northwest of the Turkey Point site. The facility would be expected to be built by the time the Units 6 and 7 construction begins.

Other projects are being planned for the area and could bring additional construction workers or traffic (e.g., see Table 7-1), but none have been identified that would add increased pressure on roads and traffic during periods when large numbers of Units 6 and 7 workers are traveling to and from the site (e.g., peak construction period or during outages), or that would be cumulative with adverse aesthetic impacts on Everglades National Park—the resources most severely affected by Turkey Point Units 6 and 7.

The review team has considered the impacts of the construction and operations activities plus all past, present, and reasonably foreseeable future activities over the license period. Because of the existing large population, labor force, and tax base of Miami-Dade County, cumulative socioeconomic impacts are likely to be SMALL and adverse, with the exception of beneficial physical impacts on roads during operations, but adverse impacts on traffic in the vicinity of projects, which are likely to be noticeable. Because of local planning and zoning regulations, noticeable impacts on roads and traffic would not be expected to destabilize existing physical and traffic attributes of the affected area. The incremental impact of NRC-authorized activities would be the principal contributor to the MODERATE adverse impacts on traffic in the vicinity of the proposed site, and the MODERATE and beneficial socioeconomic impacts on road quality near the existing Turkey Point site.

7.4.2 Environmental Justice

The description of the affected environment in Section 2.6 serves as a baseline for the cumulative impacts assessment in this resource area. As described in Section 4.5, the NRC staff identified no disproportionately high and adverse impacts on environmental justice (EJ) populations of interest from construction of the proposed Units 6 and 7. As discussed in Section 5.5., the review team identified no disproportionately high and adverse impacts on EJ populations of interest from the operations of proposed Units 6 and 7.

In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable actions that could disproportionately affect EJ populations of interest. For this cumulative analysis, the general geographic area of interest is considered to be the 50 mi region described in Section 2.5.1—the area likeliest to experience health effects (if any) and provide the workforce for proposed Units 6 and 7. This is the region for which census block groups were assessed. However, subsets of the area were considered based on the area likely to be both influenced by the particular impact of proposed Units 6 and 7 and the other facilities.

Based on the analysis above, the review team determined that there were no disproportionately high and adverse impacts on any EJ populations of interest due to preconstruction, construction, and operations activities for the Turkey Point Units 6 and 7; and that there would most likely be no disproportionately high and adverse impacts on EJ communities from any past, present, or reasonably foreseeable future projects in the 50 mi region.

7.5 Historic and Cultural Resources Impacts

The description of the affected environment in Section 2.7 serves as a baseline for the NEPA cumulative impacts assessment in this resource area. As discussed in Section 2.7, no known

resources are recorded in the Units 6 and 7 project area and, as described in Section 4.6, impacts on cultural resources from NRC-authorized construction would be SMALL and no further mitigation would be warranted. As described in Section 5.6, the review team concludes that the impacts on cultural resources from operations would be SMALL. Mitigation may be warranted in the event of an unanticipated discovery during any ground-disturbing activities associated with construction or maintenance of the operating facility. Mitigation actions would be determined by the USACE in consultation with the Florida State Historic Preservation Office. FPL has proposed that cultural resource procedures for unanticipated discoveries, to be developed as stipulated in the work plans for the site and offsite facilities (FPL 2009-TN1514; FPL 2009-TN1515; FPL 2011-TN95), would be followed if any activity encountered cultural resources during building and operation.

The combined impacts from preconstruction and construction, including transmission lines, are described in Section 4.6 and were determined to be MODERATE by the NRC staff. No known resources are located in the Area of Potential Effect (APE) for the pipelines and access roads and bridges, but known significant cultural resources are located in the direct- and indirect-effects APEs for the transmission line corridors. These resources are described in Section 2.7.3 and consist of numerous archaeological sites, historic buildings, historic districts, and linear resource groups. Construction of the transmission lines could generate visual impacts on above-ground historic period resources. If preconstruction activities associated with the transmission lines result in additional alterations of known cultural resources, then the impact could be greater.

In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis considers other past, present, and reasonably foreseeable projects that could affect historic and cultural resources. The geographic area of interest for this assessment of potential cumulative impacts includes the direct- and indirect-effects APEs for cultural resources at the Turkey Point site, which are defined in Section 2.7, and the offsite facilities including transmission line corridors, water pipelines, access roads, and bridges. The cumulative impacts assessment considers the eligibility of historical properties for listing in the National Register of Historic Places.

The cultural background for the Turkey Point site is described in Section 2.7.1. The area contains a rich record of prehistoric human habitation; thus, there are habitation, burial, and other types of sites throughout the region. Historically, several groups of Native Americans lived in Florida, many of which became extinct or merged with other groups due to non-Native American encroachment by explorers and settlers by the late 1700s. The largest groups were the Miccosukee Tribe of Indians and the Seminole Tribe of Florida. Conflict between settlers and the Seminoles was defined by warfare and slave raids until the mid-nineteenth century, by which time conflict and disease had contributed to the near-extinction of the Seminoles. European-American settlers, dominated by farmers and cattle ranchers, began to move into South Florida in greater numbers in the mid-1800s. By the early 1900s, large tracts of South Florida had been drained and numerous railroad lines were established. This expansion of infrastructure prompted the establishment and rapid growth of local communities, such as Homestead, as well as military-related facilities during World Wars I and II.

Projects within the geographic area of interest that may have a potential cumulative impact on cultural resources include ongoing infrastructure improvements and future urbanization, such as the expansion or creation of roads or pipelines near or intersecting the proposed transmission line corridors. These could include projects listed in Table 7-1, such as the Florida Gas Transmission Company Phase VIII Expansion Project, the Biscayne Bay Coastal Wetlands Project – Phase 1, the C-111 Spreader Canal Western Project, and the C-111 South Dade Project. Development of such projects could affect cultural resources if ground-disturbing activities occur or if new above-ground structures affect the visual APE. As described in Section 2.7, known cultural resources exist in the transmission line corridors. Long linear projects such as new or expanded roads, pipelines, and utilities may intersect the proposed transmission line corridors. Because cultural resources can likely be avoided by long linear projects, and because many will occur alongside existing utilities, additional impacts on cultural resources would likely be minimal. Further, because many of the projects would likely require Federal involvement, impacts would be analyzed through Federal agency compliance with the National Historic Preservation Act (54 U.S.C. § 300101 et seq.) (TN4157) and NEPA (42 U.S.C. § 4321 et seq.) (TN661), and it is likely that adverse effects on historic properties or important cultural resources would be minimized. That said, a large number of historic structures are present along the eastern transmission line corridor, in particular, and visual impacts on any of these resources found eligible for listing in the National Register could occur. If activities associated with building the transmission lines or road and pipeline projects result in significant alterations (both physical alteration and visual intrusion) of cultural resources in the transmission line corridors, then cumulative impacts on cultural resources would be greater.

Cultural resources are nonrenewable. Therefore, the impact of destruction of cultural resources is cumulative. Based on the information provided by the applicant and the NRC staff's independent evaluation, the NRC staff concludes that the cumulative cultural resources impact from preconstruction, construction, and operation of two proposed units at the Turkey Point site, including the transmission lines, and other past, present, and reasonably foreseeable projects would be MODERATE. The potential visual impact of new transmission lines on built resources is the principal contributor to the MODERATE rating of cumulative impacts. The NRC staff further concludes that the incremental impacts associated with the onsite NRC-authorized activities would not significantly contribute to the cumulative impact because no significant historic or cultural resources would be affected by these activities in the geographic area of interest.

7.6 Air-Quality Impacts

The description of the affected environment in Section 2.9 serves as a baseline for the cumulative impacts assessment in this resource area. As described in Section 4.7, the impacts of construction activities on air-quality impacts would be SMALL, and no additional mitigation would be necessary. As described in Section 5.7, the review team concludes that the effect of operations on air-quality impacts would be SMALL.

7.6.1 Criteria Pollutants

The combined impacts from construction and preconstruction were described in Section 4.7 and determined to be SMALL. Emissions associated with these activities would be predominately

fugitive dust from ground-disturbing activities and engine exhaust from heavy equipment and vehicles; these emissions are expected to be temporary and limited in magnitude. Section 5.7 addresses air-quality impacts from operations. Air emissions from operations would be primarily from worker vehicles and stationary combustion sources such as diesel generators and auxiliary boilers. Stationary sources would be permitted and operated in accordance with State and Federal regulatory requirements, and their operation would be infrequent and mostly for maintenance testing. Therefore, potential impacts on air quality from operations would be SMALL. In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could contribute to cumulative impacts on air quality (see Table 7-1). For this cumulative analysis of criteria pollutants, the geographic area of interest is Miami-Dade County, which is within the Southeast Florida Intrastate Air Quality Control Region. Air-quality attainment status for Miami-Dade County as set forth in 40 CFR Part 81 (TN255) reflects the effects of past and current emissions from all regulated air-pollutant sources in the region. Miami-Dade County is currently in attainment for all air pollutants for which for the EPA has established National Ambient Air Quality Standards (NAAQSs).

The air-quality impact of site development for proposed Units 6 and 7 would be temporary. The distance from building activities to the site boundary would be sufficient to generally limit air-quality impacts to within the facility boundary. Mobile source emissions from workforce commuting would be the principal source of offsite emissions. The major land-use projects in the immediate vicinity (within 6 mi) are wetland mitigation and restoration projects, but these would have only occasional air-quality impacts from periodic controlled burns and from mobile sources used in maintenance and monitoring activities. Other more distant reasonably foreseeable projects within Miami-Dade County that have the potential to increase air emissions include three landfill gas-power-generation projects. The closest, South Dade Landfill, is 8 mi north of Turkey Point; the two other proposed landfill gas-power plants, Medley and North Dade, are located 30 and 37 mi north of the Turkey Point site, respectively. Emissions from the operation of these landfill gas-power plants would be noticeable but would not alter or destabilize the air quality within the region. Any new projects either would have de minimis impacts or would be subject to permitting by the FDEP. State permits are issued under regulations approved by the EPA and are deemed sufficient to attain and maintain the NAAQSs and comply with other Federal requirements under the Clean Air Act. Given these institutional controls, it is unlikely that the air quality in the region would degrade significantly (i.e., degrade to the extent that the region is in nonattainment of the NAAQSs).

Combustion equipment associated with the operation of Turkey Point Units 3 and 4 is similar to the equipment that would be associated with proposed Units 6 and 7. Releases are intermittent and made at relatively low levels with little vertical velocity. Because of the intermittent nature of the releases (4 hours per month) and the small quantities of effluents being released, the review team expects that the cumulative impacts of combustion product release associated with the four Turkey Point units would be negligible.

Operation of the Units 6 and 7 cooling towers would result in plumes and salt deposition with the highest concentrations occurring within the Turkey Point site. Modeling predictions for proposed Units 6 and 7 show significant salt deposits of around 100 kilogram(s)/hectare/month (kg/ha/mo) at the makeup-water reservoir plant area when using water from the RCWs and with salt

deposition of 10 kg/ha/mo generally confined to the Turkey Point site and the IWF, with the exception of the southeastern perimeter of the site. When operated using reclaimed water, the primary water source, the salt deposition rates would be considerably lower. The natural-gas combined-cycle steam electric generating cooling tower (Unit 5) has plumes that remain primarily on the Turkey Point site as well as salt deposition from the Unit 5 cooling tower estimated to have a maximum average of 6.3 kg/ha/mo at 200 m. For the vegetation in the vicinity of the Turkey Point site these salt deposition rates were found to have minimal impact.

Future development near the Turkey Point site also could lead to increases in gaseous emissions related to transportation. Table 7-1 lists medium potential for growth within Miami-Dade County through construction of the proposed SR836/Dolphin Expressway Southwest Extension and Tampa–Orlando–Miami High-Speed Intercity Passenger Rail. Given the potential for growth, and the contribution of criteria pollutant emissions from the three landfill gas-power−generation projects, the cumulative impact on air quality would be noticeable.

7.6.2 Greenhouse Gas Emissions

As discussed in the state-of-the-science report issued by the U.S. Global Change Research Program (GCRP) (GCRP 2014-TN3472), “The majority of the warming at the global scale over the past 50 years can only be explained by the effects of human influences, especially the emissions from burning fossil fuels (coal, oil, and natural gas) and from deforestation…Oil used for transportation and coal used for electricity generation are the largest contributors to the rise in carbon dioxide that is the primary driver of recent climate change.”

Greenhouse gas (GHG) emissions associated with building, operating, and decommissioning a nuclear power plant are addressed in Sections 4.7, 5.7.1, 6.1.3, and 6.3. The review team concluded that the atmospheric impacts of the emissions associated with the building, operating, and decommissioning a nuclear power plant would be minimal. The review team also concluded that the impacts of the combined emissions for the full plant life cycle would be minimal.

It is difficult to evaluate the cumulative impacts of a single source or combination of GHG emission sources for the following reasons:

- The impact is global rather than local or regional.
- The impact is not particularly sensitive to the location of the release point.
- The magnitude of individual GHG sources related to human activity, no matter how large compared to other sources, is small when compared to the total mass of GHGs that exist in the atmosphere.
- The total number and variety of GHG emission sources are extremely large and are ubiquitous.

These points are illustrated by the comparison of annual emission rates of carbon dioxide (CO_2), one of the principal GHGs, in Table 7-2.

In the United States, the national annual GHG emission rate was 6.5 billion MT CO_2 equivalent (CO_2e) in 2012, and of that amount, 5.0 billion MT CO_2e was from fossil-fuel combustion

(EPA 2014-TN4008). The total GHG emissions in Florida were 290 million MT CO_2e in 2007, and of that amount, 256 million MT CO_2e were from fossil-fuel combustion (FDEP 2010-TN2997). Appendix J provides details of the review team's estimate for a reference 1,000 MW(e) nuclear power plant. The review team estimated the total nuclear power plant lifecycle footprint to be 10,500,000 MT CO_2e, with a 7-year preconstruction and construction phase, 40 years of operation, and 10 years of decommissioning. This value is representative of the proposed Units 6 and 7 at Turkey Point because the new units are AP1000 reactors and have the same electrical output as the reference 1,000 MW(e) reactor in Appendix J. The uranium fuel-cycle phase is projected to generate the highest emissions (see Appendix J of this EIS). Table 7-2 lists the GHG emissions from normal operations, including the uranium fuel cycle, as 260,000 MT CO_2e per year. These emissions are significantly less than the GHG emissions reported from power plants in Florida or from fossil-fuel combustion in the United States for the year 2012.

Even though GHG emission estimates from normal operations are small compared to other sources, the applicant should consider measures that would reduce GHG emissions. These could include, but would not necessarily be limited to, energy-efficient design features and features to reduce space heating and air-conditioning energy requirements, use of renewable energy sources, use of low-GHG-emitting vehicles, and other policies to reduce GHG emissions from vehicle use, such as anti-idling policies and vanpooling or carpooling.

Table 7-2. Comparison of Annual Carbon Dioxide Emission Rates

Source	Metric Tons per Year[(a)]
Global emissions from fossil-fuel combustion (2011)	3.3×10^{10} [(b)]
United States emissions from fossil-fuel combustion (2012)	5.0×10^{9} [(b)]
Florida emissions from fossil-fuel combustion (2007)	2.56×10^{8} [(c)]
1,000 MW(e) nuclear power plant (including fuel cycle, 80% capacity factor)	260,000[(d)]
1,000 MW(e) nuclear power plant (operations only)	4,500[(d)]
Average U.S. passenger vehicle	5[(e)]

Note: 1 metric ton = 1.1 U.S. tons (at 2,000 lb per U.S. ton)

(a) Nuclear power emissions estimates are in units of MT CO_2e whereas the other energy alternatives emissions estimates are in units of MT CO_2. If nuclear power emissions were represented in MT CO_2, the value would be slightly less, because other GHG emissions would not be included.
(b) EPA 2014-TN4008, expressed in metric tons per year of CO_2e.
(c) FDEP 2010-TN2997, expressed in metric tons per year of CO_2e.
(d) Appendix J, expressed in metric tons per year of CO_2e.
(e) EPA 2013-TN2505.

Evaluation of the cumulative impacts of GHG emissions requires the use of a global climate model. The GCRP report referenced above (GCRP 2014-TN3472) provides a synthesis of the results of numerous climate modeling studies; hence, the cumulative impacts of GHG emissions around the world as presented in the GCRP report provide an appropriate basis for the evaluation of cumulative impacts. Based primarily on the scientific assessments of the GCRP and National Research Council, the EPA Administrator issued a determination in 2009 (74 FR 66496) (TN245) that GHGs in the atmosphere may reasonably be anticipated to endanger public health and welfare, based on observed and projected effects of GHGs, their impact on climate change, and the public health and welfare risks and impacts associated with such climate change. Therefore, national and worldwide cumulative impacts of GHG emissions

reflect conditions within the MODERATE impact level for air quality related to GHG emissions—noticeable but not destabilizing. Based on the impacts set forth in the GCRP report, and on the CO_2 emissions criteria in the final EPA CO_2 Tailoring Rule (75 FR 31514) (TN1404), the review team concludes that the national and worldwide cumulative impacts of GHG emissions are noticeable but not destabilizing. The review team further concludes that the cumulative impacts would be noticeable but not destabilizing, with or without the GHG emissions from the proposed project.

Consequently, the review team recognizes that GHG emissions, including CO_2, from individual stationary sources and cumulatively from multiple sources can contribute to climate change and that the carbon footprint is a relevant factor in evaluating energy alternatives. Section 9.2.5 contains a comparison of carbon footprints of the viable energy alternatives.

7.6.3 Summary of Air-Quality Impacts

Cumulative impacts on air-quality resources are estimated based on the information provided by FPL and the review team's independent evaluation. Other past, present, and reasonably foreseeable activities exist in the geographic areas of interest (local for criteria pollutants and global for GHG emissions) that could affect air-quality resources. The cumulative impacts on criteria pollutants from emissions of effluents from the new units at the Turkey Point site and other projects would be noticeable but not destabilizing. The new units and the other projects listed in Table 7-1 would have minimal impacts. The national and worldwide cumulative impacts of GHG emissions are noticeable but not destabilizing. The review team concludes that the cumulative impacts would be noticeable but not destabilizing, with or without the GHG emissions from the new units at the Turkey Point site. The review team concludes that cumulative impacts from other past, present, and reasonably foreseeable future actions on air-quality resources in the geographic areas of interest would be SMALL to MODERATE for criteria pollutants and MODERATE for GHGs. The incremental contribution of impacts on air-quality resources for both criteria pollutants and GHGs from building and operating the new units at the Turkey Point site would be SMALL.

7.7 Nonradiological Health

The description of the affected environment in Section 2.10 of this EIS serves as a baseline for nonradiological health related to Units 6 and 7 at Turkey Point. As described in Section 4.8, the impacts from NRC-authorized construction would be SMALL, and no further mitigation would be warranted. As described in Section 5.8, the nonradiological health impacts from operation of the proposed Units 6 and 7 would also be SMALL, and would warrant no further mitigation.

The combined nonradiological health impacts from construction and preconstruction are described in Section 4.8 and were determined to be SMALL. In addition to the impacts from construction, preconstruction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could contribute to cumulative impacts to nonradiological health (Table 7-1).

Based on the localized nature of most of the nonradiological health impacts of Turkey Point, the geographic area of interest for this cumulative impacts analysis is expected to be limited to the

immediate vicinity of the Turkey Point site, except for (1) the wastewater underground injection location and receiving aquifers and other waters (as described in Section 2.3), and (2) the geographic area for the transmission system associated with proposed Units 6 and 7 (as described in Section 2.2.2). These two geographic areas, plus the immediate vicinity of the site, are expected to encompass the areas where public and worker health could be influenced by the proposed project in combination with any other past, present, or reasonably foreseeable future actions. No other current energy projects are within the area of interest. As noted in Section 7.1, future development of the adjacent land is not likely to occur and thus no reasonably foreseeable future projects in the geographic areas of interest that could contribute to cumulative impacts for nonradiological health are expected.

Preconstruction, construction, and operation activities that have the potential to affect the nonradiological health of the public and workers include exposure to fugitive dust emissions, occupational injuries, noise from construction and operation, exposure to etiological and chemical agents, exposure to electromagnetic fields (EMFs), and noise and vehicle emissions from the transportation of construction materials and personnel to and from the Turkey Point site. Fugitive dust emissions are addressed in Section 7.6.1. The total occupational injury rate is not expected to be significantly affected by construction and operation of the new units in the area of interest.

The closest significant noise-generating sites to Turkey Point site are the Homestead Air Reserve Base and Homestead-Miami Speedway, both approximately 5 mi away. Based on the noise analysis described in Sections 4.8 and 5.8, however, the nearest resident to Turkey Point is in Homestead Bayfront Park, which is in the general direction of the Reserve Base and speedway. This location would experience little or no discernible difference in noise from site-preparation, construction, or operation of Units 6 and 7, and therefore no cumulative noise impacts are expected.

Existing and potential development of new transmission lines could increase nonradiological health impacts from exposure to acute EMFs. As stated in Section 5.8.3, however, adherence to Federal criteria and State utility codes would create minimal cumulative nonradiological health impacts. With regard to chronic effects of EMFs, the scientific evidence on human health does not conclusively link extremely low-frequency EMFs to adverse health impacts. Noise and vehicle emissions associated with current urbanization, current operations of Turkey Point units, and other activities could contribute to public nonradiological health impacts. However, as discussed in Sections 4.8 and 5.8, the proposed Units 6 and 7 contribution to these impacts would be temporary and minimal, and existing and future facilities would likely comply with local, State, and Federal regulations governing noise and emissions. Section 7.10.2 discusses cumulative nonradiological health impacts related to additional traffic on the regional and local highway networks leading to and from the Turkey Point site, and the review team determined that these impacts would be minimal.

In Sections 5.8.1 and 5.8.5, the review team evaluated the health impacts of operating the two new proposed units at the site with regard to etiological and chemical agents in the cooling water and the wastewater discharge. Based on the lack of complete exposure pathways and other factors, including the review team's independent analysis, the review team determined that the likelihood of impacts from etiological and chemical agents on human health would be minimal and mitigation would not be warranted. The potential use of reclaimed wastewater for

cooling of Turkey Point Unit 5 could result in the release of additional etiological and chemical agents from the cooling-tower drift, which could involve subsequent exposure to workers and the public. Based on the review staff's analysis of chemical exposure from the drift from the proposed Turkey Point Units 6 and 7, however, any additional exposure from Unit 5 would be negligible.

Estimates of cumulative impacts on nonradiological health are based on information provided by FPL and the review team's independent evaluation of impacts resulting from the building and operation of proposed Units 6 and 7, along with a review of potential impacts from other past, present, and reasonably foreseeable projects and urbanization located in the geographic area of interest. The review team concludes that cumulative impacts on public and worker nonradiological health would be SMALL, and that mitigation beyond what is discussed in Sections 4.8 and 5.8 would not be warranted.

7.8 Radiological Impacts of Normal Operations

The description of the affected environment in Section 2.11 serves as a baseline for the cumulative impacts assessment in this resource area. As described in Section 4.9, the NRC staff concludes that the radiological impacts from NRC-authorized construction would be SMALL, and no further mitigation would be warranted. As described in Section 5.9, the NRC staff concludes that the radiological impacts from normal operations would be SMALL, and no further mitigation would be warranted.

The combined impacts from preconstruction and construction were described in Section 4.9 and determined to be SMALL. In addition to impacts from construction, preconstruction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could contribute to cumulative radiological impacts. For the purposes of this analysis, the geographic area of interest is the area within a 50 mi radius of the Turkey Point site. Historically, the NRC has used the 50 mi radius as a standard bounding geographic area to evaluate population doses from routine releases from nuclear power plants. The area within the 50 mi radius of the proposed Turkey Point Units 6 and 7 includes the existing operating Turkey Point Units 3 and 4 and an independent spent fuel storage installation (ISFSI). There are also likely to be medical, industrial, and research facilities within the 50 mi radius of the site that use radioactive materials. As discussed in Sections 2.11 and 5.9, there is no credible drinking water pathway from groundwater under the Turkey Point site. As described in Section 2.11, quantities of tritium are detected in monitoring wells on and around the Turkey Point site as a result of tritium in the cooling-canal system. As further stated in Section 2.11, the FDEP considers that the tritium levels found in the monitoring wells "does not represent a public health and safety issue."

As described in Section 4.9, the estimate of dose to construction workers during building of the proposed Units 6 and 7 is well within the NRC annual exposure limits (i.e., 100 mrem/yr), which are designed to protect public health. This estimate includes exposure from Turkey Point Units 3 and 4 and the ISFSI. The estimate of doses to construction workers during building Unit 7 includes Unit 6 as a source of exposure. As described in Section 5.9, the public and occupational doses predicted from the proposed operation of two new units at the Turkey Point site are below regulatory limits and standards. In addition, the site boundary dose to the

maximally exposed individual from the existing Turkey Point 3 and 4, the ISFSI and the proposed Turkey Point 6 and 7 at the Turkey Point site would be well within the regulatory standard of 40 CFR Part 190 (TN739).

The NRC staff estimated the cumulative dose to biota other than human from the operation of Turkey Point Units 3, 4, 6, and 7, as presented in Appendix G. The results of the dose estimates are provided in Tables 5-14 and 5-15, and Appendix G. The NRC staff concludes that the cumulative radiological impact on biota other than human would not be significant. The results of the radiological environmental monitoring program (REMP) indicate that effluents and direct radiation from area medical, industrial, and research facilities that use radioactive materials do not contribute measurably to the cumulative dose for biota in the vicinity of the Turkey Point site.

As stated in Section 2.11, FPL has conducted a REMP at the Turkey Point site since 1969. The REMP measures radiation and radioactive materials from all sources, including the Turkey Point site and area medical, industrial, and research facilities. The results of the REMP indicate that the levels of radiation and radioactive material in the environment around the Turkey Point site are generally not above or only a little above natural background levels.

Currently, there are no other nuclear facilities planned within 50 mi of the Turkey Point site. The NRC, the DOE, and the State of Florida would regulate or control any reasonably foreseeable future actions in the region that could contribute to cumulative radiological impacts.

Therefore, the NRC staff concludes that the cumulative radiological impacts of operating two new units, along with the existing units at the Turkey Point site and the influence of other man-made sources of radiation nearby would be SMALL, and no further mitigation would be warranted.

7.9 Nonradioactive Waste Impacts

As described in Section 4.10, the NRC staff concludes that the nonradioactive waste impacts of NRC-authorized construction would be SMALL and no further mitigation would be warranted. As described in Section 5.10, the review team concludes that the nonradioactive waste impacts of operations would be SMALL and no further mitigation would be warranted.

Cumulative impacts on water and air from nonradioactive waste are discussed in Sections 7.2 and 7.6, respectively. The cumulative impact of nonradioactive waste destined for land-based treatment and disposal are primarily related to the available capacity of area treatment and disposal facilities and the amount of waste generated by the proposed project and other reasonably foreseeable projects in Table 7-1. The geographical area of interest for this cumulative analysis is Miami-Dade County because of the availability of landfill capacity within the county and the relatively long haul distances associated with transportation outside of the county. Miami-Dade County currently operates two landfills and a waste-to-energy plant, has contracts with commercial firms for additional landfill capacity, and is currently developing a plan for solid-waste management for future disposal needs (Miami-Dade County 2013-TN2950; Miami-Dade County 2010-TN2953; Miami-Dade County 2012-TN2951).

During construction, offsite land-based waste treatment and disposal would be minimized by production and delivery of modular plant units (FPL 2014-TN4058) and by segregation of

recyclable materials. Building activities would generate small quantities of construction debris, and the construction workforce would produce small quantities of municipal solid waste (MSW). Building waste and trash would be handled, transported, and disposed in accordance with all applicable Federal, State, and local regulations (FPL 2010-TN272). Most of the projects listed in Table 7-1 generally either would not generate significant amounts of solid waste (e.g., plastics and fiberglass manufacturing), would not coincide with the construction of the proposed Turkey Point Units 6 and 7 (e.g., decommissioning Turkey Point Units 1 through 5), or would produce waste streams of a different nature (e.g., mining and park projects).

During operation, FPL estimates that Turkey Point Units 6 and 7 would generate an average of 1,000 tons of nonradioactive, nonhazardous, solid waste annually, equivalent to about 0.03 percent of the 3.2 million tons of MSW managed in Miami-Dade County in 2012 (FDEP 2013-TN2949). Therefore, such disposal impacts would be minimal.

FPL would be classified as a either a conditionally exempt small-quantity generator or a small-quantity generator under the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. § 6901 et seq.) (TN1281). Conditionally exempt small-quantity generators and small-quantity generators combined generate only 7 percent of the hazardous waste produced in Florida. No known capacity constraints exist for the treatment or disposal of hazardous wastes either within Florida or for the nation (FDEP 2007-TN1478).

Of the projects listed in Table 7-1, only the operation and decommissioning of Turkey Point Units 3 and 4 and the hospitals that use radioactive materials have the potential to generate mixed waste. None of the considered projects is expected to generate mixed waste in significant quantities above current rates, and therefore cumulative impacts would be minimal.

Based on the quantity of nonradioactive and mixed waste projected during operation of Turkey Point Units 6 and 7 and the available treatment and disposal capacity, the review team concludes that cumulative impacts of nonradioactive and mixed waste would be SMALL, and additional mitigation would not be warranted.

7.10 Postulated Accidents

As described in Section 5.11.4 of this EIS, the NRC staff concludes that the potential environmental impacts (risk) from a postulated accident related to the operation of proposed Units 6 and 7 would be SMALL, and no further mitigation would be warranted. Section 5.11 of this EIS considers both design basis accidents (DBAs) and severe accidents.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the Turkey Point site would be SMALL for an AP1000 reactor. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet NRC safety criteria. The consequences of DBAs are bounded by the consequences of severe accidents.

As described in Section 5.11.2.5, the NRC staff concludes that the severe accident probability-weighted consequences (i.e., risks) of an AP1000 reactor at the Turkey Point site are SMALL compared to risks to which the population is generally exposed. The cumulative analysis considers risk from potential severe accidents at all other existing and proposed nuclear power plants that have the potential to increase risks at any location within 50 mi of proposed Units 6 and 7. The 50 mi radius was selected to cover any potential risk overlaps from two or more

nuclear facilities. The only existing reactors within a 50 mi radius of the proposed Units 6 and 7 plant area are Turkey Point Units 3 and 4. Existing reactors that contribute to risk within this geographic area include Turkey Point Units 3 and 4.

Tables 5-15 and 5-16 in Section 5.11.2 provide comparisons of estimated risk for the proposed AP1000 units at the Turkey Point site and current-generation reactors. The estimated population dose risk for the proposed AP1000 units at the Turkey Point site is well below the median value for current-generation reactors. In addition, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028) (TN594). For existing plants within the geographic area of interest (Turkey Point Units 3 and 4), the Commission has determined that the probability-weighted consequences of severe accidents are small (10 CFR Part 51) (TN250), Appendix B, Table B-1). On this basis, the NRC staff concludes that the cumulative risks of severe accidents at any location within 50 mi of the Turkey Point site likely would be SMALL and no further mitigation would be warranted.

7.11 Fuel-Cycle, Transportation, and Decommissioning Impacts

The cumulative impacts related to the fuel cycle, transportation of radioactive materials (fuel and waste), and facility decommissioning for the proposed site are described below.

7.11.1 Fuel Cycle

As described in Section 6.1, the NRC staff concludes that the environmental impacts of the fuel cycle due to operation of proposed Turkey Point Units 6 and 7 would be SMALL. Fuel-cycle impacts would occur not only at the Turkey Point site but also at other locations in the United States or, in the case of foreign-purchased uranium, in other countries as described in Section 6.1.

In addition to fuel-cycle impacts from proposed Units 6 and 7, this cumulative analysis also considers fuel-cycle impacts from existing Units 3 and 4. There are no other nuclear power plants within 50 mi of the Turkey Point site. The fuel-cycle impact of Units 3 and 4 would be similar to that of proposed Units 6 and 7. The NRC staff concludes the impacts would be acceptable for the 1,000 MW(e) reference reactor (10 CFR Part 51) (TN250). As discussed in Section 6.1 of this EIS, advances in reactors since the development of Table S–3 of 10 CFR 51.51(TN250), would have the effect of reducing environmental impacts relative to the operating reference reactor. For example, a number of fuel-management improvements have been adopted by nuclear power plants to achieve higher performance and to reduce fuel and separative work (enrichment) requirements. Adding the fuel-cycle impacts from existing Units 3 and 4 at a combined 1,632 MW(e) (FPL 2016-TN4579) to the impacts from proposed Units 6 and 7 at a combined 2,230 MW(e) (FPL 2014-TN4058) would not increase the cumulative impacts from the fuel cycle by more than 75 percent. The NRC staff concludes the cumulative fuel-cycle impacts of operating the proposed Units 6 and 7 would be minimal.

The Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel (NUREG–2157) (NRC 2014-TN4117) examines the incremental impacts of continued storage on each resource area analyzed in NUREG–2157 in combination with other past, present, and reasonably foreseeable future actions. Section 6.5 of NUREG–2157 indicates ranges of potential cumulative impacts for multiple resource areas (NRC 2014-TN4117). These ranges

are primarily driven by impacts from activities other than the continued storage of spent fuel at the reactor site; the impacts from these other activities would occur regardless of whether spent fuel is stored during the continued storage period. In the short-term timeframe, which is the most likely timeframe for the disposal of the fuel, the potential impacts of continued storage for at-reactor storage are SMALL and would, therefore, not be a significant contributor to the cumulative impacts. Because the impacts during the short-term timeframe are SMALL, continued storage would not be a significant contributor to the cumulative impacts. In the longer timeframes for at-reactor storage, or in the less likely case of away-from-reactor storage, some of the impacts from the storage of spent fuel could be greater than SMALL. However, other Federal and non-Federal activities occurring during the longer timeframes, as noted in NUREG–2157, include uncertainties as well, contributing to the cumulative impacts. All of these uncertainties lead to the ranges in cumulative impacts as discussed throughout Chapter 6 of NUREG–2157 (NRC 2014-TN4117). The overall cumulative impact conclusions would not be changed if the impacts of continued storage were removed. Taking into account the impacts that the NRC can predict with certainty, which are SMALL; the uncertainty reflected by the ranges in some impacts; and the relative likelihood of the timeframes, the staff finds that the impacts in NUREG–2157 do not change the staff's overall finding regarding the cumulative impacts from the fuel cycle (which includes the impacts associated with spent fuel storage).

7.11.2 Transportation

The description of the affected environment in Section 2.5.2 serves as a baseline for the cumulative impacts assessment in this resource area. As described in Sections 4.8.3 and 5.8.6, the review team concludes that impacts of transporting personnel and nonradiological materials to and from the Turkey Point site would be SMALL. In addition to impacts from preconstruction, construction, and operations, the cumulative analysis also considers other past, and present, and reasonably foreseeable future actions that could contribute to cumulative transportation impacts. For this analysis the geographic area of interest is the 50 mi region surrounding the Turkey Point site.

Nonradiological transportation impacts are related to the additional traffic on the regional and local highway networks leading to and from the Turkey Point site. Additional traffic would result from shipments of construction materials and movements of construction personnel to and from the site. The additional traffic increases the risk of traffic accidents, injuries, and fatalities. A review of the projects listed in Table 7-1 indicates that other projects in the region could potentially increase nonradiological impacts. The most significant cumulative nonradiological impacts in the vicinity of the Turkey Point site would result from major construction projects. A review of Table 7-1 suggests that the only major new construction project in the vicinity of the Turkey Point site is the Tampa-Orlando-Miami Florida High-Speed Rail project. The first phase of the Florida High-Speed Rail project is currently developing the leg from Tampa to Orlando. Because Orlando is more than 250 mi north of the Turkey Point site, it is considered outside of the region of interest for this EIS. However, when construction begins on the Orlando to Miami leg, portions of the new rail line will reside within the region of interest. This interaction will minimally exacerbate nonradiological impacts because construction of the rail line will occur north of Miami, whereas the Turkey Point site is south of Miami. Therefore, traffic overlap between transport of construction materials and personnel to/from the Turkey Point site and to/from the rail line construction site will be minimal. Minor interactions with smaller construction

projects in this vicinity, including the South Dade Landfill gas generation, Medley landfill gas power, and construction activities at the Homestead Air Reserve Base are also anticipated. However, the magnitudes of these projects are small relative to construction of Turkey Point Units 6 and 7. Consequently, interactions among construction traffic are unlikely to exacerbate congestion and potentially increase nonradiological transportation impacts. The other construction projects are more than 25 mi from the Turkey Point site, and therefore the traffic from these projects is not likely to interact with traffic associated with building and operating the Turkey Point site units.

Traffic associated with the existing Turkey Point Units 3 and 4 could interact with traffic associated with proposed Units 6 and 7. However, FPL has identified mitigation measures designed to reduce traffic impacts in the vicinity of the Turkey Point site. Traffic flow to and from operating facilities in the region would be of lesser importance because fewer workers and material shipments are needed to support operating facilities than major construction projects. The operating facilities with potential for cumulative nonradiological impacts include the Resources Recovery Facility, Homestead Power Plant, Gordon Ivey Power Plant, Contender Boats Inc., and Florida Rock and Sand. As with the construction projects, FPL would identify mitigation measures for the proposed new units and would also mitigate traffic concerns and reduce the potential cumulative nonradiological impacts associated with operating facilities.

Finally, 16 parks are listed in Table 7-1. Current initiatives involving the Biscayne National Park and Florida Key National Marine Sanctuary do not involve additional construction (they are primarily legislative and regulation-related proposals). Development in the Crocodile Lake National Wildlife Refuge is considered unlikely. There are also 13 more parks within the region of interest and no reasonably foreseeable potential park improvements have been identified. When potential improvements occur, they are generally of smaller scope and have lower resource and personnel requirements than constructing a new nuclear power plant. Therefore, park improvements are not likely to result in a measurable cumulative impact.

In Sections 4.8.3 and 5.8.6, the review team concluded that the impacts of transporting construction material and construction and operations personnel to and from the Turkey Point site are a small fraction of the existing nonradiological impacts in Miami-Dade County, Florida. FPL has identified mitigation measures designed to improve traffic flow at the Turkey Point site (see Section 4.4.2.2.4). Based on the magnitude of nuclear power plant construction relative to the other construction activities listed in Table 7-1, the review team concludes the cumulative nonradiological transportation impacts of constructing and operating the proposed new reactors at the Turkey Point site would be SMALL, and it is likely no further mitigation would be warranted.

As described in Section 6.2, the NRC staff concludes that the impacts of transporting unirradiated fuel to the Turkey Point site and irradiated fuel and radioactive waste from the Turkey Point site would be SMALL. In addition to impacts from preconstruction, construction, and operations, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could contribute to cumulative transportation impacts. For this analysis, the geographic area of interest is the 50 mi region surrounding the Turkey Point site.

Historically, the radiological impacts on the public and environment associated with transportation of radioactive materials in the 50 mi region surrounding the Turkey Point site

have been primarily associated with shipments of fuel and waste to and from existing Turkey Point Units 3 and 4. Radiological impacts of transporting radioactive materials would occur along the routes leading to and from the Turkey Point site, fuel fabrication facilities, and waste disposal sites located in other parts of the United States. No other major activities with the potential for cumulative radiological impacts were identified in the geographic region of interest. The past, present, and reasonably foreseeable impacts in the region surrounding the Turkey Point site are a small fraction of the impacts from natural background radiation.

As discussed in Section 6.2, the addition of the proposed new units to the existing Turkey Point site would result in the need for additional unirradiated nuclear fuel and generation of additional spent nuclear fuel and radioactive waste. The impacts of transporting this fuel and radioactive waste to and from the Turkey Point site would be consistent with the environmental impacts associated with transportation of fuel and radioactive wastes from current-generation reactors presented in Table S–4 of 10 CFR 51.52 (TN250), which the NRC staff considers to be acceptable for the 1,100 MW(e) reference reactor. Advances in reactor technology and operations since the development of Table S–4 would reduce environmental impacts relative to the values in Table S–4. For example, fuel-management improvements have been adopted by nuclear power plants to achieve higher performance and to reduce fuel requirements. This leads to fewer unirradiated and spent fuel shipments than the 1,100 MW(e) reference reactor discussed in 10 CFR 51.52 (TN250). In addition, advances in shipping cask designs to increase their capabilities would result in fewer shipments of spent fuel to offsite storage or disposal facilities.

Therefore, the NRC staff considers the cumulative radiological and nonradiological transportation impacts of operating the proposed new reactors at the Turkey Point site to be minimal.

7.11.3 Decommissioning

As discussed in Section 6.3, the environmental impacts from decommissioning are expected to be SMALL, because the licensee would have to comply with decommissioning regulatory requirements.

In this cumulative analysis, the geographic area of interest is within a 50 mi radius of the Turkey Point site. In addition to proposed Units 6 and 7, the only other nuclear power plants within this geographic area of interest are the existing Turkey Point Units 3 and 4. In Supplement 1 to NUREG–0586, *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*, the NRC found the impacts on radiation dose to workers and the public, waste management, water quality, air quality, ecological resources, and socioeconomics to be small (NRC 2002-TN665). In addition, in Section 6.3 the NRC staff concluded that the impact of GHGs on air quality during decommissioning would be minimal.

7.11.4 Summary of Cumulative Fuel Cycle, Transportation, and Decommissioning Impacts

Based on the analysis above, the cumulative impacts from fuel-cycle activities, transportation of radioactive material, and decommissioning would be SMALL, and additional mitigation would not be warranted.

7.12 Summary of Cumulative Impacts

The review team considered the potential cumulative impacts resulting from construction, preconstruction, and operation of Turkey Point Units 6 and 7 together with past, present, and reasonably foreseeable future actions in the same resource-specific geographic area of interest. The specific resources that could be affected by the incremental effects of the proposed action and other actions listed in Table 7-1 were assessed. This assessment included the impacts of construction and operations for the proposed new units as described in Chapters 4 and 5: impacts of preconstruction activities as described in Chapter 4; impacts of fuel cycle, transportation, and decommissioning described in Chapter 6; and impacts of past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could affect the same resources affected by the proposed action.

Table 7-3 summarizes the cumulative impacts by resource area. The cumulative impacts for the majority of resource areas would be SMALL, although there could be MODERATE impacts for some resources as discussed below.

Table 7-3. Cumulative Impacts on Environmental Resources, Including the Impacts of Proposed Turkey Point Units 6 and 7

Resource Category	Impact Level
Land Use	MODERATE
Water-Related	
Water Use – Surface Water	SMALL
Water Use – Groundwater Use	SMALL
Water Quality – Surface Water	MODERATE
Water Quality – Groundwater	SMALL
Ecology	
Terrestrial Ecosystems	MODERATE to LARGE
Aquatic Ecosystems	MODERATE
Socioeconomic	
Physical Impacts	SMALL adverse to MODERATE beneficial impacts on roads
Demography	SMALL
Economic Impacts on the Community	SMALL and beneficial
Infrastructure and Community Services	SMALL to MODERATE
Environmental Justice	NONE[(a)]
Historic and Cultural Resources	MODERATE
Air Quality	SMALL to MODERATE for criteria pollutants and MODERATE for GHGs
Nonradiological Health	SMALL
Radiological Health	SMALL
Nonradiological Waste	SMALL
Postulated Accidents	SMALL
Fuel Cycle, Transportation, and Decommissioning	SMALL

(a) A determination of "NONE" for environmental justice analyses does not mean there are no adverse impacts on minority or low-income populations from the proposed project. Instead, an indication of "NONE" should inform the reader that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

Land-use impacts from placement of new transmission lines would have a MODERATE impact on existing land uses while the incremental impacts of NRC-authorized activities would be SMALL.

MODERATE cumulative impacts on land use result from a history of agricultural and urban development in portions of the geographic area of interest as well as possible land-use conflicts resulting from development of the proposed transmission lines that would serve Units 6 and 7. The incremental contribution of the overall Units 6 and 7 project would be MODERATE, primarily due to possible land-use conflicts from building and operating transmission lines in urban areas and national parks. However, the incremental contribution of NRC-authorized activities would be SMALL because the NRC does not authorize the building of transmission lines.

MODERATE cumulative impacts on surface-water quality result from historical point and non-point-source discharges that have affected the water quality of streams and rivers near the Turkey Point site. Portions of the estuary and streams along the southeast Atlantic coast to Biscayne Bay appear on the final 2010 303(d) list as impaired waterbodies because of the presence of copper, fecal coliforms, mercury, and nutrients (FDEP 2010-TN1253). However, the incremental impacts from NRC-authorized activities would be SMALL and not contribute to the cumulative impacts.

Cumulative impacts on terrestrial resources in the geographic area of interest would be MODERATE to LARGE. A range is provided because of the review team's uncertainty about the possible effects from the complex interplay of habitat losses from building Units 6 and 7 facilities; habitat loss and degradation from past, ongoing, and anticipated regional land development; the sensitivity of terrestrial habitats in the region to hydrological changes; and the number and distribution of Federally and State-listed species present in the region. Considering the wetland mitigation proposed for impacts from building the proposed Units 6 and 7 facilities, as well as mitigation measures that FPL proposes to develop with FWS to address possible avian impacts from the new transmission lines, the review team concludes that the possible incremental effects of construction, preconstruction, and operation of the Turkey Point Units 6 and 7 project would be MODERATE.

Cumulative impacts on aquatic resources in the geographic area of interest would be MODERATE primarily based on historic alterations to aquatic habitats and impacts on species within those habitats. The contribution to cumulative impacts from authorized NRC activities for proposed Units 6 and 7 would likely be SMALL and would not noticeably alter the ecology of the surrounding freshwater, estuarine, and marine environments, and therefore, would not significantly contribute to cumulative impacts.

Because of the large population, labor force, and tax base of Miami-Dade County, cumulative socioeconomic impacts are likely to be SMALL and adverse, with the exception of physical impacts on buildings, and impacts on traffic in the vicinity of projects, which are likely to be MODERATE and adverse. There would be MODERATE and beneficial socioeconomic impacts on road quality near the existing Turkey Point site.

Because of the potential for indirect visual impacts on cultural resources from the construction of offsite transmission lines, cumulative cultural resources impacts are likely to be MODERATE.

However, because the construction of transmission lines is not an NRC-authorized activity, the incremental impacts associated with the onsite NRC-authorized activities would not significantly contribute to cumulative impacts on cultural resources.

MODERATE national and worldwide cumulative impacts of GHG emissions are noticeable but not destabilizing, with or without the GHG emissions of the proposed Turkey Point Units 6 and 7. The incremental contribution of impacts on air-quality resources for both criteria pollutants and GHGs from building and operating the proposed units would be SMALL.

8.0 NEED FOR POWER

Chapter 8 of the U.S. Nuclear Regulatory Commission's (NRC's) NUREG–1555, Environmental Standard Review Plan (ESRP) (NRC 2000-TN614) guides the staff's review and analysis of the need for power for a proposed nuclear power plant. The guidance states the following:

> Affected states or regions continue to prepare need-for-power evaluations for proposed energy facilities. The NRC will review the evaluation for the proposed facility and determine if it is (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. If the State's or region's need-for-power evaluation is found acceptable, no additional independent review by NRC is needed, and the State's analysis can be the basis for ESRPs 8.2 through 8.4 (NRC 2000-TN614).

In a 2003 response to a petition for rulemaking (68 FR 55905) (TN733), the NRC concluded that "… need for power must be addressed in connection with new power plant construction so that the NRC may weigh the likely benefits (e.g., electrical power) against the environmental impacts of constructing and operating a nuclear power reactor." The NRC also stated in its response to the petition discussed above that (1) the NRC does not supplant the States, which have traditionally been responsible for assessing the need for power-generating facilities, their economic feasibility, and regulating rates and services; and (2) the NRC has acknowledged the primacy of State regulatory decisions regarding future energy options (68 FR 55905) (TN733). Consequently, the NRC staff's role with regard to a need-for-power review is to identify whether an independently derived needs determination meets the four acceptability criteria and, if it does, report the conclusions of that independently derived determination. No independent assessment of the relevant service area's need for power is necessary for the NRC staff to meet its responsibility under the National Environmental Policy Act of 1969 (42 U.S.C. § 4321 et seq.) (TN661), as amended.

The purpose and need for the Turkey Point Nuclear Power Plant (Turkey Point) Units 6 and 7 project identified in Chapter 1 is to generate 2,200 MW(e) baseload power to meet the need for baseload power within the Florida Power & Light Company (FPL) service territory by 2027 and 2028. In 2008, the Florida Public Service Commission (FPSC) analyzed the need for power upon which the NRC staff relied to reach its conclusion that there is a need for power from Turkey Point Units 6 and 7. The FPSC analysis showed a need for at least that amount of baseload power. Because the demand for baseload power is at least as much as the supply from Units 6 and 7, a need for the power exists. The following sections discuss the need for power in the context of FPSC's determination (FPSC 2008-TN735).

8.1 Description of the Power System

In Florida, investor-owned utilities such as FPL are regulated by a public service commission and serve a well-defined service territory. The State of Florida, through the FPSC, regulates FPL rates, electric service and grid reliability, and the planning and implementation of generation and transmission resources to serve loads within the FPL service territory. Expansion of FPL's power system depends on the determination of the need for additional

power within the FPL service territory. In the case of the proposed Turkey Point Units 6 and 7, FPL has obtained a "Determination of Need" from the FPSC, based on Final Order PSC-08-0237-FOF-EI, dated April 11, 2008 (FPSC 2008-TN735). In its decision, FPSC provides its full reasoning, based on FPL's petition and FPSC's own analysis, for making its determination. For the purposes of this environmental impact statement (EIS), the NRC staff identified FPSC's Determination of Need as an independently derived needs determination that was (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. Therefore, the NRC staff relied upon that FPSC Determination of Need for the remainder of this chapter of the EIS.

The remainder of this chapter characterizes the institutional and physical characteristics of the FPL system, and the NRC staff's basis for relying on FPSC's Determination of Need. Section 8.1.1 reviews the current power system, including geographic considerations, and regional characteristics. Section 8.1.2 provides an assessment of the FPSC's analytical processes in the context of the NRC's four acceptability criteria. It discusses the specific criteria FPSC used to make its determination. Section 8.2 discusses some of the key factors affecting the demand for electricity and provides a table from the FPL Environmental Report (ER) (FPL 2014-TN4058) showing the FPL/FPSC analysis of future demand. Section 8.3 describes the FPL and FPSC assessments of the supply of electricity. Section 8.4 reports the FPSC's conclusions regarding the determination of the need for power as proposed by FPL and verified by the FPSC evaluation.

8.1.1 Description of the FPL System

FPL is an investor-owned utility operating within a defined service territory in southern and northeastern Florida. It serves a population of approximately 10 million people within a 27,650 mi^2 area, and includes the large metropolitan areas of Miami and Fort Lauderdale (see Figure 8-1 for a map of FPL's service area counties) (FPL 2016-TN4579). The region of influence for the proposed action is this 35-county area.

The region of influence is within the administrative region of the Florida Reliability Coordinating Council (FRCC), which is an administrative subregion of the North American Electric Reliability Corporation (NERC). The FRCC, which includes investor-owned utilities, cooperative utilities, municipal utilities, Federal power agencies, power marketers, and independent power producers, was created to ensure the reliability and adequacy of current and future bulk electricity supply in Florida and the United States. The entire FRCC region is within the Eastern Interconnection of the alternating current power grid.

FPL is part of an interconnected power network that enables power exchange between utilities. FPL is interconnected with 19 municipal and rural electric cooperative systems (FPL 2014-TN4058). FPL's transmission system includes approximately 6,897 circuit miles of transmission lines (FPL 2016-TN4579). In 2015, FPL had total summer capacity resources of approximately 26,059 MW, consisting of system firm generation of 25,233 MW and 826 MW of firm purchased power (FPL 2016-TN4579). FPL provided electricity service to over 4.8 million customers in 35 counties in 2015, including retail and wholesale customers, municipalities, utilities, and power agencies (FPL 2016-TN4579.

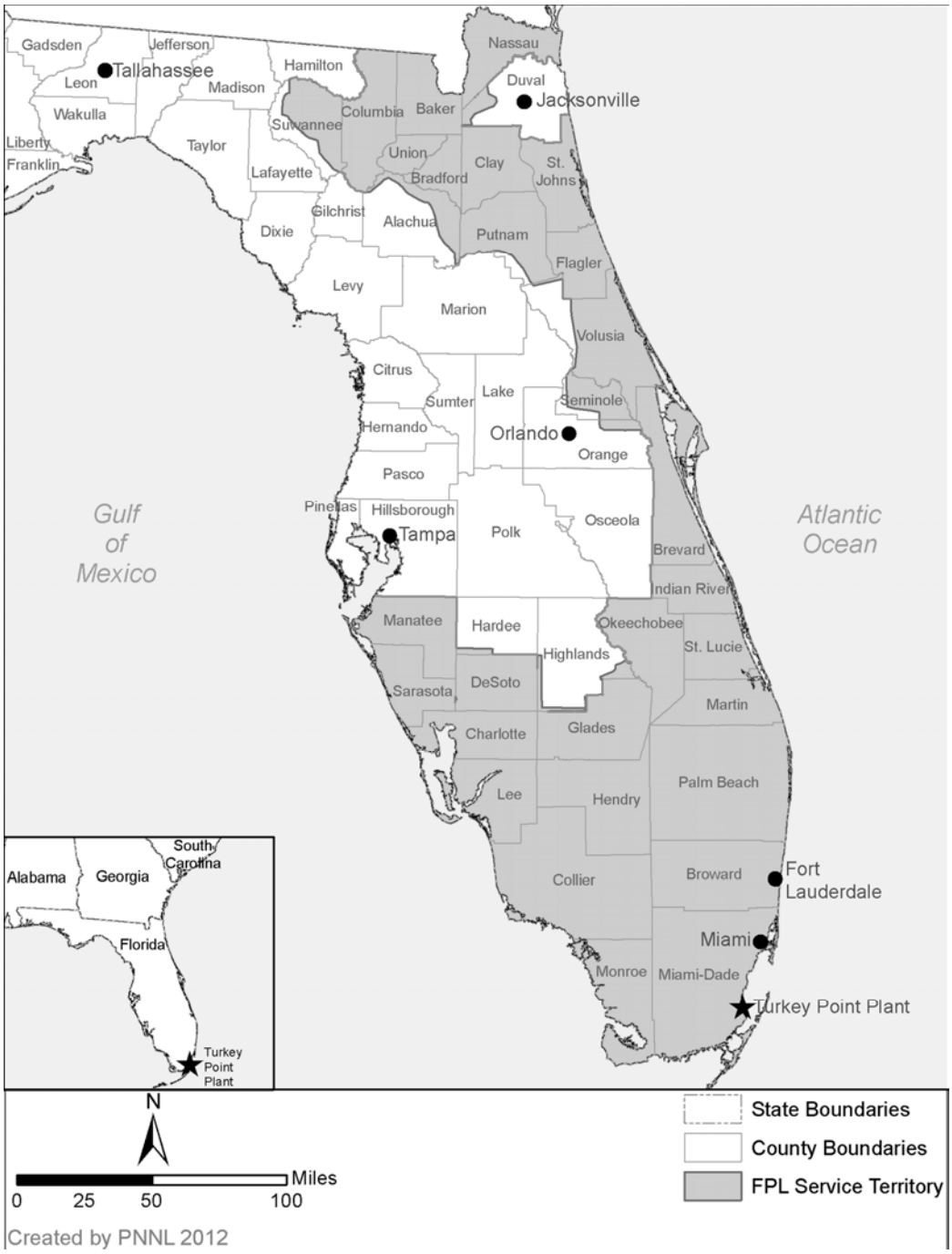

Figure 8-1. FPL Service Territory

Table 8-1 illustrates recent trends in electricity sales by customer class (FPL 2016-TN4579). FPL relies on three measures of reliability in its resource planning. First, a deterministic measure known as “reserve margin” is used to reflect FPL’s ability to meet its forecasted seasonal peak load with firm capacity. Simply stated, the reserve margin is the percentage of a utility’s total available capacity that must be available for service (firm), over and above the system peak load, as insurance against forced outages and other planned or unplanned events that could cause outages. FPL uses a 20 percent minimum reserve margin criterion in its

resource-supply planning. It uses another measure of reliability—"loss of load probability"—that reflects the probability a company will be unable to meet its load throughout the year. This measure is a utility industry standard reflecting the maximum of 1 day in 10 years (one-tenth of a day per year) loss of load probability. Lastly, FPL has implemented a 10 percent generation-only reserve margin reliability criterion. This measure reflects the reserves provided only by actual generating resources.

Table 8-1. Shares of Electricity Sales by FPL Customer Class (FPL 2016-TN4579)

Customer Class	20011	2012	2013	2014	2015
Residential (%)	51.8	51.2	51.4	50.3	50.5
Commercial (%)	42.7	43.3	43.2	41.6	40.7
Industrial (%)	2.9	2.9	2.8	2.7	2.6
Wholesale (%)	2.1	2.1	2.1	4.9	5.7
Other (%)	51.8	51.2	51.4	50.3	50.5
Total (GWh)	**105,502**	**104,462**	**104,943**	**109,763**	**116,430**

8.1.2 Evaluation of the FPL Analytical Process

In accordance with NUREG–1555 (NRC 2000-TN614), the NRC staff determined the analytical process and need-for-power evaluation performed by the FPSC met the four NRC criteria for being (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. The following sections describe how the FPSC process met the four NRC criteria.

8.1.2.1 Systematic

The NRC staff determined that FPSC used a systematic process for determining the need for the proposed Turkey Point Units 6 and 7. Regulatory provisions in Florida state that, on an annual basis, FPL must provide the most up-to-date forecast and expected resource portfolio, respective of all known current conditions. FPL accomplishes this through an iterative process for load forecasting, which is updated and reviewed annually as directed by the State through the FPSC. Load forecasts use utility industry best practices and methodological approaches to determine the utility's need for power and the most cost-effective strategies to meet its regulatory obligations. In the Determination of Need proceedings, the FPSC staff and other witnesses indicated that FPL's forecasts were reasonable for planning purposes, and the FPSC found that FPL had provided a reliable and appropriate basis for assessing the need for Turkey Point Units 6 and 7. Therefore, the regulatory provisions combined with FPSC's Determination of Need Proceedings demonstrate to the NRC staff that a systematic process was applied for determining the need for Units 6 and 7.

8.1.2.2 Comprehensive

The NRC staff concluded FPSC's analysis of issues affecting the need for power in the FPL service territory is comprehensive. The factors analyzed by FPSC include electric system reliability, the specific need for baseload capacity, the basis for forecasts and cost assumptions, the existence of viable alternatives, and cost-effectiveness. FPSC reviewed FPL's peak demand and energy forecasts which incorporate key influencing factors, such as economic and

demographic trends, weather, and implemented load-reduction programs such as new energy efficiency and demand-side management (DSM) programs. Forecasts generated included each sector of the economy, and separate forecasts were developed to determine both short- and long-term demand. Power-supply forecasts include a comprehensive evaluation of present and planned generating capabilities as well as present and planned power purchases and sales in the service territory. FPL identified all existing generators by fuel type, planned expansions, new construction, and potential closure over the relevant time period, all of which FPSC found reasonable. All analyses are performed with forecasting and statistical modeling and methodological approaches appropriate for the power industry.

The FPSC review process also takes into account the need for a reliable power system, fuel diversity, dependable supply of electricity, baseload power-generating capacity, adequate electricity at reasonable cost, and whether the project is the most cost-effective option (FPSC 2008-TN735). These factors are outside the authority of the NRC review, but demonstrate the standards of the FPSC Determination of Need review process. In view of the above, the NRC staff determined FPSC's analysis of issues affecting the need for power in the FPL service territory is comprehensive.

8.1.2.3 Subject to Confirmation

The NRC staff concluded the process, models, and estimations used in the FPSC Determination of Need are subject to a rigorous confirmation process by expert witnesses and the general public. These proceedings and relevant findings are all documented in the Final Order issued by the FPSC (2008-TN735). The FPSC performed an independent analysis of the FPL assertions made in its application and affirmed the forecasting methods and results. The NRC staff reviewed the FPSC analysis conclusions and did not identify contradictory or unconfirmed conclusions in any other independent sources such as the NERC long-term reliability assessment (NERC 2008-TN734). Accordingly, the NRC staff determined FPSC's process for making the Determination of Need was subject to confirmation.

8.1.2.4 Responsive to Forecasting Uncertainty

The NRC staff also determined that the FPSC Determination of Need was based on a forecasting methodology that incorporated uncertainty by the use of alternative scenario analysis and probabilistic modeling of the electrical system, which are standard industry practices. FPSC relied on FPL analyses that tested the validity of its overall forecast by analyzing the impact of alternative load forecasts (high, medium, and low). In addition, FPSC quantified uncertainty in the load forecast by evaluating the resource portfolios against variations in future sensitivities, such as fuel and construction costs, load forecasts, environmental laws and regulations, and risk. In doing so, FPL developed resource portfolios that quantify the long-term cost to customers under varying potential sensitivities while understanding the fundamental strengths and weaknesses of various resource configurations. Accordingly, the NRC staff determined the forecasting methodology relied upon by FPSC is responsive to forecasting uncertainty.

8.2 Determination of Demand

FPL performs demand forecasts to provide continuous service to its regulated service territory, meet its contractual commitments to wholesale customers, and contribute to the reliability of the

FRCC region. Forecasts are based on expected population growth and other economic factors. These analyses are contained in FPL's annual 10-Year Site Plan and became the basis for FPL's petition to the State of Florida for a Determination of Need for the proposed project. This process is governed by Section 403.519 of the Florida Statutes (Fla. Stat. 29-403.519-TN1057) and by Rule 25-22.080 of Florida Administrative Code (Fla. Admin. Code 25-22-TN1056). The FPSC reviewed FPL's petition for a Determination of Need, which was submitted in October 2007; and the resulting Final Order granting the petition was issued by the FPSC on April 11, 2008 (FPSC 2008-TN735).

8.2.1 Factors in the FPSC Determination of Need

This section discusses key factors affecting the future demand for electricity that FPSC considered in the issuance of its Determination of Need Final Order. The FPSC provides an independent review of the FPL forecasts and other assertions to draw its own conclusions regarding the FPL case that a need exists for both proposed units at the Turkey Point site. Each section below describes a specific factor FPSC considered in granting its Determination of Need.

8.2.1.1 Growth in Demand

The principal factor affecting the change in demand for electricity over time is the change in the number and type of customers needing that power. Electrical demand and energy usage in Florida are unique compared to other states because residential customers make up the largest part of the customer base, composing over 89 percent of Florida's electricity customers and consuming 52 percent of the total generating capacity available in the State. Because population projections are the key factor in determining the demand for electricity in Florida, FPL used population projections as one of its main independent variables. Therefore, FPL used population projections produced by the independent group IHS Global Insight to estimate growth in its customer base to develop its annual Ten-Year Power Plant Site Plan. FPL also applied standard State and national economic assumptions on growth that were produced by the IHS Global Insight. Florida's population surpassed 20 million people in 2015 and is forecasted to exceed 23 million by 2025 (FPL 2016-TN4579). FPL projected that summer peak demand will grow from 22,959 MW in 2015 to 26,572 MW in 2025 (FPL 2016-TN4579).

8.2.1.2 Electric System Reliability

One of the most important functions of an electricity generating unit is to contribute to the protection of the overall distribution system by producing more electricity than its service area demands. This approach is taken as a hedge against unforeseen emergencies that could disrupt the delivery of electricity. This excess production capacity is commonly called a "reserve margin," and FPL applies a 20 percent reserve margin to all of its demand projections (FPL 2014-TN4058). The FPSC reviewed FPL's assertion that, without the proposed action, FPL would be unable to maintain its minimum reserve margin planning requirement beginning in 2018. FPSC also reviewed FPL's assertion that with no growth in demand, there is a need for power solely from power plant retirements and expiration of purchase power agreements. The FPSC found no issue with the forecast assumptions, regression models, and projected system peak demands provided by FPL for this petition and affirmed FPL's reliance on the 20 percent

reserve margin. Table 8-2 presents FPL's reserve margin analysis used in FPL's petition to the State of Florida for a Determination of Need (FPSC 2008-TN735). FPL's current summer reserve margin forecast has changed as have the startup dates for Units 6 and 7. The current summer reserve margin forecast is shown in Table 8-2.

Table 8-2. FPL Summer Reserve Margin Forecast by Case (FPSC 2008-TN735**)**

	FPL Reserve Margin (%)		
Year	**w/ Units 6 and 7[(a)]**	**w/o Units 6 and 7[(a)]**	**No Growth, 2008−2012[(b)]**
2015	23.6	23.6	28.3
2016	20.6	20.6	19.3
2017	21.2	21.2	16.5
2018	22.9	18.6	13.9
2019	20.4	16.2	11.4
2020	21.9	13.7	8.8

(a) Includes previously certified nuclear uprates in 2012 and 2013 as well as new uncertified gas combined-cycle units in 2011, 2015, 2016, and 2017.
(b) Includes previously certified nuclear uprates in 2012 and 2013, but no new gas units.

8.2.1.3 Fuel Diversity

FPSC reviewed FPL's assertion that without the proposed action, nuclear power generation would decline to 16 percent of its portfolio by 2021 and cause FPL to rely on natural-gas power generation for up to 75 percent of its power generation. Under Section 403.519 of the Florida Statutes as amended (Fla. Stat. 29-403.519-TN1057), the FPSC is mandated to consider fuel diversity in its evaluation of electricity generation expansion plans. Section 403.519(4) (b) of the Florida Statutes (Fla. Stat. 29-403.519-TN1057) directs FPSC to account for reductions in the State's dependence on foreign natural gas and fuel oil. The FPSC concluded FPL demonstrated that the proposed action is needed to maintain a diverse fuel supply, reduce the State's dependence on natural gas, and provide a significant source of non-carbon-emitting baseload generation.

8.2.1.4 Baseload Capacity

The FPSC reviewed FPL's assertion that without the proposed action FPL would not meet its baseload needs and reduce carbon emissions because most renewable generation cannot provide baseload capacity. FPSC found that the addition of proposed Units 6 and 7 to the fleet would enable FPL to meet part of its baseload need without the use of more carbon-emitting generation. FPSC found that, by 2020, FPL's baseload needs are expected to increase by 6,000 MW, and even with substantial decreases in load forecasts or increases in DSM and renewable generation, the need for Units 6 and 7 would remain. The FPSC also found that the expected high capacity rates of Units 6 and 7 would represent a substantial addition of baseload capacity in the FPL system. Therefore, neither renewable generation resources nor DSM resources currently available or in the foreseeable future could provide enough baseload capacity to avoid or mitigate the need that would be met by the proposed action.

8.2.1.5 Adequate Electricity at a Reasonable Cost

The FPSC reviewed FPL's assertion that relative to fossil fuels, nuclear fuel will continue to be the most stable in price and lowest-cost fuel available to FPL. The FPSC found FPL's economic

assumptions and estimates of capital cost, transmission cost, and fuel price to be reasonable. These findings are based on FPSC's own analyses and on testimony from several expert witnesses (FPSC 2008-TN735).

The FPSC reviewed whether FPL included a reasonable level of environmental compliance costs associated with the proposed action. The FPSC found that because nuclear power generation is a non-carbon-emitting power-generation source, an increase in environmental compliance costs associated with expected carbon dioxide (CO_2) regulation would increase the overall cost-effectiveness of the proposed new units. Because these costs have not yet been imposed but are expected to be imposed by the time the proposed units become operational, conclusions are based on four independent assessments of potential CO_2 compliance costs.

8.2.1.6 Demand-Side Management and Renewable Energy Sources and Technologies

In its analysis of the Determination of Need for Turkey Point Units 6 and 7, the FPSC considered the availability of viable alternatives. Its findings relative to alternatives are presented here to fully characterize the FPSC's decision about the need for the new units. The NRC analysis of potential alternatives to Units 6 and 7 is documented in Chapter 9 of this EIS. Based on the record reported in its Final Order (FPSC 2008-TN735), the FPSC found that there are no renewable energy resources, technologies, DSM options, or other conservation measures reasonably available to FPL that could supply the need for 2,200 MW(e) of baseload power that Units 6 and 7 would provide. The record reflects the following observations by the FPSC:

- FPL has searched and continues to search for reliable renewable generation sources and technologies.
- FPL offers a wide range of residential and commercial DSM programs, such as load management, building envelope, lighting, and air-conditioning programs.
- Although FPL's load forecast assumes the addition of 144 MW of renewable firm capacity to its portfolio and the extension of 143 MW of renewable firm capacity from expiring municipal waste-to-energy contracts, additional capacity still would be needed to meet the need for baseload generation.
- FPL's DSM programs through 2009 resulted in summer peak reduction of 4,257 MW and energy savings of 51,055 GWh at the generator. In 2004, FPL received approval for 802 MW (at the generator) of additional DSM from 2006 to 2014. By 2020, an additional 1,899 MW (at the generator) of additional summer demand reduction is expected (FPL 2014-TN4058).

8.2.1.7 Most Cost-Effective Source of Power

In accordance with Section 403.519(4) of the Florida Statutes (Fla. Stat. 29-403.519-TN1057), the FPSC reviewed FPL's assertion that the proposed action would provide the most cost-effective source of power. The FPSC found the breadth of planning scenarios that FPL analyzed, including 18 different fuel-cost and/or environmental-cost scenarios, provided a reasonable basis for considering the question of cost-effectiveness. These scenarios included nine different fuel-cost forecasts (low, medium, and high) and environmental-cost projections.

Subsequent FPSC reviews showed the proposed action to be cost-effective in 17 of the 18 scenarios. None of the FPL scenarios included potential Federal incentives that, if considered, would serve to increase the cost-effectiveness in all cases.

Because cost savings were projected from seven of the eight plausible projection cases identified, the FPSC concluded it is highly likely that FPL rate payers would realize net benefits over the life of the proposed new units. It found that the proposed action is projected to result in nearly $1 billion in fuel-cost savings beginning in 2021 and about $94 billion over the life of the permits when compared to reasonable combined-cycle alternatives. According to the FPSC, because nuclear generation is considered a “non-emitting” technology for greenhouse gas emissions, the higher the CO_2-compliance costs imposed on other technologies, the more cost-effective the proposed action becomes.

The FPSC also recognized the role of uncertainty with long lead-time projects such as nuclear power generation, as well as the Florida provisions for early cost recovery through rate increases. As a result, the FPSC recommends that FPL continue to pursue joint ownership opportunities as a means to mitigate rate impacts. Therefore, as part of annual cost-recovery proceedings ordered by the FPSC, FPL must provide updates on its progress in this regard. As part of the annual cost-recovery proceedings, FPL must provide the FPSC with updated fuel forecasts, environmental forecasts, non-binding capital cost estimates, and an accounting of sunk costs. The FPSC then will consider each year’s new information and determine the feasibility of continued construction of the proposed Turkey Point Units 6 and 7.

8.2.2 FPL’s Demand for Electricity

This section reproduces the expected demand for electricity (Table 8-3) developed by FPL for the ER’s Chapter 8, Need for Power. The forecasted values for 2016 through 2025 in Table 8-3 are taken from FPL’s Ten-Year Plan (FPL 2016-TN4579). Values from 2026 through 2031 (three years after startup of the last unit) were derived using the growth rate from 2021 through 2025.

8.3 Determination of Supply

The FPSC reported in its 2008 Determination of Need that in 2006, FPL’s generation capacity profile in Florida was approximately as follows: 18 percent coal generated, 50 percent natural-gas generated, and 21 percent nuclear generated (FPSC 2008-TN735).

For its power-supply and capacity forecasts, FPL considered its present and planned generating capabilities (including planned uprates, closures of facilities, and additional new power-generation facilities), present and planned purchases of power from generators outside the service territory, and its sales of power to consumers outside the service territory.

FPL is expected to fall below the 20 percent summer reserve margin requirement in 2029. In 2028 the generation-only reserve margin would drop below the 10 percent requirement to 9.7 percent. Table 8-4 below shows the forecasted capacities and reserve margins from 2016 through 2031 (FPL 2016-TN4579). The forecasted values for 2016 through 2025 in Table 8-4 are taken from FPL’s Ten-Year Plan (FPL 2016-TN4579). Values from 2026 through 2031 were derived using the growth rate from 2021 through 2025 or, in the case of other public authorities, railroads, and railways, values were held constant. In the case of street and highway lighting 10 GW were added each year in keeping with the trend in the FPL Ten-Year Plan.

Table 8-3. Forecasted Energy Consumption, Capacity, and Peak Demand

	Residential (GWh)	Commercial (GWh)	Industrial (GWh)	Railroads and Railways (GWh)	Street and Highway Lighting (GWh)	Other Public Authorities (GWh)	Total Sales (GWh)	Sales for Resale (GWh)	Utility Use and Losses (GWh)	Net Energy for Load (GWh)
2016	57,282	46,420	3,173	91	478	23	107,467	6,524	5,730	119,614
2017	57,100	46,424	3,255	91	488	23	107,382	5,988	5,606	118,821
2018	57,493	46,616	3,319	91	499	23	108,041	6,013	5,702	119,552
2019	57,889	46,822	3,368	91	509	23	108,703	6,084	5,735	120,266
2020	58,627	47,245	3,407	91	519	23	109,913	6,156	5,814	121,574
2021	59,108	47,485	3,438	91	529	23	110,674	5,651	5,811	121,771
2022	59,557	47,687	3,461	91	539	23	111,359	5,202	5,817	121,954
2023	60,033	47,930	3,479	91	549	23	112,106	5,278	5,857	122,756
2024	60,524	48,235	3,492	91	559	23	112,924	5,354	5,894	123,625
2025	61,034	48,454	3,501	91	569	23	113,673	5,432	5,957	124,452
2026	61,525	48,699	3,517	91	579	23	114,434	5,379	5,994	125,131
2027	62,020	48,946	3,533	91	589	23	115,202	5,326	6,031	125,815
2028	62,520	49,194	3,549	91	599	23	115,975	5,273	6,069	126,501
2029	63,023	49,443	3,565	91	609	23	116,754	5,221	6,107	127,192
2030	63,530	49,693	3,581	91	619	23	117,537	5,170	6,145	127,886
2031	64,041	49,945	3,598	91	629	23	118,327	5,119	6,183	128,585

Source: FPL 2016-TN4579

Table 8-4. Forecasted Capacities and Reserve Margins during the Summer Peak Period

August of the Year	Projections of FPL Unit Capacity (MW)	Projections of Firm Purchases (MW)	Projection of Total Capacity (MW)	Peak Load Forecast (MW)	Summer DSM Forecast (MW)	Forecast of Firm Peak (MW)	Forecast of Summer Reserves (MW)	Forecast of Summer Reserve Margins (%)	Forecast of Generation-Only Summer Reserves (MW)	Forecast of Generation-Only Summer Reserve Margins (%)
2016	26,513	726	27,238	24,170	1,842	22,327	4,911	22.0	3,068	12.7
2017	26,003	879	26,882	24,336	1,935	22,401	4,481	20.0	2,546	10.5
2018	25,984	1150	27,134	24,606	1,995	22,611	4,522	20.0	2,528	10.3
2019	27,657	826	28,482	24,893	2,041	22,852	5,630	24.6	3,589	14.4
2020	27,812	444	28,256	25,206	2,088	23,117	5,138	22.2	3,050	12.1
2021	27,899	624	28,523	25,316	2,136	23,180	5,343	23.0	3,207	12.7
2022	27,984	624	28,608	25,540	2,185	23,355	5,252	22.5	3,068	12.0
2023	27,983	624	28,607	25,833	2,234	23,599	5,008	21.2	2,774	10.7
2024	29,605	624	30,228	26,180	2,284	23,896	6,332	26.5	4,048	15.5
2025	29,604	624	30,227	26,572	2,334	24,238	5,989	24.7	3,655	13.8
2026	29,604	624	30,228	26,896	2,387	24,510	5,718	23.3	3,332	12.4
2027	29,604	624	30,228	27,223	2,440	24,785	5,443	22.0	3,005	11.0
2028	29,604	624	30,228	27,555	2,495	25,063	5,165	20.6	2,673	9.7
2029	29,604	624	30,228	27,890	2,552	25,344	4,884	19.3	2,338	8.4
2030	29,604	624	30,228	28,230	2,609	25,629	4,599	17.9	1,998	7.1
2031	29,604	624	30,228	28,574	2,668	25,916	4,312	16.6	1,654	5.8

Source: FPL 2016-TN4579

8.4 Conclusions

As stated in Section 8.0, the NRC acknowledges the primacy of states to assess and regulate their own power needs. The State of Florida has officially determined that there is a need for about 6,000 MW (e) of additional baseload electricity generation by 2020. Further, the State has determined that, for many reasons, the need should be filled by the proposed action of constructing and operating Turkey Point Units 6 and 7. The FPSC granted FPL a Determination of Need for Units 6 and 7 in April of 2008. The NRC staff outlined in Section 8.1 how the FPSC process was (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. Because its review process met the NRC's four criteria for reliability, the NRC staff finds no reason to challenge the FPSC conclusions. Consequently, the NRC staff finds the applicant's need for power conclusions to be reasonable and establishes a positive need for power for the proposed Turkey Point Units 6 and 7.

9.0 Environmental Impacts of Alternatives

This chapter describes alternatives to the proposed U.S. Nuclear Regulatory Commission (NRC) action for a combined construction permit and operating license (combined license or COL) and the U.S. Army Corps of Engineers' (USACE's) action for a Department of the Army (DA) permit and discusses the environmental impacts of those alternatives. Section 9.1 discusses the no-action alternative. Section 9.2 addresses alternative energy sources. Section 9.3 reviews the region of interest (ROI) evaluated in the site-selection process, the Florida Power & Light Company (FPL) site-selection process, details specific to each one of the respective alternative sites, and summarizes and compares the cumulative environmental impacts for the proposed and alternative sites. Section 9.4 examines plant design alternatives.

The need to compare the proposed action with alternatives arises from the requirement in Section 102(2)(c)(iii) of the National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. § 4321 et seq.) (TN661), that environmental impact statements (EISs) include an analysis of alternatives to the proposed action. The NRC implements this requirement through its regulations in Title 10 of the *Code of Federal Regulations* (CFR) Part 51 (TN250) and its Environmental Standard Review Plan (ESRP) (NRC 2000-TN614). The environmental impacts of the alternatives are evaluated using the NRC's three-level standard of significance—SMALL, MODERATE, or LARGE—developed using Council on Environmental Quality (CEQ) guidelines (40 CFR 1508.27) (TN428) and set forth in the footnotes to Table B-1 of 10 CFR Part 51 (TN250), Subpart A, Appendix B. The issues evaluated in this chapter are the same as those addressed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, NUREG–1437, Volumes 1, 2, and 3 (NRC 2013-TN2654). Although NUREG–1437 was developed for license renewal, it provides useful information for the review of new reactors, and is referenced where appropriate throughout this chapter. Additional guidance on conducting environmental reviews is provided in *Interim Staff Guidance on Environmental Issues Associated with New Reactors* (NRC 2014-TN3767).

As part of the evaluation of permit applications subject to Section 404 of the Clean Water Act, the USACE is required by regulation to apply the criteria set forth in the joint U.S. Environmental Protection Agency (EPA) and USACE CWA Section 404(b)(1) guidelines (40 CFR Part 230) (TN427) (hereinafter "404 (b)(1) Guidelines"). These guidelines establish criteria that must be met for the proposed activities to be permitted pursuant to Section 404, which governs specification of disposal sites for dredged or fill material. Specifically, the 404(b)(1) Guidelines state, in part, that no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impacts on the aquatic ecosystem provided the alternative does not have other significant adverse consequences. An area not presently owned by the applicant that could reasonably be obtained, used, expanded, or managed to fulfill the basic purpose of the proposed activity may be considered if it is otherwise a practicable alternative. The USACE will conclude its Clean Water Act Section 404(b)(1) Guidelines and public interest analyses in its Record of Decision.

9.1 No-Action Alternative

For the purposes of an application for a COL, the no-action alternative refers to a scenario in which the NRC would deny the COLs requested by FPL, which would result in the proposed Units 6 and 7 not being built. The USACE no-action alternative is one that results in no construction requiring a DA permit. This could be accomplished by the applicant minimizing project impacts so that all work under the jurisdiction of USACE is eliminated or by USACE denying the DA permit application. Upon receiving such a denial by the NRC or the USACE, the construction and operation of two new nuclear units at the Turkey Point Nuclear Power Plant (Turkey Point) site in accordance with 10 CFR Part 52 (TN251) would not occur and the predicted environmental impacts associated with the project would not occur. Some preconstruction impacts associated with activities not within the NRC's definition of construction at 10 CFR 50.10(a) (TN249) and 10 CFR 51.4 (TN250) may occur nonetheless. However, no activities, including preconstruction activities, involving the discharge of dredged or fill materials into waters of the United States or work in navigable waters of the Unites States, could occur without a DA permit from the USACE.

If no other power plants were to be built in lieu of the proposed project or other strategy implemented to take its place, the benefits of the additional electrical capacity and electricity generation to be provided by the project would not occur. If no additional measures (e.g., conservation, importing power, restarting retired power plants, and/or extending the life of existing power plants) were implemented to realize the amount of electrical capacity that would otherwise be required for power in FPL's ROI (see Section 9.3.1), then the need for baseload power, discussed in Chapter 8, would not be met. Therefore, the purpose and need of this project would not be satisfied if the no-action alternative was chosen and the need for power was not met by other means.

If other generation sources were installed, either at another site or using a different energy source, the environmental impacts associated with these other sources would eventually occur. As discussed in Chapter 8, there is a demonstrated need for power and FPL has regulatory responsibilities in Florida to provide electrical service in its service area. It is reasonable to assume that other options to meet the need for power would be pursued. This needed power may be provided and supported through several alternatives that are discussed in Sections 9.2 and 9.3.

9.2 Energy Alternatives

The purpose and need for the proposed project identified in Section 1.3 is to provide additional baseload electrical generation capacity for use in FPL's current markets. This section examines the potential environmental impacts associated with alternatives to construction of a new baseload nuclear power plant. Section 9.2.1 discusses energy alternatives not requiring new generating capacity. Section 9.2.2 discusses energy alternatives requiring new generating capacity. Other alternatives are discussed in Section 9.2.3. A combination of alternatives is discussed in Section 9.2.4. Section 9.2.5 compares the environmental impacts from new nuclear, coal-fired, and natural-gas−fired generating units and a combination of energy sources at the Turkey Point site.

For analysis of energy alternatives, FPL assumed a bounding target value of 2,200 MW(e) net electrical output (FPL 2014-TN4058). The NRC staff also used this level of output in its analysis of energy alternatives.

The review team's analysis is based on in-service dates of 2027 for Unit 6 and of 2028 for Unit 7 based on FPL's COL Revision 7 (FPL 2015-TN4502). Even if the actual in-service date were to slip by a few years, the NRC staff would not expect such a change to affect the overall conclusions regarding energy alternatives for two reasons. First, the projections by FPL and by the U.S. Department of Energy, Energy Information Administration (DOE/EIA) that the NRC staff has used in its analyses do not change appreciably in the later years and are generally consistent with the data used for 2028. Second, the environmental impacts of the feasible alternatives are not likely to change appreciably, so the NRC staff's conclusions regarding environmental preferability are unlikely to change.

9.2.1 Alternatives Not Requiring New Generating Capacity

Four alternatives to the proposed action that do not require FPL to construct new generating capacity are as follows:

- Purchase the needed electric power from other suppliers.
- Extend the operating life of existing power plants.
- Reactivate retired power plants.
- Implement conservation or demand-side management programs.

9.2.1.1 Purchased Power

If power to replace the capacity of the proposed new nuclear units was to be purchased from sources within the United States or from a foreign country, the generating technology likely would be one of those described in NUREG–1437 (e.g., coal, natural gas, or nuclear) (NRC 2013-TN2654). The environmental impacts of other technologies described in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*, (NUREG–1437) are representative of the impacts associated with the construction and operation of new generating units at the Turkey Point site. The environmental impacts of coal-fired and natural-gas−fired plants are discussed in Sections 9.2.2.1 and 9.2.2.2, respectively.

Under the purchased power alternative, the environmental impacts of power production would still occur, but they would occur elsewhere in the region or nation. If the purchased power alternative was to be implemented, the most significant environmental unknown would be whether new transmission line corridors would be required. The construction of new transmission lines could have both environmental and aesthetic consequences, particularly if new transmission lines require new corridors (as opposed to collocating new lines with existing lines in existing corridors). The review team concludes that the local environmental impacts from purchased power would be SMALL when existing transmission line corridors are used and could range from SMALL to LARGE if acquisition of new corridors is required. The overall environmental impacts of power generation would depend on the generation technology and location of the generation site and, therefore, are unknown. However, as discussed in Section 9.2.5, the NRC staff concluded that from an environmental perspective, none of the viable

energy alternatives would be clearly preferable to construction of a new baseload nuclear power-generation plant located within FPL's ROI.

9.2.1.2 Reactivating Retired Power Plants or Extending Operating Life

In its Environmental Report (ER) (FPL 2014-TN4058), FPL acknowledged that reactivating or extending the service life of existing plants or extending their capacity through power uprates or other efficiency improvements could theoretically reduce the need for a new nuclear power station. FPL also noted in the 2014 Ten-Year Plan (FPL 2014-TN3360) that it has completed power uprates at FPL's four existing nuclear units (Turkey Point Units 3 and 4 and St. Lucie Units 1 and 2). The capacity uprates have added approximately 520 MW of capacity to FPL's system. In addition, FPL has already received renewed licenses for all of its existing nuclear units that extend the licenses through 2032 to 2043 (depending on the unit). Because extending the service life of these nuclear plants and constructing the proposed Turkey Point Units 6 and 7 are both already considered as part of FPL's future baseload generation capacity, the NRC staff concludes that extending the service life of the existing nuclear plants alone is not a feasible alternative to the proposed Turkey Point Units 6 and 7.

Another potential strategy is repowering one or more of FPL's existing generating plants. Repowering involves modifying a plant to use a different fuel source. In its ER, FPL described plans that were approved by the Florida Public Service Commission (FPSC) in September 2008 and were incorporated in FPL's recent Integrated Resource Plan to repower two existing generating plants, Cape Canaveral and Riviera Beach, each of which consists of two older fossil-fuel−fired steam-generating units that will be converted into new highly efficient natural-gas combined-cycle units. The two-unit plant at FPL's Cape Canaveral site has been replaced with a new combined-cycle plant that has an output of approximately 1,210 MW. This new unit is called the Cape Canaveral Next-Generation Clean Energy Center. The two-unit plant at FPL's Riviera site has also been replaced by a new combined-cycle plant that has an output of approximately 1,210 MW. In its 2016 Ten-Year Plan, FPL noted that the old units at Port Everglades were also replaced, and FPL will add another highly fuel-efficient combined-cycle unit in Okeechobee County in 2019 (FPL 2016-TN4579).

Older existing fossil-fueled plants, predominately coal-fired and natural-gas−fired plants, are likely to need refurbishing to extend plant life for an extended period (the proposed action assumes a minimum operating period of 40 years), and meeting current environmental requirements would also be costly. Such plants would typically be old enough that the refurbished plants would likely be viewed as new sources, subject to the current-day complement of regulatory controls on air emissions and waste management. In the ER of its COL application, FPL identified some deactivated generators within its service area (FPL 2014-TN4058). None of these retired units individually would be able to meet the proposed 2,200 MW(e) output of the Units 6 and 7. The review team also concluded that it is unlikely that a combination of retired units could be developed to meet this demand and successfully meet applicable environmental requirements. In addition, FPL's 2016 Ten-Year Plan no longer considers reactivation of these older units (FPL 2016-TN4579).

Retired generating plants, predominately coal-fired and natural-gas−fired plants that potentially could be reactivated, would ordinarily require extensive refurbishment prior to reactivation.

Such vintage plants would typically require costly refurbishment to meet current environmental requirements. The environmental impacts of any reactivation scenario would be bounded by the impacts associated with coal-fired and natural-gas−fired alternatives (Section 9.2.2), which the NRC staff concludes are not environmentally preferable to the proposed actions (Section 9.2.5). Given both these refurbishment costs and the environmental impacts of operating such facilities, the NRC staff concludes that reactivating retired generating plants would not be a reasonable alternative to the proposed action.

9.2.1.3 Energy Efficiency and Demand-Side Management

Improved energy efficiency and demand-side management (DSM) strategies can potentially cost less than construction of new generation and provide a hedge against market, fuel, and environmental risks. The FPSC approved FPL's current DSM plan in an Order dated August 16, 2011 (FPSC 2011-TN1357), as confirmed in an Order dated December 22, 2011 (FPSC 2011-TN1358). See docket 100155-EG on the FPSC website for more details. In approving the FPL plan, the FPSC determined that two other plans that would have increased DSM would be too costly to the FPL customers. On April 2, 2014, FPL submitted an updated DSM Plan to the FPSC for its review (see docket 130199). New DSM goals for FPL for the 2015 through 2024 time period were set by the FPSC in December 2014. FPL accounts for these DSM goals in its planning process and extends the annual level of DSM beyond the year 2024 (FPL 2016-TN4579).

The need-for-power discussion in Chapter 8 takes planned energy efficiency and DSM programs into account. The NRC staff concluded in Chapter 8 that there is a justified need for power in the FPL service territory even with the implementation of conservation and DSM programs. The NRC staff concludes that improved energy efficiency and DSM programs would not be a reasonable alternative to the proposed action.

9.2.1.4 Summary Statement Regarding Alternatives Not Requiring New Generating Capacity

Based on the preceding discussion, the NRC staff concludes that the options of purchasing electric power from other suppliers, reactivating retired power plants, extending the operating life of existing power plants, and energy efficiency and DSM programs are not reasonable alternatives to providing new baseload power-generation capacity.

9.2.2 Alternatives Requiring New Generating Capacity

Consistent with the NRC's evaluation of alternatives to operating license renewal for nuclear power plants, a reasonable set of energy alternatives to the building and operation of two new nuclear units at the Turkey Point site should be limited to analysis of discrete power-generation sources, a combination of sources, and those power-generation technologies that are technically reasonable and commercially viable (NRC 2013-TN2654). The current mix of baseload power-generation options in Florida is one indicator of the feasible choices for power-generation technology within the state. The electricity produced in Florida in 2014 came mainly from coal (22.6 percent), natural gas (60.9 percent), and nuclear energy (12.1 percent) (DOE/EIA 2016-TN4584). The balance came from renewable energy (2.3 percent, including hydropower) and miscellaneous sources (2.1 percent).

This section discusses the environmental impacts of energy alternatives to the proposed action that would require FPL to construct new generating capacity. The three primary energy sources for generating electric power in the United States are coal, natural gas, and nuclear energy (DOE/EIA 2016-TN4620, Table 8). Natural-gas combined-cycle power-generation plants are often used as intermediate generation sources, but they are also used as baseload generation sources (SSI 2010-TN1405).

Each year, the EIA, a component of the DOE, issues an Annual Energy Outlook. In its updated Annual Energy Outlook 2016, the EIA's reference case projects that total electric generating capacity additions between 2015 and 2040 will add 483 GW of new generating capacity using the following fuels (in GW and the approximate percentages of the total increase): natural gas[(1)] (171 GW/35 percent), renewables (302 GW/63 percent), nuclear (4 GW/1 percent), and coal (1 GW/2 percent) (DOE/EIA 2016-TN4621, Table 9). DOE/EIA also predicts that total coal capacity will decrease by 99 GW by 2040 (DOE/EIA 2016-TN4621, Table 9). The EIA projection includes baseload, intermittent, and peaking units and is based on the assumption that providers of new generating capacity would seek to minimize cost while meeting applicable environmental requirements.

The discussion in Section 9.2.2 is limited to a reasonable range of the individual energy alternatives that appear to be viable for new baseload generation: coal-fired and natural-gas combined-cycle generation. The impacts discussed in Section 9.2.2 are estimates based on present technology. Section 9.2.3 addresses alternative generation technologies that have demonstrated commercial acceptance but may be limited in application, total capacity, or technical feasibility when based on the need to supply reliable, baseload capacity.

The review team assumed that (1) new generation capacity would be located at the Turkey Point site for the coal- and natural-gas−fired alternatives,[(2)] (2) the cooling approach planned for proposed Units 6 and 7 (Section 3.2.2.2) would be used for plant cooling, and (3) two new 500 kV circuits and three new 230 kV circuits would be built to serve a new coal- or natural-gas−fired plant sited at the Turkey Point site, consistent with the FPL proposal for Units 6 and 7 (FPL 2014-TN4058).

9.2.2.1 Coal-Fired Power Generation

For the coal-fired generation alternative, the NRC staff assumed construction of four pulverized-coal−fired units, each with a total net capacity of 550 MW(e). The team's estimates of coal consumption, coal-combustion technology, air emissions, and waste products are based on the EPA's Compilation of Air Pollutant Emission Factors document (EPA AP-42), Section 1.1, Bituminous and Subbituminous Coal Combustion (EPA 2011-TN1088). The NRC staff also assumed that additional transmission line corridors would be acquired, as discussed in Section 2.2.2. The plant was assumed to have an operating life of 40 years. Because FPL assumed a

(1) This includes the projections for "combined cycle," "combustion turbine/diesel," and "distributed generation (natural gas)."

(2) The land needed for the coal alternative might exceed the land available at the site. The applicant might choose to locate the plant elsewhere or dispose of coal-combustion products in an offsite location in such a case. However, for the purposes of this analysis the review team assumed all facilities would be at the Turkey Point site.

pulverized-coal−fired alternative would consist of three boiler units, each with a net capacity of 728.4 MW (FPL 2014-TN4058), the NRC staff compared its analyses to FPL's COL application and found the results to be consistent.

Because the nearest rail line is 11 mi by road from the Turkey Point site (FPL 2014-TN4058), the rail line would have to be extended to the site or coal deliveries would have to be accomplished by barge. In its ER, FPL assumed that coal would be delivered to the site by barge, in the same way that fuel oil had been delivered previously for Units 1 and 2 (FPL 2014-TN4058). The NRC staff used this assumption in its analysis.

The NRC staff also considered integrated gasification combined-cycle (IGCC) coal-fired plants. IGCC is an emerging technology for generating electricity with coal that combines modern coal gasification technology with both gas turbine and steam turbine power generation. The technology is cleaner than conventional pulverized-coal plants because major pollutants can be removed from the gas stream before combustion. The IGCC alternative also generates less solid waste than the pulverized-coal−fired alternative. The largest solid-waste stream produced by IGCC installations is slag—a black, glassy, sand-like material that is potentially a marketable byproduct. The other large-volume byproduct produced by IGCC plants is gypsum, which is produced when sulfur is extracted during the gasification process, and it can be marketed rather than placed in a landfill. IGCC units do not produce ash or scrubber wastes. In spite of the preceding advantages, the NRC staff concludes that, at present, a new IGCC plant is not a reasonable alternative to a 2,200 MW(e) nuclear power-generation facility for the following reasons: (1) IGCC plants are more expensive than comparable pulverized-coal plants (NETL 2010-TN1423), (2) the existing IGCC plants in the United States have considerably smaller plant capacity than the proposed 2,200 MW(e) nuclear plant,[3] (3) system reliability of existing IGCC plants has been lower than that of pulverized-coal plants, and (4) a lack of overall plant performance warranties for IGCC plants has hindered commercial financing (NPCC 2005-TN1406). For these reasons, IGCC plants are not considered further in this EIS.

Therefore, for the coal-fired alternative, the NRC staff assumed that coal and limestone (calcium carbonate) would be delivered to the plant by barge (FPL 2014-TN4058). The NRC staff estimates that the plant would consume 6.55 million T/yr of pulverized bituminous coal with an ash content of approximately 10.3 percent (DOE/EIA 2009-TN1415). Slaked lime or limestone, used in the flue-gas scrubbing process for control of sulfur dioxide (SO_2) emissions, is injected as slurry into the hot effluent combustion gases to remove entrained SO_2. The limestone-based scrubbing solution reacts with SO_2 to form calcium sulfite (a food additive) or calcium sulfate (gypsum), which precipitates and is removed from the process as sludge for dewatering and then sold to industry for use in the manufacture of wallboard or other industrial products. The NRC staff estimates that approximately 450,000 T/yr of limestone, which could come from local sources, would be used for flue-gas desulfurization, generating approximately 700,000 T/yr of marketable scrubber sludge.

(3) The review team is aware that Duke Energy placed a 618 MW(e) IGCC plant into service in June 2013 (Duke 2013-TN2662) and that Mississippi Power is building an IGCC plant in Kemper County, Mississippi, with an output of 582 MW(e) (MPC 2014-TN3776).

Air Quality

The impacts on air quality from coal-fired generation would vary considerably from those of nuclear power generation because of emissions of SO_2, nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter (PM), volatile organic compounds, and hazardous air pollutants such as mercury and lead. The NRC staff estimates that a 2,200 MW(e) coal-fired plant would also have unregulated carbon dioxide (CO_2) emissions of 18.7 million T/yr that could affect climate change (EPA 2011-TN1088).

The coal-fired plant emissions were determined based on factors contained in EPA AP-42 (EPA 2011-TN1088). The estimates of emissions are based on "as fired" and controlled conditions using both combustion and post-combustion technologies to reduce criteria pollutants to maintain local and regional attainment status for the criteria pollutants listed below. Emissions estimates are not necessarily representative of what would be permitted.

A final air permit would likely require applicable Best Available Control Technologies (BACTs). The NRC staff's estimates of the emissions from the coal-fired generation alternative are approximately as follows(4) (PM_{10} is particulate matter with an aerodynamic diameter equal to or less than 10 microns (40 CFR 50.6) (TN1089):

- SO_2 – 7,469 T/yr
- NO_x – 1,638 T/yr
- CO – 1,638 T/yr
- PM – 147 T/yr
- PM_{10} – 34 T/yr(5)
- $PM_{2.5}$ – 20 T/yr
- Mercury – 0.085 T/yr.

The acid rain requirements of the Clean Air Act, as amended (42 U.S.C. § 7401 et seq.) (TN1141) capped the nation's SO_2 emissions from power plants. FPL would need to obtain sufficient pollution credits either from a set-aside pool or purchases on the open market to cover annual emissions from the plant.

Historically, CO_2, an unavoidable byproduct of combustion of carbonaceous fuels, has not been regulated as a pollutant. However, regulations are now under development for CO_2 and other greenhouse gases (GHGs). In response to the Consolidated Appropriations Act of 2008 (Public Law 110-161) (TN1485), the EPA promulgated final mandatory GHG reporting regulations in October 2009, effective in December 2009 (74 FR 56260) (TN1024) (see also http://www.epa.gov/climatechange/emissions/ghgrulemaking.html [EPA 2012-TN1670]). The rules are applicable to major sources of CO_2 (those emitting more than 25,000 T/yr). New utility-scale coal-fired power plants would be subject to those regulations.

(4) Based on 6,552,000 T/yr of bituminous coal and controlled using overfire air in combination with low-NO_x burners and selective catalytic reduction, limestone-based flue-gas desulfurization, and conventional particulate capture technology (EPA 2011-TN1088).

(5) The value for PM_{10} includes particles of smaller diameter, such as $PM_{2.5}$.

The coal-fired alternative plant would qualify as a major generator of GHGs under the "Tailoring Rule" promulgated by the EPA (75 FR 31514) (TN1404). Beginning January 2, 2011, permits issued to major sources of GHGs under the Prevention of Significant Deterioration (PSD) or Title V Federal permit programs must contain provisions requiring the use of BACTs to limit the emissions of GHGs if those sources would be subject to PSD or Title V permitting requirements because of their non-GHG pollutant emission potentials and if their estimated GHG emissions are at least 75,000 T/yr of CO_2 equivalents (CO_2e). The amount of CO_2 released per unit of power produced would depend on the quality of the fuel and the firing conditions and overall firing efficiency of the boiler. Meeting permit limitations for GHG emissions may require installation of carbon capture and sequestration devices on any new coal-fired power plant, which could add substantial power penalties. On October 23, 2015, the EPA published its final rule for new source performance standards to limit CO_2 emissions from new coal-fired power plants (80 FR 64509-TN4388). However, even with the application of this new standard, emissions from a coal-fired power plant would still be far greater than those from a comparably sized nuclear power plant. The relative efficiency penalty for adding CO_2 capture ranges from 21 to 29 percent on average, meaning that a new coal plant would have to be much larger than 2,200 MW(e) to provide a comparable amount of power to proposed Units 6 and 7 (NETL 2010-TN1423). In addition, once extracted the CO_2 would have to be piped either to a permanent sequestration site, or for use in enhanced oil recovery. Regardless of end use, the construction of a CO_2 pipeline would have the potential to increase the impacts on resources such as, but not limited to, terrestrial and aquatic ecology, socioeconomics, and cultural and historic resources. Because the exact location of such sequestration is beyond the scope of this analysis the magnitude of the impacts could not be quantified by the NRC staff. The NRC staff concludes that the cumulative impacts of construction of both a coal-fired power plant and a CO_2 pipeline could increase the level of impacts. For example, SMALL ecological impacts from a coal plant alone may become MODERATE when combined with those of a CO_2 pipeline.

A new coal-fired power-generation plant at the Turkey Point site would need a PSD permit and an operating permit under the Clean Air Act. The plant would need to comply with the new source performance standards for such plants in 40 CFR Part 60 (TN1020), Subpart Da. The standards establish emission limits for PM and opacity (40 CFR 60.42Da), SO_2 (40 CFR 60.43Da), NO_x (40 CFR 60.44Da), and mercury (40 CFR 60.45Da) (TN1020). EPA determined that coal-fired and oil-fired electric utility steam-generating units are significant emitters of the following hazardous air pollutants (HAPs): arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (65 FR 79825) (TN2536). The EPA concluded that mercury is the HAP of greatest concern and that (1) a link exists between coal combustion and mercury emissions, (2) electric utility steam-generating units are the largest domestic source of mercury emissions, and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects resulting from mercury exposures caused by the consumption of contaminated fish (65 FR 79825) (TN2536). On March 28, 2013, the EPA finalized updates to emission standards, including mercury, for power plants under the Mercury and Air Toxics Standards (EPA 2013-TN2537). This rule became effective April 24, 2013 (78 FR 24073) (TN3051). However, the NRC staff recognizes that the environmental impacts of air emissions from the coal-fired plant would be significantly greater than those from a proposed

nuclear power plant at the Turkey Point site, even after application of any new mercury emissions standards.

The NRC staff assumes that fugitive dust emissions from construction activities would be mitigated using Best Management Practices (BMPs), similar to mitigation discussed in Chapter 4 for proposed Turkey Points Units 6 and 7. Such emissions would be limited to the construction period.

The EPA has various regulatory requirements for visibility protection in 40 CFR Part 51 (TN1090), Subpart P, including a specific requirement for review of any new major stationary source in an area designated as in attainment or unclassified for criteria pollutants under the Clean Air Act (40 CFR 51.307(a)) (TN1090). The entire State of Florida is designated as in attainment or unclassified for all criteria pollutants except for Hillsborough County, which is classified as nonattainment for lead (EPA 2012-TN1245), and two small portions of Nassau County and Hillsbourough County, which are classified as nonattainment for 1-hour sulfur dioxide (EPA 2015-TN4515). National Ambient Air Quality Standards for criteria pollutants are in 40 CFR Part 50 (TN1089). Section 169A of the Clean Air Act (42 U.S.C. § 7401 et seq.) (TN1141) establishes a national goal of preventing future impairment of visibility and remedying existing impairment in mandatory Class I Federal areas when impairment is from air pollution caused by human activities. In addition, EPA regulations provide that for each mandatory Class I Federal area located within a state, the State must establish goals that provide for reasonable progress toward achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility on the most-impaired days over the period of the implementation plan and make sure there is no degradation in visibility for the least-impaired days over the same period (40 CFR 51.308(d)(1)) (TN1090). If a new coal-fired power plant was located close to a mandatory Class I or II area, additional air-pollution control requirements could be imposed. There are three mandatory Class I Federal areas in Florida (FPL 2014-TN4058):

- Chassahowitzka Wilderness Area – >250 mi northwest of the Turkey Point site
- St. Marks Wilderness Area – >250 mi northwest of the Turkey Point site
- Everglades National Park – 13 mi west of the Turkey Point site.

Of these, only Everglades National Park is close enough to the Turkey Point site to be potentially affected by air emissions from the site due to the close proximity and prevailing wind directions.

Florida is one of 27 states whose stationary sources of criteria pollutants would have been subject to revised emission limits for SO_2 and NO_x under the Cross-State Air Pollution Rule (CSAPR). Florida stationary sources of SO_2 and NO_x are subject to this rule, as well as complementary regulatory controls developed at the State level (http://www.epa.gov/cair/index.html). On July 6, 2011, the EPA announced the finalization of the CSAPR, (previously referred to as the Transport Rule) (EPA 2011-TN3962) as a response to previous court decisions and as a replacement of the EPA's 2005 Clean Air Interstate Rule. CSAPR took effect on January 1, 2015, for SO_2 and annual NO_x, and on May 1, 2015, for ozone season NO_x (EPA 2015-TN4307). Fossil-fuel power plants in Florida would be subject to the CSAPR and would be required to reduce emissions of SO_2 and NO_x to help reduce downwind ambient concentrations of fine particulates ($PM_{2.5}$) and ozone. However, the NRC staff

recognizes that the environmental impacts of air emissions from the coal-fired plant would be significantly greater than those from a proposed nuclear power plant at the Turkey Point site, even after application of the CSAPR.

NUREG–1437 (NRC 2013-TN2654) indicates that air-quality impacts from a coal-fired power plant can be significant. NUREG–1437 also provides estimates of CO_2 and other emissions (NRC 2013-TN2654). Adverse human health effects, such as cancer and emphysema, have been associated with the byproducts of coal combustion. The fugitive dust emissions from construction activities would be mitigated using BMPs, and would be temporary.

Overall, the NRC staff concludes that air-quality impacts from new coal-fired power generation at the Turkey Point site, despite the availability of BACTs, would be MODERATE. The impacts would be clearly noticeable, but would not destabilize air quality.

Waste Management

Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash, spent selective catalytic reduction catalyst, and scrubber sludge. The NRC staff estimates that the coal-fired plants would generate approximately 675,000 T/yr of ash, the largest contributor to coal-combustion residuals (CCR) (DOE/EIA 2009-TN1415). In 2012, approximately 40 percent of CCR was recycled for use in commodity products such as wallboard, concrete, roofing materials, and bricks, thus reducing the total volume needing disposal (EPA 2014-TN4164). Most CCR are managed in dedicated disposal units, i.e., landfills (dry systems) or surface impoundments (wet systems), with lesser quantities disposed of in underground mines or municipal solid-waste landfills.

Effective 6 months after publication of the final rule signed by the EPA Administrator on December 19, 2014, CCR from electric utilities will be regulated as solid waste under Subtitle D of the Resource Conservation and Recovery Act of 1976, as amended (RCRA) (42 U.S.C. § 6901 et seq.) (TN1281). The minimum criteria for new CCR units include location restrictions; design and operating criteria; groundwater monitoring and corrective action; closure requirements and post closure care; and requirements for recordkeeping, notification, and Internet posting. Different criteria apply to landfills and surface impoundments. Any existing CCR units that do not meet the location restrictions or cannot meet the structural integrity criteria must close. Any surface impoundment without a liner that exceeds the groundwater protection standard for any constituent must either install a liner or close, with limited exceptions. Inactive CCR surface impoundments that still contain water and CCR must meet the new criteria or be closed and capped (EPA 2014-TN4164).

Waste impacts on groundwater and surface water could extend beyond the operating life of the plant if leachate or runoff from the waste-storage area occurs. Disposal of the waste could noticeably affect land use (because of the acreage needed for waste) but with appropriate management and monitoring, it would not destabilize any resources. After closure of the waste site and revegetation, the land could be available for some other uses. Construction-related debris would be generated during plant construction activities, and would be disposed of in approved landfills.

For the reasons stated above, the NRC staff concludes that the impacts from waste generated at a coal-fired plant would be MODERATE. The impacts would be clearly noticeable, but would not destabilize any important resource.

Human Health

Coal-fired power generation introduces worker risks from coal and limestone mining, worker and public risk from coal and lime/limestone transportation, worker and public risk from disposal of coal-combustion waste, and worker and public risk from inhalation of stack emissions. Adverse human health effects, such as cancer, asthma, and emphysema, have been associated with the byproducts of coal combustion. In addition, the discharges of uranium and thorium from coal-fired plants can potentially produce radiological doses in excess of those arising from nuclear power plant operations (Gabbard 1993-TN1144).

Regulatory agencies, including the EPA and State agencies, base air emission standards and requirements on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. Given the regulatory oversight exercised by the EPA and State agencies, the NRC staff concludes that the human health impacts from radiological doses and inhaled toxins and particulates generated from coal-fired generation would be SMALL.

Other Impacts

Land Use

Based on the 1996 version of NUREG–1437 (NRC 1996-TN288), at least 3,700 ac of land would need to be converted to industrial use on the Turkey Point site for the power block, infrastructure and support facilities, coal and limestone storage and handling, reclaimed wastewater line, and landfill disposal of ash and scrubber sludge. Additional land would be needed for five new transmission lines in two corridors, water pipelines, and access roads, consistent with the FPL proposal for Units 6 and 7 (FPL 2014-TN4058). As for nuclear facilities, the coal plant facilities would be in close proximity to Biscayne National Park and the transmission lines would pass close to urban land uses and Everglades National Park. It is assumed that coal mining would occur at an undetermined offsite existing coal mining operation, but land-use changes would also occur if expansion of an existing mine or mines were required to supply coal for the plant. In the 1996 version of NUREG–1437 (NRC 1996-TN288), the NRC staff estimated that approximately 22,000 ac would be needed for coal mining and waste disposal to support a 1,000 MW(e) coal-fired plant over its operating life (corresponding to 48,000 ac for the 2,200 MW(e) plant needed to produce the equivalent baseload generation provided by the proposed Turkey Point Units 6 and 7). Based on the amount of land affected for the site, mining, and waste disposal (see waste-management subsection above), the NRC staff concludes that land-use impacts would be MODERATE.

Water Use and Quality

The amount of water used and the impacts on water use and quality from constructing and operating a coal-fired plant at the Turkey Point site would be comparable to those associated with a new nuclear plant. The new facility would use steam-cycle electrical generation with

closed-cycle cooling. Water consumption due to evaporative cooling in the cooling systems would be somewhat less than that of a new nuclear facility because the coal plant would operate at a somewhat higher thermal efficiency. All discharges would be injected into the Boulder Zone (in the Lower Floridan aquifer) and regulated by the Florida Department of Environmental Protection (FDEP). Water quality would be affected by acids and mercury from air emissions from the coal-fired plant and drift of reclaimed wastewater from the cooling towers. Some of the emissions are regulated to minimize impacts. Given the sensitivity of the local aquatic and terrestrial environments, consideration of emissions, such as mercury, might have impacts even at levels compliant with emission standards. In NUREG–1437, the NRC staff determined that some erosion and sedimentation would likely occur during construction of new facilities (NRC 2013-TN2654). Coal plants require only relatively shallow excavations and foundations. Constructing the plant with stormwater and sediment discharged to cooling canals would ensure the impacts are minor. These impacts would be similar to those for a new nuclear plant. Overall, the NRC staff concludes that the water-use and water-quality impacts would be SMALL.

Ecological Resources

The coal-fired power-generation alternative would introduce ecological impacts from construction and new incremental impacts from operations. The impacts would generally be similar to those of the proposed action at the Turkey Point site and along the transmission line and pipeline corridors, especially losses of mangrove forest and other wetlands. The impacts could include terrestrial and aquatic habitat loss and degradation, habitat fragmentation, reduced productivity, and a local reduction in biological diversity. Impacts on the site could be greater than described for the proposed action because of the greater land-use demands for the coal plants. The impacts could occur not only at the Turkey Point site and offsite corridors, but also at the sites used for coal and limestone mining and effects related to transporting coal to the site. If transportation by barge were used, potential vessel collisions with protected species and potential groundings could occur. Construction and maintenance of new transmission line corridors, access roads, and pipeline corridors would have ecological impacts as described for the proposed action. Stack emissions and disposal of waste products could also affect aquatic and terrestrial resources. Siting of the coal plant at Turkey Point would result in permanent loss of critical habitat for the American crocodile (*Crocodylus acutus*). Additional impacts on threatened and endangered species could result from ash disposal and mining activities, especially if the locations of such activities overlap with habitat for protected species. Overall, the NRC staff concludes that the ecological impacts would be MODERATE, primarily because of potential impacts associated with disposal of ash, impacts on South Florida wetlands and associated important species, and the large area of land affected.

Socioeconomics

Socioeconomic impacts would result from the peak workforce of approximately 2,500 construction workers and the approximately 250 workers needed to operate the coal-fired facility (FPL 2014-TN4058). Overall, the size of the workforce would be smaller than that for the proposed project, which indicates the socioeconomic impacts from building and operating a coal-fired facility at the Turkey Point site would be similar to, but of a lesser magnitude than, the same effects from building and operating the proposed project. Because the Turkey Point site

is a heavily industrialized location relatively isolated from the surrounding population centers and would require fewer workers to construct and operate the plant, the NRC staff determined that the impacts of the proposed Units 6 and 7 establish an upper bound to the socioeconomic impacts of an appropriately sized coal-fired installation. This is especially relevant in the assessment of beneficial impact categories. The overnight capital costs of a coal-fired power plant, the building and operations workforces, and the local expenditures for materials and equipment would be lower for a coal-fired plant than those of a nuclear facility. Therefore, the NRC staff concludes that the tax benefits of a coal-fired plant would be would be SMALL for Miami/Dade County. The NRC staff determined traffic-related impacts during construction and operations for the proposed project would be MODERATE. However, while the increase in traffic in the vicinity of the proposed site would be less than the traffic increase for the proposed action, the construction-related traffic increases would still constitute a noticeable but not destabilizing impact. Therefore, the NRC staff determined the construction-related traffic impacts would still be MODERATE and adverse, but the roads would provide a MODERATE and beneficial impact from identified upgrades. The NRC staff concluded that as was the case for the proposed project, all other socioeconomic impacts would be SMALL.

Coal-fired power generation would introduce mechanical sources of noise that would be much greater than the noise generated at a nuclear power plant and would likely be audible offsite. Sources contributing to the noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations, such as the equipment related to coal-handling (conveyors, crushers, pulverizers). Intermittent sources include solid-waste disposal, transportation related to coal and lime/limestone delivery, transportation related to the removal of ash and other solid wastes, use of outside loudspeakers horns and sirens, and the commuting of plant employees. The impacts of noise are attenuated by distance. The closest residents and recreational areas are located over 1.5 mi from the proposed site and the NRC staff expects impacts from noise generated at the proposed plant site to be SMALL for the general public. Because power generators would be built adjacent to existing units on the Turkey Point site, the aesthetic impacts of coal-fired power generators at the proposed site are also expected to be SMALL to the general public. However, because the noise level of a coal-fired power plant is much greater than that of a nuclear facility, the impact on visitors to the Biscayne Aquatic Preserve or boaters in the bay would be MODERATE. Any segments of the western transmission line corridor between Everglades National Park and the Levee substation would follow SW 187th Avenue, and the presence of the road would attenuate any visual contrast with the natural environment. The resulting aesthetic impacts are expected to be SMALL.

Environmental Justice

Because the NRC staff did not identify disproportionately high and adverse impacts from any pathway associated with the building and operations of Turkey Point Units 6 and 7, there is no indication that the construction and operation of a coal-fired power plant at the same site would impose any disproportionately high and adverse impacts on minority or low-income populations. Therefore, there would be no disproportionate impacts on minority and low-income populations associated with a coal-fired plant at the Turkey Point site.

Historic and Cultural Resources

The historic and cultural resource impacts of a new coal-fired plant located at the Turkey Point site would be similar to the impacts of a new nuclear plant, as discussed in Sections 4.6 and 5.6. Other lands that would be acquired to support the plant would likely need an inventory of cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of the adverse effects from ground-disturbing actions. The studies would likely be needed for all areas of potential disturbance at the plant site, any offsite affected areas, such as mining and waste-disposal sites, and along associated corridors where new construction would occur (e.g., pipeline corridors, roads, and transmission line corridors). The impact on historic or cultural resources at FPL plant property during studies for the new nuclear plant, were determined to be MODERATE because of the visual impacts from transmission lines. The reason the impacts on cultural and historic resources are similar for a coal-fired plant is that both plants would require the same amount of transmission lines and would affect the resource in the same manner. The NRC staff concludes that the historic and cultural resource impacts for a coal plant located at Turkey Point would be similar to those for the nuclear plant; i.e., MODERATE.

The construction and operational impacts of a 2,200 MW(e) coal-fired power-generation plant at the Turkey Point site are summarized in Table 9-1.

Table 9-1. Summary of Environmental Impacts of Coal-Fired Power Generation at the Turkey Point Site

Impact Category	Impact	Comment
Land Use	MODERATE	At least 3,700 ac would be needed for power block; coal-handling, storage, and transportation facilities; infrastructure facilities; and cooling-water facilities. Additional land would be needed for new transmission line and pipeline corridors and access roads. Coal mining (offsite) and waste-disposal activities would require an additional 48,000 ac.
Air Quality	MODERATE	SO_2 – 7,469 T/yr NO_x – 1,638 T/yr CO – 1,638 T/yr PM – 147 T/yr PM_{10} – 34 T/yr $PM_{2.5}$ – 20 T/yr Mercury – 0.085 T/yr CO_2 – 18.7 million T/yr Small amounts of hazardous air pollutants.
Water Use and Quality	SMALL	Impacts would be comparable to the impacts for a new nuclear power plant located at the Turkey Point site.

Table 9-1. (contd)

Impact Category	Impact	Comment
Ecology	MODERATE	Impacts could include terrestrial and aquatic habitat loss and modification, habitat fragmentation, reduced productivity, and a local reduction in biological diversity. Impacts could occur at the Turkey Point site and vicinity, along transmission line corridors, access roads, and pipeline corridors, and at the sites used for coal and limestone mining. Disposal of ash could also affect the terrestrial and aquatic environments. Additional impacts on threatened and endangered species could result from transporting coal to the site and permanent loss of critical habitat to the American crocodile. The project footprint would be larger than needed for the proposed action, resulting in greater permanent impact on habitats and wetlands.
Waste Management	MODERATE	Total volume of combustion wastes would exceed 1 million T/yr (590,000 T/yr ash and 700,000 T/yr scrubber sludge).
Socioeconomics	MODERATE Beneficial to MODERATE Adverse	All socioeconomic impacts are SMALL and adverse, with the exceptions of SMALL beneficial economic and tax impacts throughout the affected region, MODERATE and beneficial impacts from road improvements, and MODERATE adverse impacts from traffic. Impacts during operations would likely be smaller than during construction with the exception of an increased adverse noise impact from operations, which would be MODERATE.
Human Health	SMALL	Regulatory controls and oversight are assumed to be protective of human health.
Historic and Cultural Resources	MODERATE	Any potential impacts could likely be effectively managed. Most of the facility and infrastructure would be built on previously disturbed ground. Impacts may also be associated with new transmission line or pipeline corridors.
Environmental Justice	NONE[(a)]	Based on analysis of census data and field interviews, no disproportionately high and adverse impacts on minority or low-income populations would be anticipated.

(a) A determination of "NONE" for environmental justice analyses does not mean there are no adverse impacts on minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

9.2.2.2 Natural-Gas−Fired Power Generation

For the natural-gas alternative, the NRC staff assumed building and operation of a natural-gas−fired plant at the Turkey Point site. The NRC staff assumed that the plant would use four combined-cycle combustion turbines, with a net capacity of 550 MW(e) per unit. In its COL, FPL assumed three 728.4 MW natural-gas combined-cycle (NGCC) units (FPL 2014-TN4058). The team's estimates of natural-gas consumption, air emissions, and waste products are based on EPA AP-42 (Stationary Gas Turbines; EPA 2011-TN1088). The NRC staff also assumed the construction of two additional transmission line corridors, as discussed in Chapters 2 and 3. The natural-gas−fired plant is assumed to have an operating life of 40 years. The NRC staff estimated that the natural-gas−fired plant would use approximately 114 billion standard cubic feet of gas per year (EPA 2011-TN1088).

Air Quality

Natural gas is a cleaner burning fuel than combusted coal. The associated emissions estimates were estimated based on factors contained in EPA AP-42 (EPA 2011-TN1088) except where noted. It is noted that emissions estimates are based on "as fired" and controlled conditions and are not necessarily representative of what would likely be permitted.

A new natural-gas−fired power-generation plant would need a PSD permit and an operating permit under the Clean Air Act. A new NGCC plant would also be subject to the new source performance standards specified in 40 CFR Part 60 (TN1020), Subparts Da and GG. These regulations establish emission limits for particulates, opacity, SO_2, and NO_x.

The EPA has various regulatory requirements for visibility protection in 40 CFR Part 51 (TN1090), Subpart P, including a specific requirement for review of any new major stationary source in areas designated as in attainment or unclassified under the Clean Air Act. The entire State of Florida is designated as in attainment or unclassified for all criteria pollutants except for Hillsborough County, which is classified as nonattainment for lead (EPA 2012-TN1245), and two small portions of Nassau County and Hillsbourough County, which are classified as nonattainment for 1-hour sulfur dioxide (EPA 2015-TN4515).

Section 169A of the Clean Air Act (42 U.S.C. § 7401 et seq.) (TN1141) establishes a national goal of preventing future impairment of visibility and remedying existing impairment in mandatory Class I Federal areas when impairment is from air pollution caused by human activities. In addition, the EPA regulations provide that for each mandatory Class I Federal area located within a state, the State regulatory agencies must establish goals that provide for reasonable progress toward achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and make sure there is no degradation in visibility for the least-impaired days over the same period (40 CFR 51.308(d)(1)) (TN1090). If a new natural-gas−fired power plant was located close to a mandatory Class I area, additional air-pollution control requirements could be imposed. As discussed under the coal alternative, there is one mandatory Class I Federal area near the Turkey Point site

A natural-gas−fired plant equipped with appropriate combustion and post-combustion pollution-control technology would have approximately the following emissions.(6)

- SO_2 – 32 T/yr
- NOx – 564 T/yr
- CO – 214 T/yr
- PM – 108 T/yr
- PM_{10} – 108 T/yr(7)
- $PM_{2.5}$ – 108 T/yr.

(6) Emissions are based on 114 × 10E+6 MMBTU/yr and control technology, including lean-premix combustion, and catalytic control for NO_x at a 90 percent reduction rate and for CO at a 75 percent reduction rate.

(7) The value for PM_{10} includes particles of smaller diameter such as $PM_{2.5}$.

The NRC staff estimates that a natural-gas−fired power plant would also have unregulated CO_2 emissions of 6.3 million T/yr that could affect climate change (EPA 2011-TN1088). Historically, CO_2, an unavoidable byproduct of combustion of carbonaceous fuels, has not been regulated as a pollutant. However, regulations are now under development for CO_2 and other GHGs. In response to the Consolidated Appropriations Act of 2008 (Public Law 110-161) (TN1485), the EPA promulgated final mandatory GHG reporting regulations in October 2009, effective in December 2009 (74 FR 56260) (TN1024). The rules are applicable to major sources of CO_2 (those emitting more than 25,000 T/yr). New utility-scale gas-fired power plants would be subject to those regulations.

The combustion turbine portion of the combined-cycle plant would be subject to EPA's National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines (40 CFR Part 63) (TN1403) because the site would be a major source of HAPs.

The NRC staff assumes that fugitive dust emissions from construction activities would be mitigated using BMPs similar to mitigation discussed in Chapter 4 for proposed Turkey Point Units 6 and 7. Such emissions would be temporary.

A new gas-fired generation plant would qualify as a major generator of GHGs under the "Tailoring Rule" recently promulgated by the EPA (75 FR 31514) (TN1404). Beginning January 2, 2011, permits issued to major sources of GHGs under the PSD or Title V Federal permit programs must contain provisions requiring the use of BACTs to limit the emissions of GHGs if those sources would be subject to PSD or Title V permitting requirements because of their non-GHG pollutant emission potentials and if their estimated GHG emissions are at least 75,000 T/yr of CO_2e. Meeting permit limitations for GHG emissions may require installation of carbon capture and sequestration devices on any new natural-gas–fired power plant, which could reduce power output. On October 23, 2015, the EPA published its final rule for new source performance standards to limit CO_2 emissions from new stationary combustion turbines (e.g., NGCC technology) (80 FR 64509) (TN4388). However, the staff's emissions estimate of 6.3 million T/yr was already below the new standard and would, therefore, be unchanged under the new rule. Nevertheless, the review team recognizes that the environmental impacts of air emissions from the natural-gas−fired power plant would be significantly greater than those of a proposed nuclear power plant at the Turkey Point site.

The impacts of emissions from the natural-gas−fired alternative would be noticeable, but would not be sufficient to destabilize air resources. The impacts would be greater than the impacts from the proposed action (which were SMALL), but less than the impacts for the coal alternative (which were MODERATE). Overall, the NRC staff concludes that air-quality impacts resulting from construction and operation of the natural-gas−fired alternative at the Turkey Point site would be SMALL to MODERATE.

Waste Management

In the 1996 version of NUREG–1437, the NRC staff concluded that waste generation from natural-gas−fired technology would be minimal (NRC 1996-TN288). The only significant waste generated at a natural-gas−fired power plant would be spent selective catalytic reduction (SCR) catalyst, which is used to control NO_x emissions. The spent catalyst would be regenerated or

disposed of offsite. Other than spent SCR catalyst, waste generation at an operating natural-gas−fired plant would be largely limited to typical operations and maintenance waste. Construction-related debris would be generated during construction activities. Overall, the NRC staff concludes that waste impacts from natural-gas−fired power generation would be SMALL.

Human Health

Natural-gas−fired power generation introduces public risk related to gaseous emissions. The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contributes to health risk. Regulatory agencies, including the EPA and State agencies, base air emission standards and requirements on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. Given the regulatory oversight exercised by the EPA and State agencies, the NRC staff concludes that the human health impacts from natural-gas−fired power generation would be SMALL.

Other Impacts

Land Use

Based on the 1996 version of NUREG–1437 (NRC 1996-TN288), the natural-gas−fired power-generating plant would require at least 240 ac for the power block and support facilities for the 2,200 MW(e) plant. The plant would still not fit entirely onto the 218 ac island proposed as the site for Units 6 and 7, but the extent of land requirements elsewhere on the Turkey Point site may be somewhat reduced relative to the proposed action. Turkey Point Unit 5 is currently served by an existing 24 in. gas pipeline and it is assumed that if a new line were needed it could be sited within the existing pipeline corridor to minimize land-use impacts (FPL 2014-TN4058). Assuming a new pipeline within the existing corridor, the total land-use commitment, not including natural-gas wells and collection stations, would be at least 240 ac. Consistent with the proposed project, additional land would be needed for five new transmission lines in two corridors (FPL 2014-TN4058). As for nuclear facilities, the gas plant facilities would be in close proximity to Biscayne National Park and the transmission lines would pass close to urban land uses and Everglades National Park. More than 7,000 ac of additional land away from the Turkey Point site would also be required for natural-gas wells and collection stations (NRC 1996-TN288). Overall, the NRC staff concludes that the land-use impacts from new natural-gas−fired power generation would be MODERATE primarily because of the land conflicts related to the transmission lines and the land requirements for the gas wells and collection stations.

Water Use and Quality

The water use for a natural-gas−fired combined-cycle plant is about a third of an equivalent nuclear plant (NREL 2011-TN3850). Because the plant would use reclaimed water for cooling and discharge to the Boulder Zone, the impacts on water use and quality from constructing and operating a natural-gas−fired plant at the Turkey Point site would be comparable to the impacts associated with building and operating a new nuclear facility. The impacts on water quality from sedimentation during construction of a natural-gas−fired plant were characterized in the 1996 version of NUREG–1437 as SMALL (NRC 1996-TN288). The NRC staff also noted in the 1996

version of NUREG–1437 that the impacts on water quality from operations would be similar to, or less than, the impacts from other power-generating technologies (NRC 1996-TN288). Overall, the NRC staff concludes that impacts on water use and quality would be SMALL.

Ecological Resources

A natural-gas−fired plant at the Turkey Point site may have fewer ecological impacts than a new nuclear facility because less land would be affected. However, the plant would still not fit entirely onto the 218 ac plant area proposed as the site for Units 6 and 7 and therefore would require filling mangrove forest outside of the plant area and result in permanent loss of critical habitat for the American crocodile. Constructing a new underground gas pipeline to the site would result in temporary and permanent loss of some terrestrial and aquatic function as well as conversion and fragmentation of habitat, including mangrove forest; however, ecological impacts from the gas pipeline would be limited because there is an existing 24 in. transmission line pipeline to the Turkey Point site to serve Unit 5, and connection to natural-gas distribution systems would occur onsite and would use the existing natural-gas pipeline corridor. Impacts on threatened and endangered species would generally be as described for a new nuclear facility located at the Turkey Point site, despite the somewhat smaller overall onsite footprint. Overall, the NRC staff concludes that ecological impacts would be MODERATE because of the impacts on the American crocodile and impacts from transmission line corridors, access roads, and water supply pipeline corridors (all of which are expected to follow the same routes as described for the proposed nuclear units).

Socioeconomics

Socioeconomic impacts would result from the approximately 1,200 construction workers and 150 workers needed to operate the natural-gas−fired facility (FPL 2014-TN4058). Overall, the size of the workforce would be smaller than that for the proposed project, which indicates the impacts from building and operating a natural-gas facility at the Turkey Point site would be similar to, but of a lesser magnitude than the same effects from building and operating the proposed project. Because the Turkey Point site is a heavily industrialized location relatively isolated from the surrounding population centers and would require fewer workers to construct and operate the plant, the NRC staff determined that the impacts of the proposed Units 6 and 7 establish an upper bound to the socioeconomic impacts of an appropriately sized natural-gas–fired installation. This is especially relevant in the assessment of beneficial impact categories. The overnight capital costs of a natural-gas−fired power plant, the building and operations workforces, and the local expenditures on materials and equipment are substantially lower at a natural-gas plant than those of a nuclear facility. Therefore, the NRC staff concludes that the tax benefits of a natural-gas−fired plant would be would be SMALL for Miami/Dade County. The NRC staff determined traffic-related impacts during building and operations of Turkey Point Units 6 and 7 would be MODERATE. However, while there would be some increase in traffic in the vicinity of the proposed site for the natural-gas plant, that increase would be substantially less than the increase for the proposed action. Therefore, the NRC staff determined the adverse impact from an increase in traffic would be SMALL. The NRC staff concluded that, as was the case for the proposed project, all other socioeconomic impacts would be SMALL.

The turbine buildings, four exhaust stacks (each approximately 200 ft high) and associated emissions, and the gas-pipeline compressors would be visible during daylight hours from offsite. Noise and light from the plant would be detectable offsite. The new transmission lines would have an aesthetic impact. Overall, the NRC staff concludes that the aesthetic impacts associated with new natural-gas−fired power generation at the Turkey Point site would be SMALL. The impact along new transmission lines would be SMALL, similar to the proposed Turkey Point Units 6 and 7.

Environmental Justice

Because the NRC staff did not identify any disproportionately high and adverse impacts from any pathway associated with the building and operations of Turkey Point Units 6 and 7, there is no indication that the building and operation of a natural-gas−fired power plant at the same site would impose any disproportionately high and adverse impacts on minority or low-income populations. Therefore, there would be no disproportionate impacts on minority and low-income populations associated with a natural-gas−fired plant at the Turkey Point site.

Historical and Cultural Resources

Historic and cultural resource impacts for a new natural-gas−fired plant located at the Turkey Point site would be similar to the impacts for a new nuclear plant, as discussed in Sections 4.6 and 5.6. Other lands (if any) that are acquired to support the plant would also likely need an inventory of cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of the adverse effect from ground-disturbing actions. The studies would likely be needed for all areas of potential disturbance at the plant site, any offsite affected areas, such as gas wells, collection stations, and waste-disposal sites, and along associated corridors where new construction would occur (e.g., roads and any new pipelines). Given that the impacts on historic or cultural resources at FPL plant property during studies for the new nuclear plant were determined to be MODERATE due to the visual impacts from transmission lines, the NRC staff concludes that the historic and cultural resource impacts for a natural-gas plant located at Turkey Point would also be MODERATE.

The impacts of natural-gas−fired power generation at the Turkey Point site are summarized in Table 9-2.

Table 9-2. Summary of the Environmental Impacts of Natural-Gas−Fired Power Generation

Impact Category	Impact	Comment
Land Use	MODERATE	At least 240 ac would be needed for power block, cooling towers, and support systems, and connection to a natural-gas pipeline. Additional land would be needed for transmission line corridors, gas supply pipeline, other infrastructure, and facilities.

Table 9-2. (contd)

Impact Category	Impact	Comment
Air Quality	SMALL to MODERATE	SO_2 – 32 T/yr NO_x – 564 T/yr CO – 214 T/yr PM – 108 T/yr PM_{10} – 108 T/yr $PM_{2.5}$ – 108 T/yr CO_2 – 6.3 million T/yr Some hazardous air pollutants
Water Use and Quality	SMALL	Impacts would be comparable to the impacts for a new nuclear power plant located at the Turkey Point site.
Ecology	MODERATE	Constructing a new underground gas pipeline to the site would result in loss of some terrestrial and aquatic function as well as conversion and fragmentation of habitat. Most impacts from pipeline construction would be temporary. Impacts on the Turkey Point site would be less than the impacts from new nuclear generating units, although the footprint could still not be confined to the 218 ac island where the main plant facilities would be built. Although permanent impacts on wetlands within the project footprint would occur but would also be proportionally less due to a smaller project footprint, species and habitats would still be affected along transmission line and pipeline corridors. Permanent loss of critical habitat for the American crocodile would occur.
Waste Management	SMALL	The only significant waste would be from spent selective catalytic reduction catalyst used for control of emissions of NO_x.
Socioeconomics	MODERATE Beneficial to SMALL Adverse	Construction and operations workforces would be relatively small and generate small yet positive local impacts on the economy and taxes. Some construction-related impacts would occur, but the impacts would be SMALL and adverse, with the exception of a MODERATE and beneficial impact from road improvements and SMALL beneficial economic and tax impacts throughout the affected region. Aesthetic impacts associated with new natural-gas−fired power generation at the Turkey Point site would be SMALL. The impact along new transmission lines would be SMALL similar to the proposed project.
Human Health	SMALL	Regulatory controls and oversight would be protective of human health.
Historic and Cultural Resources	MODERATE	Most of the facility and infrastructure would be built on previously disturbed ground. Impacts may also be associated with transmission line and pipeline corridors.
Environmental Justice	NONE[(a)]	No disproportionately high or adverse impacts on minority or low-income populations would be anticipated based on analysis of census data and field interviews.

(a) A determination of "NONE" for environmental justice analyses does not mean there are no adverse impacts on minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

9.2.3 Other Alternatives

This section discusses other energy alternatives, the NRC staff's conclusions about the feasibility of each alternative, and the NRC staff's basis for its conclusions. New nuclear units at

the Turkey Point site would be baseload generation units. As discussed in Section 9.2.3 of the ESRP (NRC 2000-TN614), any feasible alternative to the new units would need to generate baseload power. In evaluating other energy technologies, FPL used the technologies discussed in the 1996 version of NUREG–1437 (NRC 1996-TN288). The NRC staff reviewed the information submitted by FPL in its COL and also conducted an independent review. The NRC staff determined that the other energy alternatives are not reasonable alternatives to two new nuclear units that would provide baseload power. Also, the FPSC stated that renewable generation available today or in the foreseeable future cannot provide enough baseload capacity to avoid the need for the addition of proposed Turkey Point Units 6 and 7 (FPSC 2008-TN735).

The NRC staff has not assigned significance levels to the environmental impacts associated with the alternatives discussed in this section because, as noted above, the generation alternatives are not feasible for providing 2,200 MW(e) of baseload power. In addition, some of the generation alternatives would have to be installed at a location other than the Turkey Point site, and any attempt to assign significance levels would require the NRC staff's speculation about the unknown site.

9.2.3.1 Oil-Fired Power Generation

The EIA's reference case in its *Annual Energy Outlook* 2016 Early Release, Table 8, projects that in the United States electric power generation using petroleum will decrease by around 67 percent between 2014 and 2040 (DOE/EIA 2016-TN4620). Oil-fired generation is more expensive than nuclear, natural-gas−fired, or coal-fired generation options. In addition, future increases in oil prices are expected to make oil-fired generation increasingly more expensive. The high cost of oil has resulted in a decline in its use for electricity generation. In Section 8.3.11 of the 1996 version of NUREG–1437, the NRC staff estimated that construction of a 1,000 MW(e) oil-fired plant would require about 120 ac of land (NRC 1996-TN288). Ecological impacts would be less than those identified for the proposed action because less critical habitat for the American crocodile would be lost. Operation of an oil-fired power plant would have air emissions that would be similar to those of a comparably sized coal-fired plant (NRC 1996-TN288).

For the preceding economic and environmental reasons, the NRC staff concludes that an oil-fired power plant would not be a reasonable alternative to construction of a 2,200 MW(e) nuclear power-generation facility that would be operated as a baseload plant within FPL's ROI.

9.2.3.2 Wind Power

Onshore areas within the FPL service territory are in a wind power Class 2 region (average wind speeds lower than 5.1 m/s at 10 m) (NREL 2012-TN1395). Offshore areas around the FPL service territory are in a wind power Class 3 region (average wind speeds 5.1 to 5.6 m/s at 10 m) (NREL 2009-TN1396). Areas designated Class 3 or greater are suitable for most wind turbine applications, whereas Class 2 areas are marginal (NREL 2009-TN1397). Therefore, commercial-scale development of wind energy in Florida would have to be sited in offshore locations. Modern wind turbines typically operate at an average capacity factor of 30 percent to 35 percent compared to 90 percent to 95 percent for a baseload plant such as a nuclear plant

(Wiser and Bolinger 2011-TN1361). The world's largest operating wind farms are less than 1,000 MW, but most are well under 200 MW. The 454 MW Cape Wind Project covers approximately 25 mi^2 (MMS 2009-TN1402). Based on this, a utility-scale offshore wind power-generation project would generally require about 35 ac/MW of installed capacity. The Office of Energy Efficiency and Renewable Energy's 2011 Wind Technologies Market Report indicates that average wind turbine size was about 1.79 MW for U.S. installations in 2010 (Wiser and Bolinger 2011-TN1361). Therefore even with modern wind turbine designs, more than 1,000 wind turbines would be required to produce a peak output that matches the 2,200 MW(e) of the proposed nuclear units. These wind turbines would need to be coupled with a 2,200 MW(e) NGCC plant to provide power when the wind turbines are operating at less than full power. Alternately, in order to match the average annual generation expected from the proposed nuclear units (17,345 GWh) with wind power alone, more than 3,300 2 MW(e) wind turbines would have to be installed, coupled with energy storage on a very large scale. There is no such large-scale energy-storage mechanism available in Florida. Finally, the DOE/EIA's 2016 Table 58.2 projects no growth in wind power in the Florida Reliability Coordinating Council (FRCC), which includes the FPL service territory, from 2015 to 2028 (DOE/EIA 2016-TN4623). Based on this, the NRC staff assumes no growth in wind capacity for FPL from 2012 to 2040.

Because (1) the wind resource in Florida is not optimal for utility-scale generation, (2) the DOE/EIA projects no growth in wind energy in Florida, (3) the capacity factor of wind power is too low for baseload applications, and (4) the offshore area needed (and the associated environmental impacts) would be very large, the NRC staff concludes that a wind-energy facility at the Turkey Point site or elsewhere within FPL's ROI would not be a reasonable alternative to construction of a 2,200 MW(e) nuclear power-generation facility that would be operated as a baseload plant.

9.2.3.3 Solar Power

Solar technologies use energy and light from the sun to provide heating and cooling, light, hot water, and electricity for consumers. Solar energy can be converted to electricity using solar thermal technologies or photovoltaics. Solar thermal technologies use concentrating devices to create temperatures suitable for power production. Concentrating thermal technologies is currently less costly than photovoltaics for bulk power production. They can also be provided with energy storage or auxiliary boilers to allow operation during periods when the sun is not shining (NPCC 2006-TN1408). The largest operational solar thermal plant is the 310 MW(e) Solar Energy Generating System located on approximately 1,500 ac in the Mojave Desert in southern California (NextEra 2012-TN1400).

Solar insolation has a low energy density relative to other common energy sources. Consequently, a large total acreage is needed to gather an appreciable amount of energy. Typical solar thermal power plants require 3 to 8 ac for every megawatt of generating capacity (Mendelson et al. 2012-TN1399). For solar photovoltaics, the National Renewable Energy Laboratory reports 6.38 ac are typically required per megawatt (Roberts 2011-TN1398). For FPL's target capacity of 2,200 MW(e) for Units 6 and 7, land requirements would be approximately 6,600 to 17,600 ac. Solar thermal electric technologies also typically require considerable water supplies. In addition, according to DOE/EIA an average solar capacity factor ranges from 18 to 25 percent in the United States (DOE/EIA 2010-TN1401). Finally, the

DOE/EIA projects limited growth in solar power in the FRCC, which includes the FPL service territory. From 2015 to 2028, DOE/EIA projects solar capacity in the FRCC will increase by about 1,230 MW (DOE/EIA 2016-TN4623). The 2014 Florida State Electricity Profile indicates that FPL generated about 57 percent of the power in the FRCC (DOE/EIA 2016-TN4624). Attributing 57 percent of the growth to FPL, the NRC staff assumes that growth in solar capacity for FPL from 2015 to 2028 would be around 700 MW.

Because (1) the projections for growth in solar energy in Florida are limited, (2) the area needed (and the associated environmental impacts) would be very large, and (3) the capacity factor of solar power is too low for baseload applications, the NRC staff concludes that a solar-energy facility at or in the vicinity of the Turkey Point site would not be a reasonable alternative to construction of a 2,200 MW(e) nuclear power-generation facility that would be operated as a baseload plant.

9.2.3.4 Hydropower

The EIA's reference case in its *Annual Energy Outlook* 2012 projects that U.S. electricity production from hydropower plants will remain essentially stable through the year 2035 (DOE/EIA 2011-TN1368). In the 1996 version of NUREG–1437, the NRC staff estimated that land requirements for hydroelectric power are approximately 1 million ac per 1,000 MW(e) (NRC 1996-TN288). For the target capacity of 2,200 MW(e) for proposed Turkey Point Units 6 and 7, land requirements would thus be 2.2 million ac.

A study conducted by the DOE estimates that there are 13 undeveloped potential hydropower sites in Florida. The results for individual site capacities range from 200 kW to 18 MW. The capacities of the majority (69 percent) of the hydropower sites in Florida are greater than 1 MW, and less than 10 MW. The 13 identified sites are located within one major river basin (Appalachicola River basin) and several minor river basins (Conner and Francfort 1998-TN1367). Thus, the available hydropower in the entire State of Florida is well below the approximate 2,200 MW(e) net capacity of the proposed nuclear project.

Because of the extremely low amount of undeveloped hydropower resource in Florida and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to produce 2,200 MW(e), the NRC staff concludes that hydropower is not a feasible alternative within the FPL ROI to construction of a new nuclear power-generation facility operated as a baseload plant at the proposed site.

As discussed in NUREG–1437 (NRC 2013-TN2654), ocean and tidal technologies are being developed but are in their infancy and have not been used at utility scale. In addition, DOE/EIA's 2016 Table 58.2 did not include these technologies in its projections in the *Annual Energy Outlook 2015* (DOE/EIA 2016-TN4623). Therefore, the NRC staff concludes that within the FPL ROI these technologies are not feasible alternatives to construction of a new nuclear power-generation facility operated as a baseload plant at the proposed site.

9.2.3.5 Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for baseload power where available. Geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii, where hydrothermal reservoirs are prevalent (DOE 2008-TN1409). Geothermal systems have a relatively small footprint and minimal emissions (MIT 2006-TN1410). Florida has high-temperature geothermal resources that are suitable for space-heating applications, but not for baseload power generation (DOE 2010-TN1411). A study led by the Massachusetts Institute of Technology concluded that a $300-million to $400-million investment over 15 years would be needed to make early-generation enhanced geothermal system power plant installations competitive in the evolving U.S. electricity supply markets (MIT 2006-TN1410).

The University of Florida Geophysical Laboratory has investigated heat flow values for the Gulf coastal plain and north-central Florida. Thermal gradients found in the majority of the wells drilled in Florida ranged from below average to average, indicating little promise of a significant geothermal resource (State of Florida 1984-TN1422).

For these reasons, the NRC staff concludes that a geothermal energy facility at the Turkey Point site or elsewhere in FPL's ROI would not be a reasonable alternative to construction of a 2,200 MW(e) nuclear power-generation facility operated as a baseload plant.

9.2.3.6 Wood Waste

A wood-burning facility can provide baseload power and operate with a high annual capacity factor and with thermal efficiency similar to a coal plant (EPA 2007-TN2660; NREL 1993-TN2661). The fuels required are variable and site-specific. A significant impediment to the use of wood waste to generate electricity is the high cost of fuel delivery and high construction cost per megawatt of generating capacity. Estimates in NUREG–1437 suggest that the overall level of construction impacts per megawatt of installed capacity would be approximately the same as that for a coal-fired plant (NRC 2013-TN2654). Similar to coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment. In the *Annual Energy Outlook 2016 Early Release,* Table 58.2 (DOE/EIA 2016-TN4623, DOE/EIA projects that growth in the generating capacity from biomass (which includes wood waste) in the FRCC region between 2015 and 2028 will be about 10 MW(e).

Because of the small projected increase in generating capacity for wood power-generation plants, the NRC staff concludes that wood waste would not be a reasonable alternative to a 2,200 MW(e) nuclear power-generation facility operated as a baseload plant.

9.2.3.7 Municipal Solid Waste

Municipal solid-waste combustors incinerate waste and can use the resultant heat to produce steam, hot water, or electricity. The combustion process reduces the volume of waste and the need for new solid-waste landfills. Mass-burning technologies are most commonly used in the United States. This group of technologies processes raw municipal solid waste with little or no sizing, shredding, or separation before combustion. More than one-fifth of the U.S. municipal solid-waste incinerators use refuse-derived fuel. In contrast to mass burning—where the

municipal solid waste is introduced "as is" into the combustion chamber—refuse-derived fuel facilities are equipped to recover recyclables (e.g., metals, cans, and glass) followed by shredding the combustible fraction into fluff for incineration (EPA 2009-TN1412).

Municipal solid-waste combustors generate SO_2 and NO_x emissions and an ash residue that is buried in landfills. The ash residue is composed of bottom ash and fly ash. Bottom ash refers to the portion of the unburned waste that falls to the bottom of the grate or furnace. Fly ash represents the small particles that rise from the furnace during the combustion process. Fly ash is generally removed from flue gases using fabric filters and/or scrubbers (EPA 2008-TN1413).

Currently, 84 waste-to-energy plants are operating in the United States (Michaels 2014-TN3849). These plants have a combined generating capacity of approximately 2,770 MW(e), or an average of approximately 33 MW(e) per plant (Michaels 2014-TN3849). Given the small average output of existing plants, the NRC staff concludes that generating electricity from municipal solid waste would not be a reasonable alternative to a 2,200 MW(e) nuclear power-generation facility operated as a baseload plant within FPL's ROI.

One additional generating resource that uses municipal solid waste as a fuel derivative is the capture and combustion of landfill-based gas. There are currently 21 operating landfill-based gas facilities in Florida, generating a total of 83.3 MW. Units range in size from 0.4 to 11.3 MW (EPA 2012-TN1414). Given the relatively small size of the plants and the finite number of usable resources, the NRC staff concludes that generating electricity from landfill-based gas would not be a reasonable alternative to construction and operation of a 2,200 MW(e) nuclear power plant supplying baseload electricity.

9.2.3.8 Other Biomass-Derived Fuels

In addition to wood and municipal solid-waste fuel, several other biomass-derived fuels are available for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). The EIA estimates that wind, solar, and biomass will be the largest sources of renewable electricity generation among the non-hydropower renewable fuels through 2040 (DOE/EIA 2016-TN4622, Table 58).

Co-firing biomass with coal is possible when low-cost biomass resources are available. Co-firing is the most economic option for the near future to introduce new biomass power generation. These projects require small capital investments per unit of power-generation capacity. Co-firing systems range in size from 1 to 30 MW(e) of biopower capacity (DOE 2008-TN1416).

Finally, the DOE/EIA projects limited growth in biomass power in the FRCC, which includes the FPL service territory. From 2015 to 2028, DOE/EIA projects biomass capacity (including wood-burning facilities) in the FRCC will increase by about 10 MW(e) (DOE/EIA 2016-TN4623, Table 58.2). In 2014, FPL generated about 57 percent of the power in the FRCC (DOE/EIA 2016-TN4624). Based on this, the NRC staff assumes that growth in biomass capacity for FPL from 2015 to 2028 would be around 6 MW(e).

The NRC staff concludes that given the relatively small average output of biomass power-generation facilities, biomass-derived fuels do not offer a reasonable alternative to a 2,200 MW(e) nuclear power-generation facility operated as a baseload plant within FPL's ROI.

9.2.3.9 Fuel Cells

Fuel cells work without combustion and its associated environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode, air over a cathode, and then separating the two by an electrolyte. The only byproducts are heat, water, and CO_2. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. Natural gas is typically used as the source of hydrogen.

Phosphoric acid fuel cells are generally considered first-generation technology. Higher-temperature, second-generation fuel cells achieve higher fuel-to-electricity and thermal efficiencies. The higher temperatures contribute to improved efficiencies and give the second-generation fuel cells the capability to generate steam for cogeneration and combined-cycle operations.

During the past three decades, significant efforts have been made to develop more practical and affordable fuel-cell designs for stationary power applications, but progress has been slow. The cost of fuel-cell power systems must be reduced before they can be competitive with conventional technologies (DOE 2008-TN1417). DOE has an initiative called the Solid State Energy Conversion Alliance (SECA) with the goal of developing large (i.e., 250 MW or greater) fuel-cell power systems, including those based on coal-derived fuels. Another SECA goal is to cut the costs of electricity generated via fuel cells to $700 per kilowatt (electrical) (DOE 2011-TN2083). However, it is not clear whether DOE will achieve these goals and, if so, when the associated fuel cells might reach commercial operations.

The NRC staff concludes that, at the present time, fuel cells are not economically or technologically competitive with other alternatives for baseload electricity generation. Future gains in cost competitiveness for fuel cells compared to other fuels are speculative.

For the preceding reasons, the NRC staff concludes that a fuel-cell energy facility located at or in the vicinity of the proposed site would not currently be a reasonable alternative to construction of a 2,200 MW(e) nuclear power-generation facility operated as a baseload plant.

9.2.4 Combination of Alternatives

Individual alternatives to the construction of two new nuclear units at the Turkey Point site might not be sufficient on their own to generate FPL's target value of 2,200 MW(e) because of the limited availability of the resource or lack of cost-effective opportunities. Nevertheless, it is conceivable that a combination of alternatives might be cost-effective. There are many possible combinations of alternatives. It would not be reasonable to examine every possible combination of alternatives in an EIS. Doing so would be counter to CEQ guidance that an EIS should be analytic rather than encyclopedic, should be kept concise, and should be no longer than absolutely necessary to comply with NEPA and CEQ regulations (40 CFR 1502.2(a),(b) [TN2123]; CEQ 2005-TN1394). Given that FPL's objective is for a new baseload generation

facility, a fossil-fuel energy source, most likely natural gas or coal, would need to be a significant contributor to any reasonable alternative energy combination.

Section 9.2.2.2 assumes the construction of four 550 MW(e) natural-gas−fired, combined-cycle power-generating units at the Turkey Point site using closed-cycle cooling with cooling towers. For a combined alternatives option, the NRC staff assessed the environmental impacts of an assumed 1,915 MW(e) of natural-gas−fired, combined-cycle power-generating units at the Turkey Point site using closed-cycle cooling with cooling towers, and the following contributions from within FPL's ROI: 210 MW(e) from conservation and DSM programs beyond what is currently planned, 330 MW(e) from solar, and 75 MW(e) from biomass sources, including municipal solid waste. Solar energy would need to be combined with a backup power source (most likely NGCC) or an energy-storage mechanism, such as compressed air energy storage, to be used to meet a baseload need. The 1,915 MW(e) natural-gas plant assumed by the NRC staff would provide the backup power source for solar. The NRC staff believes that the preceding contributions are reasonable and representative for FPL's ROI. The contributions reflect the NRC staff's analysis in Sections 9.2.2 and 9.2.3.

The environmental impacts of the natural-gas portion of the combination of energy alternatives would be somewhat less than those for the plant discussed in Section 9.2.2.2. The additional conservation and DSM should not have any direct impacts on the environment, although the program would involve increased costs to FPL customers. Because of its modest size, the biomass component would have minor impacts. The solar portion of the combination could have noticeable impacts on land use and terrestrial resources, depending on how it is implemented (i.e., built on cleared land versus rooftop installations). Overall, this alternative would have impacts similar to those of the natural-gas−only alternative discussed in Section 9.2.2.2. A summary of the NRC staff's characterizations of the environmental impacts associated with the construction and operation of the preceding assumed combination of alternatives is provided in Table 9-3.

Table 9-3. Summary of the Environmental Impacts of a Combination of Power Sources

Impact Category	Impact	Comment
Land Use	MODERATE	A natural-gas−fired plant would have land-use impacts for the power block, new transmission line corridors, cooling towers, and support systems, and connection to a natural-gas pipeline. Solar facilities and transmission lines could have noticeable land-use impacts because of the large footprints required for these facilities, especially the solar facilities.
Air Quality	SMALL to MODERATE	Emissions from the natural-gas−fired plant would be approximately as follows: SO_2 – 27 T/yr NO_x – 466 T/yr CO – 177 T/yr PM_{10} – 89 T/yr $PM_{2.5}$ –89 T/yr CO_2 – 5.2 million T/yr Some hazardous air pollutants. Biomass would also have some emissions.

Table 9-3. (contd)

Impact Category	Impact	Comment
Water Use and Quality	SMALL	Impacts would be less than the impacts for a new nuclear power plant located at the proposed site.
Ecology	MODERATE	Impacts would be similar to the proposed project. Solar facilities could add to impacts on terrestrial resources. Permanent impact on wetlands within the project footprint would occur.
Waste Management	SMALL	The only significant waste would be from spent selective catalytic reduction catalyst used for control of NO_x emissions and ash from biomass.
Socioeconomics	MODERATE Beneficial to SMALL Adverse	Construction and operation impacts would be similar to those for the natural-gas–fired alternative, with all impacts SMALL and adverse, with the exception of a MODERATE and beneficial impact from road improvements and SMALL beneficial economic and tax impacts throughout the affected region. Some construction-related impacts would occur, but the impacts would be minor because of the small workforce involved. Aesthetic impacts would be SMALL.
Human Health	SMALL	Regulatory controls and oversight would be protective of human health.
Historic and Cultural Resources	MODERATE	The new transmission lines would have a noticeable adverse impact on the viewshed for cultural and historic resources. The impacts could be greater if the biomass or solar component was constructed on a location that contained archaeological resources.
Environmental Justice	NONE[(a)]	No disproportionately high or adverse impacts on minority or low-income populations would be anticipated based on analysis of census data and field interviews.

(a) A determination of "NONE" for environmental justice analyses does not mean there are no adverse impacts on minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

9.2.5 Summary Comparison of Alternatives

Table 9-4 contains a summary of the NRC staff's environmental impact characterizations for constructing and operating new nuclear, coal-fired, and natural-gas−fired power-generating units, and a combination of alternatives at the Turkey Point site. The combination of alternatives shown in Table 9-4 assumes siting of the natural-gas−fired, combined-cycle units at the Turkey Point site and siting of other alternative power-generating units within FPL's ROI. The significance levels used in the comparison table for the nuclear category originate from Chapters 4, 5, and 6 for construction and preconstruction as well as operational impacts. Because all or most of the electrical generation for the alternatives would be sited at the proposed site, the consideration of climate change in Appendix I would be applicable to these energy alternatives.

The NRC staff reviewed the available information about the environmental impacts of power-generation alternatives compared to the construction of new nuclear units at the Turkey Point site. Based on this review, the NRC staff concludes that, from an environmental perspective,

none of the viable energy alternatives is environmentally preferable to construction of a new baseload nuclear power-generation plant at the Turkey Point site.

Table 9-4. Summary of the Environmental Impacts[(a)] of Construction and Operation of New Nuclear, Coal-Fired, and Natural-Gas–Fired Generating Units and a Combination of Alternatives

Impact Category	Nuclear	Coal	Natural Gas	Combination of Alternatives
Land Use	MODERATE	MODERATE	MODERATE	MODERATE
Air Quality	SMALL	MODERATE	SMALL to MODERATE	SMALL to MODERATE
Water Use and Quality	SMALL	SMALL	SMALL	SMALL
Ecology	MODERATE	MODERATE	MODERATE	MODERATE
Waste Management	SMALL	MODERATE	SMALL	SMALL
Socioeconomics	MODERATE Beneficial to MODERATE Adverse	MODERATE beneficial to MODERATE adverse	MODERATE beneficial to SMALL adverse	MODERATE beneficial to SMALL adverse
Human Health	SMALL	SMALL	SMALL	SMALL
Historic and Cultural Resources	MODERATE	MODERATE	MODERATE	MODERATE
Environmental Justice	NONE[(b)]	NONE[(b)]	NONE[(b)]	NONE[(b)]

(a) Impact levels for all alternatives are for construction and operation but are not cumulative. Thus, the nuclear impacts identified here may differ from those used to compare impacts with those of the alternative sites, which use cumulative impacts.

(b) A determination of "NONE" for environmental justice analyses does not mean there are no adverse impacts on minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

Because of current concerns related to GHG emissions, it is appropriate to specifically discuss the differences among the alternative energy sources regarding CO_2 emissions. The CO_2 emissions for the proposed action and energy-generation alternatives are discussed in Sections 5.7.1, 9.2.2.1, 9.2.2.2, and 9.2.4. Table 9-5 summarizes the CO_2 emission estimates for a 40-year period for the alternatives considered by the NRC staff to be viable for baseload power generation. These estimates are limited to the emissions from power generation and do not include CO_2 emissions for workforce transportation, construction, fuel cycle, or decommissioning. Among the reasonable energy-generation alternatives, the CO_2 emissions for nuclear power are a small fraction of the emissions of the other viable energy-generation alternatives. Even when the transportation emissions attributable to the nuclear workforce and the fuel-cycle emissions are added in, which would increase the emissions for plant operations over a 40-year period to about 11,000,000 MT CO_2e, this number is still significantly lower than the emissions for the plant operations portion of the other reasonable energy-generation alternatives.

Table 9-5. Comparison of Carbon Dioxide Emissions for Energy Alternatives

Generation Type	Years	CO_2 Emissions (MT)[a]
Nuclear Power[b]	40	362,000
Coal-Fired Generation[c]	40	748,000,000
Natural-Gas–Fired Generation[d]	40	252,000,000
Combination of Alternatives[e]	40	208,000,000

(a) Nuclear power emissions are in units of MT CO_2e whereas the other energy alternatives emissions estimates are in units of MT CO_2. If nuclear power emissions were represented in MT CO_2, the value would be slightly less, because other GHG emissions would not be included.
(b) From Section 5.7.1 for two units operational emissions, not including CO_2 emissions for workforce transportation.
(c) From Section 9.2.2.1.
(d) From Section 9.2.2.2.
(e) From Section 9.2.4

On June 3, 2010, the EPA issued a rule that tailors the applicability criteria. The rule determines which stationary sources and modifications to existing projects become subject to permitting requirements for GHG emissions under the PSD and Title V programs of the Clean Air Act (75 FR 31514) (TN1404). According to the Tailoring Rule, GHG emissions are a regulated New Source Review pollutant under the PSD major source permitting program if the source (1) is otherwise subject to PSD (for another regulated New Source Review pollutant) and (2) has a GHG potential to emit equal to or more than 75,000 T/yr of CO_2e (i.e., “carbon dioxide equivalent” adjusting for different global warming potentials for different GHGs), then the source would be subject to BACT. In addition, on October 23, 2015, the EPA published its final standards to limit CO_2 emissions from new coal- and gas-fired power plants (80 FR 64509) (TN4388). The use of BACT has the potential to reduce the amount of GHGs emitted from stationary source facilities. The implementation of this rule could reduce the amount of GHGs from the values indicated in Table 9-5 for coal and natural gas, as well as from other alternative energy sources that would otherwise have appreciable uncontrolled GHG emissions. The GHG emissions from the production of electricity from a nuclear power source are primarily from the fuel cycle, and such emissions could be reduced further if the electricity from the assumed fossil-fuel source powering the fuel cycle is subject to BACTs. The emission of GHGs from the production of electrical energy from a nuclear power source is orders of magnitude less than those of the reasonable alternative energy sources. Accordingly, the comparative relationship between the energy sources listed in Table 9-5 would not change meaningfully, even if possible reductions to the GHG emissions from the nuclear fuel cycle are ignored, because GHG emissions from the other energy source alternatives would not be sufficiently reduced to make them environmentally preferable to the proposed project.

CO_2 emissions associated with other energy-generation alternatives, such as wind power, solar power, and hydropower, would be associated with workforce transportation, construction, and decommissioning of the facilities. Because these power-generation alternatives do not involve combustion, the review team considers the GHG emissions to be minor and concludes that the GHG emissions would have a minimal cumulative impact. Other energy-generation alternatives involving combustion of oil, wood waste, municipal solid waste, or biomass-derived fuels would produce CO_2 emissions from combustion, as well as from workforce transportation, plant construction, and plant decommissioning. It is likely that the CO_2 emissions from the combustion process for these alternatives would dominate the other CO_2 emissions associated with the generation alternative. It is also likely that the CO_2 emissions from these alternatives

would be of the same order of magnitude as the emissions for the fossil-fuel alternatives considered in Sections 9.2.2.1, 9.2.2.2, and 9.2.4. However, because the review team determined that these alternatives would not meet the need for baseload power generation, their CO_2 emissions were not evaluated quantitatively.

Insofar as some of these alternatives, such as biomass, are considered in the combination of alternatives discussed in Section 9.2.4, they would increase the total CO_2 emissions beyond the numbers shown in Table 9-5; however, the review team considers the small fraction contributed by these technologies in comparison to the contributions of the natural-gas component for the combination of alternatives case to have a minimal further cumulative impact that does not warrant a more precise analysis.

As discussed in Chapter 8, the NRC staff concludes that the need for additional baseload power generation has been demonstrated. Also, as discussed earlier in this chapter, the NRC staff concludes that the viable alternatives to the proposed action all would involve the use of fossil fuels (coal or natural gas). Consequently, the NRC staff concludes that the proposed action results in the lowest level of emissions of GHGs among the viable alternatives.

9.3 Alternative Sites

The NRC's ESRP (NRC 2000-TN614) states that the ER, submitted in conjunction with an application for a COL, should include an evaluation of alternative sites to determine if any obviously superior alternative to the proposed site exists. The NRC's site-selection process guidance calls for identification of a ROI, followed by successive screening to identify candidate areas, potential sites, candidate sites, and the proposed site (NRC 2000-TN614). This section includes a discussion of FPL's ROI for the proposed siting of a new nuclear power plant, and describes its alternative site-selection process. This is followed by the review team's evaluation of the FPL site-selection process, a description of the alternative sites selected, and discussion of the environmental impacts of locating the proposed facilities at each alternative site.

The review of alternative sites consists of a two-part sequential test (NRC 2000-TN614). The first part of the test determines whether any of the alternative sites are environmentally preferable. To determine if a site is environmentally preferable, the NRC staff considers whether the applicant has (1) reasonably identified candidate sites, (2) evaluated the likely environmental impacts of the proposed action at these sites, and (3) used a logical means of comparing sites that led to selection of the proposed site. Based on its independent review, the NRC staff determines whether any of the alternative sites are environmentally preferable to the applicant's proposed site. If the NRC staff determines that one or more alternative sites are environmentally preferable, it then proceeds with the second part of the test.

The second part of the test determines if an environmentally preferable alternative site is not simply marginally better, but obviously superior to the proposed site. The NRC staff examines whether (1) one or more important aspects, either singly or in combination, of an acceptable and available alternative site are obviously superior to the corresponding aspects of the applicant's proposed site, and (2) the alternative site does not have offsetting deficiencies in other important areas. Included in this part of the test is the consideration of estimated costs (i.e., environmental, economic, and time of building the proposed plant) at the proposed site and at the environmentally preferable site or sites (NRC 2000-TN614).

The specific resources that could be affected by the incremental effects of the proposed action and other actions in the same geographic area were assessed. For the purposes of this alternative sites evaluation, impacts evaluated include NRC-authorized construction, operation, and other cumulative impacts including preconstruction activities. Sections 9.3.2 through 9.3.5 provide a site-specific description of the environmental impacts at each alternative site based on issues such as land use, water resources, terrestrial and aquatic ecology, socioeconomics, environmental justice, historic and cultural resources, air quality, nonradiological health, radiological impacts of normal operation, and postulated accidents. Section 9.3.6 contains a table of the NRC staff's characterization of the impacts at the alternative sites and comparison with the proposed site to determine if there are any alternative sites that are environmentally preferable to the proposed site.

9.3.1 Alternative Site-Selection Process

FPL's site-selection process was based on guidance provided in the NRC's ESRP (NRC 2000-TN614), NRC Regulatory Guide 4.7, Revision 2 (NRC 1998-TN1008), and the Electric Power Research Institute (EPRI) siting guide (EPRI 2002-TN1799). The site-selection and comparison process focused on identifying and evaluating sites that represented an acceptable range of alternatives for the proposed Turkey Point Units 6 and 7. The following information details the process used to identify and screen sites in successive steps until a reasonable number of alternative sites were determined and evaluated, and the proposed Turkey Point plant site was selected (FPL 2014-TN4058).

FPL's screening process proceeded through the following steps, which successively reduced the number of sites to the final candidate sites (FPL 2014-TN4058):

- ROI: Largest geographic area of consideration, defined as the FPL service area.
- Candidate Areas: Areas within the ROI that would support the facility as proposed. These areas were determined by using exclusionary and/or avoidance criteria to screen the ROI to eliminate the areas where it would not be feasible to site a nuclear facility because of regulatory, institutional, plant design, and/or significant environmental impacts.
- Potential Sites: Discrete parcels of land found within the candidate areas that would support the facility as proposed. Potential sites were determined by using a refined set of exclusionary and/or avoidance criteria to screen the candidate areas. The screening data set was more refined and of higher detail than the data set used to identify the candidate areas.
- Candidate Sites: Sites that were selected by applying suitability criteria to the potential site list. This selection process used a quantifiable weighting and ranking process, including sensitivity analysis.
- Proposed Site: FPL selected the Turkey Point site based on the exception discussed in ESRP 9.3 (NRC 2000-TN614). FPL also retained the St. Lucie site based on this exception. FPL then compared the proposed and alternative sites on an issue-by-issue basis that allowed the applicant to identify both cost and environmental trade-offs associated with developing each of the sites. This approach provided a high level of assurance that the proposed site had no fatal flaw that could result in environmental impacts outside the identified scope, licensing delays, or increased cost.

ESRP 9.3 (NRC 2000-TN614) recognizes the potential value of including existing nuclear power plant sites that were "previously found acceptable on the basis of a National Environmental Policy Act (NEPA) review, or have [been] demonstrated to be environmentally acceptable on the basis of operating experience, or allocated to an applicant by a state government from a list of state approved power plant sites." Based on FPL's interpretation of ESRP 9.3, of the five final candidate sites, FPL determined that both the Turkey Point and the St. Lucie plant sites met the preceding criteria of having been found previously acceptable after a NEPA review. The NRC staff notes that previous determinations of site acceptability do not exempt that site from the same level of rigor of evaluation applied to the other alternative sites. The ESRP simply recognizes that a significant level of site characterization may have already been conducted, thereby providing a reasonable basis for assessment.

FPL's site-selection process is summarized herein and in its ER (FPL 2014-TN4058). A more detailed discussion of FPL's site-selection process is available in FPL's initial 2006 siting document, *Project Bluegrass New Nuclear Power Generation Final Site Selection Study Report* (FPL 2007-TN3854). Subsequently, the ER and the siting report were supplemented in 2011 with a report titled *Florida Power & Light Company Turkey Point 6 & 7 New Nuclear Power Generation (Formerly Project Bluegrass) Augmented Site Selection Study Report* (FPL 2011-TN36) in response to the NRC's environmental audit and requests for additional information (NRC 2011-TN3751) to demonstrate that the site-selection process was conducted in a manner consistent with NUREG–1555, Section 9.3 (NRC 2000-TN614; FPL 2014-TN4058).

9.3.1.1 Selection of Region of Interest

For this COL application, the FPL defined the ROI as the area within (or immediately adjacent to) the FPL service territory. The FPL service territory is shown in Figure 9-1.

Although FPL's service territory extends north to south across the State of Florida, FPL indicated that its need for power is focused primarily on the load centers for the greater Miami area (FPL 2011-TN36; FPL 2014-TN4058).

9.3.1.2 Selection of Candidate Areas

FPL reduced the ROI to candidate areas by applying the following five exclusionary criteria: (FPL 2014-TN4058)

- areas greater than 10 mi from qualifying rivers and 10 mi from the Atlantic Ocean and the Gulf of Mexico
- areas greater than 10 mi from qualifying wastewater-treatment plants
- census block groups where population density >300 persons/mi^2
- lands designated as national parks, National Wildlife Refuges, National Marine Sanctuary Areas, military installations, Indian lands, and Florida State parks
- critical habitat for the following U.S. Fish and Wildlife Service (FWS)-listed threatened or endangered species: American crocodile (Crocodylus acutus), Cape Sable seaside sparrow (*Ammodramus maritimus mirabili*), Choctawhatchee beach mouse (*Peromyscus polionotus allophrys [Bowen]*), Everglade snail kite (*Rostrhamus sociabilis plumbeus*), frosted flatwoods salamander (*Ambystoma cingulatum [Cope]*), Gulf Sturgeon (*Acipenser oxyrinchus*), Johnson's seagrass (*Halophila johnsonii*), Perdido Key beach mouse (*Peromyscus*

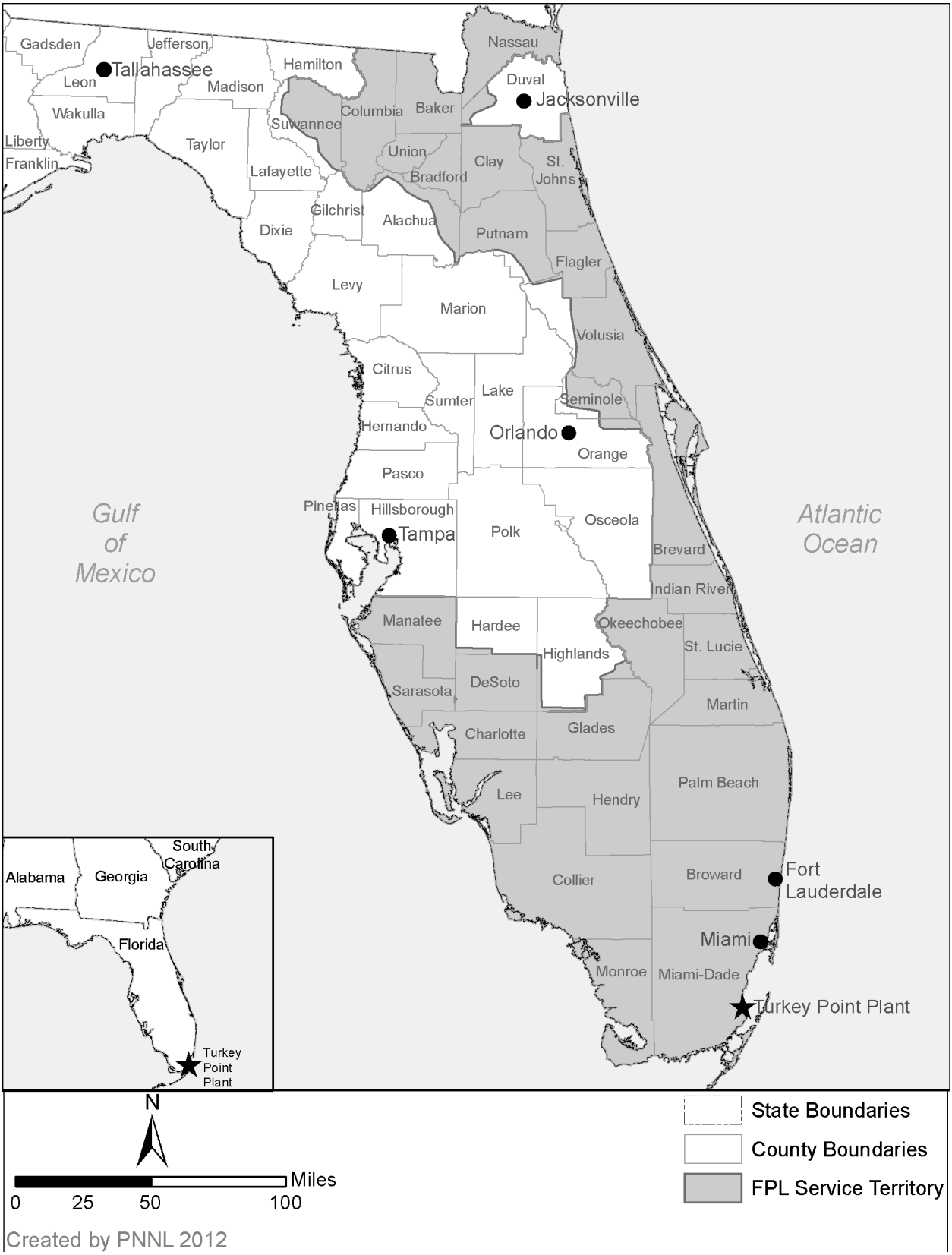

Figure 9-1. FPL Service Territory

polionotus trissyllepsis [Bowen]), piping plover (*Charadrius melodus*), purple bankclimber (*Elliptoideus sloatianus*), rice rat (*Oryzomys palustris*), right whale (*Eubalaena glacialis*), and St. Andrew beach mouse (*Peromyscus polionotus peninsularis*).

After applying these exclusionary criteria, FPL identified the 16 candidate areas identified in Figure 9-2 and Figure 9-3.

9.3.1.3 Selection of Potential Sites

In FPL's initial site-selection process (FPL 2011-TN36) an internal FPL team was canvassed to identify known available sites within or near the FPL service territory. This initial effort identified 23 potential sites consisting of existing FPL power-generation sites, FPL-owned greenfield sites, and other greenfield sites that FPL did not own. These 23 potential sites were qualitatively evaluated using the following criteria (FPL 2014-TN4058):

- sufficient land currently exists for new nuclear power plant construction
- sufficient land can be obtained for new nuclear power plant construction
- adequate sources of water
- transmission feasibility.

Based on this evaluation, the original 23 potential sites were screened and reduced to 15 sites. FPL eliminated four sites because they were too distant from the primary load center of Miami-Dade requiring new, difficult to obtain transmission line rights-of-way. An additional four sites were eliminated by FPL based on insufficient available space and determinations that additional lands were either not available or would be difficult to obtain (FPL 2014-TN4058).

As described previously in Section 9.3.1, in 2011 FPL supplemented its initial screening evaluation with its Augmented Site Selection Study Report (FPL 2011-TN36) and applied the following screening criteria to the 16 candidate areas:

- avoidance of high-population areas
- avoidance of ecologically sensitive and special designation areas
- avoidance of special dedicated land uses (e.g., national parks)
- proximity to target transmission/load centers
- a minimum size of 5,000 ac
- flexibility to optimize site layout and design for cost minimization
- flexibility to optimize site layout and design for avoidance or mitigation of environmental impacts
- optimization of site engineering factors (e.g., topography, foundation conditions, grading requirements) (FPL 2014-TN4058).

Through this process, FPL identified 6 additional greenfield sites to consider as potential sites for a total of 21 potential sites as identified in Figure 9-4.

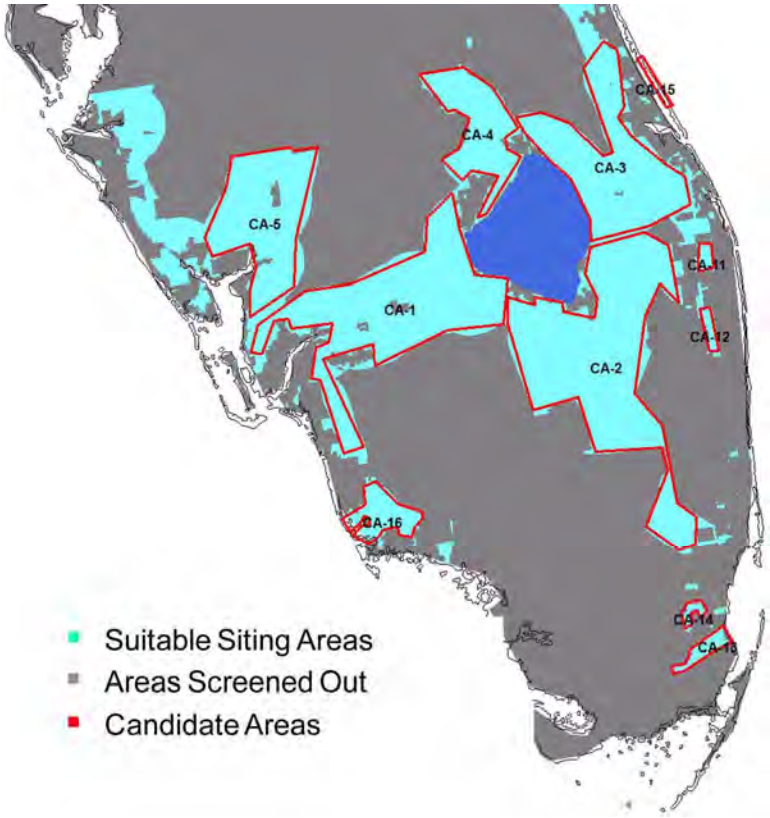

Figure 9-2. Candidate Areas: Southern Service Territory

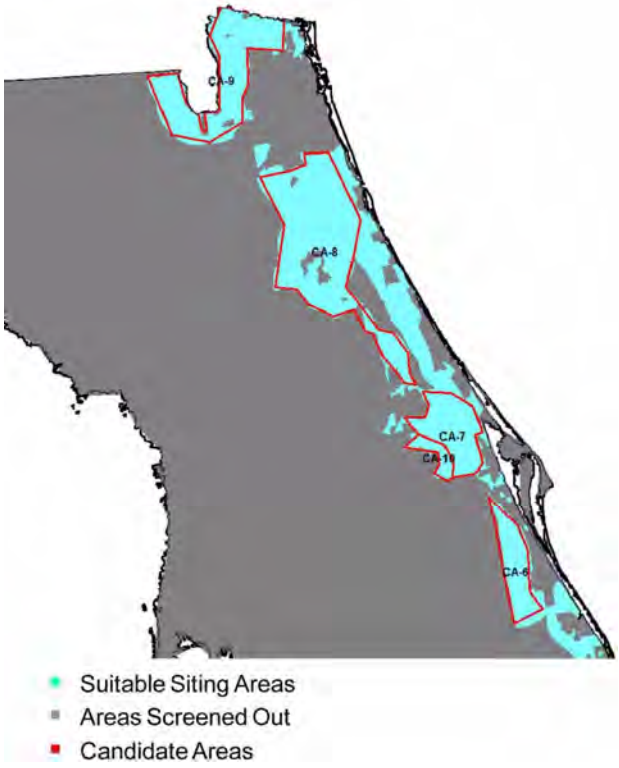

Figure 9-3. Candidate Areas: Northern Service Territory

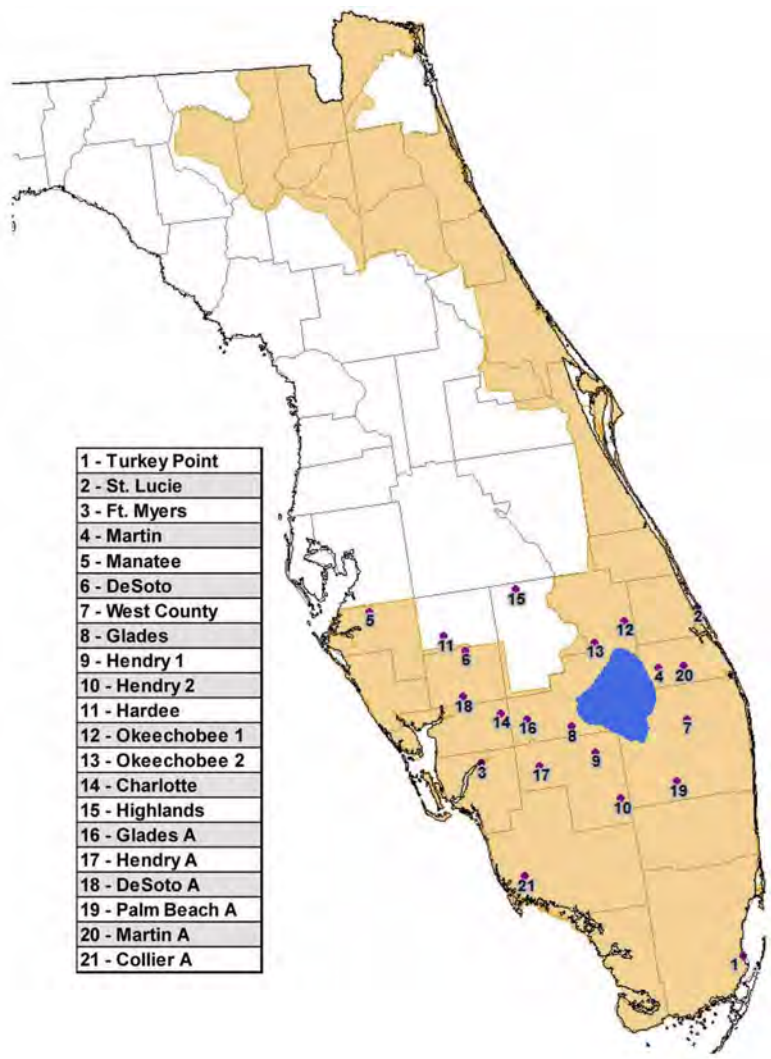

Figure 9-4. Potential Site Locations

FPL evaluated the 21 potential sites against the following 9 weighted screening criteria (FPL 2014-TN4058):

- cooling-water supply
- flooding
- population
- hazardous land uses
- ecology
- wetlands
- railroad access
- transmission access
- land acquisition.

FPL's detailed description of the metrics and rating rationale for each of these criteria is provided in the ER in Table 9.3-3. Of the original 21 potential sites FPL selected the top 8 ranked sites, and even though they ranked below these 8 sites, FPL also retained the Turkey

Point and St. Lucie sites "based on the fact that they are existing, operating nuclear power plant sites within the ROI," and FPL's determination that the sites fall within "the special case (described above) for licensed nuclear power plant sites" (FPL 2014-TN4058). The resulting 10 potential sites were:

- DeSoto
- Glades
- Glades A
- Hendry 1
- Martin
- Martin A
- Okeechobee 1
- Okeechobee 2
- St. Lucie
- Turkey Point.

9.3.1.4 Selection of Candidate Sites

FPL next subjected these 10 potential sites to further evaluation against 34 weighted screening criteria, including 12 health and safety criteria, 8 environmental criteria, 3 socioeconomic criteria, and 11 engineering and cost criteria. A detailed list of all 34 criteria can be found in the ER in Table 9.3-5 (FPL 2014-TN4058).

In the resulting composite scores, the Okeechobee 1, DeSoto, and Hendry 1 sites rated lowest and were eliminated from further consideration. Of the remaining seven sites, FPL determined that neither the Martin A nor the Glades A sites presented any significant advantages over the Martin and Glades sites, respectively (sites that had already been evaluated in detail in the 2006 study), and therefore they were also dropped from further consideration. The resulting five candidate sites proposed by FPL, from highest to lowest composite score, are:

- Turkey Point
- St. Lucie
- Martin
- Okeechobee 2
- Glades.

9.3.1.5 Selection of the Proposed Site

FPL subjected the five candidate sites to an additional qualitative review using the following 11 criteria:

- Environmental impact – existence of ecological or environmental permitting issues
- Transmission – availability of existing right-of-way and cost of upgrades
- Land acquisition – existing land ownership and expected difficulty of acquiring site (if applicable)
- Reliability (transmission) – analysis of reliability from a power-transmission perspective

- Reliability (generation) – qualitative analysis of risk factors for reliable power production and supply
- Public acceptance – ability to obtain public acceptance to support siting activities
- Political (local) – governmental/organizational support at the local level
- Political (state) – governmental and regulatory support at the State and Federal level
- Transmission takeaway – feasibility of constructing the necessary upgrades to deliver power to the system
- Schedule compatibility – level of confidence that site will support commencement of combined license application activities in January 2007
- Site layout feasibility – ability of site to accommodate plant layout.

Using a three-point scoring system where 1 equaled more favorable and 3 equaled less favorable, FPL overall scoring ranked the sites in numerical order as follows:

1. Turkey Point
2. Glades
3. Martin
4. Okeechobee 2
5. St. Lucie.

Thus FPL selected the Turkey Point site as its proposed site based on this ranking and its determination that the site was the preferred site for meeting FPL's overall business objectives (FPL 2014-TN4058).

9.3.1.6 Review Team Evaluation of FPL's Site-Selection Process

The NRC staff evaluated the methodology used by FPL and concluded that the process was reasonable and consistent with the guidelines presented in the ESRP and EPRI's siting guide. The review team found that the systematic alternative siting analysis demonstrated a logical selection process and application of screening and exclusionary siting criteria. The analysis enabled the evaluation of the likely environmental impacts associated with the respective sites, including the evaluation of suitability criteria; identified acceptable alternative sites; and clearly provided the mechanism for selection of the final proposed site.

Following the guidance provided in ESRP 9.3 (NRC 2000-TN614), the review team visited the four alternative sites and collected and analyzed reconnaissance-level information for each site. The review team then used the information in the ER, siting studies, and responses to requests for additional information (RAIs), information from other Federal and State agencies, and information gathered during the site visits to evaluate the environmental impacts of building and operating two new nuclear power plants at those sites. The analysis considered the impacts of NRC-authorized construction and operation as well as potential cumulative impacts associated with other actions affecting the same resources, including but not limited to preconstruction.

The cumulative impact analysis for the alternative sites was performed in the same manner as discussed in Chapter 7 for the proposed site except that, as specified in ESRP 9.3 (NRC 2000-

TN614), the analysis was conducted at the reconnaissance level. The review team researched EPA databases for recent EISs within the State; used an EPA database for permits for water discharges in the geographic area to identify water-use projects; and used www.recovery.gov to identify projects in the geographic area funded by the American Recovery and Reinvestment Act of 2009 (ARRA) (26 U.S.C. § 1) (TN1250). The review team developed tables of the major projects near each alternative site that were considered relevant in the cumulative analysis. The review team used the information to perform an independent evaluation of the direct, indirect, and cumulative impacts of the action at the alternative sites to determine if one or more of the alternative sites were environmentally preferable to the proposed site.

Included are past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts with the action. For the purposes of this analysis, the past is defined as the time period prior to receipt of the COL application. The present is defined as the time period from the receipt of the COL application until the beginning of NRC-authorized construction of proposed Units 6 and 7. Future actions are those that are reasonably foreseeable through NRC-authorized construction and operation of the proposed Units 6 and 7 and decommissioning.

The specific resources and components that could be affected incrementally by the action and other actions in the same geographic area were identified. The affected environment that serves as the baseline for the cumulative impacts analysis is described for each alternative site, and a qualitative discussion of the general effects of past actions is included. The geographic area over which past, present, and future actions could reasonably contribute to cumulative impacts is defined and described for each resource area. The analysis for each resource area at each alternative site concludes with a cumulative impact finding (SMALL, MODERATE, or LARGE). For conclusions greater than SMALL, the review team also discussed whether building and operating the proposed facilities would be a significant contributor to the cumulative impact. In the context of this evaluation, “significant” is defined as a contribution that is important in reaching that impact-level determination.

The review team considered in Appendix I how future climate change could affect the evaluation of the impacts of operating the proposed new nuclear units at the Turkey Point site. The considerations in Appendix I would also apply to the alternative sites because all of the alternative sites are in the same geographic area (the Southeast Region) as the proposed site for the purposes of the analysis in the third National Climate Change Assessment by the U.S. Global Change Research Program (GCRP 2014-TN3472). The inland alternative sites could experience fewer impacts from sea-level rise, but may also experience greater impacts from other climate change indicators, such as rising temperature.

The nonradiological waste impacts described in Sections 4.10 and 5.10 would not substantially vary from one site to another. The types and quantities of nonradiological and mixed waste would be approximately the same for construction and operation of two Westinghouse AP1000 pressurized water reactors at any of the alternative sites. For each alternative site, all wastes destined for land-based treatment or disposal would be transported offsite by licensed contractors to existing, licensed, disposal facilities operating in compliance with all applicable Federal, State, and local requirements. All nonradioactive, liquid discharges would be discharged in compliance with the provisions of the applicable National Pollutant Discharge

Elimination System (NPDES) permit. For these reasons, these impacts are expected to be minimal and will not be discussed separately in the evaluation of each alternative site.

The impacts described in Chapter 6 of this EIS (e.g., nuclear fuel cycle and decommissioning) would likewise not substantially vary from one site to another because the NRC staff assumes the same reactor design (therefore, the same fuel-cycle technology, transportation methods, and decommissioning methods) for all of the sites. As such, these impacts would not differentiate between the sites and would not be useful in the determination of whether an alternative site is environmentally preferable to the proposed site. For this reason, these impacts are not discussed in the evaluation of the alternative sites.

Three of the four alternative sites are located near Lake Okeechobee, the largest lake in the southeastern United States (SFWMD et al. 2011-TN3087). However withdrawal of water from the lake and its tributaries is heavily regulated to meet management and restoration goals for the lake and other resources in South Florida (SFWMD 2012-TN3085). As a result, FPL has proposed a combination of surface water and groundwater resources to meet the cooling-water needs of two nuclear power units at these alternative sites. During periods of excess flow, water from the Kissimmee River/Lake Okeechobee system would be withdrawn and stored in a 3,000 ac reservoir on the site. During periods when this water was not sufficient, groundwater from the Avon Park permeable zone (APPZ) would be withdrawn and treated with reverse osmosis to reduce the salinity of the water so that sensitive plant and animal communities in the area would not be affected by salt drift from the cooling towers (FPL 2013-TN3052). Blowdown water would be disposed of by injecting the water into the Boulder Zone resulting in no discharge of wastewater to surface waters or groundwaters used as potable water supplies.

To minimize the environmental impacts at these alternative sites, the review team considered an alternative configuration of the cooling system that FPL proposed. The review team was unable to confirm that, based on the drift rates provided by FPL for the Turkey Point cooling towers using brackish or saline water, salt deposition would be sufficiently adverse to the ecosystem to preclude the use of groundwater from the APPZ for cooling without a reverse osmosis system. The review team concluded that such a system would not be required. In addition, increased use of groundwater could reduce or eliminate the requirement for a surface-water reservoir. Therefore, the review team performed an analysis that did not include either a surface-water reservoir or a reverse osmosis system as part of the cooling system for each inland alternative site. The review team assumed that the revised design would use surface water only at times of excess flow. The review team acknowledges that the revised cooling-system design would result in a reduced number of cycles of concentration, greater groundwater pumping, and greater deep-well injection, all of which may contribute to greater operational and maintenance costs.

The review team also notes that no power-generating station in Florida relies on groundwater from an aquifer of the depth of the APPZ, and it knows of no individual user of groundwater from this depth that would use water in the quantities necessary to cool two AP1000 units. There is, therefore, significant uncertainty regarding how the cooling system might be implemented at any of these three sites. If such a plant were to be built, State regulators could require actions to address environmental concerns, such as a cooling-water reservoir or a reverse osmosis plant. To address some of this uncertainty, in addition to evaluating the environmental impacts of its

version of the cooling system, the review team qualitatively assessed how those impacts would be different if a 3,000 ac reservoir was included in the design of the system. Based on that assessment, including the reservoir would increase the impacts on land use and terrestrial ecology, while also increasing in a minor way the impacts on aquatic ecology and surface-water use. Impacts on other resources would likely not change appreciably. The review team did not include any assessment of the impacts with reverse osmosis treatment of the water because the team concluded that such treatment would not be necessary.

The cumulative impacts are summarized for each resource area in the subsections that follow. The level of detail is commensurate with the potential significance of the impacts. The four alternative sites are described in the following sections—the Glades site (9.3.2), the Martin site (9.3.3), the Okeechobee 2 site (9.3.4), and the St. Lucie site (9.3.5). A summary comparison of the review team's characterization of the impacts of the proposed action at the proposed and alternative sites is presented in Section 9.3.6 and Table 9-28.

9.3.2 Glades Site

This section covers the review team's evaluation of the potential environmental impacts of siting a new two-unit nuclear power plant on the Glades site. The Glades site is located in an undeveloped area in southeastern Glades County approximately 1 mi south of U.S. Highway 27 (US-27). Nearby towns include Moore Haven (2 mi east), Clewiston (15 mi southeast), La Belle (18 mi west), and Okeechobee (35 mi northeast). The Miami load center is approximately 75 mi southeast of the Glades site. Lake Okeechobee is approximately 5 mi to the northeast (FPL 2014-TN4058). The location of the Glades site is shown in Figure 9-5.

The Glades site is an undeveloped greenfield site approximately 3,000 ac in size (FPL 2014-TN4058). The majority of the site is currently agricultural fields. Topography does not vary considerably over the site.

FPL assumed the facility footprint, including the power units, support buildings, switchyard, storage areas, stormwater-retention ponds, and other structures, would require an estimated 362 ac Figure 9-6. Building at the Glades site would also require the creation of a transmission line corridor approximately 121 mi long, a 1.9 mi access road (23.1 ac), installation of 6.2 mi of railway (74.8 ac), and an intake/makeup pipeline (3.4 ac). Additional area (up to several hundred acres) would be temporarily disturbed for activities such as laydown areas, a batch plant, and for fill and spoil deposition (FPL 2014-TN4058). As discussed in Section 9.3.1.7, the review team considered an alternative configuration of the cooling system that FPL proposed.

The following sections include a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if implemented at the Glades site and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction and operations and impacts of preconstruction activities. Also included in the assessment are past, present, and reasonably foreseeable future Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Glades site. Other actions and projects considered in this cumulative analysis are described in Table 9-6.

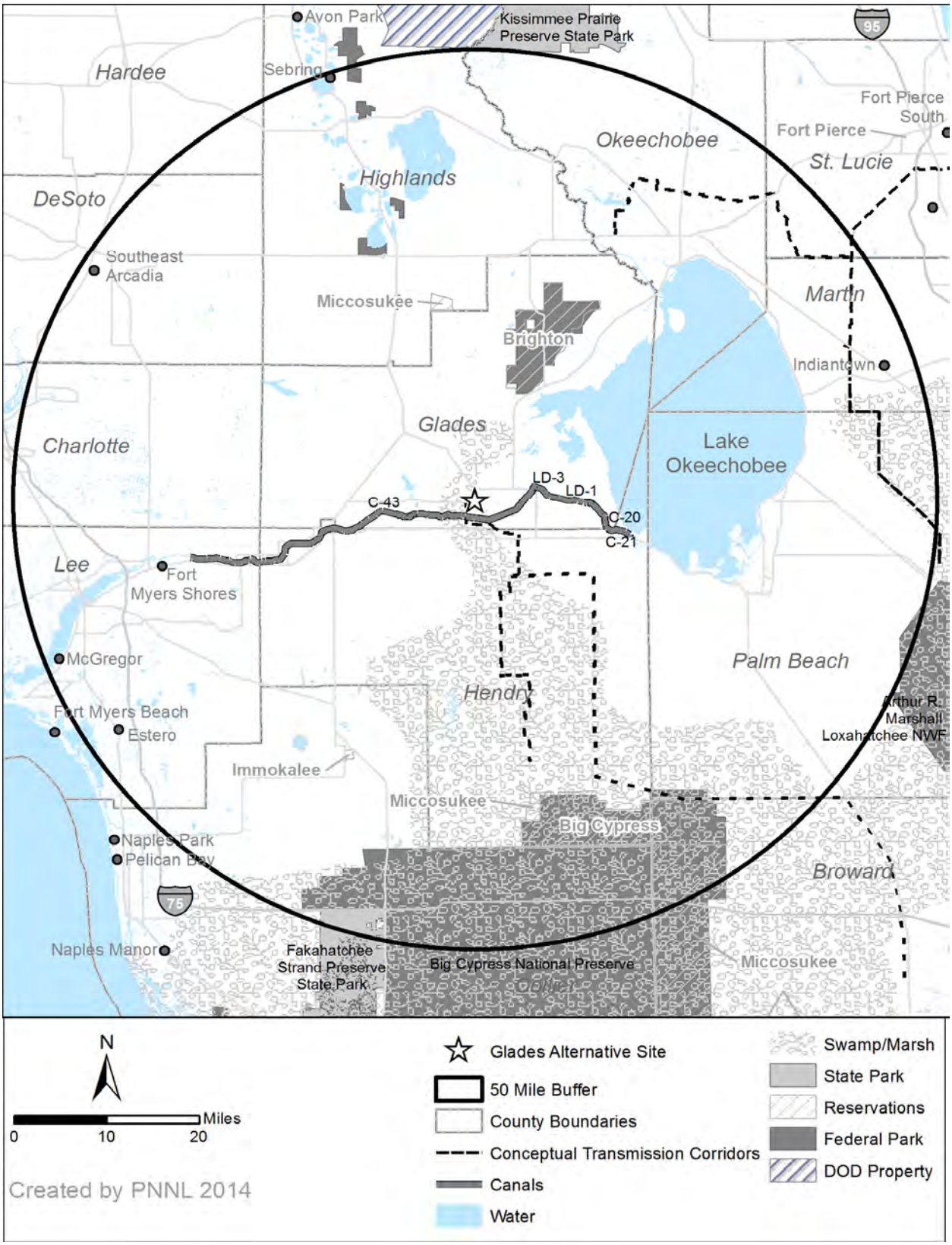

Figure 9-5. The Glades Site Region

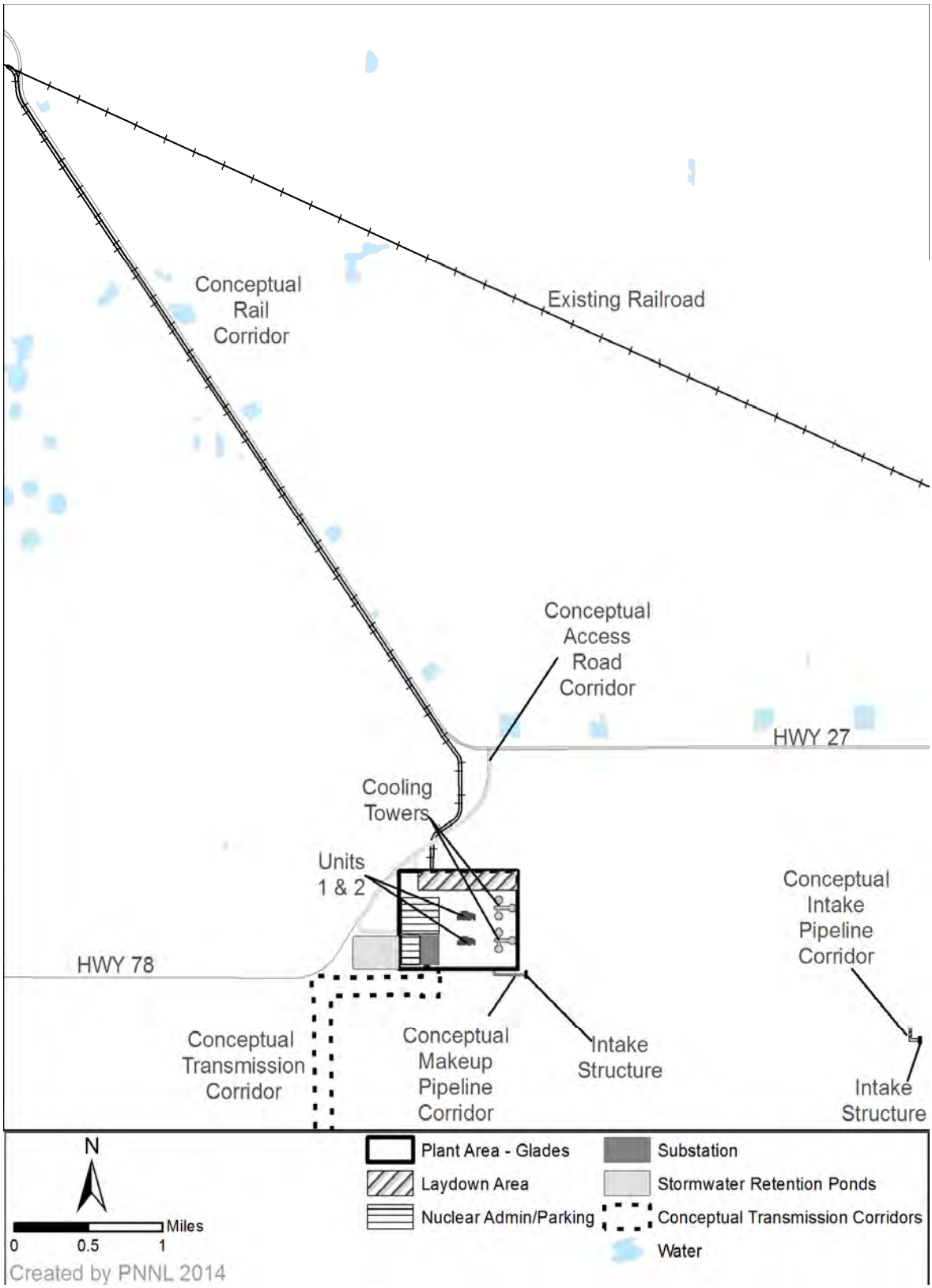

Figure 9-6. Glades Site Footprint

Table 9-6. Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Glades Alternative Site

Project Name	Summary of Project	Location	Status
Energy Projects			
St. Lucie	Two 3,020 MW(t) nuclear power reactors	68 mi NE of the Glades alternative site	Operational, Units 1 and 2 underwent license renewal in 2003. Units 1 and 2 completed 320 MW(t) power uprates in 2013 (NRC 2012-TN1668; FPL 2014-TN3360)
West County Energy Center	Three 1,250 MW natural-gas−powered units	50 mi SE of the Glades alternative site	Operational (FDEP 2013-TN2965)
Martin	Approximately 4,300 MW from five units, three natural-gas and two oil units with a solar thermal facility generating supplemental steam	41 mi NE of the Glades alternative site	Operational (FPL 2016-TN4579)
Indiantown Cogeneration Company	330 MW coal-fired power plant	43 mi NE of the Glades alternative site	Operational (FDEP 2013-TN2967)
J.H. Phillips Sebring Station	36 MW two-unit oil power facility	45 mi NW of the Glades alternative site	Put in reserve standby status in 2009 (TECO 2014-TN4125)
Ft. Myers	Combination of oil and gas units with a total combined capacity (summer) of 2,396 MW. FPL has proposed to replace 10 of the 12 63 MW oil-fired units with 3 new 200 MW gas-fired units.	39 mi SW of the Glades alternative site	Operational and Proposed. Replacement of 10 of the 12 oil-fired units is planned in 2016 (FDEP 2013-TN3003; FPL 2016-TN4579)
Lee County Waste-To-Energy Plant	Waste-to-energy power generation	39 mi SW of the Glades alternative site	Operational (Lee County 2014-TN2984)
Okeelanta Cogeneration Facility	140 MW biomass power-generation facility	31 mi SE of the Glades alternative site	Operational (FDEP 2013-TN2968)
FPL pipeline	126 mi pipeline from Sabal Trail's Central Florida Hub to FPL's Martin Clean Energy Center	Throughout region NE of the Glades alternative site	Proposed, construction set to begin 2016 (FPL 2014-TN2975)

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
Floridian Natural Gas Storage Company - Natural Gas Storage Facility	Storage of Natural Gas	40 mi NE of the Glades alternative site	Proposed, FERC Order amending Certificate issued (FERC 2015-TN4599) with associated Environmental Assessment (FERC 2015-TN4600)
DeSoto Next-Generation Solar Energy Center	25 MW solar-energy plant	50 mi NW of the Glades alternative site	Operational (FPL 2014-TN2974)
Energy Projects (contd)			
Southeastern Renewable Fuels Biorefinery and Cogeneration Plant	30 MW biofuel using leftover sweet sorghum stalk fiber	19 mi SE of the Glades alternative site	Proposed, Final air permit issued by FDEP in 2010 (FDEP 2010-TN2970)
Mining Projects			
Five Stone Mining	Stone/quarry mining	37 mi NE of the Glades alternative site	Operational (EPA 2013-TN2959)
Daniel Shell Pit, Phase 6	Stone/quarry mining	32 mi NE of the Glades alternative site	Operational (EPA 2013-TN2956)
Florida Shell and Rock	Stone/quarry mining	40 mi NW of the Glades alternative site	Operational (EPA 2013-TN2960)
Jay Rock Mine	Stone/quarry mining	40 mi NW of the Glades alternative site	Operational (EPA 2013-TN2962)
E R Jahna Industries Inc - Ortona Mine	Stone/quarry mining	8 mi SW of the Glades alternative site	Operational (EPA 2013-TN2958)
Harper Bros Inc - Alico Quarry	Stone/quarry mining	39 mi SW of the Glades alternative site	Operational (EPA 2014-TN2961)
Bonita Grande Properties	Stone/quarry mining	46 mi SW of the Glades alternative site	Operational (EPA 2014-TN2955)
Various other mine and quarry projects	Stone/quarry mining	Throughout region	Operational (FDEP 2010-TN2966)

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
Transportation Projects			
Various Transportation Projects	Road, traffic, pedestrian projects	Throughout region	Ongoing (FDOT 2014-TN4014)
Parks and Aquaculture Facilities			
Big Cypress National Preserve	Backcountry access plan to provide off-road vehicle secondary trails, non-motorized trails, and a camping management to the backcountry	38 mi S of the Glades alternative site	Proposed, backcountry access plan and EIS being developed by the National Park Service (NPS) (NPS 2014-TN3754)
Arthur R. Marshall Loxahatchee National Wildlife Refuge	Activities include picnicking, boating, fishing, and hiking	27–60 mi SE of the Glades alternative site	Development likely limited within this area (FWS 2013-TN2992)
Okaloacoochee Slough State Forest	Activities include bicycling, camping, hunting, fishing, and hiking	15–22 mi SW of the Glades alternative site	Development likely limited within this area (SFWMD 2014-TN3005)
Everglades Wildlife Management Area	Activities include bicycling, camping, hunting, fishing, and hiking	40 mi SE of the Glades alternative site	Development likely limited within this area (FFWCC 2014-TN2977)
DuPuis Wildlife and Environmental Area	Activities include bicycling, camping, hunting, fishing, and hiking	37–40 mi NE of the Glades alternative site	Development likely limited within this area (FFWCC 2014-TN2977)
Kissimmee River	Activities include bicycling, Horseback riding, hunting, camping, fishing, and hiking	N and NW of the Glades alternative site	Development likely limited within this area (FFWCC 2014-TN3004)
Okeechobee Battlefield State Park	Hiking, camping	36 mi NE of the Glades alternative site	Development likely limited within this area (FDEP 2010-TN2971)
Archbold Biological Station	Ecological research station and preserve; organization owns and protects a 5,193 ac globally significant Florida scrub preserve located on the southern end of the Lake Wales Ridge	28 mi NW of the Glades alternative site	Development likely limited within this area (Archbold Biological Station 2014-TN2954)
Highlands Hammock State Park	Activities include bicycling, camping, picnicking, horseback riding, fishing, and hiking	48 mi NW of the Glades alternative site	Development likely limited within this area (Florida State Parks 2014-TN2972)

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
Lake June in Winter Scrub State Park	Activities include picnicking, fishing, and hiking	36 mi NW of the Glades alternative site	Development likely limited within this area (Florida State Parks 2014-TN2973)
Lake Okeechobee	730 mi^2 freshwater lake, restoration and protection plan	14 mi E and NE of the Glades alternative site	Ongoing, Florida Legislature in 2007 expanded the Lake Okeechobee Protection Act (SFWMD 2014-TN2988)
Lake Wales Ridge National Wildlife Refuge	Composed of four tracts within Polk and Highlands Counties. Closed to the public	46 mi NW of the Glades alternative site	Development likely limited within this area (FWS 2011-TN2993)
Other State Nature Preserves and Wildlife Management Areas	Public recreational activities	Throughout region	Development likely limited within these areas (FFWCC 2014-TN2981)
Everglades Ecosystem Restoration and/or Comprehensive Everglades Restoration Plan Projects (DOI 2016-TN4589)			
C-43 Basin Aquifer Storage and Recovery	The Comprehensive Everglades Restoration Plan (CERP) Restudy envisioned aquifer storage and recovery wells with a capacity of approximately 220 million gallons per day and associated pre- and post-water quality treatment located in the C-43 Basin in Hendry, Glades, or Lee Counties in conjunction with another project.	24 mi SW of the Glades alternative site	Proposed, Project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3009)
Caloosahatchee River (C-43) West Basin Storage	Project to improve the timing, quantity, and quality of freshwater flows to the Caloosahatchee River estuary	21 mi SW of the Glades alternative site	Proposed, Project in Planning phase. (USACE and SFWMD 2014-TN3010)
Indian River Lagoon -South	Project purpose is to improve surface-water management in the C-23/C-24, C-25, and C-44 basins for habitat improvement in the Saint Lucie River Estuary and southern portions of the Indian River Lagoon.	49 mi E of the Glades alternative site	Proposed, Project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3013)

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
Everglades Agricultural Area Storage Reservoirs	The purpose of this project is to improve the timing of environmental deliveries to the Water Conservation Areas, including reducing damaging flood releases from the Everglades Agricultural Area to the Water Conservation Areas.	Throughout region	Proposed, Final Project Implementation Report submitted 2012 (USACE and SFWMD 2014-TN3011)
Flows to Northwest and Central Water Conservation Areas 3A	The purpose of this feature is to increase environmental water-supply availability, increase depths and extend wetland hydropatterns in the northwest corner and west-central portions of Water Conservation Area 3A.	43 mi SW of the Glades alternative site	Proposed, Project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3012)
Lake Okeechobee Aquifer Storage and Recovery	A series of aquifer storage and recovery wells adjacent to Lake Okeechobee	2 mi E of the Glades alternative site	Proposed, Project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3014)
Lake Okeechobee Watershed Project	Project to increase aquatic and wildlife habitat, regulate extreme highs and lows in lake staging, reduce phosphorus loading, and reduce damaging releases to the surrounding estuaries	Throughout Okeechobee County	Proposed, Project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3015)
Melaleuca Eradication and other Exotic Plants	The project includes (1) upgrading and retrofitting the current quarantine facility in Gainesville, and (2) large-scale rearing of approved biological control organisms for release at multiple sites within the South Florida ecosystem to control Melaleuca, Brazilian pepper, Australian pine, and Old World climbing fern.	Throughout region	Operational, Facility completed in 2013 (USACE and SFWMD 2014-TN3020)
Miccosukee Tribal Water Management Plan	Construction of a managed wetland on the Tribe's Reservation in western Broward County.	43 mi SE of the Glades alternative site	Proposed, Project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3016)

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
Modify Holey Land Wildlife Management Area Operation Plan	Modification of the current operating plan and rules for Holey Land Wildlife Management Area will be made to implement rain-driven operations for this area to improve the timing and location of water depths within this wildlife management area.	35 mi SE of the Glades alternative site	Proposed, Project in planning phase. (USACE and SFWMD 2014-TN3017)
Modify Rotenberger Wildlife Management Area Operation Plan	Modification of the current operating plan for the Rotenberger Wildlife Management Area will be made to implement rain-driven operations for this area as needed. Water deliveries are made to the Rotenberger Area from Stormwater-Treatment Area 5.	32 mi S of the Glades alternative site	Proposed, Project in planning phase. (USACE and SFWMD 2014-TN3018)
Palm Beach County Agriculture Reserve Aquifer Storage and Recovery	Supplement water supplies for central and southern Palm Beach County by capturing and storing excess water currently discharged to the Lake Worth Lagoon.	46 mi E of the Glades alternative site	Proposed, Project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3019)
Herbert Hoover Dike Major Rehabilitation Project	Rehabilitation Project and Dam Safety Modification Study	5-37 mi NE of the Glades alternative site	Environmental Assessment and FONSI (Findings of No Significant Impact) issued in 2015 (USACE 2015-TN4598) Draft Environmental Report issued (DOI 2016-TN4589)
Kissimmee River Restoration	When restoration is completed in 2017, more than 40 mi^2 of river-floodplain ecosystem will be restored, including almost 20,000 ac of wetlands and 44 mi of historic river channel.	Along Kissimmee River 30-50 mile N/NW of the Glades site	Ongoing (USACE 2014-TN3061; DOI 2016-TN4589)
Other Actions/Projects			
Atlantic Sugar Association	Sugar manufacturing	32 mi E of the Glades alternative site	Operational (FDEP 2013-TN2964)
Southern Gardens Citrus Processing Corp.	Food production/distribution	6 mi SE of the Glades alternative site	Operational (FDEP 2013-TN2969)

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
United States Sugar Corporation Clewiston	Sugar manufacturing	15 mi SE of the Glades alternative site	Operational (EPA 2014-TN2963)
Various wastewater-treatment plant facilities	Sewage treatment	Throughout region	Operational
Various Hospitals Using Nuclear Material	Medical and other industrial isotopes	Throughout region	Ongoing
Various water/flood-management projects	Water and flood management	Throughout region	Ongoing (USACE 2012-TN1133)
Future Urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; construction of water- and/or wastewater-treatment and distribution facilities and associated pipelines, as described in local land-use planning documents	Throughout region	Construction would occur in the future, as described in State and local land-use planning documents

The geographic area of interest for cumulative impacts considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Glades site. An accident at a nuclear plant within 100 mi of the Glades site could potentially increase this risk.

9.3.2.1 Land Use

The following analysis includes land-use impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect land use, including other Federal and non-Federal projects listed in Table 9-6. For the analysis of land-use impacts at the Glades site and the area within the transmission line corridors, the review team determined that a 10 mi radius, similar to that used for the Turkey Point site, would encompass an effective geographic area of interest for cumulative impact assessment for land use. The geographic area of interest includes the site and associated facilities. It also includes the nearest community, the small city of Moore Haven (2009 population of 2,358), 2 mi east of the Glades alternative site. In evaluating the land-use impacts of using the Glades site, the review team used, in addition to the project application, readily obtainable data from the Internet or published sources, including aerial photographs of the site and vicinity, U.S. Department of Agriculture (USDA) soils information, local zoning and planning documents, and data acquired from the Florida Land Use, Cover, and Forms Classification System (FLUCFCS). Impacts from both building and station operation are discussed.

Building and Operation Impacts

Existing land uses in the vicinity of the Glades alternative site consist predominantly of cultivated agriculture. The nearest community is Moore Haven, which is the County seat of Glades County. The larger region is primarily devoted to agriculture, and scattered small rural communities. The closest population center with more than 25,000 population is Fort Myers (2009 population 61,870) (FPL 2014-TN4058; USCB 2009-TN3395), 45 mi to the west. The Glades alternative site is located approximately 5 mi southwest of Lake Okeechobee.

Existing land uses at the Glades site consist predominantly of cultivated agriculture, primarily sugar cane (FPL 2014-TN4058). No commercial mineral resources are identified on the site and in vicinity (Calver 1956-TN3752; Spencer 1993-TN3753). Based on a site visit (NRC 2010-TN3304) and inspection of aerial photographs included on Google Earth, it appears that no substantial areas of developed land uses occur on or within the vicinity of the site. Wildlife management areas and recreational areas are located to the east, nearer Lake Okeechobee, several miles from the alternative plant site. The Glades County 2020 Comprehensive Plan (Glades County 2010-TN3303) identifies the existing land use at and in the vicinity of the Glades alternative site as “Agriculture” and the future land use on the Future Land Use Map (FLUM) (Glades County 2010-TN3303) as “Commercial” and “Transition.” The map depicts a small rural community that includes a roughly 1 mi^2 area on the north and south sides of US-27 of “Transition” surrounding a small commercial area. Areas to the south are designated as Agricultural. “Transition” is defined in the Glades 2020 Comprehensive Plan (Glades County 2010-TN3303) as follows:

> **Transition:** Mixed Use Areas in which the present primary use is agricultural, but which have scattered residential and nonresidential use areas and are likely to be infilled with additional residential uses. This category will not include more than 2.5% of the total land area of Glades County. The maximum densities are a gross residential density of 7 residential units per acre and the maximum floor to area ratio for nonresidential uses shall be 0.3.

Therefore, the review team believes that use of the Glades alternative site for a power plant would be inconsistent with the current Glades County FLUM. This does not mean that the plant could not be built at this location, but a change in the current FLUM would be needed. Building and operating a major industrial facility at this location would constitute a land-use change not in keeping with general plans for development in this area.

No Prime farmland is identified on or in the vicinity of the site. However, most of the soils on and in the vicinity of the plant site are considered farmlands of Unique Importance. (USDA 2014-TN3358). Unique farmland is defined in Section 2(c) of the Farmland Protection Policy Act (7 U.S.C. § 4201 et seq.) (TN708) as “land, other than Prime farmland, that has combined conditions to produce sustained high quality and high yields of specialty crops, such as citrus, nuts, fruits, and vegetables when properly managed.” No portion of the alternative plant site or site vicinity falls within the Coastal Zone (FPL 2014-TN4058). No rivers are located near the alternative plant site, as shown on the Federal Emergency Management Agency (FEMA) Flood Zones 2020 map in the Glades 2020 Comprehensive Plan (Glades County 2010-TN3303), but, as FPL states in its application (FPL 2014-TN4058), portions of the plant site fall

within the 100-year flood zone. The 15 ft fill that the ER states would be required at the alternative plant site (FPL 2014-TN4058) could noticeably affect the flood plain, because it is such a large area and such a large amount of fill.

Building and operation of the project at the Glades site would result in the conversion of existing land uses, including approximately 296.8 ac from agriculture to power-generation uses as shown in Table 9-7. Because this is a small amount of farmland in the context of the large amount of farmland under cultivation in Glades County, conversion of this amount of farmland to another use would not substantially affect the agricultural economy of the region.

Additional land-use impacts include possible additional growth and land conversions in the vicinity to accommodate new workers and services (induced development). This could result in the loss of additional farmland. Because the workforce would be dispersed over larger geographic areas in the labor supply region, the impacts from land conversion for residential and commercial buildings induced by new workers relocating to the local area could likely be absorbed in the wider region. Therefore, the review team concludes that such impacts would be minimal.

Table 9-7. Glades Site Land-Use Impacts (Acres)

	Agricultural Lands (FLUCFCS 200 Land Use Series)	Non-Agricultural Lands (all other FLUCFCS designations)	Total
Plant Site	207	113	320
Access Roads	18	5	23
Rail Corridor	47	28	75
Intake Pipeline Corridor	0	1	1
Makeup Pipeline Corridor	2	0.1	2
Stormwater-Retention Ponds	22	20	42
Total[(a)]	297	167	463
Transmission Line Corridors	3,966	1,851	5,824
Grand Total	4,559	2,185	6,750

(a) Totals may not add due to rounding

Sources: FPL 2011-TN59 and FPL 2014-TN4058

Approximately 121 mi of new transmission lines would have to be built to serve the plant. FPL states in its application (FPL 2014-TN4058) that none of the transmission lines would pass through the Coastal Zone. Approximately 5,824 ac of land would be at least temporarily affected. Of this land, approximately 3,966 ac are agricultural land, and the remainder primarily open lands and roadways. The agricultural land within the transmission line corridors would be converted from agricultural use to transmission line use, although FPL states in its application (FPL 2014-TN4058) that agriculture could continue within and along the transmission line rights-of-way. Therefore, much of the affected agricultural land would not necessarily be permanently converted to other land uses.

Under the Florida Site Certification Application process explained in Section 4.1, the State approves a corridor and the applicant chooses a specific right-of-way within the approved corridor. The objective of this process, as stated in the electrical power plant and transmission

line statute (FDEP 2013-TN2629), is "that the location of transmission line corridors and the construction, operation, and maintenance of electric transmission lines produce minimal adverse effects on the environment and public health, safety, and welfare" and "to fully balance the need for transmission lines with the broad interests of the public in order to effect a reasonable balance between the need for the facility as a means of providing reliable, economical, and efficient electric energy and the impact on the public and the environment resulting from the location of the transmission line corridor and the construction, operation, and maintenance of the transmission lines." Engineering considerations and costs are likely to suggest designs that favor collocation with existing transmission lines in existing corridors. The siting criteria identified by FPL in the application include land-use considerations to minimize potential disruption to such areas as national, state, and county parks; wildlife refuges; estuarine sanctuaries; landmarks; and historical sites. FPL states in its application that, in its development of the conceptual transmission line corridor for the Glades alternative site, it attempted to select corridors that would allow collocation with existing transmission line corridors and avoided populated areas or residential land uses to some extent (FPL 2014-TN4058). The State certification review process would also include a determination of land-use consistency with local land-use plans and zoning ordinances (Fla. Stat. 29-403.50665-TN1470).

The review team concludes that the land-use impacts from building and operating two new nuclear units at the Glades alternative site would be noticeable, but not destabilizing.

Cumulative Impacts

Within the geographic area of interest, there are no other reasonably foreseeable future projects with the potential to affect cumulative land-use impacts. The Glades County FLUM does not identify other non-agricultural future land uses near the Glades alternative site, other than the area designated for Transition and Commercial uses noted above that covers the Glades alternative site (Glades County 2010-TN3303).

Summary Statement

Based on the information provided by FPL and the review team's independent review, the review team concludes that the cumulative land-use impacts of building and operating the power plant at the Glades alternative site would be MODERATE. This conclusion primarily reflects the fact that land-use plans do not call for large-scale establishment of industrial or urban land uses in the area surrounding the Glades site. The incremental impact from the proposed project at the alternative site would be a significant, and principal contributor to the MODERATE impacts due to conflicts with the Glades 2020 Comprehensive Plan (Glades County 2010-TN3303).

9.3.2.2 Water Use and Quality

The following impact analysis includes impacts from building and operating two new nuclear units at the Glades site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-6. The Glades site is located in rural Glades County in Florida southwest of Lake Okeechobee and near the Caloosahatchee River, which is also known as the C-43 Canal (Figure 9-6).

The geographic area of interest for surface water at the Glades site is the Kissimmee-Okeechobee-Everglades watershed because this is the resource that would be affected if the proposed project were located at the Glades site. The Kissimmee-Okeechobee-Everglades watershed includes an area of about 9,000 mi^2 (McPherson and Halley 1996-TN98). For groundwater, the ROI includes 1) the surficial aquifer and the Upper Floridan aquifer at the site, 2) the APPZ of the Middle Floridan aquifer upgradient and downgradient of the site for water withdrawals, and 3) the Boulder Zone of the Lower Floridan aquifer upgradient and downgradient of the site for disposal of blowdown water.

Building Impacts

The water use for building activities at the Glades site would be comparable to the proposed water use for building activities for the Turkey Point site. During building, peak water use is estimated to be 565 gpm (0.8 Mgd) (see Table 3-4). The review team assumes that water for building the two units at the Glades site would come from a combination of surface water and groundwater. Surface water from the Caloosahatchee River or Lake Okeechobee may be available for building purposes during times of high surface-water flow. At less than 1 percent of the inflow for even the lowest month reported (January 1963), the peak water-use rate of 0.8 Mgd during the building phase is inconsequential when compared to the historic average monthly flow into Lake Okeechobee. Surface water from onsite stormwater ponds and groundwater from excavation dewatering may also be used, when available, for building purposes. The South Florida Water Management District (SFWMD) would regulate any use of surface water or shallow groundwater for plant construction.

The review team concludes that the impact of groundwater and limited surface-water use for building the potential units at the Glades site would be minimal for the following reasons:

- Withdrawal is inconsequential compared to the water resources in the Lake Okeechobee watershed.
- Any use of surface water or shallow groundwater would be regulated by SFWMD and be limited to time periods when there would not be a negative impact on the Lake Okeechobee system or shallow aquifers.
- Water use for building would be limited to the building period and the peak use of 0.8 Mgd is much less than the average 22.26 Mgd groundwater withdrawal rate reported for Glades County in 2005 (Marella 2009-TN1521).

The review team assumes that the impact of dewatering the excavations needed for building two units at the site would be managed through the installation of diaphragm walls and grouting as is proposed for the Turkey Point site. Therefore, because there would be no use of non-saline groundwater and the impact of dewatering would be controlled, the review team determined that there would be little or no impact on groundwater availability.

Surface-water quality would potentially be affected by stormwater runoff during site preparation and the building of the facilities. The FDEP would require FPL to develop an erosion and sediment control plan and a stormwater pollution prevention plan (SWPPP) before initiation of site-disturbance activities (FPL 2014-TN4058).

The plans would identify BMPs to control the impacts on surface-water quality caused by stormwater runoff. The review team anticipates that FPL would construct new detention/infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to onsite waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and the stormwater would infiltrate into the shallow aquifer. Implementation of BMPs should minimize impacts on surface waterbodies near the Glades site. Therefore, the surface-water−quality impacts near the Glades site would be temporary and minimal.

While building new nuclear units at the Glades site, groundwater quality may be affected by leaching of spilled effluents into the subsurface. The review team assumes that the BMPs FPL has proposed for the Turkey Point site would be in place during building activities and therefore the review team concludes that any spills would be quickly detected and remediated. In addition, groundwater impacts would be limited to the duration of these activities, and therefore, would be temporary. The review team reviewed the general BMPs that could be expected to be required at such a site (State of Florida 2014-TN3637). Because any spills related to building activities would be quickly remediated under BMPs, and the activities would be temporary, the review team concludes that the groundwater-quality impacts from building at the Glades site would be minimal.

Wastewater streams from building activities could be injected into the Boulder Zone of the Lower Floridan aquifer as planned at Turkey Point (FPL 2014-TN4058). Construction and operation of the disposal wells would be performed under the conditions of an Underground Injection Control (UIC) permit issued by the FDEP, with the objective of protecting water quality within the APPZ and overlying aquifers.

Operations Impacts

FPL (2014-TN4058) indicates that the water needed to operate two units would be approximately 50,000 gpm or 72.7 Mgd. As indicated in Chapter 3, evaporative losses from cooling two units would be approximately 28,800 gpm (41.5 Mgd). The review team assumed that the two units at the Glades site would primarily use brackish groundwater from the permeable zone (APPZ) within the Avon Park formation for makeup cooling water. This relatively permeable zone is considered part of the Middle Floridan aquifer and is more than 1,000 ft below ground surface near the Glades site. The SFWMD has informed the NRC that consumptive use of surface water from Lake Okeechobee or its tributaries would be limited (SFWMD 2012-TN3085). Use of water from Lake Okeechobee and the Caloosahatchee River would also have to avoid any negative impact on restoration projects in South Florida. Therefore, surface water from Lake Okeechobee and the Caloosahatchee River could be used only at times of excess surface-water flow that typically occur during the wet season.

The APPZ aquifer is not generally used because of the salinity of its water (FPL 2013-TN3052). Therefore, the current impacts of using this water for power production are minor. Because brackish or saline groundwater is not in demand, use of this resource will not result in water-use conflicts. However, groundwater in the Middle Floridan aquifer at this site is a potential source of brackish water for desalinization. If demand for desalinization source water increases, water for the plant may be obtained from deeper, more saline formations.

Blowdown discharge and other wastewater streams would be pumped into the Boulder Zone of the Lower Floridan aquifer. The Boulder Zone is isolated from the APPZ by low-permeability units. Additional low-permeability confining units separate the APPZ from the overlying Upper Floridan aquifer. Construction and operation of the disposal wells would be performed under the conditions of a UIC permit issued by the FDEP.

As indicated in Chapter 3, the consumptive water use due to evaporative losses from cooling two units would be approximately 28,800 gpm (41.5 Mgd). However, the review team assumed that surface water would only be consumed during periods of excess flow, thereby precluding water-use conflicts.

During the operation of two new nuclear units at the Glades site, impacts on surface-water quality would be minimal because wastes would be injected into the Boulder Zone and not released to the surface water. The FDEP would require FPL to develop a SWPPP (FPL 2014-TN4058). The SWPPP would identify measures to be used to control stormwater runoff. All discharges to surface waterbodies would be required to comply with limits established by FDEP in a NPDES permit.

During the operation of the two units at the Glades site, impacts on groundwater quality could result from potential spills. Spills that might affect the quality of groundwater would be controlled and mitigated by BMPs. Like the proposed site, any wastewater at this inland alternative site would be combined with cooling-tower blowdown and discharged into the Boulder Zone with no loss of beneficial uses of the water resource.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operations activities, cumulative analysis considers past, present, and reasonably foreseeable future actions that affect the same water resources.

For the cumulative analysis of impacts on surface water and groundwater at the Glades site, the geographic area of interest is the same as what was considered for building and operational impacts, and was defined earlier in this section.

Actions that have past, present, and future potential impacts on water supply and water quality near the Glades site include existing agriculture and existing and future urbanization in the region.

<u>Cumulative Impacts on Water Use</u>

The impacts of the other projects listed in Table 9-6 are considered in the analysis included above or would have little or no adverse impact on surface-water use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Glades site, use relatively little or no surface water, or have little or no discharge to surface water. Some projects (for example park and forest management) are ongoing, and changes in their operations that could have large impacts on surface-water use appear to be unlikely.

In 2000, the Florida Legislature passed the Lake Okeechobee Protection Act to establish a restoration and protection program for Lake Okeechobee (SFWMD et al. 2011-TN3087;

SFWMD 2010-TN3086). Part of the focus of this Act was to restore the natural hydrology of the system after years of altering the natural drainage around the lake to permit development of the land and to reduce flood damage. The State of Florida and the Federal government are spending hundreds of millions of dollars to restore the Lake Okeechobee and other water resources in the watershed; therefore, the review team concluded that the cumulative impact on surface-water use would be MODERATE.

Surface-water use during the building and operation of two units at the Glades site would be dominated by water use for operations. As discussed above, surface water would only be withdrawn during periods of excess flow. Therefore, the review team concluded that building and operating the proposed units at the Glades site would not be a significant contributor to the MODERATE impacts on surface-water use.

As stated above, the review team assumed that any use of shallow groundwater to build the units at the Glades site would be regulated by the SFWMD. If this source is not available in sufficient quantity for building activities, brackish groundwater from the APPZ could be used for some building activities. Groundwater impacts from dewatering would be controlled with diaphragm walls and grouting. Brackish groundwater from the APPZ would be used to operate the plant except when excess surface water is available. The APPZ aquifer is not generally used because of the salinity of its water (FPL 2013-TN3052). Because brackish or saline groundwater is not in demand, use of this resource will not result in water-use conflicts.

The impacts of the other projects listed in Table 9-6 are considered elsewhere in this analysis or else would have little or no adverse impact on groundwater use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Glades site, or use relatively little or no groundwater. Some projects (for example park and forest management) are ongoing, and changes in their operations that would have large impacts on groundwater use appear unlikely. Therefore, the review team concludes that cumulative impacts on groundwater use would be SMALL.

Cumulative Impacts on Water Quality

Point and non-point source discharges have affected the surface-water quality of the Lake Okeechobee watershed and the Caloosahatchee River upstream and downstream of the site. Water-quality information presented above for the impacts of building and operating the proposed new units at the Glades site would also apply to evaluation of cumulative impacts. Lake Okeechobee has been the target of extensive efforts to reduce nutrient loading and improve water quality (SFWMD et al. 2011-TN3087). During the operation of two new nuclear units at the Glades site, impacts on surface-water quality from the units would be minimal because plant discharges would be injected into the Boulder Zone and not released to the surface water. The State of Florida requires an applicant to develop a SWPPP (FPL 2014-TN4058) and all discharges to surface waterbodies would be required to comply with limits established by FDEP in a NPDES permit. Such permits are designed to protect water quality. The SWPPP would identify measures to be used to control stormwater runoff (FPL 2014-TN4058). Therefore, the review team concluded that the cumulative impact on surface-water quality of the receiving waterbody would be MODERATE.

The review team concluded that building and operating the proposed units at the Glades site would not be a significant contributor to the MODERATE impacts on surface-water quality, because industrial and wastewater discharges from the proposed units would be discharged directly to the Boulder Zone and any stormwater runoff from the site during operations would be managed in compliance with the SWPPP (FPL 2014-TN4058).

The APPZ aquifer is not generally used because of the salinity of its water (FPL 2013-TN3052). Because brackish or saline groundwater is not in demand, use of this resource will not result in water-use conflicts. The review team also concludes that with the implementation of BMPs, the impacts on shallow groundwater quality from building and operating two new nuclear units at the Glades site would likely be minimal. Therefore, the cumulative impact on groundwater quality would be SMALL. The impacts of other projects listed in Table 9-6 are either considered in the analysis included above or would have little or no impact on surface-water and groundwater quality.

9.3.2.3 Terrestrial and Wetland Resources

This section addresses potential impacts on terrestrial resources from siting two new nuclear units on the Glades site and a transmission line corridor, which begins in Glades County and crosses portions of Hendry, Palm Beach, and Broward Counties. Most of the Glades site has been disturbed and is primarily used for agriculture, especially sugar cane. Small areas are maintained as improved and unimproved pasture. Natural upland habitats that include hardwood forest and coniferous plantations cover only small areas on the site. The remainder includes various wetland habitats including exotic and mixed wetland hardwoods, ditches, wet prairies, freshwater marsh, holding ponds (FPL 2011-TN59).

Glades County hosts multiple terrestrial species that are listed as Federally endangered or threatened (Table 9-8). Surveys were not conducted at the Glades site or along the conceptual transmission line corridor to determine the presence and distribution of listed species. However, surveys were conducted at the formerly proposed FPL Glades Power Park site that has similar topography and habitat (FPL 2014-TN4058). The review team determined the likelihood of occurrence at project sites based on habitat preferences of each species and the land-cover types expected to be affected at Glades site and within the conceptual transmission line corridor. Audubon's crested caracaras (*Polyborus plancus audubonii*), wood storks (*Mycteria americana*), and Everglade snail kites were observed during surveys at the formerly proposed FPL Glades Power Park site, which is located approximately 4 mi north of the Glades site. Life history information for most of these species can be found in Section 2.4.1. Species not previously discussed in this document are discussed below.

Audubon's crested caracara is a raptor that occurs in the United States from Florida west to Arizona, and also in Cuba, Mexico, and Central and South America (FWS 1999-TN136). Only the Florida population is listed in the United States. It forages in open habitats including agricultural fields, pastures, and wet prairies. Audubon's crested caracaras are known to congregate in an area north of US-27 in Glades County in an area of expansive improved pasture (FWS 1999-TN136). The Glades site is south of US-27. Wood storks are colonial nesters that often use historic colonies that are located in trees over water. Wood storks forage in shallow water largely free from vegetation and often use ditches and seasonal water features

(FWS 1999-TN136). Everglade snail kites also prefer to nest over water, but prefer to feed exclusively on apple snails.

Table 9-8. Federally Listed Terrestrial Species that May Occur on the Glades Site or within the Conceptual Transmission Line Corridor

Scientific Name	Common Name	Federal Status
Birds		
Polyborus plancus audubonii	Audubon's crested caracara	Threatened
Ammodramus savannarum floridanus	Florida grasshopper sparrow	Endangered
Rostrhamus sociabilis plumbeus	Everglade snail kite	Endangered
Aphelocoma coerulescens	Florida scrub jay	Threatened
Campephilus principalis	Ivory-billed woodpecker	Endangered
Picoides borealis	Red-cockaded woodpecker	Endangered
Mycteria americana	Wood stork	Threatened
Grus americana	Whooping crane	Endangered
Charadrius melodus	Piping plover[(a)]	Threatened
Calidris canutus rufa	Red knot[(a)]	Threatened
Dendroica kirtlandii	Kirtland's warbler[a]	Endangered
Mammals		
Puma concolor coryi	Florida panther	Endangered
Peromyscus polionotus niveiventris	Southeastern beach mouse[(a)]	Threatened
Reptiles		
Drymarchon corais couperi	Eastern indigo snake	Threatened
Eumeces egregious	Bluetail mole skink	Threatened
Neoseps reynoldsi	Sand skink	Threatened
Invertebrates		
Cyclargus thomasi bethunebakeri	Miami blue[(a)]	Endangered
Strymon acis bartrami	Bartram's scrub-hairstreak[(a)]	Endangered
Anaea troglodyte floridalis	Florida leafwing[(a)]	Endangered
Plants		
Warea carteri	Carter's mustard	Endangered
Cucurbita okeechobeensis ssp. okeechobeensis	Okeechobee gourd	Endangered
Jacquemontia reclinata	Beach jacquemontia[(a)]	Endangered
Polygala smallii	Tiny polygala[(a)]	Endangered
Asimina tetramera	Four-petal pawpaw[(a)]	Endangered

(a) Additional listed species occur in Broward, Palm Beach, or Hendry Counties (FWS 2014-TN3761; FWS 2014-TN3759; FWS 2014-TN3760).

The Florida grasshopper sparrow (*Ammodramus savannarum floridanus*) only occurs in treeless tracts of dry prairie habitat frequented by wildfire (FWS 2008-TN2516). Florida scrub jays (*Aphelocoma coerulescens*) prefer early successional upland shrub-dominated landscapes that historically were maintained by natural wildfire in South Florida. Ivory-billed woodpeckers (*Campephilus principalis*) have historically occurred in extensive old-growth bottomland and wetland hardwood forests (FWS 1999-TN136). This species was believed to be extirpated from

the United States since the 1940s. A reported sighting in 2005 in Arkansas has resulted in the FWS drafting an ivory-billed woodpecker recovery plan (FWS 2010-TN2574). Red-cockaded woodpeckers require forest dominated by pine trees that are generally 60 years in age or older (FWS 1999-TN136). Florida panthers (*Puma (=Felis) concolor coryi*) have been recorded in many different habitat types, including those found on the Glades site. Eastern indigo snakes (*Drymarchon corais couperi*) use a wide variety of habitats including upland habitats, wetlands, and human-altered habitats including agricultural fields. Both the bluetail mole skink (*Eumeces egregius lividus [Mount]*) and sand skink (*Neoseps reynoldsi Stejneger*) occur in dry upland habitats found in sandy soil associated with the Lake Wales Ridge (FWS 1999-TN136) Neither the bluetail mole skink nor the sand skink are known to occur anywhere in Glades County. Carter's mustard is a fire-dependent herb found in dry habitats of the Lake Wales Ridge (FWS 1999-TN136). The Okeechobee gourd (*Cucurbita okeechobeensis*) historically grew under pond apple (*Annona glabra*), elderberry (*Sambucus canadensis*), and buttonbush (*Cephalanthus occidentalis*) trees at sites that had frequent disturbance such as seasonal flooding from Lake Okeechobee and alligator nesting, and within mowed power line and road rights-of-way (FWS 1999-TN136).

The regular use of pesticides and herbicides along with frequent human presence further reduce habitat value for native species in a predominantly agricultural landscape already highly fragmented with few native plants or habitats. Wading birds have been observed using the canals. Wading birds are an ecologically important group in the South Florida ecosystem, and both herons and ibises are considered ecological indicators (FWS 1999-TN136). Wading bird species observed in a similar setting at the FPL Glades Power Park include the cattle egret (*Bubulcus ibis*), green heron (*Butorides virescens*), great egret (*Ardea albus*), glossy ibis (*Plegadis falcinellus*), least bittern (*Ixobrychus exilis*), great blue heron (*Ardea herodias*), black-crowned night-heron (*Nycticorax nycticorax*), and yellow-crowned night-heron (*N. violaceus*). Wetlands in the surrounding landscape also provide habitat much more suitable for wading birds and other wildlife species than the canals present on the Glades site.

Recreationally important species observed at the FPL Glades Power Park and also expected to occur on the Glades site include white-tailed deer (*Odocoileus virginianus*), feral hog (*Sus scrofa*), raccoon (*Procyon lotor*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), mourning dove (*Zenaida macroura*), and bobwhite quail (*Colinus virginianus*). Waterfowl are also hunted in Florida and numerous species could occur in suitable habitats on the Glades site.

Building Impacts

Typical impacts from building nuclear units include permanent and temporary habitat loss from development, habitat fragmentation and degradation, disturbance and displacement of individuals, exposure of wildlife to increased noise levels and human presence, and increased risk of vehicle collision mortality. The conversion of fully developed and stable plant communities to earlier successional communities dominated by lower growing vegetation during development of linear transmission or pipeline corridors often results in a high degree of habitat fragmentation within the landscape.

FPL assumed a 362 ac area within the Glades site for evaluating the potential impacts of building two new nuclear power reactors and associated infrastructure and an additional

3,000 ac for a cooling-water storage reservoir (FPL 2014-TN4058) (see Figure 9-6). The review team determined cooling water could be obtained from groundwater beneath the Glades site and that the cooling-water storage reservoir was unnecessary. FPL stated offsite facilities and development would also be needed to construct and operate nuclear power plants at the Glades site. FPL estimated a 121 mi transmission line would be necessary to service power plants at the Glades site. FPL also assumed a 1.9 mi access road, 6.2 mi rail line, and pipeline corridors connecting the C-43 Canal to the site (assumed cooling-water source) would be necessary.

Impacts from the plant area, access road, rail line, and pipeline corridors are discussed first below. Impacts from the transmission line are discussed in a separate section below. The access road would contribute 23 ac to the project footprint; the rail line would contribute 75 ac; and the intake/makeup pipeline corridors would contribute 3.4 ac.

Plant Facilities

If the plant facilities, access road, rail line, and pipelines were built within the proposed footprint, FPL estimated 464 ac would be affected (Table 9-9). Approximately half (243 ac) of this area is currently used for row crops. With the inclusion of other field crops as well as improved and unimproved pastures, agricultural lands cover 64 percent (297 ac) of the proposed footprint. Wetlands cover an additional 30 percent (141 ac) of the proposed footprint and include exotic and mixed wetland hardwoods, ditches, wet prairies, and freshwater marshes. The remainder (26 ac) is conifer plantation, upland hardwood forest, or existing roads and highways.

Table 9-9. Acreage within the Conceptual Footprint at the Glades Site

FLUCFCS Code	Description	Site and Non-Transmission (ac)	Transmission (ac)
200-series	Agriculture	297	3,966
300-series	Uplands	0	108
400-series	Forest	26	91
500-600 series	Wetlands	141	1,627
800-series	Developed	0.1	32
Total		464	5,824

Source: FPL 2011-TN59

Surveys of the occurrence, abundance, and distribution of Federally listed species have not been performed for the Glades site. Audubon's crested caracaras, wood storks, and Everglade snail kites were observed during surveys at FPL's formerly proposed Glades Power Park site, which is nearby and in a similar landscape. The Glades site appears to provide habitat suitable for Audubon's crested caracara, including 37 ac of improved pasture. Wood storks may also use the ditches and wetlands for foraging. The 9.5 ac of freshwater marsh may be used by foraging storks as well as Everglade snail kites. However, it does not appear there is habitat suitable for nesting present for any of these three listed bird species. Florida panthers are known to occur in Glades County and may also occur on the Glades site, but they generally prefer upland habitats over wetlands and use native landscapes more than agricultural fields (FWS 1999-TN136). White-tailed deer, feral hogs, and many other medium-sized mammals are prey for Florida panthers. Although their abundance and distribution is unknown at the Glades site, their presence may indicate suitable habitat is present for panthers. The fragmented natural habitat and agricultural nature of the Glades site would likely preclude substantial use by

Florida panthers, but the site lies very near the eastern boundary of the FWS-designated primary dispersal zone. Florida panthers may pass through the site while dispersing to more suitable habitats to the north, especially if prey is in abundance. Eastern indigo snakes are habitat generalists, widely distributed, and likely occur on the Glades site. They would be prone to increased mortality from off-road vehicle use during land clearing and increased traffic during construction and operation. Limited distribution and/or lack of suitable habitat likely preclude the occurrence of the other listed species on the Glades site.

Although the Florida grasshopper sparrow has historically occurred in Glades County, it has not been observed there in recent years (FWS 2008-TN2516). The Florida scrub jay may currently occur in Glades County, but distribution information indicates this species is restricted to areas within the county west of the Glades site (FWS 2007-TN2517). High-quality forested wetlands are present on the Glades site, but large contiguous forested wetlands of the type that might harbor remnant individuals of ivory-billed woodpecker are not present. The Glades site contains both upland forest and conifer plantations, but the extent of forest and degree of forest fragmentation within the general landscape makes these habitats poorly suited to red-cockaded woodpeckers (*Picoides borealis*). The Lake Wales Ridge is not near the Glades site, excluding the occurrence of the blue mole skink, sand skink, and Carter's mustard (*Warea carteri*). The Okeechobee gourd is now limited to nine sites outside of Glades County (FWS 1999-TN136). Therefore, it is the staff's conclusion that Audubon's crested caracara, the wood stork, Everglade snail kite, Florida panther, and the eastern indigo snake could occur at the Glades site.

Potential foraging habitat for the caracara, stork, kite, and panther would be permanently lost during site preparation at the Glades site. Approximately 39 ac of both improved and unimproved pasture potentially suitable for caracaras would be lost. Lost ditch and freshwater marsh habitat that storks could forage in would total 19 ac. If apple snails are present in the wetland habitats within the Glades site, kites could lose less than 10 ac of habitat. The loss of 9.7 ac of upland forest and habitats that support panther prey and the subsequent loss of prey could also affect Florida panthers. However, the Glades site does not provide nesting or breeding habitat for any of the listed species and the suitability of these habitats would likely be low due to fragmentation within the landscape from agricultural development. Eastern indigo snakes could use most of the Glades site, and would likely be affected the most by preconstruction activities. Because they use burrows, they are also prone to direct mortality during preconstruction activities such as land clearing and grading. Snakes in general are also prone to vehicle collision mortality, and increased traffic could increase the risk of death to eastern indigo snakes on local roads. As with construction and operation at the Turkey Point site, mitigation requirements by the Florida Fish and Wildlife Conservation Commission (FFWCC) including staff awareness training and reporting would minimize negative impacts on the eastern indigo snake. Loss of habitats would also affect local populations of wildlife not Federally listed, but expected to occur within the region in suitable habitat. However, these effects are not expected to be noticeable and would not destabilize even local populations of any of these animals.

Transmission Lines and Access Roads

FPL stated offsite facilities and development would also be required to construct and operate nuclear power plants at the Glades site. The conceptual transmission line corridor is estimated to occupy 5,824 ac of additional land (Table 9-9). Because the conceptual transmission line corridor would pass through Glades, Hendry, and Broward Counties and could also pass through Palm Beach County, depending on the exact route ultimately selected, the review team also considered impacts on Federally listed species and those species proposed for Federal listing known to occur in those counties. Similar to the Glades site, the major land cover within the conceptual corridor is agriculture. Most of the corridor is used for agricultural purposes, including field crops, row crops, citrus groves, and pastures. Wetlands, including freshwater marsh, mixed wetland hardwoods, and wet prairies, account for much of the remainder of the conceptual corridor. There are also some areas of upland habitats, including improved pasture and dry prairie, and others (FPL 2014-TN4058). Forested areas would be converted to more open habitats with low ground cover including grass (FPL 2014-TN4058).

FPL estimated approximately 1,780 ac of potential Audubon's crested caracara habitat would be altered within the conceptual transmission line corridor (FPL 2011-TN59). Approximately 1,037 ac of potential wood stork habitat would also be altered. Alteration of 995 ac of wetland habitats, including 902 ac of freshwater marsh, could affect the Everglade snail kite. Removal of trees could affect the quality and quantity of nesting habitats for these three bird species. The likelihood of non-native plants being accidentally introduced would also increase and could result in habitat alteration. Conversion of uplands into open habitats to accommodate the transmission right-of-way could increase foraging habitat for the caracara. The sum of remaining natural, upland habitats that would be crossed by the conceptual transmission line corridor and that could provide habitat value to panther's amounts to almost 150 ac or approximately 2.5 percent of the corridor (FPL 2011-TN59). Alteration of natural land cover from agricultural conversion has highly fragmented the landscape north of Everglades National Park. This conversion and fragmentation not only reduces the amount of natural habitats usable by Florida panthers, it further reduces the value of habitats still present.

Two large swaths of land designated as Everglade snail kite critical habitat lie between the Glades site and the Andytown substation. A gap between these two swaths approximately 1.25 mi wide lies at the intersection of I-75 and SR-27 in Broward County. If the transmission line is built through this gap, then impacts on this critical habitat could be avoided. If not, then adverse impact on designated critical habitat for the Everglade snail kite could result. FPL would be expected to reduce and mitigate for increased mortality risk as well as lost habitat for listed species as required by the FFWCC and FWS. Effects from building the transmission lines would not be expected to result in a measurable decrease in the productivity of most local populations except possibly local populations of the Everglade snail kite. Impacts on designated critical habitat could measurably affect the snail kite and recovery efforts to save the species from extinction.

Operations Impacts

The operation of two nuclear units at the Glades site would create noise, fogging and dissolved solid deposition from cooling towers, runoff from increased impermeable surfaces, light

pollution, and increased vehicle collision mortality of local wildlife populations. Operation of transmission lines could increase the risk of bird collision and electrocution mortality.

Operational noise from the cooling towers would only displace individual animals from the immediate vicinity of the cooling towers, as the use of splash guards on air inlets and stacks on mechanical fans would limit cooling-tower noise to approximately 73 dBA at a distance of 200 ft from the cooling towers (FPL 2014-TN4058). The review team determined the salinity of the groundwater used for cooling would be less than or equal to that of seawater and salt deposition from cooling-tower drift at the Glades site would be similar in scale and intensity to deposition at the Turkey Point site. Most of the salt would likely be deposited on developed land near the cooling towers, and concentrations as high as 10 kg/ha/mo that have resulted in observable effects on sensitive plant species could be expected as far as 1.25 mi from the cooling towers. Unlike Turkey Point, the Glades site is located inland, and vegetation growing there would not be expected to be as tolerant to atmospheric-deposited salt. Some sensitive vegetation could be affected by salt drift, but the spatial extent would be limited and the climate of South Florida would quickly dissipate salt deposited in the landscape.

The creation of impermeable surfaces at the Glades site would likely result in the concentration of stormwater runoff into surrounding wetlands. Increased runoff could result in siltation, pollutant deposition, and decreased habitat value of these areas to local natural communities.

Light pollution during facility operation could affect wildlife residing on or migrating through the Glades site. Design criteria could include minimization of upward lighting, turning off unnecessary lighting between 11 p.m. and sunrise, and luminary selection and mounting to provide light only where needed (FPL 2014-TN4058). If these actions are taken, the review team expects that impacts from light pollution on wildlife would be minimal.

The impacts of transmission line operation consist of bird collisions with transmission lines, electromagnetic field (EMF) effects on flora and fauna, and habitat alteration by vegetation control. Direct mortality resulting from birds colliding with tall structures has been observed (Avatar et al 2004-TN892). Factors that appear to influence the rate of avian impacts with structures are diverse and related to bird behavior, structure attributes, and weather. Migratory flight by flocking birds during darkness has contributed to the largest mortality events. Tower height, location, configuration, and lighting also appear to play roles in avian mortality. Weather, such as low cloud ceilings, advancing fronts, and fog, also contribute to this phenomenon. Waterfowl may be particularly vulnerable due to their low, fast flight and flocking behavior (EPRI 1993-TN73). However, in NUREG–1437, the NRC staff concluded that the threat of avian collision as a biologically significant source of mortality is very low because only a small fraction of total bird mortality could be attributed to collision with nuclear power plant structures, including transmission line corridors with multiple transmission lines (NRC 1996-TN288). Although collision may contribute to local losses, thriving bird populations can withstand these losses without threat to their existence (EPRI 1993-TN73). Transmission line structures, conductors, and guy wires all pose a potential avian collision hazard for all resident birds that live in the vicinity of the transmission lines and for migratory birds that may pass through these areas. At least 41 species of birds are known to have been killed by interaction with Florida electrical utility structures, 20 of which have been killed by FPL electrical utility structures (FPL 2011-TN1283). Transmission lines connecting the Glades site to the Andytown substation

would pass through core foraging areas of multiple wood stork nesting colonies (FWS 2014-TN3732). Although the NRC has concluded that bird collisions with transmission lines at existing U.S. nuclear power plants are of small significance, including transmission line corridors with variable numbers of transmission lines (NRC 2013-TN2654), the Federally listed wood stork, whooping crane (*Grus canadensis*), and Audubon's crested caracara are particularly prone to transmission line collision mortality and members of all of these species have been killed by collision with and electrocution by electrical utility structures in Florida (FPL 2011-TN1283). Wading birds are not particularly agile flyers and many large bird species are especially uncoordinated when young. Wood storks also routinely perch on tall structures, and their large wing span could pose an increased risk of electrocution by bridging the gap between live wires and ground circuits.

The FWS Southeast Florida Ecological Services Office recognizes a 0.47 mi nest colony buffer. The FWS also recommends the establishment of at least a 500 ft primary zone around stork nesting colonies where no vegetation should be removed. Wetland vegetation under and surrounding the colony shall be maintained. Power-transmission lines, roadways, and other infrastructure should not be built within the primary zone. Also, humans should not get within 300 ft of the colony and human activity patterns should not be changed when storks are present at the colony. FWS also recommends the establishment of a secondary zone that extends 1,000 to 2,000 ft beyond the primary zone. The FWS also recommends that transmission lines not be built within 1 mi of stork nest colonies to lower the probability of low-flying stork strikes. FWS guidelines drafted to address management of the wood stork foraging habitat recommend an 18.6 mi core foraging area management zone around all known wood stork colonies that have had active nests within the last 10 years in South Florida. Human activity should be restricted within 300 ft of forage sites when storks are present and no closer than 750 ft if there is no vegetation to screen human activities from feeding storks (FWS 2010-TN226). It is not known whether the conceptual transmission line corridor contains any wood stork colonies or is within the range of the various protection distances (300 ft–18.6 mi) recognized by the FWS.

If construction and operation were to occur at the Turkey Point site, FPL would be required by the FWS and FFWCC to conduct numerous activities and actions to minimize impacts on wood storks, and it is reasonable to assume the same requirements would apply for the use of the Glades site. Among these activities and actions are preconstruction and post-construction flight surveys of known wood stork nesting colonies to determine the flight corridors of fledging wood storks. FPL would be expected to conduct pre-clearing aerial surveys of transmission line corridors if nesting by wading birds is confirmed to occur within 0.5 mi of proposed transmission line corridors. FPL would be expected to conduct post-construction monitoring during the breeding season after transmission line installation near wood stork colonies. Monitoring would include carcass searches and flight behavior observation near operating transmission lines. FPL had proposed to evaluate the loss of wood stork foraging habitat within designated core foraging areas that would be intersected by transmission line corridors emanating from the Turkey Point site if the plants were located there. Impacts on suitable foraging habitats from building at Turkey Point would require mitigation (FWS 2010-TN226) and the staff assumed these requirements would also occur if needed at the Glades site. Audubon's crested caracaras have also been electrocuted by electric utility structures in Florida (FPL 2011-TN1283), so installation and operation of transmission lines through caracara habitat could also increase the

risk of electrocution mortality to this species. Mitigation to dissuade large birds from perching on transmission structures would benefit caracaras. Operational effects on other important species would be minimal.

FPL stated field surveys would be conducted for listed species as part of the permitting process before any preconstruction activities (FPL 2014-TN4058). Preconstruction activities would be conducted in accordance with all Federal and State regulations, permit conditions, good construction practices, and BMPs, including the use of directed drainage ditches and silt fencing. Acreage within the conceptual transmission line corridor was minimized to the extent possible by using the most direct route while avoiding areas with important resources and high biological value. FPL also stated that any Glades site wetland functions affected would be replaced or restored.

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NRC 2013-TN2654). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NRC 2013-TN2654). The impacts of EMFs on terrestrial flora and fauna are of small significance at operating nuclear power plants, including transmission line systems with variable numbers of power lines and lines energized at levels less than 765 kV (NRC 2013-TN2654). Since 1997, more than a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2005-TN1329). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2005-TN1329). Therefore, the incremental EMF impact posed by operation of existing transmission lines and the addition of new lines for two new nuclear units would be negligible at the Glades alternative site.

Transmission line corridor vegetation-management activities (cutting and herbicide application) and related impacts on floodplains and wetlands in transmission line corridors are of minor significance at operating nuclear power plants, including those with transmission line corridors of variable widths (NRC 2013-TN2654). Consequently, the incremental effects of transmission line corridor maintenance and associated impacts on floodplains and wetlands for two new nuclear units would be negligible at the Glades site.

Cumulative Impacts

The geographic area of interest for the assessment of the potential cumulative impacts of building and operating a new reactor at the Glades site and other past, present, and reasonably foreseeable future actions on terrestrial resources and wetlands is defined as a 50 mi radius around the Glades site. A list of past, present, and reasonable foreseeable actions within 50 mi of the Glades site is presented in Table 9-6. This list includes a variety of energy-production projects, stone mining, manufacturing, transportation and infrastructure-development projects, set-aside areas for recreation and conservation, CERP-related projects, and other miscellaneous activities that could affect terrestrial and wetland resources.

Past land use in South Florida, especially agriculture and more recently urbanization, has greatly affected the distribution and abundance of unfragmented plant and wildlife habitats still

remaining. Development and urbanization of higher elevation lands for energy, infrastructure, and manufacturing projects have further reduced the amount of pine flatwoods and other remaining upland habitat. Ditching and draining created more dry land, reducing the amount of wetlands available as habitat. The continued operation and maintenance of existing facilities would likely not exacerbate the current situation with respect to terrestrial and wetland ecosystems. New mining activities have the potential to expand their footprint and development in general on the landscape, as does continued human population growth in South Florida. Lands set aside for recreation and conservation provide buffers against development, provide habitat for plants and animals, and serve to preserve fragments of the ecosystem of South Florida. Projects that continue to incrementally reverse changes in land cover due to man-made changes in surface water flow, including CERP-related activities, would continue to benefit the terrestrial and wetland ecology of the region.

As described in Chapter 7, terrestrial and wetland environments in South Florida may also be affected by continued population growth and related development. The overall impact from past, present, and reasonably foreseeable future activities on regional terrestrial and wetland ecology is substantial.

Summary Statement

Most land cover in the Glades site landscape is already converted to agriculture. Approximately 140 ac of wetland and 26 ac of upland habitats would be permanently lost including high-quality forested wetlands. Although most of the conceptual transmission line corridor is currently used for agriculture, installation and operation of a 121 mi long transmission system could affect an undefined subset of the 1,627 ac of wetlands and nearly 200 ac of uplands contained within the conceptual transmission line corridor. Although the entire corridor would not be developed and all lands lost as habitat, some portion would be lost to pole installation, access road development, or altered to low-growing vegetation. Substantial amounts of ecologically valuable land-cover types would be affected and include freshwater marsh, wet prairies, and mixed wetland hardwoods. Intact habitats that reside in an already fragmented landscape would be fragmented further. Substantial amounts of potentially suitable habitat for Audubon's crested caracara, the wood stork, and Florida panther would be altered.

Based on the information provided by FPL and the review team's independent evaluation, the review team concludes that the cumulative impacts on terrestrial and wetland resources of building and operating two new nuclear units at the Glades alternative site, including impacts attributable to permanent conversion of habitat for the facility footprint as well as operation of the cooling towers and transmission lines would be MODERATE. The incremental effect of the building and operation of two new nuclear units at the Glades site would be a significant contributor to this impact primarily because of the proposed length of the transmission line corridor.

9.3.2.4 Aquatic Resources

What follows is an assessment of the potential impacts on aquatic resources that may occur if the two nuclear reactors described by FPL (2014-TN4058) were constructed and operated at the Glades alternative site. Based on a review of potential cooling-water sources discussed in

Section 9.3.2.2, the review team assumes no cooling ponds or reverse osmosis facilities would be required for the Glades site. Unless otherwise noted, the information presented in this section was obtained from FPL's ER, Revision 6 (FPL 2014-TN4058).

The Glades site is an undeveloped greenfield site in the southeastern portion of Glades County that encompasses approximately 3,000 ac of primarily agricultural land. The site is located just north of the C-43 Channel (Caloosahatchee Canal) and Lake Hicpochee, and is approximately 5 mi southwest of Lake Okeechobee (Figure 9-4). The size and elevation of Lake Hicpochee is directly influenced by the water-management activities occurring at Lake Okeechobee to maintain the existing Lake Okeechobee level. Lake Hicpochee also receives stormwater from Lake Okeechobee during storm events. Thus, Lake Hicpochee may support aquatic biota during the wet season, while resembling a sandy desert plain during the dry season. For this assessment, the review team assumes FPL would use groundwater as a primary water source for reactor cooling, supplemented by additional water from the C-43 Channel during high surface-water flow periods using a conventional intake structure. Cooling-tower blowdown would be injected into the Boulder Zone.

The C-43 Channel connects to Lake Okeechobee just east of the Glades site, and likely contains aquatic resources that are similar to the lake. Lake Okeechobee is the largest lake in Florida, and the center of South Florida's regional water-management system, providing commercial and sport fisheries, flood control, and a source of potable and irrigation water. The lake encompasses over 730 mi^2, and has an average depth of about 9 ft (FFWCC 2013-TN2842). Desired lake elevations (stages) are between 12.5 ft and 15.5 ft (USACE and SFWMD 2009-TN2848). Major natural tributaries to the lake are Fisheating Creek, Taylor Creek, and the Kissimmee River. Approximately 70 percent of the water entering the lake is associated with these tributaries; rainfall accounts for the remaining 30 percent. Evaporation accounts for about 70 percent of the water loss, and the remaining water exits the lake through engineered outfalls (FFWCC 2013-TN2842).

As described in Section 2.4, water-management practices in South Florida over the past 100 years have dramatically changed the regional hydrology and sheet-water flow, and influenced the aquatic plants and animals in the area. Creation of levees, canals, and channels to support agriculture and development has confined Lake Okeechobee to a smaller area than historically present, and resulted in a variety of water-management activities to maintain the lake level during the dry season and reduce flooding during the wet season. Lake Okeechobee and the connecting rivers, canals, channels, and engineered outfalls are also greatly affected by weather events. During the hurricane season of 2004, Hurricanes Frances and Jeanne created high water surges of over 18 ft, and created turbid conditions that affected submerged aquatic vegetation; the drought of 2006 lowered the level of Lake Okeechobee to an all-time record of 8.82 ft msl (FFWCC 2013-TN2842). Currently, the USACE is responsible for managing water levels in Lake Okeechobee between 12.5 and 15.5 ft NGVD (National Geodetic Vertical Datum of 1929) to balance flood control, public safety, navigation, water supply, and public health (SFWMD 2012-TN2883).

Based on the information provided by FPL (2014-TN4058), the facility footprint at the Glades site will encompass approximately 362 ac. Although the affected area is primarily farmland, building activities have the potential to directly or indirectly affect aquatic resources present in

small streams or ponds at or near the site. Installation of the water-intake structure for intermittent cropping of water in the C-43 Channel may temporarily affect resident aquatic biota, and the construction of a water pipeline to the site may temporarily affect surface-water habitats. As described by FPL (2014-TN4058), approximately 121 mi of transmission lines encompassing 5,823 ac may also affect aquatic resources in areas where the transmission lines support structures or access roads are adjacent to surface-water habitats. During the operation of the nuclear reactors, cooling water obtained from two intake structures on the C-43 Channel during high-flow periods creates the potential for impingement and/or entrainment of aquatic biota present in the channel, or those entering the channel from Lake Okeechobee. Because Lake Okeechobee and the rivers, streams, channels, and canals in the vicinity of the Glades site are highly connected, it is assumed the biota present in the lake are indicative of the aquatic resources that might be affected by the building and operation of two nuclear reactors, as described below.

Commercial and Recreational Species

As noted above, the review team assumes the fish and invertebrates present in the Lake Okeechobee would be representative of species occurring in the C-43 Channel and other surface water habitats near the lake, given the hydrological connections that are present. Recreational species present in Lake Okeechobee include Largemouth Bass (*Micropterus salmoides*), Black Crappie (*Pomoxis nigromaculatus*); commercial fishing also occurs for various species of catfish (Ictaluridae) and bream (*Lepomis* spp.).

Important Species

The USACE (2013-TN2847) reports 69 species of fish present in Lake Okeechobee and the Okeechobee Waterway, ranging from small forage fish like the Threadfin Shad (*Dorosoma petenense)* and Inland Silversides (*Menidia beryllina)* to larger predatory species like the Largemouth Bass and Black Crappie (*P. nigromaculatus*). Electrofishing studies conducted by the FFWCC at 21 stations during the fall of 2011 yielded 34 species. Dominant species based on abundance, were Bluegill (*L. macrochirus*), Redear Sunfish (*Lepomis microlophus*), Largemouth Bass, Inland Silverside, and Gizzard Shad (*D. cepedianum*). Dominant species based on biomass were Largemouth Bass, Striped Mullet (*Mugil cephalus*), Bluegill, Florida Gar (*Lepisosteus platyrhincus*), Bowfin (*Amia calva*), Redear Sunfish, and Channel Catfish (*Ictalurus punctatus*). Lake-wide trawl sampling from 2005 to 2011 resulted in the capture of 3,281 fish. Dominant species by abundance were Threadfin Shad, Bluegill, White Catfish (*Ameiurus catus*) and Black Crappie. Dominant species based on biomass were White Catfish, Bluegill, Black Crappie, Florida Gar, Channel Catfish, Threadfin Shad, and Redear Sunfish (Zhang and Sharfstein 2013-TN2894).

Lake Okeechobee also supports a wide variety of benthic invertebrates. Because the restoration of Lake Okeechobee is one of the primary goals of CERP, a 3-year project funded by SFWMD was conducted by FFWCC to establish pre-CERP environmental conditions in the lake. During the 2005 to 2008 study period, sampling was conducted at 18 stations during wet and dry seasons. A total of 118 aquatic invertebrate taxa representing 28 major taxonomic group were collected. Samples were numerically dominated by oligochaete worms and larval

chironomid midges. Pelecypod, amphipods, gastropods, and isopods were also observed in the samples (Warren et al. 2009-TN2846).

Non-Native or Nuisance Species

Of the 69 fish species present in Lake Okeechobee, the USACE (2013-TN2847) noted 17 species were non-native, including several species of catfish, carp, tilapia and cichlids. Additional information about exotic species is provided in the Lake Okeechobee Protection Program Exotic Species Plan, which includes the lake and 39 surrounding hydrologic basins identified in the Lake Okeechobee Surface Water Improvement and Management Plan (SFWMD 2003-TN2852). Exotic plants identified in the plan included hydrilla (*Hydrilla verticillata*), waterhyacinth (*Eichornia crassipes*), and waterlettuce (*Pista stratiotes*). Exotic aquatic animals identified in the plan included Blue Tilapia (*Oreochromis aureus*), Asian swamp eel (*Monopterus albus*), spiny water flea (*Daphnia lumholtzii*), Asiatic clam (*Corbicula fluminea* or *C. manilensis*), and Sailfin Catfish (*Pterygoplichthys multiradiatus*). Work by Harvey et al. (2010-TN3158) has shown that up to 70 percent of the fish community within a canal system may be composed of non-native species, and that the canals can also act as a conduit that enables invasive species to colonize new areas. Given the hydrological connections that exist in and around Lake Okeechobee, many or all of the above species could be present at or near the Glades site.

Federally and State-Listed Species and Critical Habitat

Federally and State-listed aquatic species present in Glades County that could occur at or near the Glades site include the endangered Florida manatee (*Trichechus manatus latirostis*), the threatened American crocodile, and the threatened American alligator (*Alligator mississippiensis*); the alligator is listed because of its similarity in appearance to the American crocodile (FNAI 2013-TN2850). Detailed information about these species is found in Section 2.4.2. Critical habitat for manatee and crocodile is not present at the Glades site, but the manatee consultation area includes Lake Okeechobee (FWS 2003-TN2916).

Building Impacts

Building-related impacts on aquatic species are unlikely at the Glades site, because the majority of the land required for the facility footprint is currently used for farming and agriculture. Some existing drainage ditches that support a seasonal population of some of the fish species listed above may be adversely affected. Building of the surface-water intake on the C-43 Channel may result in short-term increases in water turbidity, and some disturbance of the shoreline area, but it is expected these impacts would be temporary and minor, and addressed primarily by the use of BMPs discussed by FPL (2014-TN4058). Installation of the transmission line system necessary to connect the new facility to the power grid would disturb approximately 5,000 ac of agricultural land, with limited aquatic resources expected to be present. Building activities are not expected to affect the recreational and commercial aquatic resources in Lake Okeechobee or the C-43 Channel, or any Federal or State-listed species that may occur at or near the building area. FPL has also indicated that field surveys for listed species would occur before land preparation or building activities occurred. Building activities related to the facility and transmission line systems would be conducted in accordance with State and Federal regulations, permits, and BMPs. Installation of the intake structure would use turbidity curtains, silt screens,

or similar technology to minimize impacts. The use of BMPs during tower erection and conductor installation would minimize building-related impacts along transmission line corridors.

Operations Impacts

Based on the review team assumptions described above, the majority of the water required to operate the cooling-water system for the two nuclear facilities at the Glades site would be obtained from groundwater resources, limiting the potential for impingement or entrainment of aquatic biota to periods of surface-water use. During times of excess surface-water flow that typically occurs during the wet season, supplemental water would be obtained from a surface-water intake located in the C-43 Channel. Impingement and entrainment of organisms from the intake canal would be the most likely operational impacts on aquatic populations that would occur. Assuming a closed-cycle cooling system and compliance with the EPA's 316(b) Phase I requirements for intake structures (66 FR 65256) (TN243), the intake is considered protective of aquatic life. The anticipated impacts attributed to impingement and entrainment are considered by the review team to be minimal. Furthermore, the intakes would likely be only operated intermittently throughout the year when excess surface water is available. Impingement or entrainment that does occur should not result in noticeable changes to aquatic biota species composition or abundance. Because cooling-tower blowdown would be discharged into the Boulder Zone of the Lower Floridan aquifer via deep-injection wells, surface-water resources would not be adversely affected. There is no available information about biological communities that may be present in the Boulder Zone formations near the Glades site, so it is not possible to determine whether a complete exposure pathway is present or assess potential biological effects. Thus, the potential risk of chemical exposure to aquatic resources resulting from discharge of cooling-tower blowdown cannot be determined. Based on an NRC assessment of a similar cooling system proposed at the Levy site in western Florida using brackish saltwater for cooling-tower makeup water (NRC 2012-TN1976), cooling-tower drift impacts on aquatic resources would likely be minimal, because deposition would be expected to occur primarily on plant property or adjacent agricultural lands. No detectable increase in surface-water salinity resulting from salt-drift deposition is anticipated.

Cumulative Impacts

A list of past, present, or reasonably foreseeable projects in the vicinity of the Glades site is presented in Table 9-6. As shown in the table, a wide variety of energy, mining, transportation, and restoration projects exist within the vicinity of the Glades site that have the potential to noticeably alter the surrounding landscape and affect plant, animal, and human populations. In addition, a variety of parks, wildlife refuges, and recreational areas are and will continue to provide both protection for wildlife and recreational opportunities for residents and visitors to South Florida. The operational or proposed regional energy facilities are powered by coal, oil, natural gas, biofuels, or solar energy. Collectively, these projects occupy land that was previously drained and channelized, as discussed in Section 2.4.2. Continued operation of these facilities may affect aquatic biota through interference with natural drainage patterns and consumptive water use. Rock-mining activities have the potential to negatively affect terrestrial and wetland species during excavation processes. However, rock mining may provide limited benefits to some aquatic species through the creation of new habitat after mining activities are completed.

As discussed above, the presence of parks, preserves, refuges, and natural areas will provide a net positive benefit to aquatic biota by maintaining or enhancing existing populations, providing recreational opportunities to residents and tourists, and ensuring that the potential impact of new projects near these areas are protective of the environment. Specific projects listed in Table 9-6 with the potential to provide a positive environmental benefit to aquatic resources are associated with the ongoing CERP. Examples include a proposed project to increase water-storage capacity in the C-43 Basin (USACE and SFWMD 2014-TN3009); a project to improve the timing, quantity, and quality of freshwater flows into the Caloosahatchee River estuary (USACE and SFWMD 2014-TN3010); and various regional projects to improve surface-water management and reduce damaging flood releases (USACE and SFWMD 2014-TN3013; USACE and SFWMD 2014-TN3011; 78 FR 1164 [TN2991]). In addition, a proposed project to increase aquatic and wildlife habitat, regulate extreme fluctuations in Lake Okeechobee elevations, and reduce nutrient loading will likely improve water quality in adjacent canal systems as well as coastal areas east and west of the Glades site (USACE and SFWMD 2014-TN3015). As discussed in Section 7.3.2, aquatic environments in this region of South Florida may also be affected by continued population growth and related development. Overall the review team concludes that the cumulative impacts on aquatic resources in the vicinity of the Glades site would be MODERATE.

Summary Statement

Based on a review of the information provided by FPL and the review team's independent assessment, it is likely the building and operation of a nuclear generating plant at the Glades site would contribute only minimally to the cumulative effects on aquatic species likely to occur in that portion of South Florida. Although the building of nuclear units at the Glades site would displace some existing agricultural land, surface-water habitats would be likely minimally affected. During the normal operation of the plant, groundwater would be used for reactor cooling, and deep aquifer discharge of cooling-tower blowdown would be employed, eliminating the need for conventional surface-water intake and discharge structures. During periods of excess surface-water flow, cooling water from the C-43 Channel (Caloosahatchee Canal) would be withdrawn for cooling. Some impingement and entrainment losses would be expected; however, assuming a closed-cycle cooling system and compliance with the EPA's 316(b) Phase I requirements for intake structures (66 FR 65256) (TN243), the intake is considered protective of aquatic life and the anticipated impacts attributed to impingement and entrainment are considered minimal. Furthermore, the intakes would likely be only operated intermittently throughout the year when surface water is available. Impingement or entrainment that does occur should not result in noticeable changes to aquatic biota species composition or abundance. Thus, the review team concludes that the cumulative impacts of building and operation of two new nuclear reactors at the Glades site, combined with the other past, present, or reasonably foreseeable future activities on aquatic resources would be MODERATE, but building and operating two new nuclear units at the Glades site would not be a significant contributor to the MODERATE impact.

9.3.2.5 Socioeconomics

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect socioeconomics, including other Federal and non-Federal projects listed in Table 9-6.

For the analysis of socioeconomic impacts at the Glades site, the geographic area of interest is considered to be the 50 mi region centered on the Glades site with special consideration of Glades, Hendry, Highland, Lee, and Okeechobee Counties because that is where the review team expects socioeconomic impacts to be the greatest. In evaluating the socioeconomic impacts of site development and operation at the Glades site near Moore Haven in Glades County, the review team used readily obtainable data from the Internet or published sources. Impacts from both building and station operation are discussed.

Physical Impacts

People who work or live around the site would be exposed to noise, fugitive dust, and gaseous emissions from building and operations activities. Noise, dust, and air-pollution emissions generated within the boundaries of the Glades site would be expected to be similar to those for the Turkey Point site. Because the surrounding site is rural and sparsely populated and because noise and air-pollution impacts are attenuated by distance, members of the surrounding population exposed would be relatively few and the impacts would be expected to be negligible. Best practices and applicable regulations would be expected to protect building workers and personnel working onsite. Truck and vehicle traffic related to building and operations would generate noise, fugitive dust, and gaseous emissions offsite. In addition, offsite structures include a transmission line and intake/makeup pipelines (FPL 2014-TN4058). Because the area affected by offsite structures would be rural and sparsely populated and because FPL would be expected to implement a dust-control plan similar to that for the Turkey Point site, noise and air-pollution impacts from these offsite activities would be expected to be minor.

Based on FPL's conceptual site layout for the Glades site (FPL 2011-TN59) and on aerial photography, there is one structure within the boundaries of the proposed site. There are also agricultural crops that would be lost. Offsite project-related building activities include construction of an access road and widening of 1.9 mi of SR-78, and a 6.2 mi railway. The impact on road quality based on any road improvements made by the applicant to facilitate project-related traffic would only affect a small population base, and therefore that impact would be minor and beneficial. Offsite project-related building activities also includes construction of a 121 mi transmission line, and intake/makeup pipelines (FPL 2014-TN4058). The conceptual design of these activities routes them, to the extent possible, along existing rights-of-way and avoids populated areas and residences (FPL 2014-TN4058). The physical impacts on existing structures and crops within the proposed site and offsite areas for supporting infrastructure would be minimal.

The area around the site is relatively flat, sparsely populated, and is used mainly as farmland. Building would use cranes (which could exceed 400 ft in height) and would alter the regional viewscape. Construction of the transmission lines would pose similar impacts. The power plant and water-intake facilities would likely be visible from several angles and contrast highly with the present viewscape. Building and operation would noticeably alter the aesthetics of the area. Because of the sparse population, the negative impact would likely not interfere with the daily routine of local public around the Glades site and would not destabilize the aesthetic characteristics of the area.

Based on the information provided by FPL (2014-TN4058) and the review team's independent analysis, the review team concludes that the overall physical impacts of building activities and operations would be minor and adverse, with the exceptions of minor and beneficial impacts on road quality and noticeable but not destabilizing adverse aesthetic impacts near the Glades site.

Demography

The Glades site is located in Glades County, 2.0 mi west of Moore Haven (2012 population 2,700) and 45 mi east of Fort Myers (2012 population 63,427), the closest population center with more than 25,000 residents (FPL 2014-TN4058; USCB 2012-TN4098). The population distribution within and around the Glades site is typically rural with low population densities. There are 11 counties within the 50 mi area, but the review team estimates the areas in which workers would most likely live and from which they would commute are within Glades, Hendry, Highland, Okeechobee, Palm Beach, and Lee Counties, based on current commuter patterns[(8)] (USCB 2011-TN4078). For the purposes of assessing potential socioeconomics impacts, the review team excluded Palm Beach County as a potential area of residence for construction and operation workers: the main residential areas in this county are along the coast, in cities such as West Palm Beach (at nearly a 2-hour driving distance), which would be less likely to accommodate workers than closer communities, such as Fort Myers, in Lee County. Because the population of Palm Beach would be over 60 percent of the population of the six counties together, the impacts would be distorted by the inclusion of Palm Beach County in the potential area of residence. The remainder of the analysis focuses on the five-county area encompassing Glades, Hendry, Highland, Okeechobee, and Lee Counties.

FPL estimated the peak number of workers during building would be 3,983, including 33 operation workers. The review team assumed that the share of construction and operation workers relocating from outside the five-county area would be 87 percent of the estimated peak number of workers. This assumption was reached by using the assumption made for the proposed Turkey Point site as a reference and assuming that the share of workers that would come from outside the region is inversely proportional to the population of the region[(9)] (USCB 2009-TN3395). As described in Section 4.4, 70 percent of the construction workforce and 100 percent of the operation workforce that moved to the area were assumed to bring their families. Based on these assumptions, a peak of 3,437 construction and 29 operation workers would relocate to the area during the project construction phase, and 2,435 of these workers would bring their families. Based on an average household size of 3.25 people, the total increase in population attributable to the peak total workforce at the Glades site would be 8,946 people. An influx of 8,946 people represents a 1.1 percent increase in the five-county 2012 population of 814,289.

(8) Over 80 percent of the workers in Glade County currently reside in one of these six counties (USCB 2011-TN4078).

(9) The proposed Turkey Point site analysis assumed 50 percent of the peak workers would come from outside the 50 mi region and that 83.3 percent of them would reside in Miami-Dade County; i.e., 41.65 percent (0.5 × 0.833) of the peak workers would migrate into Miami-Dade County. Because the population of the five-county area is approximately 32 percent of that of Miami-Dade County (814,289/2,512,219; USCB 2012-TN4098), the review team assumed the share of peak workers migrating into the five-county area would be 1-(0.32 × 0.4165) ≈ 87 percent.

FPL estimated the total onsite operations workforce to be 806 workers. As explained above, the review team assumed that 87 percent of these workers (702) would relocate from outside the five-county area. For this analysis, the review team assumed that 100 percent of operation workers who relocate would bring their families. Based on an average household size of 3.25 people, the total population increase attributable to project operations is 2,282 (702 × 3.25) people. This represents a 0.3 percent increase in the five-county area.

The review team concluded that the impact on the local demography would not be noticeable.

Economic Impacts on the Community

Economy

FPL estimated the peak number of workers during building would be 3,983, including 33 operation workers. Employment of 3,983 construction and operation workers would have positive economic impacts in the five-county area. Based on a multiplier of 1.7604 jobs (direct and indirect) for every construction job and 2.3016 for every operation job, 3,983 new construction and operation jobs would create 3,047 indirect jobs, for a total of 7,030 new jobs in the five-county area during peak employment (3,950 × 1.7604 + 33 × 2.3016) (FPL 2011-TN56).[10] This represents a 2.0 percent increase in the total employment in the five-county area.[11] Peak employment would last 1 month and the average employment generated during the 10-year building period would be about half of that of peak employment. This added employment would generate added earnings to the economy of the five-county area, but the added employment and earnings would not be noticeable to most of those living or working in the area.

An estimated 806 workers would be required for the operation of two nuclear power facilities. Based on a multiplier of 2.3016 jobs (direct and indirect) for every operations job at the new units (FPL 2011-TN56), an influx of 806 workers would create 904 indirect jobs for a total of 1,855 new jobs in the region. This represents a 0.5 percent increase in the total employment in the five-county area. This added employment would also generate added earnings to the economy of the five-county area, but the added employment and earnings would not be noticeable to most of those living or working in the area.

Taxes

State corporate income taxes and sales and use taxes paid at the Glades site during construction and operations of the proposed units would be similar to those paid by the same units at the proposed Turkey Point site. As discussed in Sections 4.4 and 5.4, State taxes paid by the proposed units would not exceed 2 percent of the annual collected State corporate income and sales and use taxes. The impact would be minor and beneficial. County surtax rates in the five-county area are typically 1 percent, with the exception of Lee County, for which the rate is zero percent (FDOR 2014-TN3393). County surtax collections from the proposed units would be highest during construction when annual expenses related to the proposed units

(10) Multipliers are for a four-county area (excluding Highlands County) and are used as an approximation.
(11) Employment of 348,759 (BLS 2013-TN4085)

would be estimated to reach up to $1.56 billion (Section 4.4). A 1 percent sales surtax would generate $15.6 million in revenues for the five-county area.[12] This would correspond to approximately 1.1 percent of total County revenues in the five-county area for 2012.[13] The impact would be minor and beneficial. County and school district governments in Florida may levy taxes up to 10 mills each (1 percent) in property taxes (FDOR 2012-TN459). If the value of property taxes for the two nuclear reactors at the Glades site were the same as the value estimated for Units 6 and 7 at the Turkey Point site in Section 5.4.3.2, FPL would pay $20 million in property taxes to the Glades County School District and $20 million to Glades County. These payments would correspond to up to 1.7 times the Glades County School District 2011-2012 total revenues ($20 million compared $11.7 million) (FLDOE 2012-TN3391) and 0.8 times the Glades County 2011-2012 total revenues ($20 million compared to $26.3 million) (FLDFS 2013-TN3392). Because property taxes paid to school districts are reallocated through Florida's Education Finance Program, the benefit to the Glades County School District would be diluted to some extent, and the exact amount distributed to each school district is not known at this time. Because of the value of project-related property tax payments relative to current property taxes, the review team considers the impacts on tax revenues to both the Glades County School District and Glades County to be substantial and beneficial

The review team concluded that the economic impact would not be noticeable and would be beneficial, with the exception of property tax revenues to Glades County and to the Glades County School District, which would be beneficial and substantially alter current property tax levels in Glades County and the Glades County School District.

Infrastructure and Community Service Impacts

Traffic

Workforce access to the Glades site would occur through US-27 coming from the east and the west, and from the north through SR-78. The review team estimated the current level of service (LOS) of these roads at three Florida Department of Transportation (FDOT) traffic-monitoring sites based on the peak hour directional traffic and FDOT LOS thresholds. Peak hour directional traffic information was obtained from FDOT Florida Traffic Online (FDOT 2013-TN3558) and consists of the Annual Average Daily Traffic (AADT) at each traffic-monitoring site, a Standard Peak Hour Factor (K) and a Directional Distribution Factor (D). The multiplication of these three elements (AADT × K × D) provides an estimate of the current peak hour directional traffic volume. The LOS was determined comparing this peak hour directional traffic volume with the maximum thresholds for each LOS in Table 9 (areas less than 5,000 population) of FDOTs Generalized Service Volume Tables (FDOT 2013-TN3297). The review team used FDOT's 2011 LOS Reports by County (FDOT 2011-TN3557) to determine the correct classification of each road for the purposes of identification of the appropriate threshold in the Generalized Service Volume Tables (e.g., whether the road should be considered highway or a freeway; whether the area should be considered rural developed or rural undeveloped). Based on the procedure described above, the LOS at all three traffic-monitoring sites is B. To estimate

(12) To the extent that some of the expenditures would be made in Lee County, and to the extent that the sales surtax rate in that County is kept at zero, the total sales surtax collected would be smaller.
(13) $1,405 million (FLDFS 2013-TN3392).

the project impact on the traffic LOS during the project's peak workforce building period, the review team followed a methodology similar to that described in Section 4.4: The peak workforce of 3,983 construction and operation workers were divided into two shifts, with 70 percent assigned to shift 1 (6:00 a.m. to 4:30 p.m.) and 30 percent to shift 2 (5:00 p.m. to 3:00 a.m.). The hour of peak commuting traffic would be 4:30 p.m. to 5:30 p.m. The review team also assumed up to 36 trucks per hour. The project-related directional traffic during the peak commuting hour would be 2,824 vehicles (70 percent × 3,983 + 36). The review team assumed that one-third of the project-related traffic would come from each of the three directions—east, west, and north[14] (USCB 2011-TN4078). The results of this analysis are presented in Table 9-10 below. The additional building traffic would keep the roadway at a LOS classification of B in the western direction, and drop it to a LOS classification of C in the eastern direction. The LOS classification at the northern portion of SR-78 would drop the roadway to a LOS classification of D. The proposed widening of SR-78, however, would allow the LOS classification to remain at a B.

Table 9-10. Peak Workforce Traffic LOS Analysis for the Glades Site

Traffic-Monitoring Site	Baseline Peak Hour Directional Traffic	Baseline LOS	Distribution of Project-Related Peak Traffic	Added Peak Hour Directional Traffic	Peak Hour Directional Traffic with Project	LOS with Project
US-27 west of site	376	B	0.33	932	1,308	B
SR-78 north of site	145	B	0.33	932	1,077	D (B)[a]
US-27 east of site	533	B	0.33	932	1,465	C

(a) LOS with proposed widening of road.

Source: Review team calculations based on FDOT 2011-TN3557, FDOT 2013-TN3558 and FDOT 2013-TN3297

FPL estimated the total onsite operations workforce to be 806 workers. If access of this workforce to the Glades site were distributed among the three directions equally, the LOS at each of the three monitoring sites would remain at B.

Based on the above analysis, the review team concludes that the impact of building and operations of the proposed nuclear reactors at the Glades site would be minor, after widening of SR-78, although noticeable on US-27 east of the site during the building phase.

Recreation

The Glades site is located approximately 11 mi from Lake Okeechobee and the Lake Okeechobee Scenic Trail that circles the lake. The lake is used for boating, fishing, and duck hunting, and the scenic trail is used for hiking and bird watching (Palm Beach County 2013-TN3298). The Nicodemus Slough is located at approximately 5 mi north of the site. Other parks and recreational areas exist within the county. The influx of project-related population to the five-county area would increase the number of local users of recreational facilities. Because the in-migrating population would be less than 2 percent of the local population, the review team expects the impact on current recreational infrastructure to be negligible.

(14) Based on U.S. Census Bureau commuter patterns (USCB 2011-TN4078) it was not possible to determine the likely direction of outgoing project-related traffic.

Housing

The review team estimates that 3,466 construction and operation workers would migrate into the five-county area, and each of these workers would need a place to live. Based on American Community Survey 2008–2012 5-Year estimates, within the five-county area, there are 466,004 housing units of which 156,022 are vacant (33.5 percent). This includes housing that is designated as seasonal, recreational, or occasional use (USCB 2012-TN4089). The review team estimates that, in absolute numbers, the available housing would be sufficient to house the construction workforce. The in-migrating construction and operation workforce would occupy no more than 2.3 percent of vacant housing units in the five-county area. FPL estimated that approximately 806 workers would be needed for operation of two nuclear power facilities at the Glades site, and the review team assumed that 87 percent of these workers (702) would relocate from outside the region and would settle in the five-county area. Based on these assumptions, the entire operations workforce would occupy no more than 0.5 percent of vacant housing units in the five counties. The review team concludes that impact on housing would be minor.

Public Services

In-migrating construction workers and plant operations staff would also likely affect local municipal water, wastewater-treatment facilities, police and fire-protection services, and other public services in the region. These impacts would be expected to be in proportion with the demographic impacts experienced in the region. In-migration to the five-county area would represent an estimated 1.1 percent of the local population (less during operations). The review team concludes that the impact on public services would be minor.

Education

Based on data for the 2011-2012 school year, there are approximately 109,547 full-time equivalent students in public schools in the five-county area[15] (FLDOE 2013-TN3299). The review team estimated that 3,466 construction and operation workers would migrate to the area, and that 2,435 workers would bring a family. Based on an estimate of 0.8 school-aged children per family (Malhotra and Manninen 1981-TN1430), an estimated 1,948 (2,435 × 0.8) school-aged children would be migrating into the five-county area. This would yield a 1.8 percent increase in the student population. During operations, the review team assumed that 702 operation workers and their families would relocate from outside the region. This would include an estimated 562 (702 × 0.8) children in the PK-12 school range. This influx of students would increase the student population in the five-county area by 0.5 percent. The review team concludes that impact on education would be minor.

Based on the information provided by FPL (2014-TN4058) and the review team's independent analysis, the review team concludes that the overall infrastructure and community service impacts of building activities and operations at the Glades site would be minor except for noticeable, but not destabilizing adverse impacts on traffic.

(15) Full-time equivalent (FTE) is a measure of enrollment based on the number of full-time students that it would take to fill the number of classes offered.

Cumulative Impacts

In addition to the socioeconomic impacts from building and operations of the proposed project at the Glades site, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could have socioeconomic impacts.

The socioeconomic impacts of past and present actions in the affected area are largely captured by the current baseline conditions used for analysis above of project impacts. For example, the impacts of past and present actions on the demography and economy of the area are largely captured by current baseline data on population, employment, and tax revenues, and are incorporated in the baseline and trend assessments of the Regional Input-Output Modeling System (RIMS II) multipliers.

Reasonably foreseeable future actions are listed in Table 9-6. Several of these future actions would be expected to have cumulative socioeconomic impacts with the proposed project at the Glades site. The Southeastern Renewable Fuels Biorefinery and Cogeneration Plant is proposed for Hendry County, approximately 20 mi southeast of the Glades site. During construction the plant would generate local employment and earnings and construction traffic on nearby roads. When operational, it would purchase sorghum from adjacent agricultural fields, also generating local employment and earnings, and also generating truck traffic, particularly during harvest (FDEP 2010-TN3394). The Herbert Hoover Dike Rehabilitation Project and Dam Safety Modification Study will likely generate some local expenditures in the affected area. Other proposed projects that would generate employment and earnings during construction and operations include various proposed CERP water projects. The Florida Southeast Connection pipelines proposed through Highlands, Okeechobee, and Martin Counties (construction 2016–2017; FSC 2014-TN3301) would not pass close enough to the Glades site to contribute to the a cumulative socioeconomic impact.

Summary Statement

The cumulative impact of the projects identified above with the proposed project at the Glades site would depend largely on the timing of construction, when employment and earnings impacts are expected to be highest. However, based on the location of the identified future projects and their magnitudes, the cumulative socioeconomic impacts would be expected to be SMALL and adverse; with the exception of MODERATE adverse physical impacts on roads, aesthetics, and traffic. However, as a result of road improvements there would be a SMALL beneficial physical impact on road quality near the Glades site The staff expects LARGE and beneficial impacts of property tax revenues to Glades County and to the Glades County School District. Building and operating two new nuclear units at the Glades alternative site would be a significant contributor to the MODERATE adverse impacts.

9.3.2.6 Environmental Justice

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect environmental justice, including other Federal and non-Federal projects listed in Table 9-6.

The 2008–2012 American Community Survey block groups were used to identify minority and low-income population distributions in the area (USCB 2012-TN4098). The census data for Florida characterizes 15.9 percent of the population as Black; 0.3 percent as American Indian or Alaskan Native; 2.5 percent as Asian; 0.1 percent as Native Hawaiian or other Pacific Islander; 2.6 percent as other single minorities; 2.2 percent as multiracial; 22.5 percent as Hispanic ethnicity; and 42.2 percent as aggregate minority. There are 611 block groups within 50 mi of the Glades site. Following the criteria described in Section 2.6.1, Black minority populations exist in 64 block groups; American Indian or Alaskan Native minority populations exist in 1 block group; Asian minority populations exist in 5 block groups; other race minority populations exist in 31 block groups; multiracial minority populations exist in 2 block groups; ethnic Hispanic minority populations exist in 99 block groups; and aggregate minority populations exist in 180 block groups. There are no block groups containing Native Hawaiian or other Pacific Islander minority populations within 50 mi of the Glades site. Three Indian Reservations lie within 50 mi of the Glades site: the Brighton Indian Reservation, the Big Cypress Indian Reservation, and a portion of the Miccosukee Indian Reservation. The locations of the aggregate minority populations and Indian Reservations within 50 mi of the Glades site are shown in Figure 9-7. The locations of Hispanic minority populations and Black minority populations within the 50 mi of the Glades site are shown in Figure 9-8 and Figure 9-9, respectively.

The U.S. Census Bureau (USCB) data characterize 15.3 percent of Florida residents as low income (USCB 2012-TN4098). Out of a possible 611 block groups within 50 mi of the Glades site, 91 block groups contain low-income populations. The locations of the low-income populations within 50 mi of the Glades site are shown in Figure 9-10.

The NRC's environmental justice (EJ) methodology includes an assessment of affected populations of particular interest or with unusual circumstances, such as minority communities that are exceptionally dependent on subsistence resources or identifiable in compact locations (e.g., Native American reservations) and those that have a high density of minority or low-income groups. Based on literature research, the review team did not identify high-density minority or low-income presence near the site, nor differentiated subsistence consumption of natural resources by EJ populations of interest.

The analyses of impacts of building and operating new nuclear reactors at the Glades site identified noticeable adverse impacts on land use, terrestrial and wetland ecosystems, aesthetics, traffic, and historic and cultural resources. The review team did not identify any special pathways through which any impacts would disproportionately affect EJ populations of interest. Therefore, the review team concluded there would be no disproportionately high and adverse impacts on EJ populations of interest.

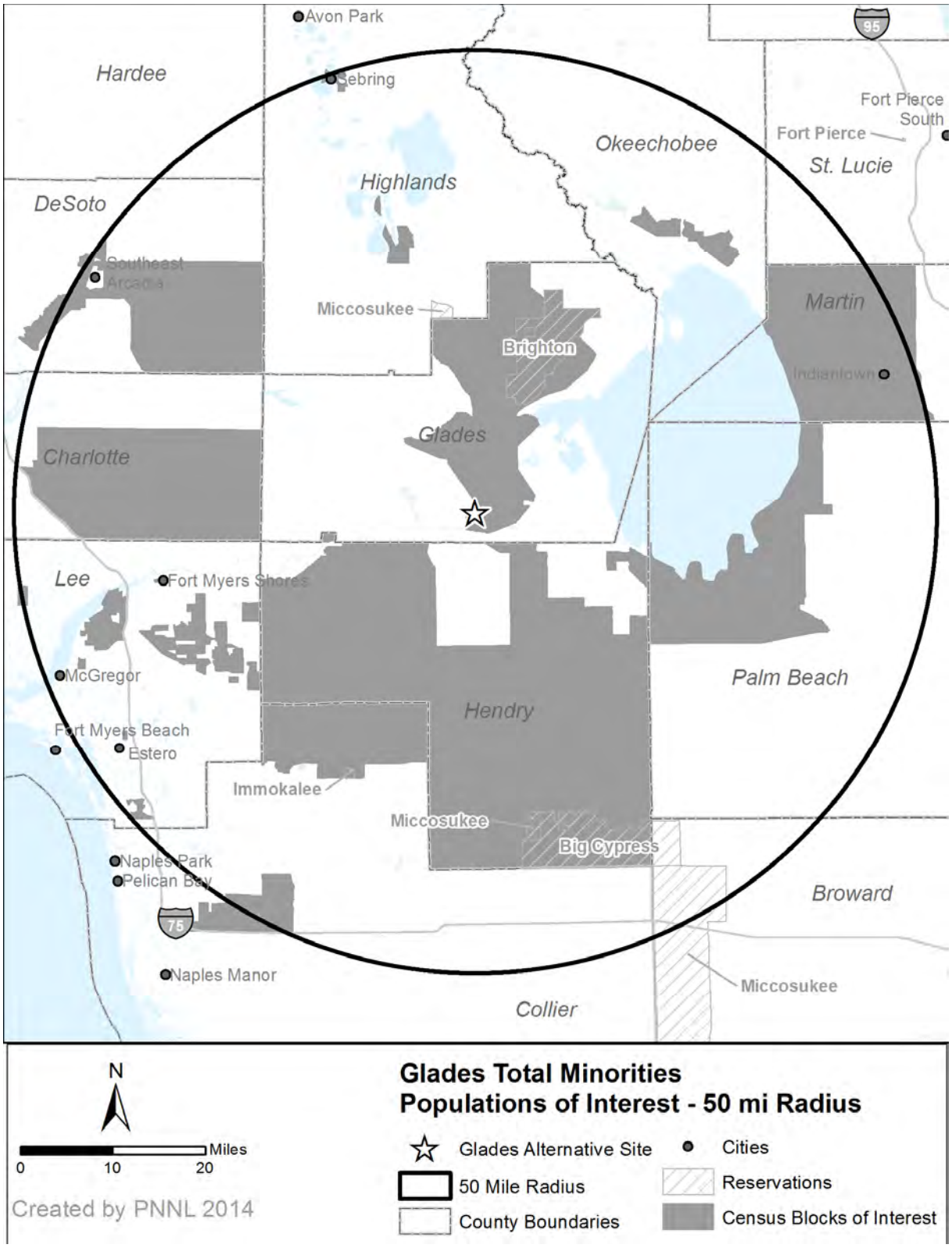

Figure 9-7. Aggregate Minority Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Glades Alternative Site

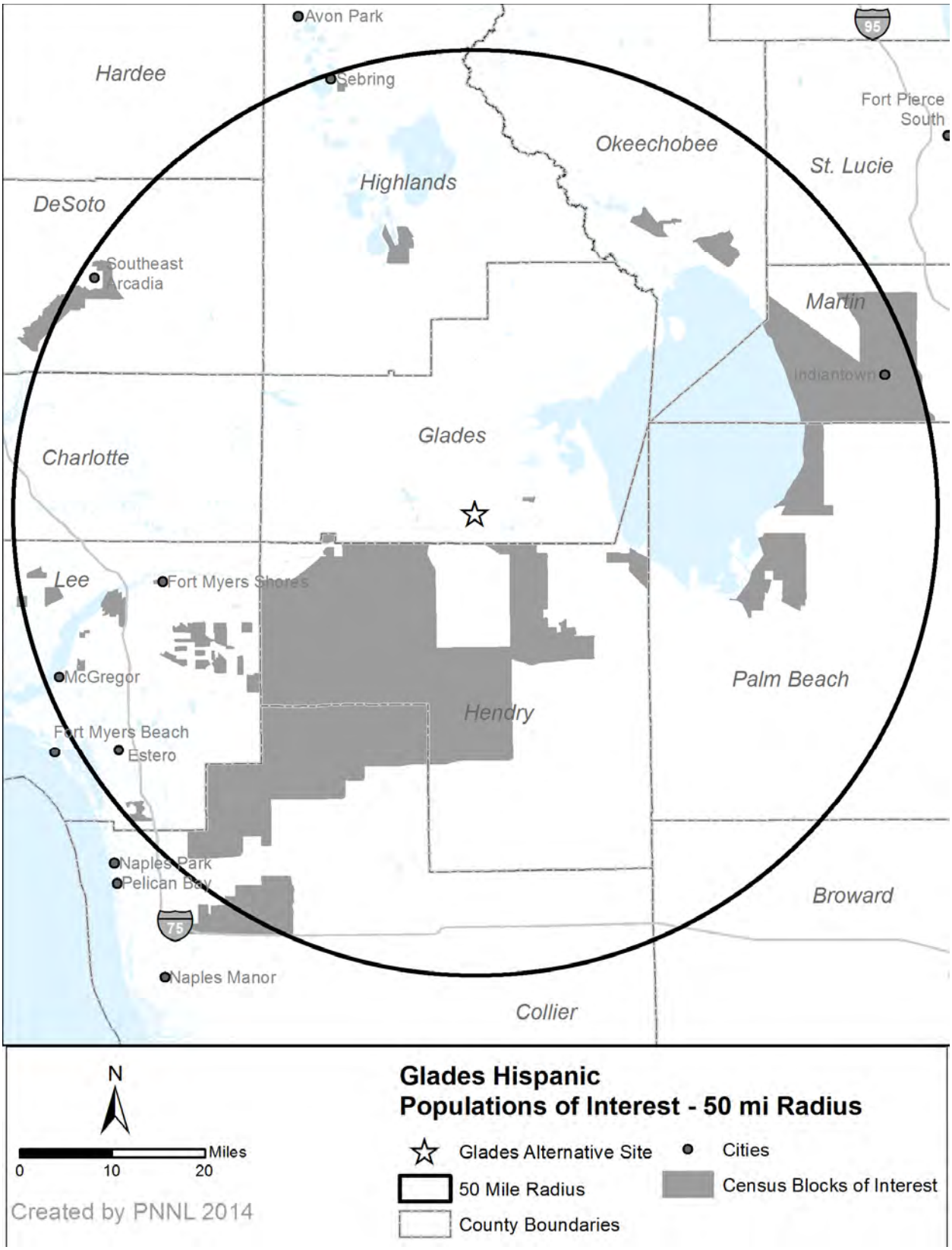

Figure 9-8. Hispanic Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Glades Alternative Site

Figure 9-9. African American Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Glades Alternative Site

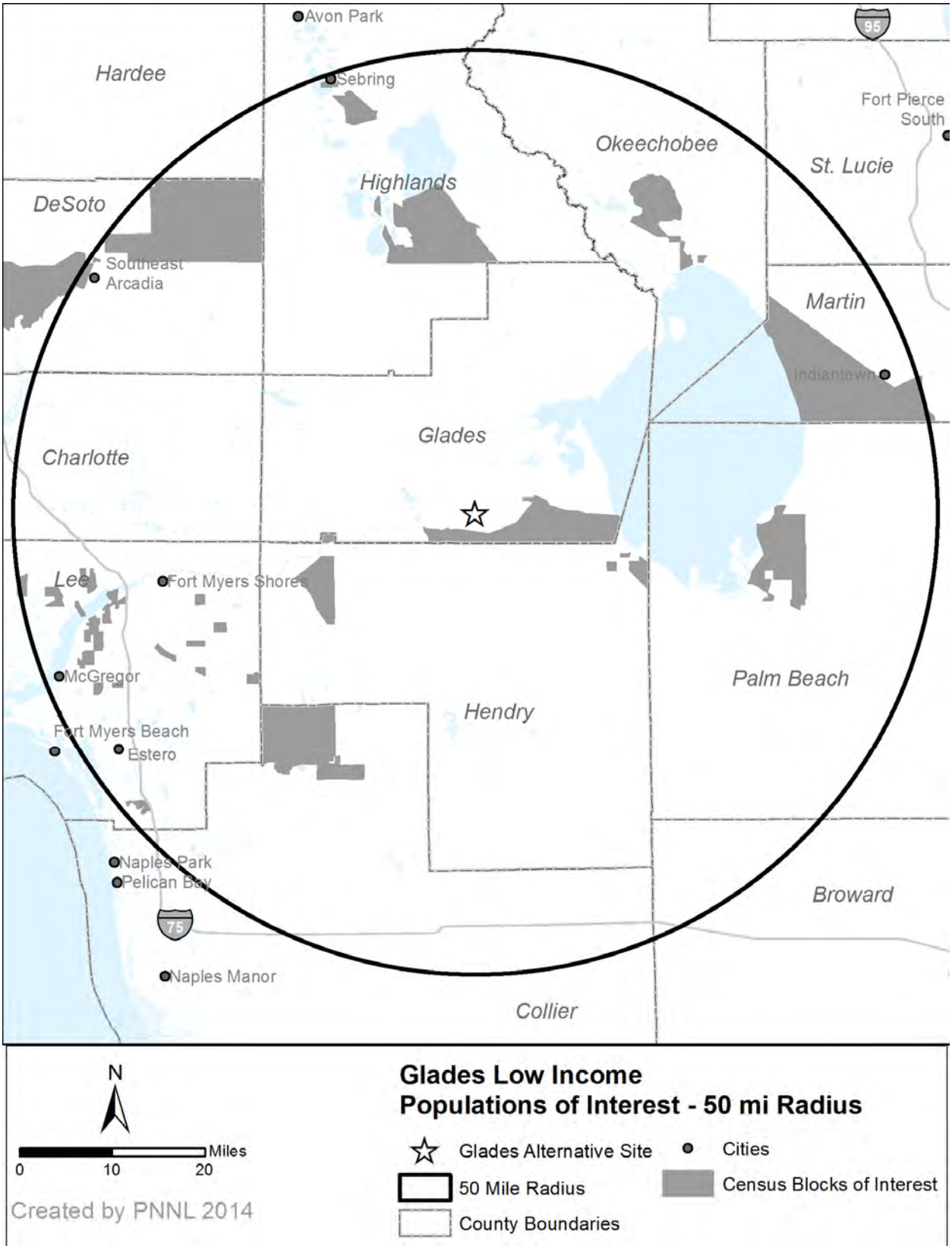

Figure 9-10. Low-Income Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Glades Alternative Site

Cumulative Impacts

In addition to the EJ impacts from building and operations of the proposed project at the Glades site, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could have EJ impacts. Based on a literature review of past and present actions in the affected area, and based on the reasonably foreseeable actions listed in Table 9-6, the review team found no evidence that the cumulative effects would disproportionately affect EJ populations.

9.3.2.7 Historic and Cultural Resources

The following cumulative impact analysis addresses building and operating two new nuclear generating units at the Glades site. The analysis also considers other past, present, and reasonably foreseeable future actions that could affect cultural resources, including other Federal and non-Federal projects and the projects listed in Table 9-6. For the analysis of cultural impacts at the Glades site, the geographic area of interest is considered to be the Area of Potential Effect (APE) that would be defined for this proposed undertaking. This includes the direct effects APE, defined as the area physically affected by the site-development and operation activities at the site and transmission line corridors. The indirect effects APE is defined as the area visually affected and includes an additional 0.5 mi radius APE around the transmission line corridors and a 1 mi radius APE around the cooling towers.

Reconnaissance activities in a cultural resource review have particular meaning. Typically, they include preliminary field investigations to confirm the presence or absence of cultural resources. However, in developing this EIS, the review team relied upon reconnaissance-level information to perform its alternative site evaluation in accordance with ESRP 9.3 (NRC 2000-TN614). Reconnaissance-level information consists of data that are readily available from agencies and other public sources. It can also include information obtained through visits to the site area. The following information was used to identify the historic and cultural resources at the Glades site:

- NRC Alternative Sites Visit, July 2010 (NRC 2010-TN3304)
- FPL ER Revision 6 (FPL 2014-TN4058)
- Florida Historical Markers program (FDHR 2014-TN3875)
- National Register of Historic Places database (NPS 2014-TN3879).

The approximately 3,000 ac Glades site occurs in predominantly agricultural land. Historically, the Glades site and vicinity have remained largely undeveloped. Over time, the area has been disturbed by low-impact development including agriculture and low-density rural development, and it likely contains intact archaeological sites and other cultural resources associated with the past 10,000 years of human settlement. A search of the National Register shows that two significant historic districts are located within 10 mi of the Glades site (FPL 2014-TN4058; NPS 2014-TN3879). These two resources are the Glades Moore Haven Downtown Historic District and the Glades Moore Haven Residential Historic District, located several miles away. A total of 61 properties was found in four counties in the vicinity of the Glades site—Glades, Lee, Okeechobee, and Hendry Counties. A National Register search of the indirect effects APE for the proposed transmission line corridor shows that only the two properties noted above, the

Glades Moore Haven Downtown Historic District and the Glades Moore Haven Residential Historic District, are located along the route, though still outside the indirect effects APE. Numerous historic properties are located within the urban coastal area of Broward County, toward the southeastern end of the transmission line corridor, but these occur more than 10 mi from the APE.

A search of the Florida Historical Markers Program revealed that there are two historic markers in Glades County (FDHR 2014-TN3875). One is for the "Lone Cypress" and Everglades Drainage in the city of Moore Haven. The marker is near the two Glades Moore Haven Historic Districts. The other is for the hurricane of 1924, and is located about 10 mi to the west of the Glades site.

In 2006, FPL conducted background research for a proposed project located north of the Glades site (FPL 2014-TN4058). That work identified five prehistoric sites and one prehistoric archaeological district in the vicinity of that project, but none has been evaluated for National Register eligibility. The resources include primarily prehistoric habitation sites and burial mounds, as well as the Fort Center Archaeological District, which contains numerous prehistoric archaeological sites and a historic period Seminole War fort. None of these resources has been evaluated for eligibility for listing in the National Register. In addition, a historic district, the Herbert Hoover Dike, dating to the 1930s, is located in the area and has been determined eligible for listing in the National Register, but it is not listed. None of these resources is located within the direct effects APE of the Glades site, but they do indicate that archaeological sites and historical resources are located in the area.

In addition, there are three Indian Reservations in the area. These include the Brighton Seminole Indian Reservation in Glades County approximately 12 mi to the northeast of the Glades site, the Big Cypress Seminole Reservation in Hendry and Palm Beach Counties, approximately 33 mi to the southeast, and the Miccosukee Indian Reservation 5 mi farther south in Broward County. A portion of the proposed transmission line for the Glades site passes through the northern portion of the Big Cypress Seminole Indian Reservation, and within 5 mi of the Miccosukee Indian Reservation, but in this area the proposed transmission line follows an existing transmission line corridor.

While there are no known historic properties located within the direct effects APE of the Glades site, reconnaissance-level information shows that there are cultural, historic, and archaeological resources in the general vicinity of the site, including two historic districts located a few miles from the property (though outside the direct and indirect effects APE) and potentially significant archaeological resources associated with Lake Okeechobee, including burial mounds. No archaeological or architectural surveys have been conducted at the Glades site, and locating the nuclear plants there would require formal cultural resources survey and consultation with the State Historic Preservation Office (SHPO), Tribes, and other interested parties. If any significant cultural, historic, or archaeological resources are identified, the project could cause adverse effects and appropriate mitigation measures would need to be put in place before construction and operation.

Building Impacts

To accommodate the building of two nuclear units and associated facilities at the Glades site, FPL estimates that the total area of land that would be disturbed would involve approximately 362 ac for the facility footprint. In addition, a 1.9 mi long paved road and a 6.2 mi long railroad spur would need to be constructed in the predominantly agricultural land (FPL 2014-TN4058). Further, portions of SR-78 would need to be widened. An additional 3.4 ac would be required for pipelines and associated facilities (FPL 2014-TN4058). If the Glades site were chosen for the proposed project, identification of cultural resources would be accomplished through additional cultural resource surveys and consultation with the SHPO, Tribes, and interested parties. The results would be used in the site-planning process to address cultural resources impacts. If significant cultural resources were identified by these surveys, the review team assumes that FPL would use the same protective measures used at the Turkey Point site, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land-clearing, excavation, and grading activities could potentially destabilize important attributes of historic and cultural resources.

There are no existing transmission lines connecting directly to the Glades site, and Section 9.3.2.1 discusses the proposed transmission lines, which would extend for a total of 121 mi through areas likely containing cultural and historic resources. FPL has stated that consideration would be given to sensitive environmental and built resources in determining a route for the transmission lines (FPL 2014-TN4058), but visual impacts from transmission lines may result in significant alterations to the visual setting of cultural and historic resources within the geographic area of interest. These include the Glades Moore Haven Downtown Historic District and the Glades Moore Haven Residential Historic District, both listed in the National Register. While both districts are located outside the indirect effects APE, both the nuclear generating plant and the new transmission lines likely would be visible from them. The effects would be particularly noticeable given that the setting in the area is primarily rural, without existing industrial development. If the Glades site were chosen for the proposed project, the review team assumes that FPL would conduct its transmission line-related cultural resource surveys and procedures in a manner similar to that for the Turkey Point site. In addition, the review team assumes that the State of Florida's final Conditions of Certification (State of Florida 2014-TN3637) regarding transmission line siting and building activities would also apply at this site. If direct effects on significant cultural resources could not be avoided, land-clearing, excavation, and grading activities could potentially destabilize important attributes of historic cultural resources. Similarly, both the transmission lines and nuclear generating units could indirectly affect cultural and historic resources through visual impacts on the setting of the resources.

Operations Impacts

Impacts on historic and cultural resources from operation of two new nuclear generating units at the Glades site include those associated with the operation of new units and maintenance of transmission lines. The review team assumes that the same procedures developed by FPL for the Turkey Point site, as well as the State of Florida's final Conditions of Certification, would be used for onsite and offsite maintenance activities. Consequently, the incremental effects of the maintenance of transmission line corridors and operation of the two new units and associated

impacts on the cultural resources would be negligible for the direct and indirect effects APEs. However, the indirect visual impacts would continue throughout the life of the transmission lines.

Cumulative Impacts

Past actions in the geographic area of interest that have similarly affected historic and cultural resources include rural and agricultural development and activities associated with these land-disturbing activities such as road development. Table 9-6 lists past, present, and reasonably foreseeable projects and other actions that may contribute to cumulative impacts on historic and cultural resources in the geographic area of interest. Projects from Table 9-6 that may fall within the geographic area of interest for cultural resources include the Ortona Sand Mine Expansion and future urbanization, such as new or expanded roads and other infrastructure. These projects may significantly affect historic and cultural resources in a manner similar to those associated with the building and operation of two new nuclear generating units.

Long linear projects such as roadways and pipelines may intersect the proposed transmission line corridors. Because cultural resources can likely be avoided by long linear projects, impacts on cultural resources would likely be minimal. However, this is not necessarily the case for transmission lines, which can have indirect effects on cultural resources through alteration of the visual setting. If building associated with such activities results in significant alterations of cultural resources in the transmission line corridors, either physical or visual, then cumulative impacts on cultural and historic resources would be greater.

Summary Statement

Cultural resources are nonrenewable. Therefore, the impact of the destruction or visual alteration of cultural resources is cumulative. Based on the information provided by FPL and the review team's independent evaluation, the review team concludes that the cumulative impacts from building and operating two new nuclear generating units on the Glades site would be MODERATE. The impacts of building and operating the project at the Glades site would be a significant contributor to the MODERATE impact primarily because of the indirect viewshed impacts from the nuclear power-generating plant and transmission lines on historic properties. This impact-level determination is based on reconnaissance-level information and the review team assumes that, if the Glades site were to be developed, cultural resource surveys and evaluations would be conducted and FPL, in consultation with SHPO, Tribes, and interested parties, would assess and resolve any adverse effects of the undertaking. If additional cultural or historic resources are present, and if there are adverse effects to those resources, the project could result in greater cumulative impacts.

9.3.2.8 Air Quality

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable actions that affect air quality, including other Federal and non-Federal projects listed in Table 9-6. As described in Section 9.3.2, Glades is a greenfield site; there are currently no nuclear facilities on the site. The geographic area of interest for the Glades site is Glades County, which is in the Southwest Florida Intrastate Air Quality Control Region (40 CFR 81.97) (TN255).

Sections 4.7 and 5.7 discuss air-quality impacts during building and operation. The emissions related to building and operating a nuclear power plant at the Glades alternative site would be similar to those at the Turkey Point site. The air-quality attainment status for Glades County, as set forth in 40 CFR Part 81 (TN255), reflects the effects of past and present emissions from all pollutant sources in the region. Glades County is in attainment of all National Ambient Air Quality Standards.

As described in Chapters 4 and 5, the criteria pollutants from building and operation were found to have a SMALL impact on air quality. In Chapter 7, the cumulative impacts of criteria pollutants were evaluated and determined to be SMALL to MODERATE because of nearby emission sources. Reflecting on the projects listed in Table 9-6, there are no significant projects within the area of interest that would contribute in a meaningful way to the cumulative impacts of criteria pollutants for the Glades site.

The air-quality impacts from development of the Glades site would be local and temporary. The applicant would develop a dust-control plan that identifies specific measures to minimize fugitive dust emissions during building activities. The distance from building activities to the site boundary would be sufficient to generally avoid significant air-quality impacts. There are no land uses or projects in Table 9-6 that would have emissions during site development that would, in combination with emissions from the Glades site, result in degradation of air quality in the region. Emissions from operation of two new nuclear units at the Glades site would be intermittent and made at low levels with little or no vertical velocity, similar to operational impacts at the Turkey Point site as discussed in Section 5.7, and the associated air-quality impacts would be SMALL. Other sources of emissions in Table 9-6 would likely have de minimis impacts due to their distance from the site. Given that these projects are subject to Clean Air Act permitting requirements, it is unlikely that the air quality in the region would degrade to the extent that the region would be in nonattainment of the National Ambient Air Quality Standards.

The cumulative impacts of GHG emissions related to nuclear power are discussed in Section 7.6. The impacts of the emissions are not sensitive to location of the source. Consequently, the discussion in Section 7.6 is applicable to a nuclear power plant located at the Glades site. The review team concludes that the national and worldwide cumulative impacts of GHG emissions are noticeable but not destabilizing. The review team further concludes that the cumulative impacts would be noticeable but not destabilizing, with or without the GHG emissions of two new nuclear units at the Glades site.

Summary Statement

The review team concludes that cumulative impacts from other past, present, and reasonably foreseeable future actions on air-quality resources in the geographic areas of interest would be SMALL for criteria pollutants and MODERATE for GHG emissions. The incremental contribution of impacts on air-quality resources from building and operating two units at the Glades site would not be a significant contributor to the MODERATE impacts.

9.3.2.9 Nonradiological Health Impacts

The following analysis considers nonradiological health impacts from building and operating two new nuclear units at the Glades site. The analysis also includes past, present, and reasonably foreseeable future actions that could contribute to cumulative nonradiological health impacts on site workers (construction and operation workers) and members of the public, including other Federal and non-Federal projects and the projects listed in Table 9-6 within the geographic area of interest. Nonradiological health impacts at the Glades site are estimated based on information provided by FPL and the review team's independent evaluation. For the analysis of nonradiological health impacts at the Glades site, the geographic area of interest is the site and the immediate vicinity (~2 mi radius) and the associated road and transmission line corridors. This geographic area of interest is based on the localized nature of nonradiological health impacts and is expected to encompass all nonradiological health impacts.

Building activities that have the potential to affect the health of members of the public and workers at the Glades site include exposure to dust and vehicle exhaust, occupational injuries, noise, and increased traffic associated with the transport of construction materials and personnel to and from the site. The operations-related activities that have the potential to affect the health of members of the public and workers include exposure to etiological (disease-causing) agents, noise, EMFs, occupational injuries, and impacts from the transport of workers to and from the site.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the Glades site would be similar to those evaluated in Section 4.8 for the Turkey Point site. During the site-preparation and building phase FPL would comply with applicable Federal and State regulations on air quality and noise (FPL 2014-TN4058). The Glades site is located in a rural area, and building impacts would likely be negligible on the surrounding populations, which are classified as medium- and low-population areas. The incidence of construction worker accidents would be the same as that for the Turkey Point site.

The review team concludes that nonradiological health impacts on construction workers and the public from building two new nuclear units and associated transmission lines at the Glades site would be minimal. Nonradiological health impacts associated with traffic accidents during building activities at the Glades alternative site were evaluated in Section 4.8.3 and the review team concludes that the impacts would be minimal.

Operations Impacts

Nonradiological health impacts on operation workers and members of the public would include those associated with the operation of cooling towers and transmission lines as described in Section 5.8. Based on the configuration of the proposed new units at the Glades site (see Chapter 3 for a detailed site layout description), etiological agents would not be an issue with regard to members of the public because cooling-tower blowdown would be discharged into deep-injection wells not into surface waters. Impacts on workers' health from occupational injuries, noise, and EMFs would be similar to those described in Section 5.8 for the Turkey Point

site. Noise and EMF exposure would be monitored and controlled in accordance with applicable Occupational Safety and Health Administration (OSHA) regulations. Although no detailed noise modeling has been performed for the Glades site, it is likely that noise impacts would be similar to those predicted for operations at the Turkey Point site. Effects of EMFs on human health would be controlled and minimized by conformance with National Electrical Safety Code criteria and adherence to the standards for transmission systems regulated by the FDEP.

The review team concludes that nonradiological health impacts on workers and the public from operating two new nuclear units and associated transmission lines at the Glades site would be minimal. Impacts associated with traffic accidents during operations at the Glades alternative site were evaluated in Section 5.8.6 and the review team concludes that the impacts would be minimal.

Cumulative Impacts

Table 9-6 identifies no past or present projects within the geographic area of interest that could affect nonradiological human health in a way similar to the building of two nuclear units at the Glades site. All of the projects that could apply are more than 10 mi from the Glades site.

Reasonably foreseeable projects that could affect nonradiological human health in a way similar to the building of two nuclear units at the Glades site identified in Table 9-6 include various transportation (roads, traffic, pedestrian) and mining/quarry projects that are planned throughout the region.

There are no past, present, or reasonably foreseeable projects within the geographic area of interest that would affect nonradiological human health in a way similar to operating two nuclear units at the Glades site.

Summary Statement

Impacts on nonradiological health from building and operation of two new units at the Glades site are estimated based in the information provided by FPL and the review team's independent evaluation. Although some future activities in the geographical area of interest could affect nonradiological health in ways similar to the building and operation of two new units at the Glades site and associated offsite facilities, those impacts would be localized and managed through adherence to existing regulatory requirements. The review team concludes that nonradiological health impacts on workers and the public resulting from the building of two new nuclear units and associated road and transmission lines at the Glades site would be minimal. The review team expects that the nonradiological health impacts on the operations employees and the public of two new nuclear units at the Glades site would be minimal. Finally, the review team concludes that cumulative impacts on nonradiological health from past, present, and reasonably foreseeable actions in the geographic area of interest would be SMALL.

9.3.2.10 Radiological Impacts of Normal Operations

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable actions that affect radiological health, including other Federal and non-Federal projects listed in Table 9-6. As

described in Section 9.3.2, Glades is a greenfield site; there are currently no nuclear facilities on the site. The geographic area of interest is the area within a 50 mi radius of the Glades site. There are no major facilities that potentially affect radiological health within the 50 mi radius of the Glades site. However, there are likely to be medical, industrial, and research facilities within 50 mi of the Glades site that use radioactive materials.

The radiological impacts of building and operating the two proposed Westinghouse AP1000 nuclear power units at the Glades site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. These impacts are expected to be similar to those estimated for the Turkey Point site.

The NRC staff concludes that the dose from direct radiation and effluents from hospitals and industrial facilities that use radioactive material would be an insignificant contribution to the cumulative impact around the Glades site. This conclusion is based on data from the radiological environmental monitoring programs conducted around currently operating nuclear power plants.

Based on the information provided by FPL and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed Westinghouse AP1000 nuclear power units and other existing and planned projects and actions in the geographic area of interest around the Glades site would be SMALL.

9.3.2.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from the operation of two nuclear units at the Glades alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from postulated accidents, including other Federal and non-Federal projects and the projects listed in Table 9-6. As described in Section 9.3.2, the Glades site is a greenfield site; there are currently no nuclear facilities at the site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Glades alternative site. Facilities potentially affecting radiological accident risk within this geographic area of interest are the existing two units of St. Lucie—Units 1 and 2.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of design basis accidents (DBAs) at the Turkey Point site would be minimal for AP1000 reactors. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet NRC safety criteria. The environmental consequences of DBAs depend on the plant design and the atmospheric dispersion. The AP1000 design is independent of site conditions and the differences in the meteorology of the Glades alternative and Turkey Point sites are not significant with regard to the conditions that are important to assessing DBAs. Therefore, the NRC staff concludes that the environmental consequences of DBAs at the Glades alternative site would be minimal.

With a lower population density and the land-use values for the Glades alternative site, the NRC staff expects the risks from a severe accident for an AP1000 reactor located at the Glades

alternative site to be similar to or lower than those analyzed for the proposed Turkey Point site. The risks for the proposed Turkey Point site are presented in Tables 5-14 and 5-15 and are well below the median value for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028) (TN594). For existing plants within the geographic area of interest (St. Lucie Units 1 and 2), the Commission has determined that the probability-weighted consequences of severe accidents are small (10 CFR Part 51 [TN250], Appendix B, Table B-1). On this basis, the NRC staff concludes that the cumulative risks from severe accidents at any location within 50 mi of the Glades alternative site would be SMALL.

9.3.3 Martin Site

This section covers the review team's evaluation of the potential environmental impacts of siting a new two-unit nuclear power plant on the Martin site. The site is located in western Martin County, approximately 40 mi northwest of West Palm Beach, 5 mi east of Lake Okeechobee, and 7 mi northwest of Indiantown. The Miami load center is approximately 65 mi to the south-southeast. The site is bounded on the west by the Florida East Coast Railway and the adjacent SFWMD L-65 Canal; on the south by the St. Lucie Canal (C-44 or Okeechobee Waterway); and on the northeast by SR-710 and the adjacent CSX Railroad (FPL 2014-TN4058). The Martin site is an 11,300 ac area that includes five fossil-fuel–fired power units and a solar unit. The majority of the site is currently used for agriculture. The elevation reaches as high as 28 ft above sea level (FPL 2011-TN40), and the entire site lies outside the 100-year floodplain (FPL 2011-TN40). The location of the Martin site is shown in Figure 9-11.

The facility footprint (Figure 9-12), including the power units, support buildings, switchyard, storage areas, stormwater-retention ponds, and other structures, would encompass an estimated 363 ac. Use of the Martin site would also require the development of a 31 mi transmission line corridor (763.6 ac), a 39.3 mi access road (473.3 ac), a 4.3 mi railway (51.5 ac), and an intake/makeup pipeline connected to the C-44 Canal/St. Lucie Canal (21.7 ac). These additional features (not counting the transmission line) would add an estimated 547 ac to the overall permanent footprint at the site, and an additional area (up to several hundred acres) would have to be temporarily disturbed for activities such as laydown areas, a batch plant, and spoil deposition.

As discussed in Section 9.3.1.7, the review team considered an alternative configuration of the cooling system that FPL proposed.

The following sections include a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if implemented at the Martin site and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction and operations and impacts of preconstruction activities. Also included in the assessment are past, present, and reasonably foreseeable future Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Martin site. Other actions and projects considered in this cumulative analysis are described in Table 9-11.

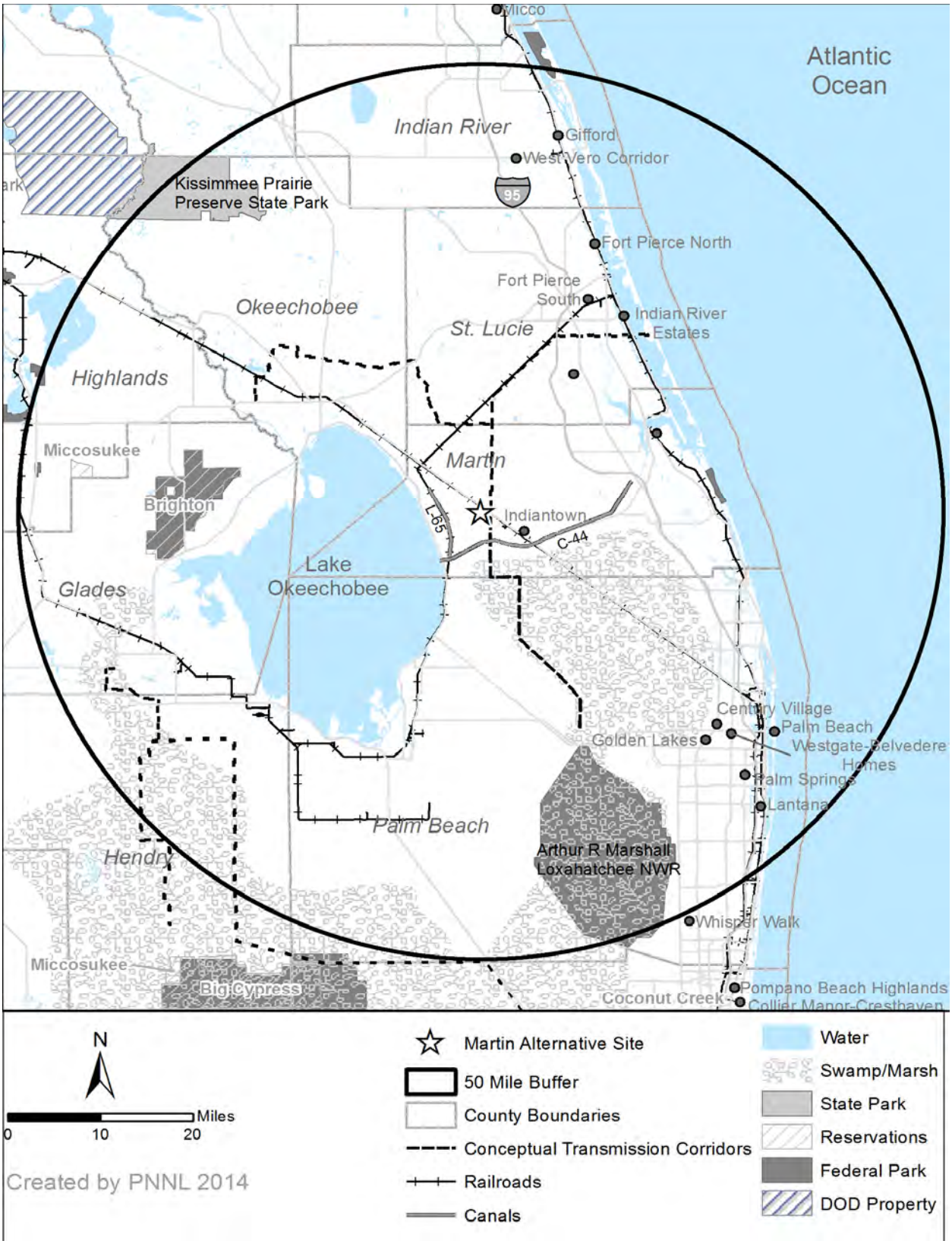

Figure 9-11. Martin Site Region

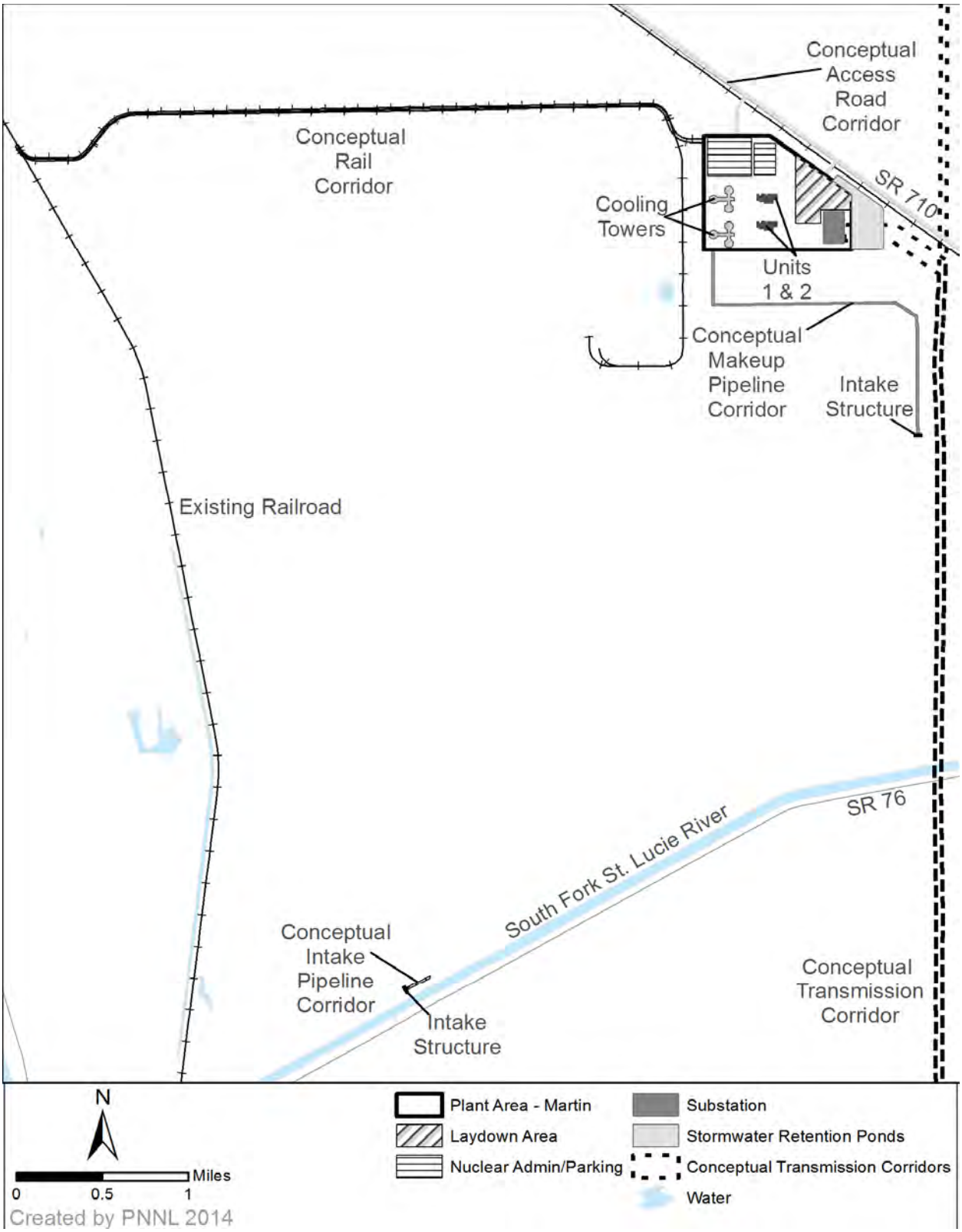

Figure 9-12. Martin Site Footprint

Table 9-11. Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of Martin Site

Project Name	Summary of Project	Location	Status
Energy Projects			
St. Lucie	Two 3,020 MW(t) nuclear power reactors	28 mi NE of the Martin alternative site	Operational, Units 1 and 2 underwent license renewal in 2003. Units 1 and 2 completed 320 MW(t) power uprates in 2013 (NRC 2012-TN1668; FPL 2014-TN3360)
West County Energy Center	Three 1,250 MW natural-gas−powered units	28 mi SE of the Martin alternative site	Operational (FDEP 2013-TN2965)
Martin	Approximately 4,300 MW from five units, 3 natural-gas and 2 oil units with a solar thermal facility generating supplemental steam. Combined natural-gas/oil and solar power-generating station	Adjacent	Operational (FPL 2016-TN4579)
Indiantown Cogeneration Company	330 MW coal-fired power plant	4 mi E of the Martin alternative site	Operational (FDEP 2013-TN2967)
Okeelanta Cogeneration Facility	140 MW biomass power-generation facility	35 mi SW of the Martin alternative site	Operational (FDEP 2013-TN2968)
FPL pipeline	126 mi pipeline from Sabal Trail's Central Florida Hub to FPL's Martin Clean Energy Center	Throughout region	Proposed, construction set to begin 2016 (FPL 2014-TN2975)

Table 9-11. (contd)

Project Name	Summary of Project	Location	Status
Floridian Natural Gas Storage Company – Natural Gas Storage Facility	Storage of natural gas	4 mi E of the Martin alternative site	Proposed, FERC Order amending Certificate issued (FERC 2015-TN4599) with associated Environmental Assessment (FERC 2015-TN4600), amendment to modify application sent to FERC in 2013 (78 FR 58529) (TN3002)
Southeastern Renewable Fuels Biorefinery and Cogeneration Plant	30 MW biofuel using leftover sweet sorghum stalk fiber	41 mi SW of the Martin alternative site	Proposed, final air permit issued by FDEP in 2010 (FDEP 2010-TN2970)
Treasure Coast Energy Center	300 MW natural-gas power plant	25 mi NE of the Martin alternative site	Operational (FMPA 2014-TN3029)
Tom G. Smith Power Plant (Lake Worth)	Three-unit, 105 MW gas- and oil-fired plant	43 mi SE of the Martin alternative site	Operational (EPA 2014-TN3031)
INEOS New Planet Bioenergy Center	6.3 MW bioenergy facility	37 mi NE of the Martin alternative site	Operational (EPA 2014-TN3032)
Riviera Beach Energy Center	1,250 MW gas-fired plant	37 mi SE of the Martin alternative site	Operational and completed in 2014 (FPL 2014-TN3033)
Okeechobee Landfill energy	Waste-to-Energy facility	21 mi NW of the Martin alternative site	Operational (Waste Management 2014-TN3034)
Mining Projects			
FiveStone Mining	Stone/quarry mining	8 mi SW of the Martin alternative site	Operational (EPA 2013-TN2959)

Table 9-11. (contd)

Project Name	Summary of Project	Location	Status
Daniel Shell Pit, Phase 6	Stone/quarry mining	33 mi NW of the Martin alternative site	Operational (EPA 2013-TN2956)
E R Jahna Industries Inc. – Ortona Mine	Stone/quarry mining	48 mi SW of the Martin alternative site	Operational (EPA 2013-TN2958)
Florida Rock Industries/Fort Pierce	Stone/quarry mining	13 mi NE of the Martin alternative site	Operational (EPA 2014-TN3038)
Hammond Sand Mine	Sand/quarry mining	44 mi NE of the Martin alternative site	Operational (EPA 2014-TN3044)
Various other mine and quarry projects	Stone/quarry mining	Throughout region	Operational (FDEP 2010-TN2966)
Transportation Projects			
Various Transportation Projects	Road, traffic, pedestrian projects	Throughout region	Ongoing (FDOT 2012-TN1132)
Parks and Aquaculture Facilities			
Arthur R. Marshall Loxahatchee National Wildlife Refuge	Activities include picnicking, boating, fishing, and hiking	27-60 mi SE of the Martin alternative site	Development likely limited within this area (FWS 2013-TN2992)
DuPuis Wildlife and Environmental Area	Activities include bicycling, camping, hunting, fishing, and hiking	3mi S of the Martin alternative site	Development likely limited within this area (FFWCC 2014-TN2977)
Okeechobee Battlefield State Park	Hiking, camping	17 mi NW of the Martin alternative site	Development likely limited within this area (FDEP 2010-TN2971)
Archbold Biological Station	Ecological research station and preserve, organization owns and protects a 5,193 ac globally significant Florida scrub preserve located on the southern end of the Lake Wales Ridge	49 mi NW of the Martin alternative site	Development likely limited within this area (Archbold Biological Station 2014-TN2954)

Table 9-11. (contd)

Project Name	Summary of Project	Location	Status
Lake Okeechobee	730 mi^2 freshwater lake, restoration and protection plan	5−28 mi W of the Martin alternative site	Ongoing, Florida Legislature in 2007 expanded the Lake Okeechobee Protection Act (SFWMD 2014-TN2988)
Johnathan Dickinson State Park	Activities include bicycling, camping, boating, horseback riding, picnicking, fishing, and hiking	28 mi E of the Martin alternative site	Development likely limited within this area (Florida State Parks 2014-TN3048)
Savannas Preserve State Park	Activities include bicycling, boating, horseback riding, picnicking, fishing, and hiking	24 mi NE of the Martin alternative site	Development likely limited within this area (Florida State Parks 2014-TN3050)
Fort Pierce Inlet State Park	Activities include bicycling, camping, boating, swimming, picnicking, fishing, and hiking	33 mi NE of the Martin alternative site	Development likely limited within this area (Florida State Parks 2014-TN3053)
Pepper Beach State Recreation Area	Activities include swimming, picnicking, fishing, and hiking	33 mi NE of the Martin alternative site	Development likely limited within this area (St. Lucie County 2014-TN3054)
St. Sebastian River Preserve State Park	Activities include bicycling, camping, boating, picnicking, fishing, and hiking	49 mi N of the Martin alternative site	Development likely limited within this area (Florida State Parks 2014-TN3055)
Hobe Sound National Wildlife Refuge	Activities include fishing, and hiking	26 mi E of the Martin alternative site	Development likely limited within this area (FWS 2013-TN3056)
John D. Macarthur Beach State Park	Activities include boating, swimming, picnicking, fishing, and hiking	35 mi SE of the Martin alternative site	Development likely limited within this area (Florida State Parks 2014-TN3057)
Peanut Island Park	Activities include boating, picnicking, fishing, and hiking	37 mi SE of the Martin alternative site	Development likely limited within this area (Palm Beach County 2014-TN3058)

Table 9-11. (contd)

Project Name	Summary of Project	Location	Status
Other State nature preserves and wildlife management areas	Public recreational activities	Throughout region	Development likely limited within these areas (FFWCC 2014-TN2981)
Everglades Ecosystem Restoration and/or Comprehensive Everglades Restoration Plan Projects (DOI 2016-TN4589)			
Acme Basin B	Goals of this project include capturing surface water for reuse for the Arthur R. Marshall Loxahatchee National Wildlife Refuge and the Lake Worth Drainage District municipal water supply that would otherwise be routed through Basin A to C-51 and lost to tide; and to reduce harmful discharges to the Lake Worth Lagoon.	35 mi SE of the Martin alternative site	Proposed, project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3045)
Indian River Lagoon – South	Project purpose is to improve surface-water management in the C-23/C-24, C-25, and C-44 basins for habitat improvement in the Saint Lucie River Estuary and southern portions of the Indian River Lagoon.	2 mi N of the Martin alternative site	Proposed, project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3013)
Everglades Agricultural Area Storage Reservoirs	The purpose of this project is to improve the timing of environmental deliveries to the Water Conservation Areas, including reducing damaging flood releases from the Everglades Agricultural Area to the Water Conservation Areas.	Throughout region	Proposed, Final Project Implementation Report submitted 2012 (USACE and SFWMD 2014-TN3011)

Table 9-11. (contd)

Project Name	Summary of Project	Location	Status
Flows to Northwest and Central Water Conservation Areas 3A	The purpose of this feature is to increase environmental water-supply availability, increase depths and extend wetland hydropatterns in the northwest corner and west-central portions of Water Conservation Area 3A.	50 mi S of the Martin alternative site	Proposed, project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3012)
Lake Okeechobee Aquifer Storage and Recovery	A series of aquifer storage and recovery wells adjacent to Lake Okeechobee	4 mi W of the Martin alternative site	Proposed, project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3014)
Lake Okeechobee Watershed Project	Project to increase aquatic and wildlife habitat, regulate extreme highs and lows in lake staging, reduce phosphorus loading and reduce damaging releases to the surrounding estuaries	Throughout Okee-chobee County	Proposed, project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3015)
Melaleuca eradication and other exotic plants	The project includes (1) upgrading and retrofitting the current quarantine facility in Gainesville, and (2) large-scale rearing of approved biological control organisms for release at multiple sites within the South Florida ecosystem to control Melaleuca, Brazilian pepper, Australian pine, and Old World climbing fern.	Throughout region	Operational, facility completed in 2013 (USACE and SFWMD 2014-TN3020)
Modify Holey Land Wildlife Management Area Operation Plan	Modification of the current operating plan and rules for Holey	43 mi S of the Martin alternative	Proposed, project in planning phase. (USACE and

Table 9-11. (contd)

Project Name	Summary of Project	Location	Status
	Land Wildlife Management Area will be made to implement rain-driven operations for this area to improve the timing and location of water depths within this wildlife management area.	site	SFWMD 2014-TN3017)
Modify Rotenberger Wildlife Management Area Operation Plan	Modification to the current operating plan for the Rotenberger Wildlife Management Area will be made to implement rain-driven operations for this area as needed. Water deliveries are made to the Rotenberger Area from Stormwater-Treatment Area 5.	48 mi SW of the Martin alternative site	Proposed, project in planning phase. (USACE and SFWMD 2014-TN3018)
Palm Beach County Agriculture Reserve Aquifer Storage and Recovery	Supplement water supplies for central and southern Palm Beach County by capturing and storing excess water currently discharged to the Lake Worth Lagoon.	42 mi SE of the Martin alternative site	Proposed, project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3019)
Palm Beach County Agriculture Reserve Reservoir	Project to supplement water supplies for central and southern Palm Beach County by capturing and storing excess water currently discharged to the Lake Worth Lagoon	42 mi SE of the Martin alternative site	Proposed, project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3019)
Loxahatchee National Wildlife Refuge Internal Canal Structures	Project to improve the timing and location of water depths within the Refuge	28 mi NW of the Martin alternative site	Proposed, project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3046)

Table 9-11. (contd)

Project Name	Summary of Project	Location	Status
Strazzulla Wetlands	Project to provide a hydrological and ecological connection to the Loxahatchee National Wildlife Refuge and expand the spatial extent of protected natural areas	36 mi SE of the Martin alternative site	Proposed, Project in Preconstruction, Engineering and Design phase (USACE and SFWMD 2014-TN3047)
Other Actions/Projects			
Herbert Hoover Dike Major Rehabilitation Project	Rehabilitation Project and Dam Safety Modification Study	5–35 mi W of the Martin alternative site	Proposed - Environmental Assessment and FONSI issued in 2015 (USACE 2015-TN4598), Draft Environmental Report issued (DOI 2016-TN4589)
Comprehensive Shoreline Stabilization Project in Palm Beach County	Discharge fill for the purpose of shoreline stabilization	Shoreline of Palm Beach County	USACE submitted Notice of Intent in 2013 (78 FR 40128) (TN3059); EIS completed (CB&I 2014-TN4015)
Lake Worth Inlet Project	Deepening and widening of the Lake Worth Inlet	38 mi SE of the Martin alternative site	USACE completed integrated feasibility report and environmental impact statement in 2014 (USACE 2014-TN4016);
Kissimmee River Restoration	When restoration is completed in 2017, more than 40 mi^2 of river-floodplain ecosystem will be restored, including almost 20,000 ac of wetlands and 44 mi of historic river channel.	Along Kissimmee River	Ongoing (USACE 2014-TN3061; DOI 2016-TN4589)
Other Actions/Projects			
Atlantic Sugar Association	Sugar manufacturing	26 mi SW of the Martin alternative	Operational (FDEP 2013-TN2964)

Table 9-11. (contd)

Project Name	Summary of Project	Location	Status
		site	
Southern Gardens Citrus Processing Corp.	Food production/distribution	41 mi SW of the Martin alternative site	Operational (FDEP 2013-TN2969)
United States Sugar Corporation Clewiston	Sugar manufacturing	32 mi SW of the Martin alternative site	Operational (EPA 2014-TN2963)
Harbor Branch Oceanographic Institute	Oceanic science and research	35 mi SE of the Martin alternative site	Operational (EPA 2014-TN3071)
Pratt & Whitney	Aircraft engine and engine parts manufacturing	19 mi SE of the Martin alternative site	Operational (EPA 2014-TN3062)
Maverick Boat Company	Fiberglass boat manufacturing	33 mi NE of the Martin alternative site	Operational (EPA 2014-TN3063)
Tropicana Products Inc.	Citrus and animal feed	24 mi NE of the Martin alternative site	Operational (EPA 2014-TN3068)
S2 Yachts Inc.	Fiberglass boat manufacturing	32 mi NE of the Martin alternative site	Operational (EPA 2013-TN3069)
Twin Vee Inc.	Fiberglass boat manufacturing	28 mi NE of the Martin alternative site	Operational (EPA 2013-TN3070)
Various wastewater-treatment plant facilities	Sewage treatment	Throughout region	Operational
Various hospitals using nuclear material	Medical and other industrial isotopes	Throughout region	Ongoing
Various water/flood-management projects	Water and flood management	Throughout region	Ongoing (USACE 2012-TN1133)
Future urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; construction of water- and/or wastewater-treatment	Throughout region	Construction would occur in the future, as described in State and local land-use planning documents

Table 9-11. (contd)

Project Name	Summary of Project	Location	Status
	and distribution facilities and associated pipelines, as described in local land-use planning documents		

The geographic area of interest for cumulative impacts considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) of a severe accident at any location within 50 mi of the Martin site. An accident at a nuclear plant within 100 mi of the Martin site could potentially increase this risk. However, other nuclear plants in Florida, Alabama, and Georgia that are more than 100 mi from the Martin site are not included in the cumulative impact analysis.

9.3.3.1 Land Use

The following analysis includes land-use impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect land use, including other Federal and non-Federal projects listed in Table 9-11. For the analysis of land-use impacts at the Martin site and its associated transmission line corridors, the review team determined that a 10 mi radius, similar to that used for the Turkey Point site, would encompass an effective geographic area of interest for cumulative impact assessment for land use, because it would include the site and associated facilities. In evaluating the land-use impacts of using the Martin site, the review team used information from the project application and other readily obtainable data from the Internet or published sources, including aerial photographs of the site and vicinity, USDA soils information, local zoning and planning documents, and FLUCFCS data. Impacts from both building and station operation are discussed.

Existing land uses in the vicinity of the Martin alternative site consist predominantly of cultivated agriculture. The nearest community is Indiantown, approximately 7 mi to the southeast, an unincorporated town in Martin County of just under 7,000 population (Martin County 2014-TN3306). The nearest incorporated city is Port St. Lucie, 20 mi to the east. The Martin alternative site is located approximately 5 mi east of Lake Okeechobee.

Existing land uses at the Martin site consist of an operating power plant and other energy-generation uses FPL states in its application (FPL 2014-TN4058). In response to RAI EIS 9.3.1-8 (eRAI 6353), FPL acknowledged that its solar facility used available lands and that additional new land would have to be acquired in order to develop the new units (FPL 2012-TN1727). No commercial mineral resources are identified within the site and in the vicinity (Calver 1956-TN3752; Spencer 1993-TN3753). Based on a review of aerial photos available on Google Earth, no substantial areas of developed land uses other than existing energy-generating uses occur on or within the vicinity of the site (CleanEnergy 2012-TN3307). Wildlife management areas and recreational areas are located several miles from the alternative plant site. FPL has entered into a voluntary partnership with the Treasured Lands Foundation to protect approximately 400 ac of old-growth bald cypress swamp on the Martin site termed the

Barley Barber Swamp, and offers public tours of an interpretative boardwalk traversing the swamp (TLF and FPL 2014-TN3755). The Barley Barber Swamp is located on a peninsula on the western shore of a reservoir in the central part of the Martin site.

Building and Operation Impacts

The Martin County FLUM (Martin County 2014-TN3756) designates the site as "Major Power Generation" and the land in the vicinity of the site as "Agricultural." Martin County zoning (Martin County 2012-TN3351) designates the site as a mix of industrial designations, and the vicinity as Agriculture. Therefore, the review team believes that use of the Martin alternative site for a power plant would be compatible with the Martin County FLUM. However, the review team notes that the applicant would have to acquire agricultural land adjoining the site in order to build and operate the proposed new facilities.

Most of the soils on and in the vicinity of the plant site, with the exception of those areas developed for energy-generation and related facilities, are considered farmlands of Unique Importance. Unique farmland is defined in Section 2(c) of the Farmland Protection Policy Act (7 U.S.C. § 4201 et seq.) (TN708) as "land, other than Prime farmland, that has combined conditions to produce sustained high quality and high yields of specialty crops, such as citrus, nuts, fruits, and vegetables when properly managed." No Prime farmland soils are identified in the vicinity (USDA 2014-TN3353). For the purposes of this analysis, the review team assumes that the entire site consists of farmland of Unique Importance. The plant site and transmission line corridors fall within the Coastal Zone (FPL 2014-TN4058). The site falls within an area designated on the Flood Insurance Rate Map (FIRM; as shown on FEMA FIRM for Martin County Panel 250 of 527 dated October 4, 2002) as Zone X: areas of 500-year flood, areas of 100-year flood with average depths of less than 1 ft or with drainage areas less than 1 mi^2, and areas protected from the 100-year flood by levees (FEMA 2002-TN4119).

Building and operation of the project at the Martin site would result in the conversion of existing land uses, including approximately 264 ac owned by FPL, and additional lands FPL would need to acquire, from agriculture to power-generation uses as shown in Table 9-12.

Table 9-12. Martin Alternative Site Land-Use Impacts (acres)

	Agricultural Lands (FLUCFCS 200 Land-Use Series)	Urban Developed Lands, including Power Generation (other than roads and pipelines)	Other Non-Agricultural Lands (all other FLUCFCS designations)	Total
Plant Site	60	260	0	320
Access Roads	195	260	18	473
Rail Corridor	1	50	0	52
Intake Pipeline Corridor	0	1	0	1
Makeup Pipeline Corridor	0	20	0	20
Stormwater-Retention Ponds	8	34	0	42
Total[(a)]	264	626	18	908
Transmission Line Corridor	100	0	663	764
Grand Total	364	627	680	1,672

(a) Totals may not add due to rounding

Sources: FPL 2011-TN59 and FPL 2014-TN4058

Because this is a small amount of farmland in the context of the large amount of farmland under cultivation in Martin County, conversion of this amount of farmland to another use would not substantially affect the agricultural economy of the region. Although there could be a loss of more than 300 ac of farmlands of Unique Importance, the review team expects that the loss would not noticeably affect regional agriculture, considering the regional abundance of such farmland. However, because additional lands beyond those currently owned by FPL and used for power generation would have to be acquired, potentially noticeable land-use conflicts are possible.

The review team does not expect building or operation of the new units on the Martin site to interfere with continued public tours of the Barley Barber Swamp and boardwalk. The swamp and boardwalk are already operated within the confines of a privately owned and operated power-generation facility, and the two new units would be built near the periphery of the FPL-owned property and not immediately adjacent to the swamp.

Additional land-use impacts include possible additional growth and land conversions in the vicinity to accommodate new workers and services (induced development). Because the workforce would be dispersed over larger geographic areas in the labor supply region, the impacts from land conversion for residential and commercial buildings induced by new workers relocating to the local area can be absorbed in the wider region. Therefore, the review team concludes that such impacts would be minimal.

Use of the Martin site would also require the development of approximately 31 mi of transmission line corridor. FPL states in its application (FPL 2014-TN4058) that the new transmission lines would pass through the Coastal Zone. Approximately 763.6 ac of land would be at least temporarily affected by building and operating the transmission lines. Much of this land is agricultural land; the remainder is primarily open lands and roadways. The agricultural land within the transmission line corridors would be converted from agricultural use to transmission line use, although FPL states in its application (FPL 2014-TN4058) that agriculture could continue within and along the transmission line rights-of-way. The land uses along the conceptual corridors for new transmission lines to serve the Martin alternative site are identified in Table 9-12.

Under the Florida Site Certification Application process explained in Chapter 4.1, the State approves a corridor and the applicant chooses a specific right-of-way within the approved corridor. The objective of this process, as stated in the electrical power plant and transmission line statute (Fla. Stat. 29-403.501 2011-TN1068) is “that the location of transmission line corridors and the construction, operation, and maintenance of electric transmission lines produce minimal adverse effects on the environment and public health, safety, and welfare” and “to fully balance the need for transmission lines with the broad interests of the public in order to effect a reasonable balance between the need for the facility as a means of providing reliable, economical, and efficient electric energy and the impact on the public and the environment resulting from the location of the transmission line corridor and the construction, operation, and maintenance of the transmission lines.” Finalized siting plans and permitting conditions that would be imposed by the various affected State and local agencies would minimize impacts within the corridors. Engineering considerations and costs are likely to suggest designs that favor collocation with existing transmission lines in existing corridors. The siting criteria include

land-use considerations to minimize potential disruption to areas such as national, state, and county parks; wildlife refuges; estuarine sanctuaries; landmarks; and historical sites. FPL states in its application that, in its development of the conceptual transmission line corridor for the Martin alternative site, it attempted to select corridors that would allow collocation with existing transmission line corridors and avoided populated areas or residential land uses to some extent (FPL 2014-TN4058). The State certification review process also includes a determination of land-use consistency with local land-use plans and zoning ordinances (Fla. Stat. 29-403.50665-TN1470).

The review team concludes that the land-use impacts from building and operating two new nuclear units at the Martin alternative site would be noticeable, primarily because of the lack of adequate land on the Martin site and the expected need for FPL to acquire additional offsite land, likely from private owners.

Cumulative Impacts

The review team expects that the principal contribution to cumulative land-use impacts in the geographic area of interest defined for the Martin site would be from the two subject nuclear units. Within the geographic area of interest, there are several other reasonably foreseeable projects with the potential to affect cumulative land-use impacts as listed in Table 9-11, including the Lake Point Mine project and other existing and proposed power-generation uses at the Martin site. In addition, the Martin County FLUM designates land for future industrial uses near the Martin alternative site. But because these other projects are consistent with the existing and planned uses in the geographic area of interest, the review team does not expect them to noticeably contribute to cumulative land-use impacts.

Other linear projects are proposed for lands near the proposed conceptual corridor, including the Florida Gas Transmission Phase VIII Expansion Project, as listed in Table 9-11. However, the review team expects that the corridor would have only a minimal cumulative land-use impact.

Summary Statement

Based on the information provided by FPL and the review team's independent review, the review team concludes that the cumulative land-use impacts of building and operating the power plant at the Martin alternative site would be MODERATE. Building and operating the proposed nuclear units at the Martin site would be a significant, and the principal, contributor to these impacts primarily because of the lack of adequate land on the Martin site and the expected need for FPL to acquire additional offsite land, likely from private owners.

9.3.3.2 Water Use and Quality

The following impact analysis includes impacts from building and operating two new nuclear units at the Martin site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-11. The Martin site is located in rural Martin County in Florida near an existing power plant and approximately 5 mi east of Lake Okeechobee and 2 mi north of the St. Lucie Canal.

The geographic area of interest for surface water at the Martin site is the Kissimmee-Okeechobee-Everglades watershed because this is the resource that would be affected if the proposed project were located at the Martin site. The Kissimmee-Okeechobee-Everglades watershed includes an area of about 9,000 mi^2 (McPherson and Halley 1996-TN98). For groundwater, the ROI includes (1) the surficial aquifer and the Upper Floridan aquifer at the site; (2) the APPZ of the Middle Floridan aquifer upgradient and downgradient of the site for water withdrawals; and (3) and the Boulder Zone of the Lower Floridan aquifer upgradient and downgradient of the site for disposal of blowdown water.

Building Impacts

Water use for building activities at the Martin site would be comparable to the proposed water use for building activities for the Turkey Point site. During building, water use is estimated to be 565 gpm (0.8 Mgd) (see Table 3-4). The review team assumes that water for building the two units at the Martin site would come from a combination of surface water and groundwater. Surface water from the St. Lucie Canal or Lake Okeechobee may be available for building purposes during times of high surface-water flows. The peak water-use rate during the building phase is inconsequential when compared to the historic average monthly flows into Lake Okeechobee from the Kissimmee River; the rate of 0.8 Mgd is less than 1 percent of the river discharge for even the lowest month reported (January 1963). Surface water from stormwater ponds and groundwater from excavation dewatering may also be used, when available, for building purposes. Groundwater from the surficial aquifer would be used for building purposes when excess surface water is not available. The SFWMD would regulate any use of surface or shallow groundwater for plant construction.

The review team concludes that the impact of surface-water use for building the potential units at the Martin site would be minimal for the following reasons:

- Withdrawal is small compared to the water resources in the Lake Okeechobee watershed.
- Any use of surface water or shallow groundwater would be regulated by SFWMD and limited to time periods when there would not be a negative impact on the Lake Okeechobee system or shallow aquifers.
- Water use would be temporary and limited to the building period, and the peak use of 0.8 Mgd is much less than the average 37.72 Mgd groundwater withdrawal rate reported for Martin County in 2005 (Marella 2009-TN1521).

The review team assumes that the impact of dewatering the excavations needed for building two units at the site would be managed through the installation of diaphragm walls and grouting as is proposed for the Turkey Point site. Therefore, because groundwater withdrawal caused by dewatering would be controlled, the review team determined that there would be little or no impact on groundwater resources.

Surface-water quality would potentially be affected by stormwater runoff during site preparation and the building of the facilities. The FDEP would require FPL to develop an erosion and sediment control plan and a SWPPP before initiation of site-disturbance activities (FPL 2014-TN4058).

The plans would identify BMPs to control the impacts on surface-water quality caused by stormwater runoff. The review team anticipates that FPL would construct new detention/infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to onsite waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and the stormwater would infiltrate into the shallow aquifer. Implementation of BMPs should minimize impacts on surface waterbodies near the Martin site. Therefore, the impacts on surface-water-quality near the Martin site would be temporary and minimal.

While building new nuclear units at the Martin site, groundwater quality may be affected by leaching of spilled effluents into the subsurface. The review team assumes that the BMPs FPL has proposed for the Turkey Point site would be in place during building activities and therefore the review team concludes that any spills would be quickly detected and remediated. In addition, groundwater impacts would be limited to the duration of these activities, and therefore, would be temporary. The review team reviewed the general BMPs that could be expected to be required at such a site (State of Florida 2014-TN3637). Because any spills related to building activities would be quickly remediated under BMPs, and the activities would be temporary, the review team concludes that the groundwater-quality impacts from building at the Martin site would be minimal.

Wastewater streams from building activities could be injected to the Boulder Zone of the Lower Floridan aquifer as planned at Turkey Point (FPL 2014-TN4058). Construction and operation of the disposal wells would be performed under the conditions of a UIC permit issued by the FDEP, with the objective of protecting water quality within the APPZ and overlying aquifers.

Operations Impacts

FPL (2014-TN4058) indicates that the water needed to operate two units would be approximately 50,000 gpm or 72.7 Mgd. As indicated in Chapter 3, evaporative losses from cooling two units would be approximately 28,800 gpm (41.5 Mgd). The review team assumed that the two units at the Martin site would primarily use brackish groundwater from the permeable zone (APPZ) within the Avon Park formation for makeup-cooling water. This relatively permeable zone is considered part of the Middle Floridan aquifer and is more than 1,000 ft below the ground surface near the Martin site. The SFWMD has informed the NRC that consumptive use of surface water from Lake Okeechobee or its tributaries would be limited (SFWMD 2012-TN3814). Use of water from Lake Okeechobee and the St. Lucie Canal would also have to avoid any negative impact on restoration projects in South Florida. Therefore, surface water from Lake Okeechobee and the St. Lucie Canal could be used only at times of excess surface-water flow that typically occur during the wet season.

The APPZ aquifer is not generally used because of the salinity of its water (FPL 2013-TN3052). Therefore, current impacts of using this water for power production are minor. Because brackish or saline groundwater is not in demand, use of this resource will not result in water-use conflicts. However, groundwater in the Middle Floridan aquifer at this site is a potential source of brackish water for desalinization. If demand for desalinization source water increases, water for the plant may be obtained from deeper, more saline formations.

Blowdown discharge and other wastewater streams would be pumped into the Boulder Zone of the Lower Floridan aquifer. The Boulder Zone is isolated from the APPZ by low-permeability units. Additional low-permeability confining units separate the APPZ from the overlying Upper Floridan aquifer. Construction and operation of the disposal wells would be performed under the conditions of an UIC permit issued by the FDEP.

As indicated in Chapter 3, the consumptive water use due to evaporative losses from cooling two units would be approximately 28,800 gpm (41.5 Mgd). However, the review team assumed that surface water would only be consumed during periods of excess flow, thereby precluding water-use conflicts.

During the operation of two new nuclear units at the Martin site, impacts on surface-water quality would be minimal because wastes would be injected into the Boulder Zone and not released to the surface water. FDEP would require FPL to develop a SWPPP (FPL 2014-TN4058). These plans would identify measures to be used to control stormwater runoff. All discharges to surface waterbodies would be required to comply with limits established by FDEP in a NPDES permit.

During the operation of the two units at the Martin site, impacts on groundwater quality could result from potential spills. Spills that might affect the quality of groundwater would be prevented and mitigated by BMPs. Like the proposed site, any wastewater at this inland alternative site would be combined with cooling-tower blowdown and discharged into Boulder Zone with no loss of beneficial uses of the water resource.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operations activities, cumulative analysis considers past, present, and reasonably foreseeable future actions that affect the same water resources.

For the cumulative analysis of impacts on surface water and groundwater at the Martin site, the geographic area of interest is the same as what was considered for building and operational impacts, and was defined earlier in this section.

Actions that have past, present, and future potential impacts on water supply and water quality near the Martin site include existing agriculture and existing and future urbanization in the region.

<u>Cumulative Impacts on Water Use</u>

The impacts of the other projects listed in Table 9-11 are considered in the analysis included above or would have little or no adverse impact on surface-water use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Martin site, use relatively little or no surface water, or have little or no discharge to surface water. Some projects (for example park and forest management) are ongoing, and changes in their operations that could have large impacts on surface-water use appear unlikely.

In 2000, the Florida Legislature passed the Lake Okeechobee Protection Act to establish a restoration and protection program for Lake Okeechobee (SFWMD et al. 2011-TN3087; SFWMD 2010-TN3086). Part of the focus of this act was to restore the natural hydrology of the

system after years of altering the natural drainage around the lake to permit development of the land and to reduce flood damage. The State of Florida and the Federal government are spending hundreds of millions of dollars to restore the Lake Okeechobee and other water resources in the watershed; therefore, the review team concluded that the cumulative impact on surface-water use would be MODERATE.

Surface-water use during the building and operation of two units at the Martin site would be dominated by water use for operations. As discussed above, surface water would only be withdrawn during periods of excess flow. Therefore, the review team concluded that building and operating the proposed units at the Martin site would not be a significant contributor to the MODERATE impacts on surface-water use.

As stated above, the review team assumed that any use of shallow groundwater to build the units at the Martin site would be regulated by the SFWMD. If this source is not available in sufficient quantity for building activities, brackish groundwater from the APPZ could be used for some building activities. Groundwater impacts from dewatering would be controlled with diaphragm walls and grouting. Groundwater from the APPZ would be used to operate the plant except when excess surface water is available. The APPZ aquifer is not generally used because of the salinity of its water (FPL 2013-TN3052). Because brackish or saline groundwater is not in demand, use of this resource will not result in water-use conflicts.

The impacts of the other projects listed in Table 9-11 are considered elsewhere in this analysis or else would have little or no adverse impact on groundwater use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Martin site, or use relatively little or no groundwater. Some projects (for example park and forest management) are ongoing, and changes in their operations that would have large impacts on groundwater use appear unlikely. Therefore, the review team concludes that cumulative impacts on groundwater use would be SMALL.

Cumulative Impacts on Water Quality

Point and non-point source discharges have affected the surface-water quality of the Lake Okeechobee watershed upstream, and the St. Lucie Canal and other discharge canals downstream of the Martin site. Water-quality information presented above for the impacts of building and operating the proposed new units at the Martin site would also apply to evaluation of cumulative impacts. Lake Okeechobee has been the target of extensive efforts to reduce nutrient loading and improve water quality (SFWMD et al. 2011-TN3087). Therefore, the review team concluded that the cumulative impact on surface-water quality of the receiving waterbody would be MODERATE. During the operation of two new nuclear units at the Martin site, impacts on surface-water quality from the units would be minimal because plant discharges would be injected into the Boulder Zone and not released to the surface water. The State of Florida requires an applicant to develop a SWPPP (FPL 2014-TN4058) and all discharges to surface waterbodies would be required to comply with limits established by FDEP in a NPDES permit. Such permits are designed to protect water quality. The SWPPP would identify measures to be used to control stormwater runoff (FPL 2014-TN4058).

The review team concluded that building and operating the proposed units at the Martin site would not be a significant contributor to the MODERATE impacts on surface-water quality, because industrial and wastewater discharges from the proposed units would be discharged

directly to the Boulder Zone and any stormwater runoff from the site during operations would be managed in compliance with the SWPPP (FPL 2014-TN4058).

The APPZ aquifer is not generally used because of the salinity of its water (FPL 2013-TN3052). Because brackish or saline groundwater is not in demand, use of this resource would not result in water-use conflicts. The review team also concludes that with the implementation of BMPs, the impacts on shallow groundwater quality from building and operating two new nuclear units at the Martin site would likely be minimal. Therefore, the cumulative impact on groundwater quality would be SMALL. The impacts of other projects listed in Table 9-11 are either considered in the analysis included above or would have little or no impact on surface-water and groundwater quality.

9.3.3.3 Terrestrial and Wetland Resources

The following section addresses potential impacts on terrestrial resources from siting two new nuclear units on the Martin site and transmission line corridors, which cross through portions of Martin and Palm Beach Counties. The proposed Martin power plant site presently supports existing power units that occupy about 300 ac along with a 6,500 ac cooling-water reservoir serving those units (FPL 2014-TN4058). A 1,200 ac wetland mitigation site exists immediately north of the reservoir and contains a 400 ac wetland forest preserved as a natural area known as the Barley Barber Swamp (FPL 2014-TN3750). Other wetland habitats include freshwater marsh and wet prairie. A significant portion of the site and vicinity also exists as upland land-cover classes including pine flatwoods, palmetto prairie, hardwood-conifer forest, and dry prairie. Habitats in the surrounding vicinity include pasture, rangeland, upland forest, wetland forest, freshwater marsh, and wet prairie.

Martin and Palm Beach Counties host multiple terrestrial species that are listed as Federally endangered or threatened (Table 9-13). Nine of the listed species also occur in Glades County. Habitat preferences for those nine species were discussed in the Glades alternative site section, and only the other nine species that are unique to Martin County are described here. Surveys were not conducted at the Martin site or along the conceptual transmission line corridor to determine the presence and distribution of listed species. Therefore, the staff determined the likelihood of occurrence at project sites based on habitat preferences of each species and the land-cover types expected to be affected at Martin site and within the conceptual transmission line corridor. Kirtland's warbler (*Dendroica kirtlandii*) is a migrant songbird that does not nest in Florida and occurs there during spring and fall migration (FWS 1999-TN136). During migration, Kirtland's warblers use dense scrub vegetation less than 1.5 m (5 ft) in height. The piping plover is a shorebird that overwinters in Florida on wide beaches, mudflats, and other open coastal wetlands (FWS 1999-TN136). The Miami blue (*Cyclargus thomasi bethunebakeri*) is a butterfly that historically occurred in Martin County in tropical coastal hammocks, scrub, and pine rocklands (Daniels 2005-TN141). It is now only known to occur in on the Bahia Honda Key in Monroe County. The southeastern beach mouse (*Peromyscus polionotus niveiventris*) is found in sea oats (*Uniola paniculata*) and shrubs that grow on coastal sand dunes (FWS 1999-TN136). Beach jacquemontia (*Jacquemontia reclinata*) is a coastal species found on sand dunes (FWS 1999-TN136). Florida perforate cladonia (*Cladonia perforata*) is a species of lichen that grows among scrub habitat found high sand dune ridges along the Atlantic Coast as well as the Lake Wales Ridges (FWS 1999-TN136). Four-petal pawpaw (*Asimina tetramera*) is a shrub or small tree that inhabits coastal scrub vegetation of pine, oak, or palmetto on the

Atlantic Coastal Ridge. This species is known to occur at one location each in northern and southern Martin County (CPC 2010-TN3729). Lakela's mint (*Decerandra immaculata*) is a small shrub that grows in sand scrub (CPC 2010-TN3730). This species was translocated to the Hobe Sound National Wildlife Refuge in Martin County and this is the only location within Martin County this plant is known to occur (CPC 2010-TN3730). The tiny polygala (*Polygala smalii*) is a herbaceous plant species that occurs in very dry habitats prone to natural fire including pine rocklands, scrub vegetation, high pine, and coastal spoil found on the Atlantic Coastal Ridge (FWS 1999-TN136).

Table 9-13. Federally Listed Terrestrial Species that May Occur on the Martin Site or within the Conceptual Transmission Line Corridor

Scientific Name	Common Name	Federal Status
Birds		
Polyborus plancus audubonii	Audubon's crested caracara	Threatened
Rostrhamus sociabilis plumbeus	Everglade snail kite	Endangered
Aphelocoma coerulescens	Florida scrub jay	Threatened
Campephilus principalis	Ivory-billed woodpecker	Endangered
Dendroica kirtlandii	Kirtland's warbler	Endangered
Charadrius melodus	Piping plover	Threatened
Picoides borealis	Red-cockaded woodpecker	Endangered
Grus americana	Whooping crane	Endangered
Mycteria americana	Wood stork	Threatened
Calidris canutus rufa	Red knot	Threatened
Mammals		
Puma concolor coryi	Florida panther	Endangered
Peromyscus polionotus niveiventris	Southeastern beach mouse	Threatened
Reptiles		
Drymarchon corais couperi	Eastern indigo snake	Threatened
Invertebrates		
Cyclargus thomasi bethunebakeri	Miami blue	Endangered
Strymon acis bartrami	Bartram's scrub-hairstreak[(a)]	Endangered
Anaea troglodyte floridalis	Florida leafwing	Endangered
Plants		
Jacquemontia reclinata	Beach jacquemontia	Endangered
Asimina tetramera	Four-petal pawpaw	Endangered
Decerandra immaculata	Lakela's mint	Endangered
Polygala smallii	Tiny polygala	Endangered
Cucurbita okeechobeensis ssp. okeechobeensis	Okeechobee gourd[(a)]	Endangered

(a) Additional listed species occurring in Palm Beach County (FWS 2014-TN3759)

Source: FWS 2014-TN3731

The Martin site is dominated by a 6,500 ac water reservoir and supporting dikes that provide cooling water for five fossil-fuel power units. The site also has a solar power-generation unit. FPL assumed a footprint of 362 ac for the new nuclear power units. The proposed site of the

new nuclear power units contains both upland and wetland habitats (FPL 2011-TN59). Upland cover types include palmetto prairie, pine flatwoods, hardwood-coniferous forest, shrub and brushland, dry prairie, upland hardwood forest, woodland pasture, and unimproved pasture. Wetland cover types include freshwater marsh, wet prairies, and mixed wetland hardwoods (FPL 2011-TN59). Wading birds have been observed using the stormwater basin and ditch system for the existing units. White ibis (*Eudocimus albus*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), snowy egret (*Egretta thula*), wood stork, and sandhill crane (*Grus canadensis*) have either been observed or would be expected to occur in the project area (FPL 2014-TN4058). Wading birds are an ecologically important group in the South Florida ecosystem, and both herons and ibises are considered ecological indicators (FWS 1999-TN136). The wood stork is a Federally threatened species. Recreationally important species observed at the Martin site include white-tailed deer, feral hog, and turkey (*Meleagris gallopavo osceola*). Waterfowl are also hunted in Florida and numerous species could occur in suitable habitats on the Martin site.

Building Impacts

Typical impacts from building nuclear units include permanent and temporary habitat loss from development, habitat fragmentation and degradation, disturbance and displacement of individuals, exposure of wildlife to increased noise levels and human presence, and increased risk of vehicle collision mortality. The conversion of fully developed and stable plant communities to earlier successional communities dominated by lower growing vegetation during development of linear transmission line or pipeline corridors often results in a high degree of habitat fragmentation within the landscape.

FPL assumed a 362 ac area for the main power plant site within the Martin site for evaluating potential impacts of building two new nuclear power reactors and associated infrastructure and an additional 3,000 ac for a cooling-water storage reservoir (FPL 2014-TN4058). The review team determined cooling water could be obtained from groundwater beneath the Martin site and that the cooling-water storage reservoir was unnecessary. FPL stated offsite facilities and development would also be needed to construct and operate nuclear power plants at the Martin site. FPL estimated a 39 mi long corridor approximately 100 ft wide for road access and also plans to install 4.3 mi of rail line and pipeline corridors connecting the C-44 Canal to the site (assumed cooling-water source).

Impacts from the plant area, access road, rail line, and pipeline corridors are discussed first below. Impacts from the transmission line are discussed in a separate section below.

<u>Plant Facilities</u>

If the nuclear power units, access road, rail line, and pipeline were built within the proposed footprint, an estimated total of 909 ac would be affected (Table 9-14). Approximately 362 ac of this area is naturally vegetated uplands, approximately 283 ac is currently used for agriculture, and approximately 151 ac is open water and wetlands (FPL 2011-TN59). Approximately 112 ac of the proposed footprint has been previously developed (FPL 2011-TN59). Although access to the Martin site is currently available to service the existing fossil units, SR-710 would require widening to accommodate additional traffic during construction of the new nuclear plant.

Additional acreage may be permanently or temporarily disturbed when used for laydown areas, a batch plant, and fill and spoil deposition. FPL would use cleared land to the greatest extent possible and temporary use areas would be reclaimed (FPL 2014-TN4058). Impacts from building the plant area, access road, rail line, and pipeline corridors are discussed first because most of these activities result in permanent habitat loss. Many of the impacts from building the transmission line represent habitat alteration rather than loss and are discussed in a separate section below.

Table 9-14. Acreage within the Conceptual Footprint at the Martin Site

FLUCFCS Code	Description	Site and Offsite Non-Transmission (ac)	Transmission (ac)
200-series	Agriculture	283	100
300-series	Uplands	162	288
400-series	Forest	200	53
500-600 series	Water and Wetlands	151	321
100, 700, and 800 series	Developed	112	2
Total		908	764

Source: FPL 2011-TN59

Surveys of the occurrence, abundance, and distribution of Federally listed species have not been performed for the Martin site. Only species that could be affected by the new nuclear power units at the Martin site are discussed here, because limited distribution and/or lack of suitable habitat likely preclude impacts on the ivory-billed woodpecker, piping plover, Miami blue, southeastern beach mouse, beach jacquemontia, Florida perforate cladonia, four-petal pawpaw, and Lakela's mint. Audubon's crested caracaras nest in palmetto prairie habitat and also use other open habitats such as both wet and dry prairie as well as improved pasture. Almost 87 ac of palmetto prairie at the Martin site would be permanently lost, as would approximately 169 ac of wet prairie, dry prairie, and improved pasture. Approximately 64 ac of freshwater marsh would also be lost. Everglade snail kites rely on freshwater marsh. Although their presence has not been documented at the site, the distribution of this species includes Lake Okeechobee and Martin County. Florida scrub jays and Kirtland's warblers thrive in scrub vegetation, especially oak scrub. Preconstruction activities would eliminate 27 ac of shrub and brushland cover. The red-cockaded woodpecker nests in mature pine forest and forages in mixed pine forest. Pine flatwoods is the single most affected cover type that is found on the Martin site and FPL estimated 143 ac would be permanently lost during preconstruction activities, including 124 ac in the plant area. However the Martin site is not within the FWS red-cockaded woodpecker consultation area so the loss of these habitats on the site should not affect this species (FWS 2014-TN3734). Whooping cranes use wetlands, including freshwater marsh and wet prairies, and the combined acreage expected to be permanently lost is 78 ac. The wood stork is the only species that has either been observed at the Martin site or would be expected to occur there (FPL 2014-TN4058) and the loss of freshwater marsh could also affect this species. Wood storks nest and forage in forested wetlands and 4 ac of mixed wetland hardwoods would be lost. Although no known stork nest colony is present on the site, the site lies within the core foraging area of at least one wood stork nest colony (FWS 2014-TN3732). The Florida panther uses many upland habitats, and preconstruction activities would permanently affect 320 ac of uplands within the FWS Florida panther consultation area (FWS 2012-TN3733). Eastern indigo snakes use a variety of upland habitats including pine

flatwoods, dry prairie, and edges of freshwater marsh. The permanent loss 320 ac of uplands including 143 ac of pine flatwoods and 15 ac of dry prairie would represent lost habitat for the eastern indigo snake. They would also be prone to increased mortality from off-road vehicle use during land clearing and increased traffic during construction and operation. The tiny polygala is known to occur in pine rocklands, scrub vegetation, and under upland pine forest (FWS 1999-TN136). Loss of shrub and brushland cover as well as pine flatwoods and other mixed pine forest would also represent lost habitat for the tiny polygala.

The review team expects that the FWS would establish eastern indigo snake mitigation requirements similar to those established for the Turkey Point site, including preconstruction surveys, staff awareness training, and reporting mortality incidents (FPL 2014-TN4058; State of Florida 2014-TN3637). The 2013 Standard Protective Measures for the Indigo Snake are typically prescribed by FWS to conclude the Endangered Species Act consultation process (FWS 2013-TN3749).

Loss of habitats would also affect local populations of wildlife not Federally listed, but expected to occur within the region in suitable habitat. However, these effects are not expected to be noticeable and would not destabilize even local populations of any of these animals.

Transmission Lines and Access Roads

Offsite facilities and development required to construct and operate nuclear power plants at the Martin site include transmission lines and an access road. FPL estimated the 39.3 mi of transmission line would occupy an additional 764 ac. Similar to the Martin plant site, much of the corridor is upland cover types. Uplands and forest compose 341 ac of the conceptual transmission corridor, with approximately 190 ac, being herbaceous dry prairie. Pine flatwoods, shrub and brushland, mixed rangeland, hardwood-coniferous forest, and a small amount of palmetto prairie would also be contained within the corridor. Wetlands and water compose approximately 42 percent of the conceptual transmission line corridor including 179 ac of freshwater marsh, 55 ac of wet prairie, 24 ac of mixed wetland hardwoods, 18 ac of emergent aquatic vegetation, and small amounts cypress and waterbodies such as lakes, streams, and waterways. Approximately 13 percent (100 ac) of the corridor is used for agriculture including 79 ac of citrus groves, 14 ac of improved pasture, and 8 ac of field crops. Cover types that are dominated by low herbaceous vegetation, such as dry prairie, would not be altered extensively except where the tower pads would be placed and access roads created. Tall vegetation, including trees and wood brush, would have to be removed or mowed under power lines. Therefore, much of the pine flatwoods, hardwood-coniferous forest, palmetto prairie, mixed wetland hardwoods, cypress, and possibly the shrub and brushland would in essence be permanently lost when it would be converted to and maintained as low-growing vegetation cover. The likelihood of non-native plants being accidentally introduced would also increase and could result in habitat alteration.

Loss or conversion of palmetto and dry prairie could reduce the quality of Audubon's crested caracara habitat. Permanent loss from tower pads and access roads would occur and the risk of introducing non-native invasive plants would increase. However, plants within these cover types are low-growing and would not require clearing or vegetation control under transmission lines. In addition, the conversion of woody habitats into low-growing herbaceous habitats could

increase the amount of habitat suitable for caracaras. Building transmission lines through 179 ac of freshwater marsh would likely exclude Everglade snail kites from wetlands at least temporarily and could also permanently degrade habitat through uncontrolled runoff and erosion. Snail kites would not be particularly prone to electrocution or collision with power lines. Shrub and brushland is a component within the transmission line corridor, but the elimination of trees from this component should not substantially affect either the Florida scrub jay or Kirtland's warbler and the conversion of forest cover to shrub-dominated habitats could result in a net increase of habitat for these two species within the transmission line corridor. Elimination of trees from 43 ac of pine flatwoods and 9 ac of mixed hardwood-coniferous forest could reduce the amount of habitat available to the red-cockaded woodpecker because the conceptual transmission line corridor is very near the border of the FWS red-cockaded woodpecker consultation area (FWS 2014-TN3734). Cutting a corridor through large patches of forest could also cause fragmentation and reduce the value of surrounding habitat. Freshwater marsh is a predominant habitat within the transmission line corridor, and approximately 55 ac wet prairie habitat would also exist within the corridor. Both of these habitats could potentially be used transiently by the whooping crane. These habitats would not necessarily be altered because they are already dominated by low-growing vegetation.

Native upland forested habitats are preferred by the Florida panther. The Martin site is within the Florida Panther Secondary Management Zone. Although building a 39.3 mi long transmission line corridor would result in more habitat conversion than permanent habitat loss, the conversion of habitats would likely result in panther habitat fragmentation, degradation, and ultimately loss of habitat value. The tiny polygala is associated with pine rocklands and scrub vegetation. Periodic maintenance of vegetation within the transmission line corridor could mimic periodic disturbances necessary to inhibit succession of rockland and shrub habitats into forest, possibly increasing habitat suitability for the tiny polygala. The eastern indigo snake inhabits many upland habitats. Conversion of habitats from forest to low-growing vegetation would not decrease habitat suitability for this species, and increased heterogeneity within the landscape may actually increase habitat quality. FPL stated field surveys would be conducted for Federally listed and State-protected species as part of the permitting process before any preconstruction activities would occur at the Martin site (FPL 2014-TN4058). Preconstruction activities would be conducted in accordance with all Federal and State regulations, permit conditions, good construction practices, and BMPs including the use of directed drainage ditches and silt fencing. Acreage within the conceptual transmission line corridor was minimized to the extent possible by using the most direct route while avoiding areas with important resources and high biological value. FPL also stated that any wetland functions affected within the transmission line corridor would be replaced or restored.

Operations Impacts

The review team assumed the facility configuration and operation at the Martin site would be similar to that at the Turkey Point site. Operation of two nuclear units at the Martin site would create noise, fogging and dissolved solid deposition from cooling towers, runoff from increased impermeable surfaces, light pollution, and increased vehicle collision mortality to local wildlife populations. Operation of transmission lines could increase the risk of bird collision and electrocution mortality.

Operational noise from the cooling towers would only displace individual animals from the immediate vicinity of the cooling towers, because the use of splash guards on air inlets and stacks on mechanical fans would limit cooling-tower noise to approximately 73 dBA at a distance of 200 ft from the cooling towers. The review team determined the salinity of the groundwater used for cooling would be less than or equal to that of seawater and salt deposition from cooling-tower drift at the Martin site would be similar in scale and intensity to deposition at the Turkey Point site if the radial collector wells were the sole cooling-water source. Most of the salt would be deposited on developed land very near the cooling towers, and concentrations as high as 10 kg/ha/mo that have resulted in observable effects on sensitive plant species could be expected as far as 1.25 mi from the cooling towers. The Barley Barber Swamp, located on a peninsula within the cooling pond for the existing power units and the Martin site, is more than 1.25 mi from the existing plants and would be even farther from any new units at the Martin site and would not be expected to be affected by salt from cooling-tower drift.

The creation of impermeable surfaces at the higher relative elevations of the Martin site would likely result in the concentration of stormwater runoff into surrounding wetlands, including the 6,500 ac water reservoir and supporting dikes that provide cooling water for five fossil-fuel power units and perhaps affect the 400 ac Barley Barber Swamp within the 1,200 ac mitigation site. Other wetlands, including nearby freshwater marsh and wet prairie, would also receive runoff. Although BMPs would be expected to be followed, runoff could result in silt and pollutant deposition into these areas.

Light pollution during facility operation could affect wildlife residing on or migrating through the Martin site. Design criteria could include minimization of upward lighting, turning off unnecessary lighting between 11 p.m. and sunrise, and luminary selection and mounting to provide light only where needed (FPL 2014-TN4058). If these actions are taken, the review team expects that impacts from light pollution on wildlife would be minimal.

Proposed transmission lines to support additional units at the Martin site could pose a risk to listed wildlife. Direct mortality resulting from birds colliding with tall structures has been observed (Avatar et al 2004-TN892). Factors that appear to influence the rate of avian impacts with structures are diverse and related to bird behavior, structure attributes, and weather. Migratory flight by flocking birds during darkness has contributed to the largest mortality events. Tower height, location, configuration, and lighting also appear to play roles in avian mortality. Weather, such as low cloud ceilings, advancing fronts, and fog, also contribute to this phenomenon. Waterfowl may be particularly vulnerable due to their low, fast flight and flocking behavior (EPRI 1993-TN73). However, in NUREG–1437, the NRC staff concluded that the threat of avian collision as a biologically significant source of mortality is very low because only a small fraction of total bird mortality could be attributed to collision with nuclear power plant structures, including transmission line corridors with multiple transmission lines (NRC 2013-TN2654). Although collision may contribute to local losses, thriving bird populations can withstand these losses without threat to their existence (EPRI 1993-TN73). Transmission line structures, conductors, and guy wires all pose a potential avian collision hazard for all resident birds that live in the vicinity of the transmission lines and for migratory birds that may pass through these areas. At least 41 species of birds are known to have been killed by interaction with Florida electrical utility structures, 20 of which have been killed by FPL electrical utility structures (FPL 2011-TN1283). Although the NRC (NRC 2013-TN2654) has concluded that

bird collisions with transmission lines at existing U.S. nuclear power plants are of small significance, including transmission line corridors with variable numbers of transmission lines, listed wildlife including the wood stork, whooping crane, and Audubon's crested caracara could still be at risk. Although endangered, whooping cranes in the Kissimmee Prairie in central Florida are the result of efforts to establish a nonmigratory whooping crane population officially designated as an experimental nonessential population (58 FR 5647) (TN3324). During 2001, additional efforts were initiated to establish a population of migratory whooping cranes that would winter on the Chassahowitzka National Wildlife Refuge in Citrus County, Florida. Chassahowitzka National Wildlife Refuge is approximately 165 mi northwest of the Martin site, while Kissimmee Prairie Preserve State Park is approximately 50 mi northwest. Whooping cranes are large birds that travel long distances and the conceptual transmission line corridor supporting the Martin site contains suitable whooping crane habitats. Transmission lines connecting the Martin site to the Corbett substation would have to pass through the core foraging areas of multiple wood stork nesting colonies (FWS 2014-TN3732). However, like the whooping crane, the risk of collision and electrocution mortality for the wood stork increases if transmission lines are operated within their range and there is suitable habitat within the transmission right-of-way. The level of risk is commensurate with the location of the transmission lines and wood stork nesting colonies, foraging habitat, and travel corridors. Operational effects on other important species would be minimal.

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NRC 2013-TN2654). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NRC 2013-TN2654). The impacts of EMFs on terrestrial flora and fauna are of small significance at operating nuclear power plants, including transmission systems with variable numbers of power lines and lines energized at levels less than 765 kV (NRC 2013-TN2654). Since 1997, more than a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2005-TN1329). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2005-TN1329). Therefore, the incremental EMF impact posed by operation of existing transmission lines and the addition of new lines for two new nuclear units would be negligible at the Martin alternative site.

Transmission line corridor vegetation-management activities (cutting and herbicide application) and related impacts on floodplains and wetlands in transmission line corridors are of minor significance at operating nuclear power plants, including those with transmission line corridors of variable widths (NRC 2013-TN2654). Consequently, the incremental effects of transmission line corridor maintenance and associated impacts on floodplains and wetlands for two new nuclear units would be negligible at the Martin site.

Cumulative Impacts

The geographic area of interest for the assessment of the potential cumulative impacts of building and operating a new reactor at the Martin site and other past, present, and reasonably foreseeable future actions on terrestrial resources and wetlands is defined as being within a 50 mi radius around the Martin site. A list of past, present, and reasonable foreseeable actions

within 50 mi of the Martin site is presented in Table 9-11. This list includes a variety of energy-production projects, stone mining, manufacturing, transportation and infrastructure-development projects, set-aside areas for recreation and conservation, CERP-related projects, and other miscellaneous activities that could affect terrestrial and wetland resources.

Past land use in South Florida, especially agriculture and more recently urbanization, has greatly affected the distribution, quality, and quantity of plant and wildlife habitats still remaining. Development and urbanization of higher elevation lands for energy, infrastructure, and manufacturing projects have further reduced the amount of pine flatwoods and other remaining upland habitat. Ditching and draining created more dry land, reducing the amount of wetlands available as habitat. The continued operation and maintenance of existing facilities would likely not exacerbate the current situation with respect to terrestrial and wetland ecosystems. New mining activities have the potential to expand their footprint and development in general on the landscape, as does continued human population growth in South Florida. Lands set aside for recreation and conservation provide buffers against development, provide habitat for plants and animals, and serve to preserve fragments of the ecosystem of South Florida. Projects that continue to incrementally reverse changes in land cover due to man-made changes in surface-water flow, including CERP-related activities, would continue to benefit both terrestrial and wetland ecology of the region.

As described in Chapter 7, terrestrial and wetland environments in South Florida may also be affected by continued population growth and related development. The overall impact from past, present, and reasonably foreseeable future activities on regional terrestrial and wetland ecology is substantial.

Summary Statement

The landscape around the Martin site is composed mostly of upland cover types with scattered wetlands, in addition to a large cooling-water reservoir. Approximately 909 ac of upland and wetland habitat would be permanently lost at (and just outside of) the plant site, and approximately 764 ac of upland and wetland habitat would be affected by building and operating the transmission line corridor. Although the entire corridor would not be developed and all lands would not be lost as habitat, some portion would be lost to pole installation, road development, or altered to low-growing vegetation. Effects could involve the Florida panther, Audubon's crested caracara, Everglade snail kite, wood stork, and eastern indigo snake among others. Although the 39.3 mi long conceptual transmission line corridor is relatively short compared to the other sites considered, upland habitat would still be degraded through fragmentation if it were developed. Whooping cranes from the Chassahowitzka National Wildlife Refuge could range south and risk collision with transmission lines.

Based on the information provided by FPL and the review team's independent evaluation, the review team concludes that the cumulative impacts on terrestrial and wetland resources of building and operating two new nuclear units at the Martin alternative site, including impacts attributable to permanent conversion of habitat for the facility footprint as well as operation of the cooling towers and transmission lines, would be MODERATE. The incremental effect of the building and operation of two new nuclear units at the Martin site would be a significant contributor to this impact primarily because of the proposed impacts on undeveloped upland, forest, and wetland habitats and their respective species.

9.3.3.4 Aquatic Resources

What follows is an assessment of the potential impacts on aquatic resources that may occur if the two nuclear reactors described by FPL (2014-TN4058) were constructed and operated at the Martin alternative site. Based on a review of potential cooling-water sources discussed in Section 9.3.3.2, the review team assumes no cooling ponds or reverse osmosis facilities would be required for the Martin site. Unless otherwise noted, the information presented in this section was obtained from FPL's ER, Revision 6 (FPL 2014-TN4058).

The Martin site is located in western Martin County, approximately 40 mi northwest of West Palm Beach, 5 mi east of Lake Okeechobee, and 7 mi northwest of Indiantown, Figure 9-11. The existing 22,300 ac site includes five fossil-fuel–fired electrical generating units and a solar unit. The site is bounded on the west by SFWMD L-65 Canal and on the south by the St. Lucie Canal, also known as the C-44 Canal or Okeechobee Waterway. Onsite surface waterbodies at the Martin site include an existing cooling pond and a makeup/discharge canal that supports the fossil units, Barley Barber Swamp, and the Northwest Parcel mitigation area. FPL indicated in its ER that a 1,200 ac area north of the proposed site has been set aside as a mitigation area (FPL 2014-TN4058). The facility footprint for the proposed units would occupy approximately 362 ac. New transmission lines to support the nuclear power-generating units would be 31 mi long and encompass 764 ac that include previously disturbed areas, existing rights-of-way, forests, and agricultural land. As a basis for this assessment the review team assumes the primary water source for the reactor cooling system would be groundwater, with additional water obtained from the C-44 (St. Lucie) Channel during high-flow periods using a conventional intake. Cooling-tower blowdown would be injected into the Boulder Zone.

The C-44 Channel connects to Lake Okeechobee just west of the Martin site, and likely contains aquatic resources that are similar to those in the lake. Lake Okeechobee is the largest lake in Florida, and the center of South Florida's regional water-management system, providing commercial and sport fisheries, flood control, and a source of potable and irrigation water. The lake encompasses over 730 mi^2, and has an average depth of about 9 ft (FFWCC 2013-TN2842). Desired lake elevations (stages) are between 12.5 and 15.5 ft (USACE and SFWMD 2009-TN2848). Major natural tributaries to the lake are Fisheating Creek, Taylor Creek, and the Kissimmee River. Approximately 70 percent of the water entering the lake is associated with these tributaries; rainfall accounts for the remaining 30 percent. Evaporation accounts for about 70 percent of the water loss, and the remaining water exits the lake through engineered outfalls (FFWCC 2013-TN2842).

As described in Section 2.4, water-management practices in South Florida over the past 100 years have dramatically changed the regional hydrology and sheet-water flow, and influenced the aquatic plants and animals in the area. Creation of levees, canals, and channels to support agriculture and development has confined Lake Okeechobee to a smaller area than historically present, and resulted in a variety of water-management activities to maintain the lake level during the dry season and reduce flooding during the wet season. Lake Okeechobee and the connecting rivers, canals, channels, and engineered outfalls are also greatly affected by weather events. During the hurricane season of 2004, Hurricanes Frances and Jeanne created high water surges of over 18 ft, and created turbid conditions that affected submerged aquatic vegetation; the drought of 2006 lowered the level of Lake Okeechobee to an all-time record of

8.82 ft msl (FFWCC 2013-TN2842). Currently, the USACE is responsible for managing water levels in Lake Okeechobee between 12.5 and 15.5 ft NGVD (National Geodetic Vertical Datum of 1929) to balance flood control, public safety, navigation, water supply, and public health (SFWMD 2012-TN2883).

Based on the information provided by FPL (2014-TN4058), the facility footprint at the Martin site would encompass approximately 362 ac. Although the affected area is primarily farmland, building activities have the potential to directly or indirectly affect aquatic resources present in small streams or ponds at or near the site. Installation of the water-intake structure for intermittent cropping of water in the C-44 Channel may temporarily affect resident aquatic biota, and the construction of a water pipeline to the site may temporarily affect surface-water habitats. As described in FPL 2014 (TN4058), approximately 31 mi of transmission lines encompassing 764 ac may also affect aquatic resources in areas where the transmission lines support structures or access roads are adjacent to surface-water habitats. During the operation of the nuclear reactors, cooling water obtained from two intake structures on the C-44 Channel during high-flow periods creates the potential for impingement and/or entrainment of aquatic biota present in the channel, or those entering the channel from Lake Okeechobee. Because Lake Okeechobee and the rivers, streams, channels, and canals in the vicinity of the Martin site are highly connected, it is assumed the biota present in the lake are indicative of the aquatic resources that might be affected by the building and operation of two nuclear reactors, as described below.

Commercial and Recreational Species

Because the St. Lucie and L-65 Canals both connect to Lake Okeechobee, it is assumed the aquatic biota are similar, and the general descriptions of fish and invertebrates presented for the Glades alternative site would apply (Section 9.3.2.4). Thus, the canal systems adjacent to the Martin site would likely support a diverse food web that includes smaller bait fish and larger piscivores, including Largemouth Bass, crappie, catfish, and bream, which have recreational and commercial importance.

Important Species

Based on the hydraulic connections described above, the important species described for the Martin site would be similar to those at the Glades site (Section 9.3.2.4). These would include a variety of forage fish, like Threadfin Shad and Inland Silversides, and larger predators like the Largemouth Bass and Black Crappie (USACE 2013-TN2847; Zhang and Sharfstein 2013-TN2894).

Non-Native or Nuisance Species

As noted previously in the discussion of the Glades site (Section 9.3.2.4), Lake Okeechobee and the connecting canal systems contain a variety of non-native and nuisance species. Many of these species would likely be present in the St. Lucie and L-65 Canal systems.

Federally and State-Listed Species and Critical Habitat

Based on information obtained from the Florida Natural Areas Inventory database (FNAI 2013-TN2900) Federally and State-listed aquatic species and Species of Concern present in Martin County include a variety of species that are found at or near the site: Striped Croaker (*Bairdiella sanctaeluciae*), the Opossum Pipefish (*Microphis brachyurus*), the American alligator (*Alligator mississippiensis*), and four species of sea turtle—loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), and hawksbill (*Eretmochelys imbricata*) (FNAI 2013-TN2900). FPL also noted the endangered Smalltooth Sawfish (*Pristis pectinata*) and the threatened American crocodile has been reported from Martin County (FPL 2012-TN2043). Of these species, only the manatee and alligator would likely occur near the Martin site. Critical habitat for manatee and crocodile is not present at the Martin site, but the manatee consultation area includes Lake Okeechobee (FWS 2003-TN2916). FPL has indicated no listed species have been observed in St. Lucie Canal near the Martin site (FPL 2012-TN2043).

Building Impacts

Building of the proposed nuclear units at the Martin site would occur primarily within the industrial area containing the existing fossil-fuel plants, or in small areas of farmland adjacent to the site. Some existing drainage ditches that support a seasonal population of some of the fish species listed above may be adversely affected. Building of the surface-water intake on the C-44 (St. Lucie) Canal would likely result in short-term turbidity and temporary displacement of aquatic resources, which would be expected to quickly recolonize after building is completed. Building activities related to the transmission lines would occur in previously disturbed areas, existing rights-of-way, and forest or agricultural land. FPL has indicated field surveys for Federally or State-listed species would be conducted prior to construction at the site or within transmission line corridors. Installation of the intake structure would use turbidity curtains, silt screens, or similar technology to minimize impacts. The use of BMPs during tower erection and conductor installation would minimize building-related impacts along transmission line corridors. Impacts would be comparable to those described for the Glades site (Section 9.3.2.4).

Operations Impacts

Based on the review team assumptions described above, the majority of the water required to operate the cooling-water system for the two nuclear facilities at the Martin site would be obtained from groundwater resources, limiting the potential for impingement or entrainment of aquatic biota to periods of surface-water use. During times of excess surface-water flow that typically occurs during the wet season, supplemental water would be obtained from a surface-water intake located in the St. Lucie Canal. Impingement and entrainment of organisms from the intake canal would be the most likely operational impacts on aquatic populations that would occur. Assuming a closed-cycle cooling system and compliance with the EPA's 316(b) Phase I requirements for intake structures (66 FR 65256) (TN243) the intake is considered protective of aquatic life. The anticipated impacts due to impingement and entrainment are considered by the review team to be minimal. Furthermore the intakes would likely be only operated intermittently throughout the year when excess surface water is available. Impingement or entrainment that does occur should not result in noticeable changes in aquatic biota species composition or abundance in the canal or Lake Okeechobee. Because cooling-tower blowdown

would be discharged into the Boulder Zone of the Lower Floridan aquifer via deep-injection wells, surface-water resources would not be adversely affected. There is no available information about biological communities that may be present in the Boulder Zone formations near the Martin site, so it is not possible to determine if a complete exposure pathway is present or assess potential biological effects. Thus, the potential risk of chemical exposure to aquatic resources resulting from discharge of cooling-tower blowdown cannot be determined. Based on an NRC assessment of a similar cooling system proposed at the Levy site in western Florida using brackish saltwater for cooling-tower makeup water (NRC 2012-TN1976), cooling-tower drift impacts on aquatic resources would likely be minimal, because deposition would be expected to occur primarily on plant property or adjacent agricultural lands. Impacts would be comparable to those described for the Glades site (Section 9.3.2.4). No detectable increase in surface-water salinity resulting from salt-drift deposition is anticipated.

Cumulative Impacts

Past, present, and reasonable foreseeable projects and other actions in the vicinity of the Martin site are presented in Table 9-11. As described above for the Glades site, these activities include existing and proposed energy projects, mining activities, transportation projects, parks and aquaculture facilities, and restoration activities associated with CERP goals and objectives that are designed to improve surface-water management practices, restore hydrologic and natural process, and protect and restore natural resources. With the exception of the St. Lucie nuclear facility, most energy projects in the vicinity of the Martin site use coal, natural gas, oil, or biomass/biofuel to produce electrical power. These facilities require pipelines, transmission lines, and access to water to function, resulting in permanent loss of habitat and disturbance to both terrestrial and aquatic resources. Rock mining is also common in areas near the Martin site (five project examples are included in Table 9-11). These sites have the potential to affect hydrological patterns as well as terrestrial and aquatic resources. Areas near the Martin site have also provided opportunities for outdoor recreation and ecological research. The continued existence of these areas will provide sanctuaries and refuges for terrestrial and aquatic wildlife, and additional construction or development near these areas is expected to be limited. Restoration projects sponsored by CERP and others include integrated efforts to better manage surface-water resources, provide flood protection, and explore strategies for increasing aquifer storage. Given the proximity of the Martin site to Lake Okeechobee and the C-44 Canal, restoration activities designed to improve water quality and increase habitat in Lake Okeechobee and the adjacent canals, including the C-44 Canal, are expected to provide a positive benefit to both aquatic and terrestrial biota.

As shown in Table 9-11, a variety of existing, pending, or proposed projects will contribute to the overall cumulative effects that will occur near the Martin site. In some cases, the projects will contribute to habitat loss and lack of hydrologic connectivity that has plagued South Florida since the beginning of the last century. In other cases, the projects will contribute to the overarching goal of CERP to restore lost hydrologic and ecological function, providing an overall positive environmental benefit. As discussed in Section 7.3.2, aquatic environments in this region of South Florida will also be affected by continued population growth and related development, and short- or long-term changes in climate that have the potential to alter weather patterns and influence hydrology. Overall, the review team concludes that the cumulative impacts to aquatic resources in the vicinity of the Martin site are MODERATE.

Summary Statement

Based on a review of the information provided by FPL and the review team's independent assessment, it is likely the building and operation of a nuclear generating plant at the Martin site would contribute only minimally to the cumulative effects on aquatic species likely to occur in that portion of South Florida. Although the building of nuclear units at the Martin site would displace some existing agricultural land, surface-water habitats would be likely minimally affected. During the normal operation of the plant, groundwater would be used for reactor cooling, and deep aquifer discharge of cooling-tower blowdown would be employed, eliminating the need for conventional surface-water intake and discharge structures. During periods of excess surface-water flow, cooling water from the C-44 Channel would be withdrawn for cooling. Some impingement and entrainment losses are expected, however assuming a closed-cycle cooling system and compliance with the EPA's 316(b) Phase I requirements for intake structures (66 FR 65256) (TN243) the intake is considered protective of aquatic life and the anticipated impacts due to impingement and entrainment are considered minimal. Furthermore, the intakes would likely be only operated intermittently throughout the year when surface water is available. Impingement or entrainment that does occur should not result in noticeable changes to aquatic biota species composition or abundance. Thus, the review team concludes that the cumulative impacts of building and operation of two new nuclear reactors at the Martin site, combined with the other past, present, or reasonably foreseeable future activities on aquatic resources would be MODERATE. Building and operating two new nuclear units at the Martin site would not be a significant contributor to the MODERATE impact.

9.3.3.5 Socioeconomics

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect socioeconomics, including other Federal and non-Federal projects listed in Table 9-11. For the analysis of socioeconomic impacts at the Martin site, the geographic area of interest is considered to be the 50 mi region centered on the Martin site with special consideration of Martin, Okeechobee, St. Lucie, and Palm Beach Counties because that is where the review team expects socioeconomic impacts to be the greatest. In evaluating the socioeconomic impacts of site development and operation at the Martin site near Indiantown in Martin County, the review team used readily obtainable data from the Internet or published sources.

Physical Impacts

People who work or live around the site would be exposed to noise, fugitive dust, and gaseous emissions from building and operations activities. Noise, dust, and air-pollution emissions generated within the boundaries of the Martin site would be expected to be similar to those for the Turkey Point site. Because the surrounding site is rural and sparsely populated and because noise and air-pollution impacts are attenuated by distance, the surrounding population exposed would be relatively few and the impacts would be expected to be negligible. Best practices and applicable regulations would be expected to protect building workers and personnel working onsite. Truck and vehicle traffic related to building and operations would generate noise, fugitive dust, and gaseous emissions offsite.

In addition, offsite structures include a transmission line and intake/makeup pipelines (FPL 2014-TN4058). Because the area affected by offsite structures and traffic would also be

rural and sparsely populated and because FPL would be expected to implement a dust-control plan similar to that for the Turkey Point site, noise and air-pollution impacts from these offsite activities would be expected to be minor.

Offsite project-related building activities include widening of 39.1 mi of SR-710 and a 4.3 mi railway. The impact on road quality based on any road improvements made by the applicant to facilitate project-related traffic would be noticeable and beneficial. Other offsite project-related building activities include a 31 mi transmission line and intake/makeup pipelines (FPL 2014-TN4058). The conceptual design of these activities routes them, to the extent possible, along existing rights-of-way and avoids populated areas and residences (FPL 2014-TN4058). The physical impacts on existing structures and crops within the proposed site and offsite areas for supporting infrastructure would be minor.

The area around the site is relatively flat, sparsely populated, and is used mainly as farmland. Building would use cranes (which could exceed 400 ft in height) and would alter the regional viewscape. Construction of the transmission lines would pose similar impacts. The power plant and water-intake facilities would likely be visible from several angles. Building and operations would noticeably alter the aesthetics of the area. However, because there is already a power plant at the proposed site, the contrast with the existing viewscape would be somewhat attenuated. Because of the sparse population and existence of other power plants on the proposed site, the negative impact would likely not interfere with the daily routine of local public around the Martin site and would not destabilize the aesthetic characteristics of the area.

Based on the information provided by FPL (2014-TN4058) and the review team's independent analysis, the review team concludes that the overall physical impacts of building activities and operations would be minor and adverse, with the exceptions of noticeable and beneficial impacts on road quality and noticeable but not destabilizing adverse impacts on aesthetics near the Martin site.

Demography

The Martin site is located in Martin County, 7 mi northwest of Indiantown (2012 population 6,730) and 20 mi southwest of Port St. Lucie (2012 population 163,748), the closest population center with more than 25,000 residents (FPL 2014-TN4058; USCB 2012-TN4098). The population distribution within and around the Martin site is typically rural with low population densities. There are nine counties within the 50 mi area, but the review team estimates the areas in which workers would most likely live in and from which they would commute are within Martin, St. Lucie, Palm Beach, and Okeechobee Counties, based on current commuter patterns of the FPL staff working on the existing Martin site power units.[16]

FPL estimated the peak number of workers during building would be 3,983, including 33 operation workers. The review team assumed that the share of construction and operation workers relocating from outside the four-county area would be 70 percent of the estimated peak number of workers. This assumption was reached by using the assumption made for the proposed Turkey Point site as a reference and assuming that the share of workers that would

(16) The entire workforce of these power units lives in this four-county area (FPL 2014-TN4058).

come from outside the region is inversely proportional to the population of the region.[17] As in Section 4.4, 70 percent of the construction workforce and 100 percent of the operation workforce that moved to the area were assumed to bring their families. Based on these assumptions, a peak of 2,765 construction and 24 operation workers would relocate to the area during the project construction phase, and 1,960 of these workers would bring their families. Based on an average household size of 3.25 people, the total increase in population attributable to the peak total workforce at the Martin site would be 6,370 people. An influx of 6,370 people represents a 0.4 percent increase in the four-county 2012 population of 1,788,607.

FPL estimated the total onsite operations workforce to be 806 workers. As explained above, the review team assumed that 70 percent of these workers (565) would relocate from outside the four-county area. For this analysis, the review team assumed that 100 percent of operation workers who relocate would bring their families. Based on an average household size of 3.25 people, the total population increase attributable to project operations is 1,837 (565 x 3.25) people. This represents a 0.1 percent increase in the four-county area.

The review team concluded that the impact on local demography would not be noticeable.

Economic Impacts on the Community

Economy

FPL estimated the peak number of workers during building would be 3,983, including 33 operation workers. Employment of 3,983 construction and operation workers would have positive economic impacts in the four-county area. Based on a multiplier of 1.7289 jobs (direct and indirect) for every construction job and 2.2799 for every operation job, 3,983 new construction and operation jobs would create 3,047 indirect jobs, for a total of 7,104 new jobs in the four-county area during peak employment (3,950 × 1.7289 + 33 × 2.2799) (FPL 2011-TN56). This represents a 0.9 percent increase in the total employment in the four-county area.[18] Peak employment would last 1 month and the average employment generated during the 10-year building period would be about half of that of peak employment. This added employment would generate added earnings to the economy of the four-county area, but the added employment and earnings would not be noticeable to most of those living or working in the area.

An estimated 806 workers would be required for the operation of two nuclear power facilities. Based on a multiplier of 2.2799 jobs (direct and indirect) for every operations job at the new units (FPL 2011-TN56), an influx of 806 workers would create 1,032 indirect jobs for a total of 1,838 new jobs in the region. This represents a 0.2 percent increase in the total employment in the four-county area. This added employment would also generate added earnings to the

(17) The proposed Turkey Point site analysis assumed 50 percent of the peak workers would come from outside the 50-mi region and that 83.3 percent of those would reside in Miami-Dade County, i.e., 41.65 percent (0.5 x 0.833) of the peak workers would migrate into Miami-Dade County. Because the population of the four-county area is approximately 71 percent of that of Miami-Dade County (USCB 2012-TN4098), the review team assumed the share of peak workers migrating into the four-county area would be 1-(0.71 x 0.4165) ≈ 70 percent.

(18) Employment of 793,457 (BLS 2013-TN4085).

economy of the four-county area, but the added employment and earnings would not be noticeable to most people living or working in the area.

Taxes

State corporate income taxes and sales and use taxes paid at the Martin site during construction and operations of the proposed units would be similar to those paid by the same units at the proposed Turkey Point site. As discussed in Sections 4.4 and 5.4, State taxes paid by the proposed units would not exceed 2 percent of the annual collected State corporate income and sales and use taxes. The impact would be minor and beneficial. County sales surtax rates in the four-county area for the 2014 calendar year are zero percent for Martin and Palm Beach Counties, one-half percent for St. Lucie, and 1 percent for Okeechobee County (FDOR 2014-TN3393). County surtax collections from the proposed units would be highest during construction when annual expenses related to the proposed units would be estimated to reach up to $1.56 billion (Section 4.4). A 1 percent sales surtax would generate $15.6 million in revenues for the four-county area.(19) This would correspond to less than 1 percent of total County revenues in the four-county area for 2014.(20) The impact would be minor and beneficial. County and school district governments in Florida may levy taxes up to 10 mills each (1 percent) in property taxes (FDOR 2012-TN459). If the value of property taxes for the two nuclear reactors at the Martin site were the same as the value estimated for Units 6 and 7 at the Turkey Point site in Section 5.4.3.2, FPL would pay $20 million in property taxes to the Martin School District and $20 million to Martin County during operations. These payments would correspond to 15.6 percent of the Martin School District 2011-2012 total revenues ($20 million compared to $128 million)(21) and to 6.2 percent the Martin County 2011-2012 total revenues ($20 million compared to $322.2 million).(22) Because property taxes paid to school districts are reallocated through Florida's Education Finance Program, the benefit to the Martin School District would be diluted to some extent, and the exact amount distributed to each school district is not known at this time. Because of the value of project-related property tax payments relative to current property taxes, the review team considers the impacts on tax revenues to the Martin School District to be noticeable and beneficial.

The review team concluded that the economic impact would not be noticeable and would be beneficial, with the exception of property tax revenues to the Martin School District, which would be noticeable and beneficial, but would not substantially alter current property tax levels in the Martin School District.

Infrastructure and Community Service Impacts

Traffic

Workforce access to the Martin site would occur through SR-710 coming from the east and the west. The review team estimated the current LOS (Level of Service) of these roads at two FDOT traffic-monitoring sites based on the peak hour directional traffic and FDOT LOS

(19) To the extent that some of the expenditures would be made outside Okeechobee County, and assuming the sales surtax rates are unchanged, the total sales surtax collected would be smaller.
(20) $3,412 million (FLDFS 2013-TN3392).
(21) FLDOE 2013-TN3299
(22) FLDFS 2013-TN3392

thresholds. Peak hour directional traffic information was obtained from FDOT Florida Traffic Online (FDOT 2013-TN3558) and consists of the AADT at each traffic-monitoring site, a Standard Peak Hour Factor (K) and a Directional Distribution Factor (D). The multiplication of these three elements (AADT × K × D) provides an estimate of the current peak hour directional traffic volume. The LOS was determined comparing this peak hour directional traffic volume with the maximum thresholds for each LOS in Table 9 (areas less than 5,000 population) of FDOTs Generalized Service Volume Tables (FDOT 2013-TN3297). Based on this procedure, the LOS at both traffic-monitoring sites is B. To estimate the project impact on traffic LOS during the project's peak workforce building period, the review team followed a methodology similar to that described in Section 4.4: The peak workforce of 3983 construction and operation workers were divided into two shifts, with 70 percent assigned to shift 1 (6:00 a.m. to 4:30 p.m.) and 30 percent to shift 2 (5:00 p.m. to 3:00 a.m.). The hour of peak commute would be 4:30 p.m. to 5:30 p.m. The review team also assumed up to 36 trucks per hour. The project-related directional traffic during the peak commute hour would be 2,824 vehicles (70 percent × 3,983 + 36). The review team assumed that half of the project-related traffic would come from each direction, east and west.[23] Results of this analysis are presented in Table 9-15 below. The additional building traffic would drop the LOS classification at both traffic-monitoring sites to F. The proposed widening of SR-710 would bring the LOS classification to a C.

Table 9-15. Peak Workforce Traffic LOS Analysis for the Martin Site

Traffic-Monitoring Site	Baseline Peak Hour Directional Traffic	Baseline LOS	Distribution of Project-Related Peak Traffic	Added Peak Hour Directional Traffic	Peak Hour Directional Traffic with Project	LOS with Project
SR-710 west of site	276	B	0.50	1,412	1,688	F (C)[a]
SR-710 east of site	364	B	0.50	1,412	1,776	F (C)[a]

(a) LOS classification with widening of SR 710

Source: Review team calculations based on FDOT 2013-TN3297 and FDOT 2013-TN3558

FPL estimated the total onsite operations workforce to be 806 workers. If access of this workforce to the Martin site were distributed among the two directions equally, the LOS at each of the two monitoring sites would drop to C.

Based on the above analysis, the review team concludes that the impact of building and operation of the proposed nuclear reactors at the Martin site would be noticeable during building, although not destabilizing, after widening of SR-710.

Recreation

The Martin site is located within 2 mi from Lake Okeechobee and the Lake Okeechobee Scenic Trail that circles the lake. The lake is used for boating, fishing, and duck hunting, and the scenic trail is used for hiking and bird watching (Palm Beach County 2013-TN3298). The DuPuis Wildlife and Environmental Area is located just south of the Martin site. During building, access to these sites from some directions could be affected by increased traffic. Other parks and

(23) Based on U.S. Census Bureau commuter patterns (USCB 2011-TN4078) it was not possible to determine the likely direction of outgoing project-related traffic.

recreational areas exist within the county. The influx of project-related population to the four-county area would increase the number of local users of recreational facilities. Because the in-migrating population would be less than 1 percent of the local population, the review team expects the impact on current recreational infrastructure to be negligible.

Housing

The review team estimates that 2,789 construction and operation workers would migrate into the four-county area, and each of these workers would need a place to live. Based on American Community Survey 2008–2012 5-Year estimates, within the four-county area, there are 896,705 housing units of which 195,413 are vacant (21.8 percent). This includes housing that is designated as seasonal, recreational, or occasional use (USCB 2012-TN4089). The review team estimates that, in absolute numbers, the available housing would be sufficient to house the construction workforce. The in-migrating construction and operation workforce would occupy no more than 1.5 percent of vacant housing units in the four-county area. FPL estimated that approximately 806 workers would be needed for operation of two nuclear power facilities at the Martin site, and the review team assumed that 70 percent of these workers (565) would relocate from outside the region and would settle in the four-county area. Based on these assumptions, the entire operations workforce would occupy no more than 0.3 percent of vacant housing units in the four counties. The review team concludes that impact on housing would be minor.

Public Services

In-migrating construction workers and plant operations staff would also likely affect local municipal water, wastewater-treatment facilities, police and fire-protection services and other public services in the region. These impacts would be expected to be in proportion with the demographic impacts experienced in the region. In-migration to the four-county area would represent an estimated 0.4 percent of the local population (less during operations). The review team concludes that impact on public services would be minor.

Education

Based on data for the 2011-2012 school year, there are approximately 238,373 full-time equivalent students in public schools in the four-county area(FLDOE 2013-TN3299).[24] The review team estimated that 2,789 construction and operation workers would migrate into the area, and that 1,960 workers would bring their families. Based on an estimate of 0.8 school-aged children per family (Malhotra and Manninen 1981-TN1430), an estimated 1,568 (1,960 × 0.8) school-aged children would be migrating into the four-county area. This would yield a 0.7 percent increase in the student population. During operations, the review team assumed that 565 operation workers and their families would relocate from outside the region. This would include an estimated 452 (565 × 0.8) children in the PK-12 school range. This influx of students would increase the student population in the four-county area by 0.2 percent. The review team concludes that the impact on education would be minor.

(24) FTE is a measure of enrollment based on the number of full-time students that it would take to fill the number of classes offered.

Based on the information provided by FPL (2014-TN4058) and the review team's independent analysis, the review team concludes that the overall infrastructure and community service impacts of building activities and operations at the Martin site would be minor except for noticeable, but not destabilizing, adverse impacts on traffic.

Cumulative Impacts

In addition to the socioeconomic impacts from building and operation of the proposed project at the Martin site, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could have socioeconomic impacts.

The socioeconomic impacts of past and present actions in the affected area are largely captured by the current baseline conditions used for analysis above of project impacts. For example, the impacts of past and present actions on the demography and economy of the area are largely captured by current baseline data on population, employment, and tax revenues and are incorporated in the baseline and trend assessments of the RIMS II multipliers.

Reasonably foreseeable future actions are listed in Table 9-11. Several of these future actions would be expected to have cumulative socioeconomic impacts with the proposed project at the Martin site. The proposed Floridian Natural Gas Storage Facility in Martin County would be located at Indiantown, 3 mi east of the proposed Martin site on SR-710. The construction would likely generate added traffic on SR-710. During construction it would also generate an estimated 1,000 jobs in Martin County during peak employment. An estimated 250 jobs would be supported statewide during operations (Stronge et al. 2007-TN3302). Other proposed projects that would generate employment and earnings during construction and operations include the Florida Southeast Connection pipelines proposed through Highlands, Okeechobee and Martin Counties (construction 2016-2017; FSC 2014-TN3301), and various proposed CERP water projects. The Herbert Hoover Dike Rehabilitation Project and Dam Safety Modification Study will likely also generate some local expenditures in the affected area.

Summary Statement

The cumulative impact of the projects identified above with the proposed project at the Martin site would depend largely on the timing of construction. In particular, cumulative impacts on traffic along SR-710 could add to the adverse impact that would be expected from the proposed project on the Martin site. Other potential cumulative impacts that would be beneficial include increased employment and earnings during construction and operations. Based on the location of the identified future projects and their magnitudes, the cumulative socioeconomic impacts would be expected to be SMALL and adverse, with the exception of MODERATE adverse physical impacts on aesthetics and traffic; and MODERATE and beneficial impacts of property tax revenues to the Martin School District and MODERATE and beneficial impacts on road quality near the Martin site. Traffic impacts on SR-710 could add to the already MODERATE impacts of the proposed project on the Martin site to the point of making them LARGE, depending on the timing of construction. Building and operating two new nuclear units at the Martin alternative site would be a significant contributor to the adverse impacts that are greater than SMALL.

9.3.3.6 Environmental Justice

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect EJ, including other Federal and non-Federal projects listed in Table 9-11.

The 2008–2012 American Community Survey census block groups were used to identify minority and low-income population distributions in the area (USCB 2012-TN4098). The census data for Florida characterizes 15.9 percent of the population as Black; 0.3 percent as American Indian or Alaskan Native; 2.5 percent as Asian; 0.1 percent as Native Hawaiian or other Pacific Islander; 2.6 percent as other single minorities; 2.2 percent as multiracial; 22.5 percent as Hispanic ethnicity; and 42.2 percent as aggregate minority. There are 1,098 block groups within 50 mi of the Martin site. Following the criteria described in Section 2.6.1, Black minority populations exist in 151 block groups; American Indian or Alaskan Native minority populations exist in 2 block groups; Asian minority populations exist in 3 block groups; other race minority populations exist in 11 block groups; multiracial minority populations exist in 2 block groups; ethnic Hispanic minority populations exist in 116 block groups; and aggregate minority populations exist in 323 block groups. There are no block groups containing Native Hawaiian or other Pacific Islander minority populations within 50 mi of the Martin site. The locations of the aggregate minority populations within 50 mi of the Martin site are shown in Figure 9-13. The locations of Hispanic minority populations and Black minority populations within the 50 mi of the Martin site are shown in Figure 9-14 and Figure 9-15, respectively.

The USCB data characterize 15.3 percent of Florida residents as low-income (USCB 2012-TN4098). Out of a possible 1,098 block groups, 108 block groups contain low-income populations. The locations of the low-income populations within 50 mi of the Martin site are shown in Figure 9-16.

The analyses of impacts of building and operating new nuclear reactors at the Martin site identified noticeable adverse impacts on land use, terrestrial and wetland ecosystems, aesthetics, and traffic. The review team did not identify any special pathways through which any impacts would disproportionately affect EJ populations of interest. Therefore, the review team concluded there would be no disproportionately high and adverse impacts on EJ populations of interest.

The NRC's EJ methodology includes an assessment of affected populations of particular interest or with unusual circumstances, such as minority communities that are exceptionally dependent on subsistence resources or identifiable in compact locations (e.g., Native American reservations) and those that have a high density of minority or low-income groups. Based on a literature research, the review team did not identify high-density minority or low-income presence in the proximity of the site, or any differentiated subsistence consumption of natural resources by EJ populations of interest.

Cumulative Impacts

In addition to the EJ impacts from building and operations of the proposed project at the Martin site, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could have EJ impacts. Based on a literature review of past and present actions in the affected area, and based on the reasonably foreseeable actions listed in Table 9-11, the review team found no evidence that the cumulative effects would disproportionately impact EJ populations of interest.

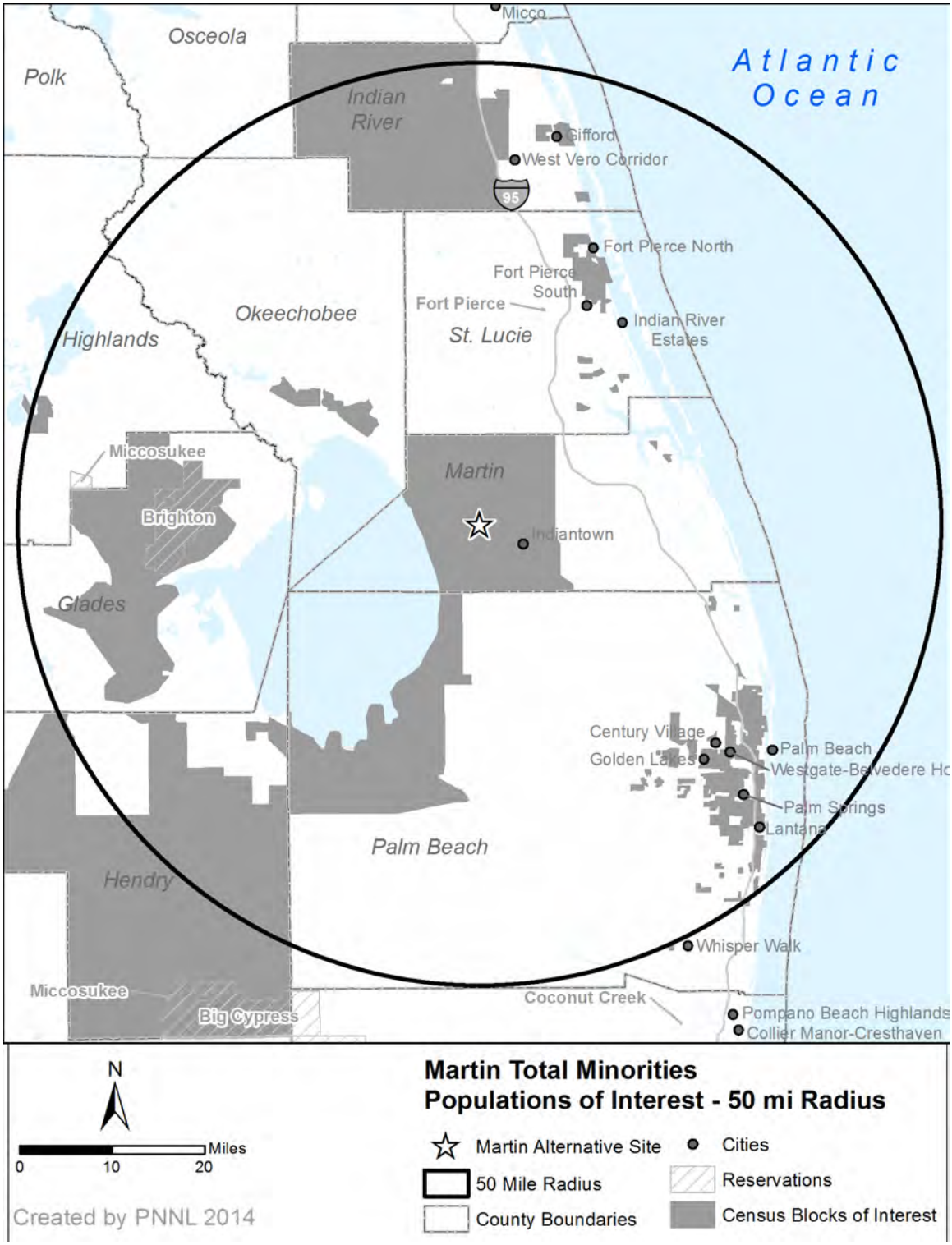

Figure 9-13. Aggregate Minority Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Martin Alternative Site

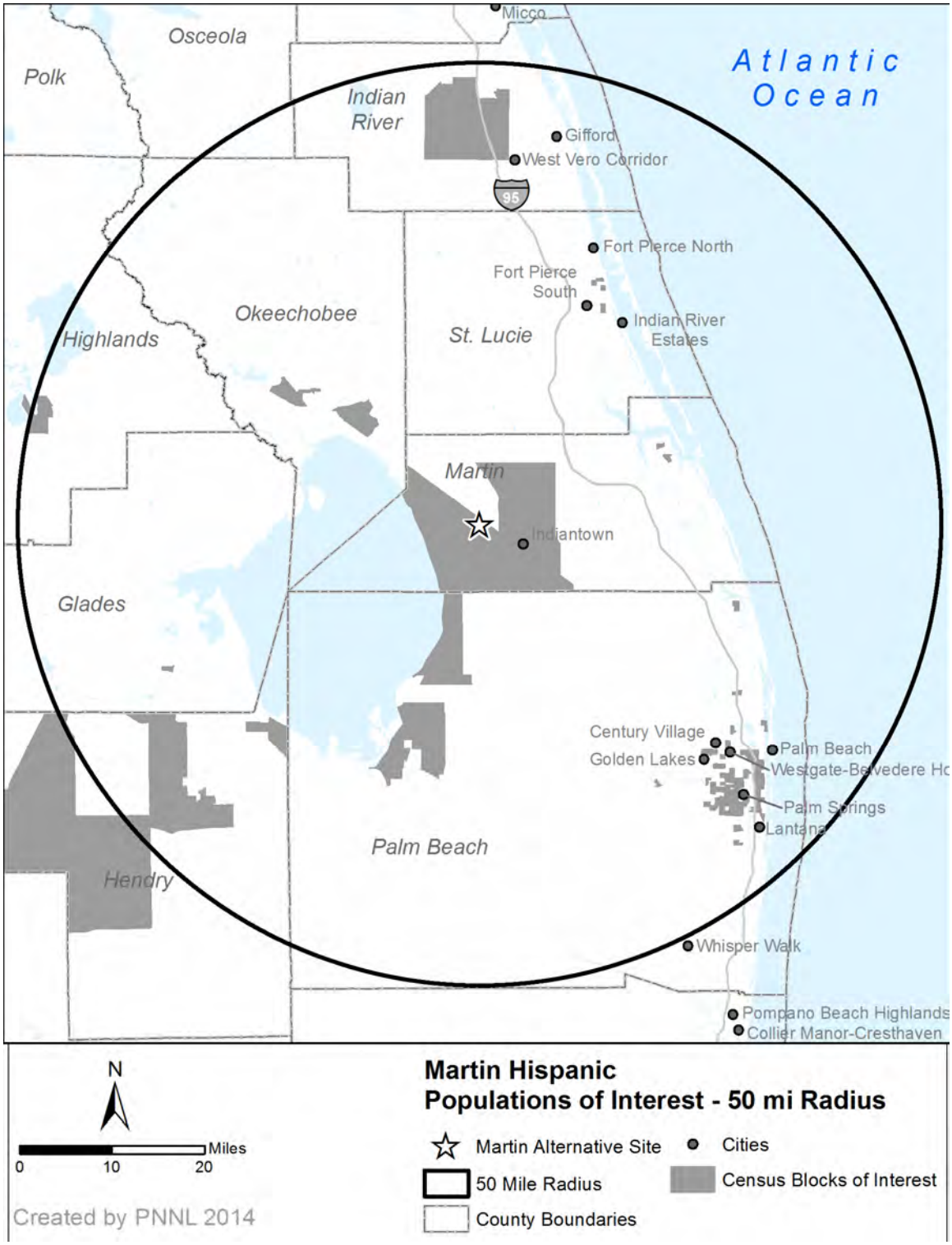

Figure 9-14. Hispanic Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Martin Alternative Site

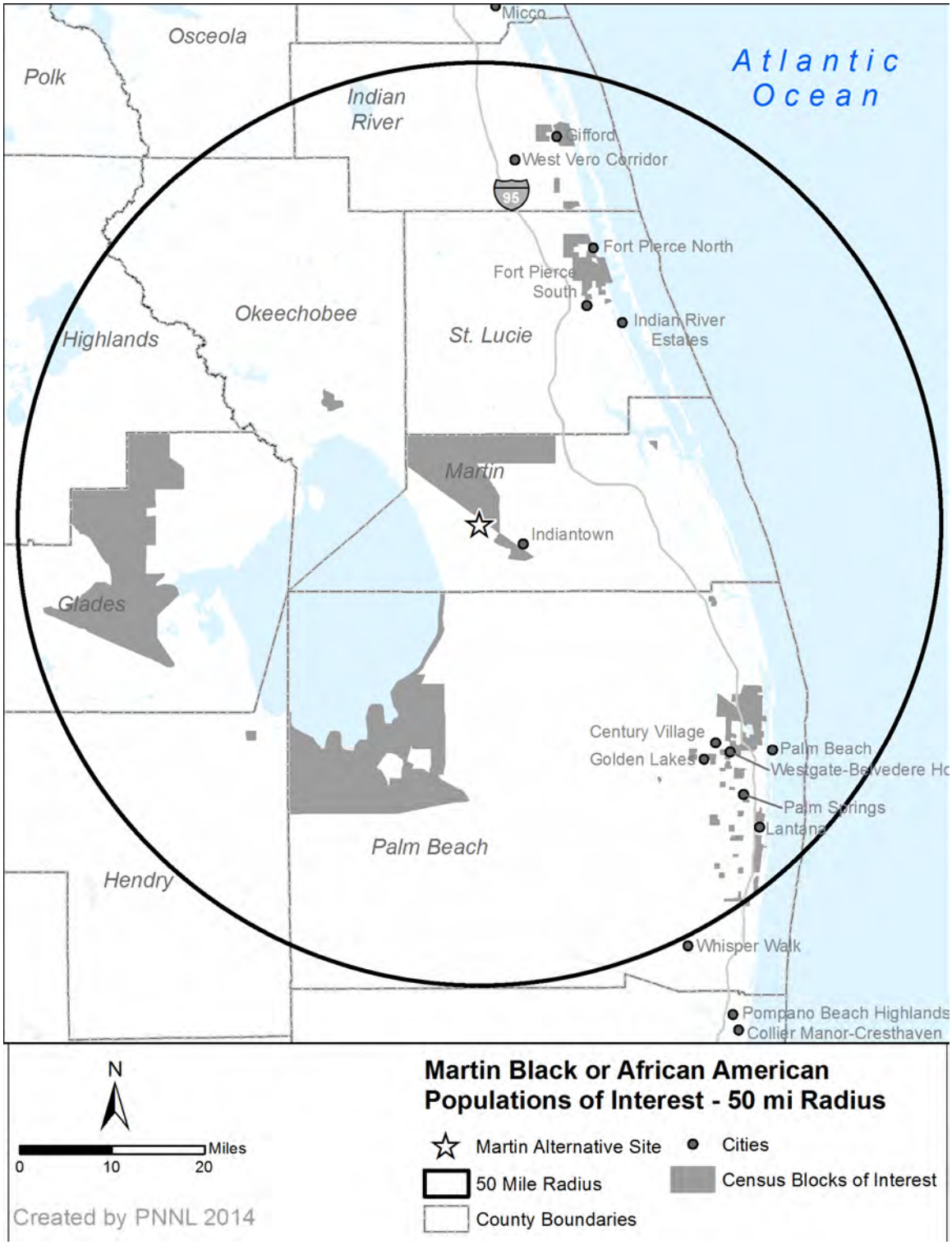

Figure 9-15. African American Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Martin Alternative Site

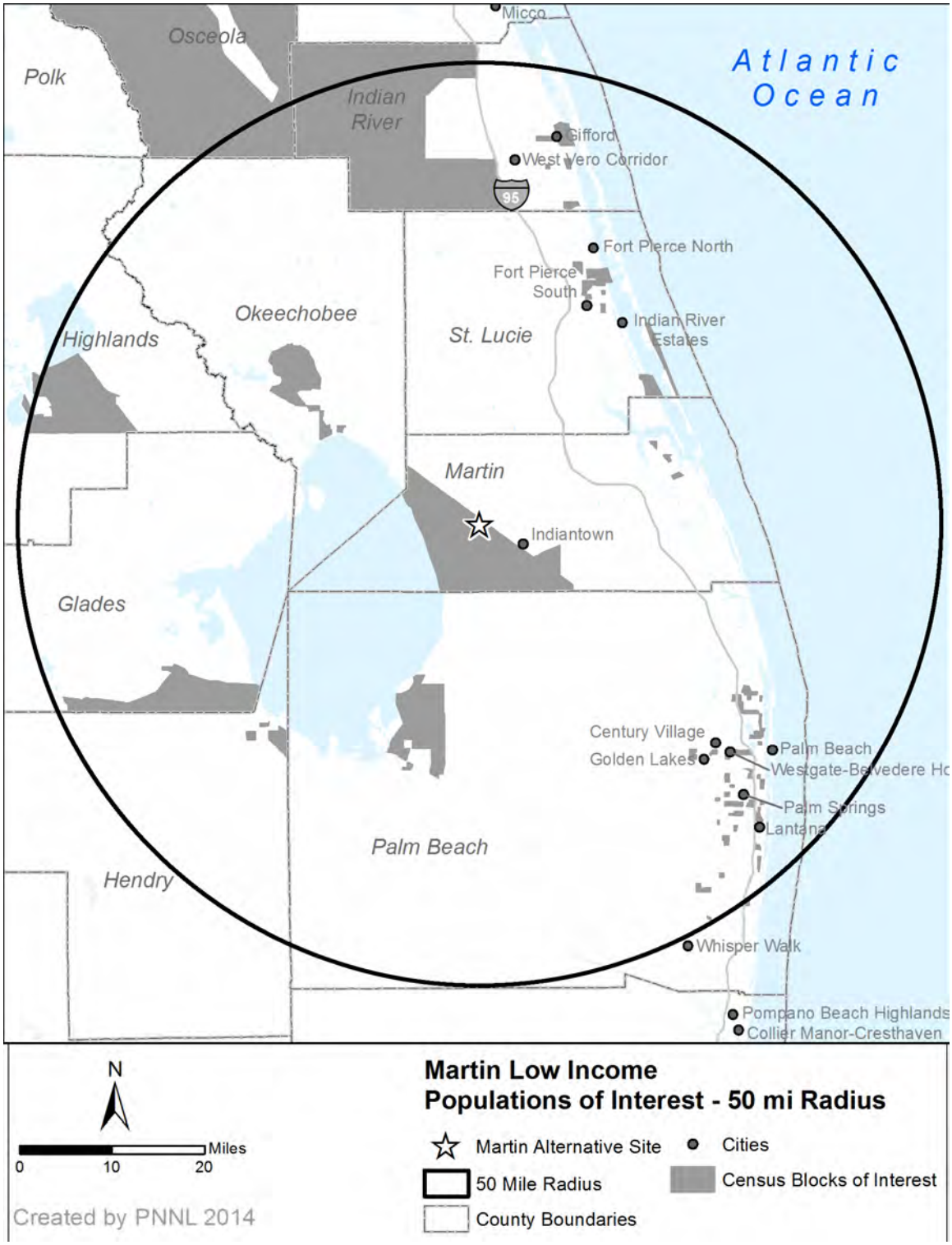

Figure 9-16. Low-Income Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Martin Alternative Site

9.3.3.7 Historic and Cultural Resources

The following cumulative impact analysis addresses building and operating two new nuclear power-generating units at the Martin site. The analysis also considers other past, present, and reasonably foreseeable future actions that could affect cultural resources, including the other Federal and non-Federal projects listed in Table 9-11. For the analysis of cultural impacts at the Martin site, the geographic area of interest is considered to be the APE that would be defined for this site. This includes the direct effects APE, defined as the area physically affected by the site-development and operation activities at the site and within transmission line corridors. The indirect effects APE is defined as the area visually affected and includes an additional 0.5 mi radius APE around the transmission line corridors and a 1 mi radius APE around the cooling towers.

Reconnaissance activities in a cultural resource review have particular meaning. Typically, they include preliminary field investigations to confirm the presence or absence of cultural resources. However, in developing this EIS, the review team relied upon reconnaissance-level information to perform its alternative site evaluation in accordance with ESRP 9.3 (NRC 2000-TN614). Reconnaissance-level information consists of data that are readily available from agencies and other public sources. It can also include information obtained through visits to the site area. The following information was used to identify the historic and cultural resources at the Martin site:

- NRC Alternative Sites Visit, July 2010 (NRC 2010-TN3304)
- FPL ER Revision 6 (FPL 2014-TN4058)
- Florida Historical Markers program (FDHR 2014-TN3876)
- National Register of Historic Places database (NPS 2014-TN3880).

The approximately 11,300 ac Martin site is an FPL-owned property located in predominantly forested land, scattered wetlands, and agricultural land. The site has been developed for power generation and contains five fossil-fule–fired power units, occupying 300 ac, and a 6,800 ac water reservoir. A solar unit was recently constructed (FPL 2014-TN4058). Historically, the Martin site and vicinity were largely undeveloped and likely contained intact archaeological sites associated with the past 10,000 years of human settlement. Over time, the area has been heavily disturbed by impacts related to agricultural and industrial development.

A search of the National Register shows that one significant historic property, the Seminole Inn in Indiantown, is located within 10 mi of the Martin site (FPL 2014-TN4058; NPS 2014-TN3880). A total of 100 properties was found in the four counties in the vicinity of the Martin site, consisting of Martin, Palm Beach, St. Lucie, and Okeechobee Counties. A National Register search of the indirect effects APE for the proposed transmission line corridor shows that only the single property noted above, the Seminole Inn, occurs within the area. The property lies approximately 4 mi to the east of the proposed transmission line route. However, the proposed transmission line follows an existing transmission line corridor in this area and any impacts caused by the addition of a new transmission line would be negligible.

A search of the Florida Historical Markers Program (FDHR 2014-TN3876) revealed that there are six historic markers in Martin County, but none are found within 10 mi of the Martin site. One marker, for the Jupiter Indiantown Road, is located just outside Indiantown, about 4 mi from the transmission line corridor. In addition, there is a known archaeological resource within the Barley Barber Swamp adjacent to the plant property, but the area is preserved as a nature area and will not be directly affected.

In 1989, FPL conducted detailed cultural resources studies for an expansion of the Coal Gasification/Combined-Cycle facility located on the Martin site (FPL 2014-TN4058). Approximately 3,300 ac of FPL's existing plant property were assessed. However, any additional property required for the new nuclear generating units was not surveyed as part of the 1989 study. The study included a review of the Florida Master Site Files, and examination of historical and archaeological literature, historical records, maps, and photographs. Areas identified as archaeologically sensitive were systematically surveyed in the field. The research revealed that no archaeological sites have been recorded in the 3,300 ac study area for that project, and the archaeological survey did not identify any new resources.

Reconnaissance-level information indicates that there are no known historic properties located within surveyed portions of the existing Martin plant. However, any additional land that would be acquired for the project has not been surveyed for archaeological or historical resources. Further, reconnaissance-level information shows that there are historic properties in the general vicinity of the site, including archaeological resources nearby and historic resources in the broader region.

Building Impacts

To accommodate the building of two nuclear generating units and associated facilities at the Martin site, FPL estimates that the total area of land that would be disturbed would be approximately 362 ac for the facility footprint. In addition, a 39.3 mi long paved road and a 4.3 mi long railroad spur would need to be constructed through predominantly agricultural or undeveloped land (FPL 2014-TN4058). A portion of SR-710 would need to be widened, and 21.7 ac would be disturbed for pipeline corridors and associated facilities (FPL 2014-TN4058). If the Martin site were chosen for the proposed project, identification of cultural resources would be accomplished through additional cultural resource surveys and consultation with the SHPO, Tribes, and interested parties. The results would be used in the site-planning process to address cultural resources impacts. If significant cultural resources were identified by these surveys, the review team assumes that FPL would use the same protective measures used at the Turkey Point site, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land-clearing, excavation, and grading activities could potentially destabilize important attributes of historic and cultural resources.

Section 9.3.3.1 describes the transmission line corridors, which will extend for a distance of 31 mi following extant transmission line corridors for the existing Martin plant. FPL has stated that consideration would be given to sensitive environmental and built resources in determining a route for the transmission lines (FPL 2014-TN4058). If the Martin site were chosen for the proposed project, the review team assumes that FPL would conduct its transmission line related cultural resource surveys and procedures in a manner similar to that for the Turkey Point site.

In addition, the review team assumes that the State of Florida's final Conditions of Certification (State of Florida 2014-TN3637) regarding transmission line siting and building activities would also apply, and therefore impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land-clearing, excavation, and grading activities could potentially destabilize important attributes of historic cultural resources. Similarly, both the transmission lines and nuclear power-generating units could indirectly affect cultural and historic resources through visual impacts on the setting of the resources.

Operations Impacts

Impacts on historic and cultural resources from operation of two new nuclear generating units at the Martin site include those associated with the operation of new units and maintenance of transmission lines. The review team assumes that the same procedures developed by FPL for the Turkey Point site, as well as the State of Florida's final Conditions of Certification, would be used for onsite and offsite maintenance activities. Consequently, the incremental effects of the maintenance of transmission line corridors and operation of the two new units and associated impacts on the cultural resources would be negligible for the direct and indirect effects APEs.

Cumulative Impacts

Past actions in the geographic area of interest that have similarly affected historic and cultural resources include rural, agricultural, and industrial development and associated activities such as road construction. Table 9-11 lists past, present, and reasonably foreseeable projects and other actions that may contribute to cumulative impacts on historic and cultural resources in the geographic area of interest. Projects from Table 9-11 that may fall within the geographic area of interest for cultural resources include the Florida Gas Transmission Expansion project, the Florida Natural Gas Storage Facility, the FPL Martin Next-Generation Solar Energy Center, various water-storage and water-treatment projects, the Lake Point Mine project, and future urbanization. These projects may significantly affect historic and cultural resources in a manner similar to those associated with the building and operation of two new nuclear generating units.

Long linear projects such as new or expanded roads and pipelines may intersect the proposed transmission line corridors. Because cultural resources can likely be avoided by long linear projects, impacts on cultural resources would likely be minimal. If building associated with such activities results in significant alterations of cultural resources in the transmission line corridors, either physical or visual, then cumulative impacts on cultural and historic resources would be greater.

Cultural resources are nonrenewable. Therefore, the impact of the destruction of cultural resources is cumulative. Based on the information provided by FPL and the review team's independent evaluation, the review team concludes that the cumulative impacts from building and operating two new nuclear generating units on the Martin site would be SMALL. This impact-level determination is based on reconnaissance-level information and reflects the fact that there are no known cultural resources on the proposed site. Although the proposed transmission line would extend approximately 31 mi, it would follow an existing transmission line corridor and would only incrementally add to potential visual impacts on cultural resources. The assessment also assumes that, if the Martin site were to be developed, cultural resource

surveys and evaluations would be conducted and FPL, in consultation with SHPO, Tribes, and interested parties, would assess and resolve any adverse effects of the undertaking. If cultural or historic resources are present, and if there are adverse effects on those resources, the project could result in greater cumulative impacts.

9.3.3.8 Air-Quality Impacts

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable actions that affect air quality, including other Federal and non-Federal projects listed in Table 9-11. As described in Section 9.3.3, the Martin site area includes five fossil-fuel–fired (gas and oil) power units; there are no current nuclear facilities at the site. The geographic area of interest for the Martin site is Martin County, which is in the Southeast Florida Intrastate Air Quality Control Region (40 CFR 81.49) (TN255).

Sections 4.7 and 5.7 discuss air-quality impacts during building and operation. The emissions related to building and operating a nuclear power plant at the Martin alternative site would be similar to those at the Turkey Point site. The air-quality attainment status for Martin County, as set forth in 40 CFR Part 81 (TN255), reflects the effects of past and present emissions from all pollutant sources in the region. Martin County is in attainment of all National Ambient Air Quality Standards.

As described in Chapters 4 and 5, the criteria pollutants from building and operation were found to have a SMALL impact on air quality. In Chapter 7, the cumulative impacts of criteria pollutants were evaluated and also determined to be SMALL to MODERATE. Reflecting on the projects listed in Table 9-11, the most significant of the facilities operating in the county are the five fossil-fuel–fired (oil and gas) units (Martin plant), with a combined 3,734 MW capacity, operating at the Martin site and a 330 MW coal-fired power plant (Indiantown Cogeneration) located 4 mi east of the Martin site. Emissions from power plants such as these are released through stacks and with significant momentum and buoyancy. In addition, a proposed liquefied natural-gas storage and vaporization facility (Florida Natural Gas Storage Facility) with designed storage capacity of eight billion cubic feet will operate at a distance of about 2 mi from the Martin site. Other industrial projects listed in Table 9-11 would likely have de minimis impacts. Given that these projects are subject to Clean Air Act permitting requirements, it is unlikely that the air quality in the region will degrade to the extent that the region would be in nonattainment of the National Ambient Air Quality Standards.

The air-quality impact from development of the Martin site would be local and temporary. The applicant would develop a dust-control plan that identifies specific measures to minimize fugitive dust emissions during building activities. The distance from building activities to the site boundary would be sufficient to generally avoid significant air-quality impacts. There are no land uses or projects in Table 9-11, including the aforementioned sources, that would have emissions during site development that would, in combination with emissions from the Martin site, result in degradation of air quality in the region. Emissions from operation of two new nuclear units at the Martin site would be intermittent and made at low levels with little or no vertical velocity, similar to operational impacts at the Turkey Point site, as discussed in Section 5.7. The air-quality impacts of the Martin fossil-fuel units are included in the baseline

air-quality status. The air-quality impacts of the Florida Natural Gas Storage Facility would be similar to the air-quality impacts of the natural-gas−fired power plant units discussed in Section 9.2.2.10, which would be noticeable but not destabilizing. The cumulative impacts from emissions of effluents from the Martin site and the aforementioned sources would be noticeable but not destabilizing.

The cumulative impacts of GHG emissions related to nuclear power are discussed in Section 7.6. The impacts of the emissions are not sensitive to location of the source. Consequently, the discussion in Section 7.6 is applicable to a nuclear power plant located at the Martin site. The review team concludes that the national and worldwide cumulative impacts of GHG emissions are noticeable but not destabilizing. The review team further concludes that the cumulative impacts would be noticeable but not destabilizing, with or without the GHG emissions of the two new nuclear units at the Martin site.

The review team concludes that cumulative impacts from other past, present, and reasonably foreseeable future actions on air-quality resources in the geographic areas of interest would be SMALL to MODERATE for criteria pollutants and MODERATE for GHG emissions. The incremental contribution of impacts on air-quality resources from building and operating two units at the Martin site would not be a significant contributor to the MODERATE impacts.

9.3.3.9 Nonradiological Health

The following analysis considers nonradiological health impacts from building and operating two new nuclear units at the Martin site. The analysis also includes past, present, and reasonably foreseeable future actions that could contribute to cumulative nonradiological health impacts on site workers (construction and operation workers) and members of the public, including other Federal and non-Federal projects and the projects listed in Table 9-11 within the geographic area of interest. Nonradiological health impacts at the Martin site are estimated based on information provided by FPL and the review team's independent evaluation. For the analysis of nonradiological health impacts at the Martin site, the geographic area of interest is the site and the immediate vicinity (~2 mi radius) and the associated road and transmission line corridors. This geographic area of interest is based on the localized nature of nonradiological health impacts and is expected to encompass all nonradiological health impacts.

Building activities with the potential to affect the health of members of the public and workers at the Martin site include exposure to dust and vehicle exhaust, occupational injuries, noise, and increased traffic associated with the transport of construction materials and personnel to and from the site. The operations-related activities that have the potential to affect the health of members of the public and workers include exposure to etiological (disease-causing) agents, noise, EMFs, occupational injuries, and impacts from the transport of workers to and from the site.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the Martin site would be similar to those evaluated in Section 4.8 for the Turkey Point site. During the site-preparation and building phase, FPL would comply with applicable Federal and State regulations on air quality and noise (FPL 2014-TN4058). The

Martin site is located in a rural area, and building impacts would likely be negligible on the surrounding populations, which are classified as medium- and low-population areas. The incidence of construction worker accidents would be the same as that for the Turkey Point site. The review team concludes that nonradiological health impacts on construction workers and the public from building two new nuclear units and associated transmission lines at the Martin site would be minimal. Nonradiological health impacts associated with traffic accidents during building activities at the Martin alternative site were evaluated in Section 4.8.3 and the review team concludes that the impacts would be minimal.

Operations Impacts

Nonradiological health impacts on operation workers and members of the public would include those associated with the operation of cooling towers and transmission lines as described in Section 5.8. Based on the configuration of the proposed new units at the Martin site (see Chapter 3 for detailed site layout description), etiological agents would not be an issue with regard to members of the public because cooling-tower blowdown would be discharged into deep-injection wells not into surface waters. Impacts on workers' health from occupational injuries, noise, and EMFs would be similar to those described in Section 5.8 for the Turkey Point site. Noise and EMF exposure would be monitored and controlled in accordance with applicable OSHA regulations. Although no detailed noise modeling has been performed for the Martin site, it is likely that noise impacts would be similar to those predicted for operations at the Turkey Point site. The effects of EMFs on human health would be controlled and minimized by conformance with National Electrical Safety Code criteria and adherence to the standards for transmission systems regulated by the FDEP.

The review team concludes that nonradiological health impacts on workers and the public from operating two new nuclear units and associated transmission lines at the Martin site would be minimal. Impacts associated with traffic accidents during operations at the Martin alternative site were evaluated in Section 5.8.6 and the review team concludes that the impacts would be minimal.

Cumulative Impacts

The past and present project that is within the geographic area of interest that could affect nonradiological human health in a way similar to the building of two nuclear units at the Martin site identified in Table 9-11 is a combined natural-gas/oil and solar power-generating station adjacent to the proposed Martin site, as well as various transportation (roads, traffic, pedestrian) and mining/quarry projects that have occurred and are ongoing throughout the region.

Reasonably foreseeable projects that could affect nonradiological human health in a way similar to the building of two nuclear units at the Martin site identified in Table 9-11 include various transportation (roads, traffic, pedestrian) and mining/quarry projects that are planned throughout the region.

Summary Statement

Impacts on nonradiological health from building and operation of two new units at the Martin site are estimated based in the information provided by FPL and the review team's independent

evaluation. Although some future activities in the geographical area of interest could affect nonradiological health in ways similar to the building and operation of two new units at the Martin site and associated offsite facilities, those impacts would be localized and managed through adherence to existing regulatory requirements. The review team concludes that nonradiological health impacts on workers and the public resulting from the building of two new nuclear units and associated road and transmission lines at the Martin site would be minimal. The review team expects that the nonradiological health impacts on the operations employees and the public of two new nuclear units at the Martin site would be minimal. Finally, the review team concludes that cumulative impacts on nonradiological health from past, present, and reasonably foreseeable actions in the geographic area of interest would be SMALL.

9.3.3.10 Radiological Impacts of Normal Operations

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable actions that affect radiological health, including other Federal and non-Federal projects listed in Table 9-11. As described in Section 9.3.3, Martin is a fossil-fuel power plant and a solar power plant site; there are currently no nuclear facilities on the site. The geographic area of interest is the area within a 50 mi radius of the Martin site. St. Lucie Units 1 and 2 (i.e., two nuclear power plants) are the only major facilities within this geographic area of interest that potentially affect radiological health. In addition, there are likely to be medical, industrial, and research facilities within 50 mi of the Martin site that use radioactive materials.

The radiological impacts of building and operating the two proposed Westinghouse AP1000 nuclear power units at the Martin site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. These impacts are expected to be similar to those estimated for the Turkey Point site.

The radiological impacts of St. Lucie Units 1 and 2 include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways result in low doses to people and biota offsite that are well below regulatory limits as demonstrated by the ongoing radiological environmental monitoring program conducted around St. Lucie Units 1 and 2. The NRC staff concludes that the dose from direct radiation and effluents from hospitals and industrial facilities that use radioactive material would be an insignificant contribution to the cumulative impact around the Martin site. This conclusion is based on data from the radiological environmental monitoring programs conducted around currently operating nuclear power plants.

Based on the information provided by FPL and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed Westinghouse AP1000 nuclear power units and other existing and planned projects and actions in the geographic area of interest around the Martin site would be SMALL.

9.3.3.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from the operation of two nuclear units at the Martin alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from

postulated accidents, including other Federal and non-Federal projects and the projects listed in Table 9-11. As described in Section 9.3.3, the Martin site is a brownfield site with existing solar power and fossil-fuel facilities. There are currently no nuclear facilities at the site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Martin alternative site. Facilities potentially affecting radiological accident risk within this geographic area of interest are the existing two units of St. Lucie Units 1 and 2.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the Turkey Point site would be minimal for AP1000 reactors. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet NRC safety criteria. The environmental consequences of DBAs depend on the plant design and the atmospheric dispersion. The AP1000 design is independent of site conditions and the differences in meteorology of the Martin alternative and Turkey Point sites are not significant with regard to the conditions that are important to assessing DBAs. Therefore, the NRC staff concludes that the environmental consequences of DBAs at the Martin alternative site would be minimal.

With the lower population density and land-use values for the Martin alternative site, the NRC staff expects the risks from a severe accident for an AP1000 reactor located at the Martin alternative site to be similar to or lower than those analyzed for the proposed Turkey Point site. The risks for the proposed Turkey Point site were presented in Tables 5-19 and 5-20 and are well below the median value for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028) (TN594). For existing plants within the geographic area of interest (St. Lucie Units 1 and 2), the Commission has determined that the probability-weighted consequences of severe accidents are small (10 CFR Part 51, Appendix B, Table B-1) (TN250). On this basis, the NRC staff concludes that the cumulative risks from severe accidents at any location within 50 mi of the Martin alternative site would be SMALL.

9.3.4 Okeechobee 2 Site

This section covers the review team’s evaluation of the potential environmental impacts of siting a new two-unit nuclear power plant at the Okeechobee 2 alternative site in central Florida. The site is located in a rural area in Okeechobee County east of the Kissimmee River and north of Lake Okeechobee. Okeechobee 2 is a greenfield site not currently owned by FPL (2014-TN4058) The location of the Okeechobee 2 site is shown in Figure 9-17.

The Okeechobee site is a 3,000 ac undeveloped greenfield site. The majority of the site is currently used for agriculture and contains a lot of pasture for cattle and dairy farms as well as citrus fields. Topography does not vary considerably over the site (FPL 2014-TN4058).

FPL assumed the facility footprint (Figure 9-18) that would include the power units, support buildings, switchyard, storage areas, stormwater-retention ponds, and other structures would require 362 ac. Building at the Okeechobee site would also require the creation of a transmission line corridor of approximately 38 mi, a 9.3 mi access road (112.3 ac), installation of 3.9 mi of railway (46.6 ac), and an intake/makeup pipeline (22.5 ac). The area permanently affected by these facilities and infrastructure (except the transmission line) is approximately

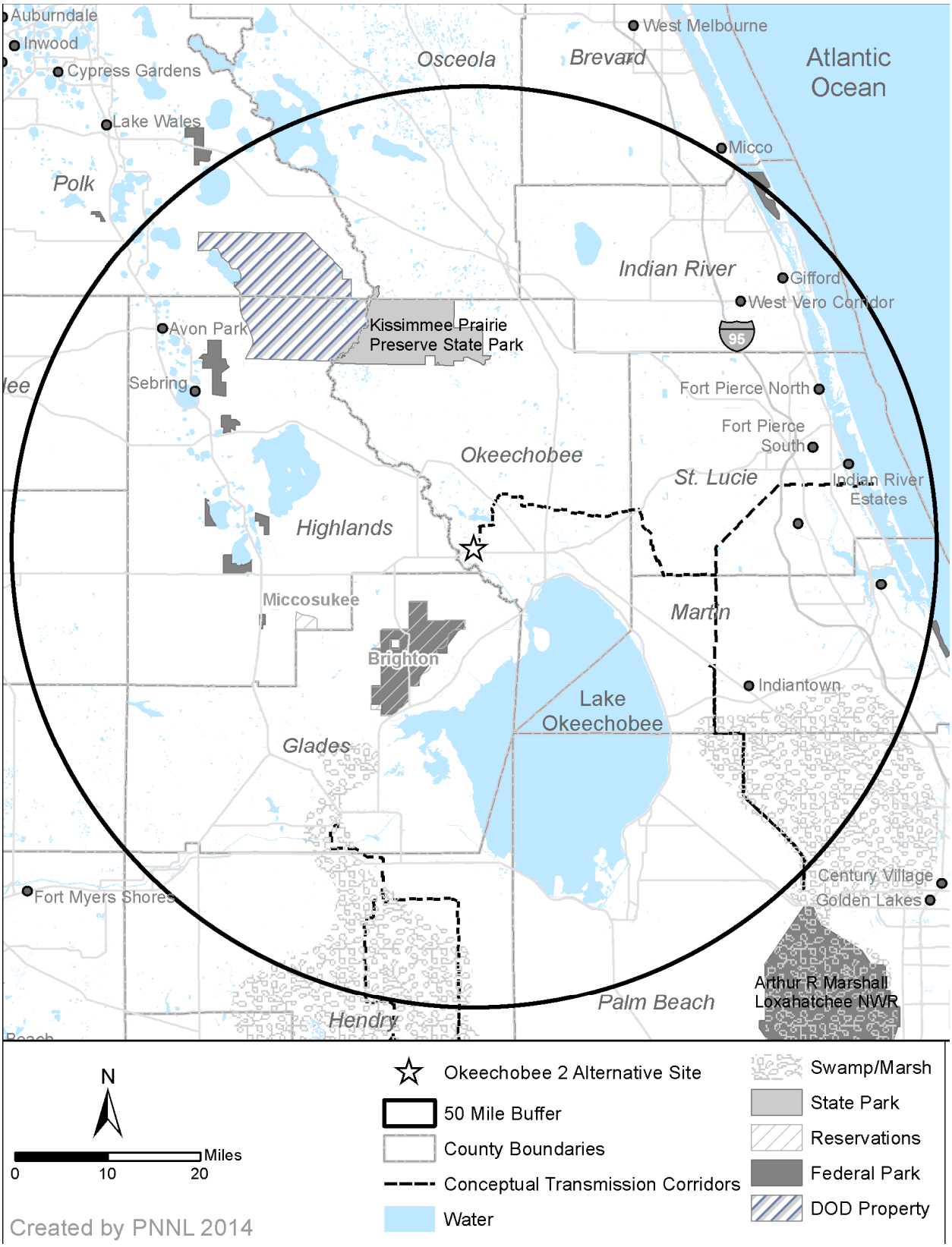

Figure 9-17. Okeechobee 2 Site Region

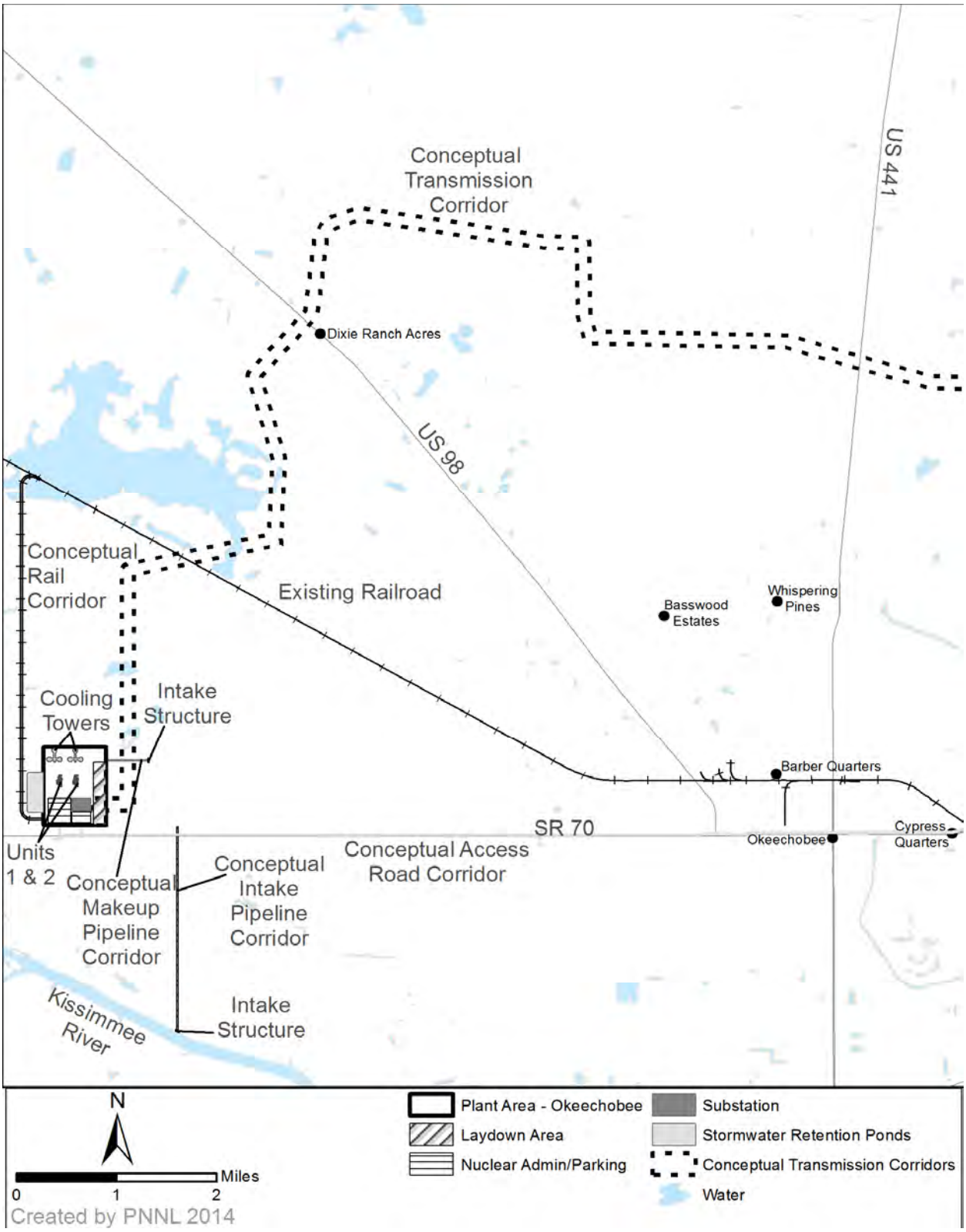

Figure 9-18. Okeechobee 2 Site Footprint

502 ac. The conceptual transmission line corridor would occupy an additional 3,022 ac. Additional area (up to several hundred acres) would be temporarily disturbed for activities such as laydown areas, a batch plant, and for fill and spoil deposition (FPL 2014-TN4058).

As discussed in Section 9.3.1.7, the review team considered an alternative configuration of the cooling system that FPL proposed.

The following sections include a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if implemented at the Okeechobee 2 site and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction and operations and impacts of preconstruction activities. Also included in the assessment are past, present, and reasonably foreseeable future Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Okeechobee 2 site. Other actions and projects considered in this cumulative analysis are described in Table 9-16.

The geographic area of interest for cumulative impacts considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Okeechobee 2 site. An accident at a nuclear plant within 100 mi of the Okeechobee 2 site could increase this risk. The St. Lucie nuclear plant is within 50 mi of the Okeechobee 2 site and is included in Table 9-16. Other nuclear plants in Florida, Alabama, and Georgia are more than 100 mi from the Okeechobee 2 site and are therefore not included in the cumulative impact analysis.

Table 9-16. Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the Okeechobee 2 Site

Project Name	Summary of Project	Location	Status
Energy Projects			
St. Lucie	Two 3,020 MW(t) nuclear power reactors	43 mi E of the Okeechobee alternative site	Operational, Units 1 and 2 underwent license renewal in 2003. Units 1 and 2 completed 320 MW(t) power uprates in 2013 (NRC 2012-TN1668; FPL 2014-TN3360)
West County Energy Center	Three 1,250 MW natural-gas−powered units	50 mi SE of the Okeechobee alternative site	Operational (FDEP 2013-TN2965)
Martin	Approximately 4,300 MW from five units, 3 natural-gas and 2 oil units with a solar thermal facility generating supplemental steam	26 mi SE of the Okeechobee alternative site	Operational (FPL 2016-TN4579)
Indiantown Cogeneration Company	330 MW coal-fired power plant	29 mi SE of the Okeechobee alternative site	Operational (FDEP 2013-TN2967)

Table 9-16. (contd)

Project Name	Summary of Project	Location	Status
Okeelanta Cogeneration Facility	140 MW biomass power-generation facility	47 mi S of the Okeechobee alternative site	Operational (FDEP 2013-TN2968)
FPL pipeline	126 mi pipeline from Sabal Trail's Central Florida Hub to FPL's Martin Clean Energy Center	Throughout region	Proposed, construction set to begin 2016 (FPL 2014-TN2975)
Floridian Natural Gas Storage Company – Natural Gas Storage Facility	Storage of natural gas	29 mi SE of the Okeechobee alternative site	Proposed, FERC Order amending Certificate issued (FERC 2015-TN4599) with associated Environmental Assessment (FERC 2015-TN4600)
Southeastern Renewable Fuels Biorefinery and Cogeneration Plant	30 MW biofuel using leftover sweet sorghum stalk fiber	45 mi S of the Okeechobee alternative site	Proposed, final air permit issued by FDEP in 2010 (FDEP 2010-TN2970)
Treasure Coast Energy Center	300 MW natural-gas–fired power plant	35 mi E of the Okeechobee alternative site	Operational (FMPA 2014-TN3029)
INEOS New Planet Bioenergy Center	6.3 MW bioenergy facility	36 mi NE of the Okeechobee alternative site	Operational (EPA 2014-TN3032)
Okeechobee Landfill Energy	Waste-to-energy facility	16 mi NE of the Okeechobee alternative site	Operational (Waste Management 2014-TN3034)
Mining Projects			
Five Stone Mining	Stone/quarry mining	29 mi SE of the Okeechobee alternative site	Operational (EPA 2013-TN2959)
Daniel Shell Pit, Phase 6	Stone/quarry mining	4 mi SE of the Okeechobee alternative site	Operational (EPA 2013-TN2956)
E R Jahna Industries, Inc. – Ortona Mine	Stone/quarry mining	37 mi SW of the Okeechobee alternative site	Operational (EPA 2013-TN2958)
Florida Rock Industries/Fort Pierce	Stone/quarry mining	25 mi E of the Okeechobee alternative site	Operational (EPA 2014-TN3038)
Hammond Sand Mine	Sand/quarry mining	41 mi NE of the Okeechobee alternative site	Operational (EPA 2014-TN3044)
Various other mine	Stone/quarry mining	Throughout	Operational (FDEP 2010-

Table 9-16. (contd)

Project Name	Summary of Project	Location	Status
and quarry projects		region	TN2966)
Transportation Projects			
Various transportation projects	Road, traffic, pedestrian projects	Throughout region	Ongoing (FDOT 2014-TN4014)
Parks and Aquaculture Facilities			
DuPuis Wildlife and Environmental Area	Activities include bicycling, camping, hunting, fishing, and hiking	27 mi SE of the Okeechobee alternative site	Development likely limited within this area (FFWCC 2014-TN2977)
Okeechobee Battlefield State Park	Hiking, camping	9 mi SE of the Okeechobee alternative site	Development likely limited within this area (FDEP 2010-TN2971)
Archbold Biological Station	Ecological research station and preserve, organization owns and protects a 5,193 ac globally significant Florida scrub preserve located on the southern end of the Lake Wales Ridge	26 mi SW of the Okeechobee alternative site	Development likely limited within this area (Archbold Biological Station 2014-TN2954)
Lake Okeechobee	730 mi^2 freshwater lake, restoration and protection plan	7-37 mi S and SW of the Okeechobee alternative site	Ongoing, Florida Legislature in 2007 expanded the Lake Okeechobee Protection Act (SFWMD 2014-TN2988)
Savannas Preserve State Park	Activities include bicycling, boating, horseback riding, picnicking, fishing, and hiking	38 mi E of the Okeechobee alternative site	Development likely limited within this area (Florida State Parks 2014-TN3050)
Fort Pierce Inlet State Park	Activities include bicycling, camping, boating, swimming, picnicking, fishing, and hiking	41 mi NE of the Okeechobee alternative site	Development likely limited within this area (Florida State Parks 2014-TN3053)
Pepper Beach State Recreation Area	Activities include swimming, picnicking, fishing, and hiking	41 mi NE of the Okeechobee alternative site	Development likely limited within this area (St. Lucie County 2014-TN3054)
St. Sebastian River Preserve State Park	Activities include bicycling, camping, boating, picnicking, fishing, and hiking	42 mi NE of the Okeechobee alternative site	Development likely limited within this area (Florida State Parks 2014-TN3055)
Hobe Sound National Wildlife	Activities include fishing, and hiking	49 mi NE of the Okeechobee	Development likely limited within this area (FWS 2013-

Table 9-16. (contd)

Project Name	Summary of Project	Location	Status
Refuge		alternative site	TN3056)
Kissimmee Prairie Preserve State Park	Activities include bicycling, horseback riding, camping, wildlife viewing, and hiking	21 mi NW of the Okeechobee alternative site	Development likely limited within this area (Florida State Parks 2014-TN3196)
Other State nature preserves and wildlife management areas	Public recreational activities	Throughout region	Development likely limited within these areas (FFWCC 2014-TN2981)
Everglades Ecosystem Restoration and/or Comprehensive Everglades Restoration Plan Projects (DOI 2016-TN4589)			
Indian River Lagoon -South	Project purpose is to improve surface-water management in the C-23/C-24, C-25, and C-44 basins for habitat improvement in the Saint Lucie River Estuary and southern portions of the Indian River Lagoon.	41 mi NE of the Okeechobee alternative site	Proposed, project in preconstruction, engineering and design phase (USACE and SFWMD 2014-TN3013)
Everglades Agricultural Area Storage Reservoirs	The purpose of this project is to improve the timing of environmental deliveries to the Water Conservation Areas, including reducing damaging flood releases from the Everglades Agricultural Area to the Water Conservation Areas.	Throughout region	Proposed, Final Project Implementation Report submitted 2012 (USACE and SFWMD 2014-TN3011)
Lake Okeechobee Aquifer Storage and Recovery	A series of aquifer storage and recovery wells adjacent to Lake Okeechobee	6 mi SE of the Okeechobee alternative site	Proposed, project in preconstruction, engineering and design phase (USACE and SFWMD 2014-TN3014)
Lake Okeechobee Watershed Project	Project to increase aquatic and wildlife habitat, regulate extreme highs and lows in lake staging, reduce phosphorus loading, and reduce damaging releases to the	Throughout Okeechobee County	Proposed, project in preconstruction, engineering and design phase (USACE and SFWMD 2014-TN3015)

Table 9-16. (contd)

Project Name	Summary of Project	Location	Status
	surrounding estuaries		
Melaleuca eradication and other exotic plants	The project includes (1) upgrading and retrofitting the current quarantine facility in Gainesville, and (2) large-scale rearing of approved biological control organisms for release at multiple sites within the South Florida ecosystem to control Melaleuca, Brazilian pepper, Australian pine, and Old World climbing fern.	Throughout region	Operational, facility completed in 2013 (USACE and SFWMD 2014-TN3020)
Palm Beach County Agriculture Reserve Aquifer Storage and Recovery	Supplement water supplies for central and southern Palm Beach County by capturing and storing excess water currently discharged to the Lake Worth Lagoon.	35 mi SE of the Okeechobee alternative site	Proposed, project in preconstruction, engineering and design phase (USACE and SFWMD 2014-TN3019)
Herbert Hoover Dike Major Rehabilitation Project	Rehabilitation Project and Dam Safety Modification Study	3-40 mi S of the Okeechobee alternative site	Proposed – Environmental Assessment and FONSI issued in 2015 (USACE 2015-TN4598) Draft Environmental Report issued (DOI 2016-TN4589)
Comprehensive Shoreline Stabilization Project in Palm Beach County	Discharge fill for the purpose of shoreline stabilization	Shoreline of Palm Beach County	USACE submitted Notice of Intent in 2013 (78 FR 40128) (TN3059); EIS completed (CB&I 2014-TN4015)
Kissimmee River Restoration	When restoration is completed in 2017, more than 40 mi^2 of river-floodplain ecosystem will be restored, including almost 20,000 ac of wetlands and 44 mi of historic river channel.	Along Kissimmee River	Ongoing (USACE 2014-TN3061; DOI 2016-TN4589)
Other Actions/Projects			
Atlantic Sugar Association	Sugar manufacturing	41 mi SE of the Okeechobee alternative site	Operational (FDEP 2013-TN2964)

Table 9-16. (contd)

Project Name	Summary of Project	Location	Status
Southern Gardens Citrus Processing Corp.	Food production/distribution	37 mi S of the Okeechobee alternative site	Operational (FDEP 2013-TN2969)
United States Sugar Corporation Clewiston	Sugar manufacturing	35 mi S of the Okeechobee alternative site	Operational (EPA 2014-TN2963)
Harbor Branch Oceanographic Institute	Oceanic Science and Research	41 mi NE of the Okeechobee alternative site	Operational (EPA 2014-TN3071)
Pratt & Whitney	Aircraft engine and engine parts manufacturing	45 mi SE of the Okeechobee alternative site	Operational (EPA 2014-TN3062)
Maverick Boat Company	Fiberglass boat manufacturing	39 mi NE of the Okeechobee alternative site	Operational (EPA 2014-TN3063)
Tropicana Products, Inc.	Citrus and animal feed	34 mi NE of the Okeechobee alternative site	Operational (EPA 2014-TN3068)
S2 Yachts, Inc.	Fiberglass boat manufacturing	39 mi NE of the Okeechobee alternative site	Operational (EPA 2013-TN3069)
Twin Vee, Inc.	Fiberglass boat manufacturing	39 mi NE of the Okeechobee alternative site	Operational (EPA 2013-TN3070)
Avon Park Air Force Range	Military training facility	25 mi NW of the Okeechobee alternative site	Operational (APAFR 2014-TN3195)
Various wastewater-treatment plant facilities	Sewage treatment	Throughout region	Operational
Various hospitals using nuclear material	Medical and other industrial isotopes	Throughout region	Ongoing
Various water/ flood-management projects	Water and flood management	Throughout region	Ongoing (USACE 2012-TN1133)
Future urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; construction of water- and/or wastewater-treatment and distribution facilities and associated	Throughout region	Construction would occur in the future, as described in State and local land-use planning documents

Table 9-16. (contd)

Project Name	Summary of Project	Location	Status
	pipelines, as described in local land-use planning documents.		

9.3.4.1 Land Use

The following analysis includes land-use impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect land use, including other Federal and non-Federal projects listed in Table 9-16. For the analysis of land-use impacts at the Okeechobee 2 site and the area within the transmission line corridors, the review team determined that a 10 mi radius, similar to that used for the proposed Turkey Point plant site, would encompass an effective geographic area of interest for cumulative impact assessment for land use. It would include the site and associated facilities and the city of Okeechobee 8 mi to the east. In evaluating the land-use impacts of using the Okeechobee 2 site, the review team used in addition to the project application, readily obtainable data from the Internet or published sources, including aerial photographs of the site and vicinity, USDA soils information, local zoning and planning documents, and FLUCFCS data. Impacts from both building and station operation are discussed.

Building and Operation Impacts

Okeechobee County is a rural county, largely devoted to agriculture and other rural land uses. Existing land uses in the vicinity of the Okeechobee 2 alternative site consist predominantly of agriculture. The nearest community is Okeechobee (2004 population under 5,500) (Okeechobee 2011-TN3308), the county seat of Okeechobee County, and the only incorporated city in Okeechobee County. The larger region is primarily devoted to agriculture, with scattered small rural communities. The closest population center with more than 25,000 population is Port St. Lucie, 80 mi to the east. The Okeechobee 2 alternative site is located approximately 2 mi east of the Kissimmee River and 7.6 mi northwest of Lake Okeechobee (Okeechobee 2011-TN3308).

Existing land uses at the Okeechobee 2 site consist of agriculture (FPL 2014-TN4058). No commercial mineral resources are identified in the site and vicinity (Calver 1956-TN3752; Spencer 1993-TN3753). No substantial areas of developed land uses occur on or within the vicinity of the site. Recreational areas, including the River Bluff Recreational Vehicle and Fishing Resort, are located to the west along the Kissimmee River. The Okeechobee County Comprehensive Plan identifies future land use on the FLUM (Okeechobee County 2012-TN3347) at and in the vicinity of the Okeechobee 2 alternative site as “Rural Estate” (1 unit per 5 ac) south of SR-70 and “Agriculture” north of SR-70.

A Rural Activity Center, the River Oaks Rural Activity Center, is identified on the Okeechobee County FLUM near the Okeechobee alternative site. The Okeechobee County Comprehensive Plan Future Land Use Element defines a Rural Activity Center as follows (Okeechobee County 2009-TN3348):

> Policy L1.4: **Rural Activity Center**: Rural Activity Centers accommodate low densities of development outside of the Urban Residential Mixed Use area. Public supply water and sewer facilities generally are not available, nor are they anticipated to be available during the planning period. Where appropriate or required, however, a developer may provide a package treatment plant or otherwise provide for adequate public supply potable water and sewage facilities. A Rural Activity Center generally acknowledges existing communities or subdivisions, and provides decentralized job creation and economic opportunities. A rural activity center can provide for self-supporting communities so as to reduce dependence on the one existing urban area in the County for all employment opportunities and goods and services. Accordingly, Rural Activity Centers allow for existing and future agricultural and residential uses, as well as for recreational, public, neighborhood commercial and light industrial uses that support or complement agricultural uses or residential and community development and that provide employment or economic opportunities. Specific locations of Rural Activity Centers are shown on the Future Land Use Map series and are intended to separate urban from non-urban uses. Additional Rural Activity Centers shall require an amendment to the Future Land Use Map series. The land uses and intensities of development permissible within a Rural Activity Center must meet the requirements of concurrency.
>
> A Rural Activity Center provides for agricultural, recreational, residential, neighborhood commercial and certain light industrial uses, subject to compatibility and buffering criteria provided in local land development regulations. Neighborhood commercial uses and, where permissible, light industrial uses, shall constitute no more than the greater of 30 acres or 5 percent of the total area of a Rural Activity Center; shall not exceed a floor area ratio of 1.0; and shall not exceed impervious surface coverage of 70 percent. Subject to density and intensity criteria as established by this Policy.

The Okeechobee County Comprehensive Plan provides for the following for the River Oaks Rural Activity Center:

> **River Oaks (J):** Residential development not to exceed a density of 1 unit per gross acre, agricultural, recreational and public uses.

The River Oaks Rural Activity Center would encompass the existing River Oaks development, through which roadways associated with the Okeechobee 2 alternative site would run, and for that reason, use of the Okeechobee 2 alternative site for a power plant may not be compatible with the Okeechobee County FLUM. For the other areas designated for rural residential land uses in the vicinity of the alternative site, the power plant use could be compatible, based on site design, but would represent a change in land use for the site and vicinity.

None of the soils on the plant site are considered by USDA to be Prime farmlands (USDA 2014-TN3349). Most of the soils in the vicinity of the plant site are not considered by USDA to be Prime farmlands, but small areas of soils in the vicinity are considered to be Unique farmlands

(USDA 2014-TN3350). Unique farmland is defined in Section 2(c) of the Farmland Protection Policy Act (7 U.S.C. § 4201 et seq.) (TN708) as "land, other than Prime farmland, that has combined conditions to produce sustained high quality and high yields of specialty crops, such as citrus, nuts, fruits, and vegetables when properly managed." Therefore, no Prime farmland soils and only a minimal amount of Unique farmland soils would be lost. No part of the site or vicinity falls within the Coastal Zone (FPL 2014-TN4058). As FPL states in its ER (FPL 2014-TN4058) and as shown on the Okeechobee County FIRM map Panel 175 of 275 dated February 4, 1981, portions of the plant site fall within the 100-year flood zone, and as FPL states in its ER (FPL 2014-TN4058) some areas would require unspecified amounts of fill.

Building and operation of the project at the Okeechobee 2 alternative site would result in the conversion of existing land uses, including approximately 149 ac from agriculture (on non-Prime farmlands) to power-generation uses as shown in Table 9-17 below. The new plant would also convert approximately 354 ac of other undeveloped lands to power-generation use. Roadways would run through approximately 40 ac of existing developed lands associated with the existing River Oaks housing and airport development (AirNav 2014-TN3309). The total land conversion on the site would be approximately 543 ac.

Table 9-17. Okeechobee 2 Alternative Site Land-Use Impacts (acres)

	Agricultural Lands (FLUCFCS 200 Land Use Series)	Urban Developed Lands (other than roads and pipelines)	Other Non-Agricultural Lands (all other FLUCFCS designations)	Total
Plant Site	45	0	275	320
Access Roads	50	40	22	112
Rail Corridor	35	0	12	47
Intake Pipeline Corridor	16	0	2	19
Makeup Pipeline Corridor	3	0	0.4	4
Stormwater-Retention Ponds	0	0	42	42
Total[(a)]	149	40	354	543
Transmission Line Corridor	2,431	0	592	3,022
Grand Total	2,580	40	945	3,566

(a) Totals may not add due to rounding

Sources: FPL 2011-TN59 and FPL 2014-TN4058

Additional land-use impacts include possible additional growth and land conversions in the vicinity to accommodate new workers and services (induced development). Because the workforce would be dispersed over larger geographic areas in the labor supply region, the impacts from land conversion for residential and commercial buildings induced by new workers relocating to the local area can be absorbed in the wider region. Therefore, the review team concludes that such impacts would be minimal.

Approximately 38 mi of new transmission lines would have to be built to serve the plant. FPL states in its application (FPL 2014-TN4058) that some of the transmission lines would pass through the Coastal Zone. Approximately 3,022 ac of land would be at least temporarily affected. Of this land, approximately 2,431 ac are agricultural land, and the remainder is

primarily open lands and roadways. The agricultural land within the transmission line corridors would be converted from agricultural use to transmission line use, although FPL states in its ER (FPL 2014-TN4058) that agriculture could continue within and along the transmission line rights-of-way.

Under the Florida Site Certification Application process explained in Chapter 4.1, the State approves a corridor and the applicant chooses a specific right-of-way within the approved corridor. The objective of this process, as stated in the electrical power plant and transmission line statute (Fla. Stat. 29-403.501 2011-TN1068) is "that the location of transmission line corridors and the construction, operation, and maintenance of electric transmission lines produce minimal adverse effects on the environment and public health, safety, and welfare" and "to fully balance the need for transmission lines with the broad interests of the public in order to effect a reasonable balance between the need for the facility as a means of providing reliable, economical, and efficient electric energy and the impact on the public and the environment resulting from the location of the transmission line corridor and the construction, operation, and maintenance of the transmission lines." FPL states in its application that, in its development of the conceptual transmission line corridor for the Okeechobee 2 alternative site, it attempted to select corridors that would allow collocation with existing transmission line corridors and avoided populated areas or residential land uses to some extent (FPL 2014-TN4058). The State certification review process also includes a determination of land-use consistency with local land-use plans and zoning ordinances (Fla. Stat. 29-403.50665-TN1470).

The review team concludes that the land-use impacts from building and operating two new nuclear units at the Okeechobee 2 alternative site would noticeably change the predominantly rural and agricultural character of the surrounding landscape and potentially result in conflicts with nearby rural residential and recreational areas, especially those associated with the River Oaks Rural Activity Center.

Cumulative Impacts

The review team expects that the principal contribution to cumulative land-use impacts in the geographic area of interest defined for the Okeechobee 2 site would be from the two subject nuclear units. There are no other reasonably foreseeable projects in the geographic area of interest with the potential to substantially contribute to cumulative land-use impacts. The Okeechobee County FLUM designates the land surrounding the Okeechobee 2 site for activities typical of rural areas. Other linear projects are proposed for lands near the proposed conceptual corridors for the transmission lines, including the Florida Gas Transmission Phase VIII Expansion Project. However, the review team expects that these corridors would have only a minimal cumulative land-use impact.

Summary Statement

Based on the information provided by FPL and the review team's independent review, the review team concludes that the cumulative land-use impacts of building and operating the power plant at the Okeechobee 2 alternative site would be MODERATE. This conclusion primarily reflects the fact that plans do not call for large-scale establishment of industrial or urban land uses in the area surrounding the Okeechobee 2 site. Building and operating the

proposed nuclear units at the Okeechobee 2 site would be a significant, and the principal, contributor to these impacts.

9.3.4.2 Water Use and Quality

The following impact analysis includes impacts from building and operating two new nuclear units at the Okeechobee 2 site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-16. The Okeechobee 2 site is located in rural Okeechobee County in Florida near the Kissimmee River, which flows into Lake Okeechobee.

The geographic area of interest for surface water at the Okeechobee 2 site is the Kissimmee-Okeechobee-Everglades watershed because this is the resource that would be affected if the proposed project were located at the Okeechobee 2 site. The Kissimmee-Okeechobee-Everglades watershed includes an area of about 9,000 mi^2 (McPherson and Halley 1996-TN98). For groundwater, the ROI includes (1) the surficial aquifer and the Upper Floridan aquifer at the site, (2) the APPZ of the Middle Floridan aquifer upgradient and downgradient of the site for water withdrawals, and (3) and the Boulder Zone of the Lower Floridan aquifer upgradient and downgradient of the site for disposal of blowdown water.

Building Impacts

Water use for building activities at the Okeechobee 2 site would be comparable to proposed water use for building activities for the Turkey Point site. During building, the peak water use is estimated to be 565 gpm (0.8 Mgd) (see Table 3-4). The review team assumes that water for building the two units at the Okeechobee 2 site would come from a combination of surface water and groundwater. Surface water from the Kissimmee River may be available for building purposes during times of high river flows. The peak water-use rate of 0.8 Mgd during the building phase is inconsequential when compared to the historic average monthly flow in the Kissimmee River; the water use rate is less than 1 percent of the river discharge for even the lowest month reported (January 1963). Surface water from onsite stormwater ponds and groundwater from excavation dewatering may also be used, when available, for building purposes. Groundwater from the surficial aquifer would be used for building purposes when excess surface water is not available. The SFWMD would regulate any use of surface or shallow groundwater for plant construction.

The review team concludes that the impact of using surface-water and groundwater for building the proposed units at the Okeechobee 2 site would be minimal for the following reasons:

- Withdrawal is inconsequential compared to the water resources in the Lake Okeechobee watershed.
- Any use of surface water or shallow groundwater would be regulated by SFWMD and limited to time periods when there would not be a negative impact on the Lake Okeechobee system or shallow aquifers.
- Water use for building would be limited to the building period and the peak use of 0.8 Mgd is much less than the average 46.51 Mgd groundwater withdrawal rate reported for Okeechobee County in 2005 (Marella 2009-TN1521).

The review team assumes that the impact of dewatering the excavations needed for building two units at the site would be managed through the installation of diaphragm walls and grouting as proposed for the Turkey Point site. Therefore, because groundwater withdrawal caused by dewatering would be controlled, the review team determined that there would be little or no impact on groundwater resources.

Surface-water quality would potentially be affected by surface-water stormwater runoff during site preparation and the building of the facilities. The FDEP would require FPL to develop an erosion and sediment control plan before initiation of site-disturbance activities (SWPPP) (FPL 2014-TN4058).

The plans would identify BMPs to control the impacts on surface-water quality caused by stormwater runoff. The review team anticipates that FPL would construct new detention/infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to onsite waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and the stormwater would infiltrate into the shallow aquifer. Implementation of BMPs should minimize impacts on surface waterbodies near the Okeechobee 2 site. Therefore, the surface-water−quality impacts near the Okeechobee 2 site would be temporary and minimal.

While building new nuclear units at the Okeechobee 2 site, groundwater quality may be affected by leaching of spilled effluents into the subsurface. The review team assumes that the BMPs FPL has proposed for the Turkey Point site would be in place during building activities and therefore the review team concludes that any spills would be quickly detected and remediated. In addition, groundwater impacts would be limited to the duration of these activities, and therefore, would be temporary. The review team reviewed the general BMPs that could be expected to be required at such a site (State of Florida 2014-TN3637). Because any spills related to building activities would be quickly remediated under BMPs, and the activities would be temporary, the review team concludes that the groundwater-quality impacts on the surficial aquifer from building at the Okeechobee 2 site would be minimal.

Wastewater streams from building activities could be injected into the Boulder Zone of the Lower Floridan aquifer as planned at Turkey Point (FPL 2014-TN4058). Construction and operation of the disposal wells would be performed under the conditions of a UIC permit issued by the FDEP, with the objective of protecting water quality within the APPZ and overlying aquifers.

Operations Impacts

FPL (2014-TN4058) indicates that the water needed to operate two units would be approximately 50,000 gpm or 72.7 Mgd. As indicated in Chapter 3, evaporative losses from cooling two units would be approximately 28,800 gpm (41.5 Mgd).

The review team assumed that the two units at the Okeechobee 2 site would primarily use brackish groundwater from the APPZ within the Avon Park formation for makeup cooling water. This relatively permeable zone is considered part of the Middle Floridan aquifer and is more than 1,000 ft below the ground surface near the Okeechobee 2 site. The SFWMD has informed the NRC that consumptive use of surface water from Lake Okeechobee or its tributaries would be limited (SFWMD 2012-TN3814). Use of water from the Lake Okeechobee or the Kissimmee

River would also have to avoid any negative impact on restoration projects including the Kissimmee River Restoration Project. Surface water could potentially be used only at times of excess surface-water flow that typically occur during the wet season.

The APPZ aquifer is not generally used because of the salinity of its water (FPL 2013-TN3052). Therefore, current impacts of using this water for power production are minor. Because brackish or saline groundwater is not in demand, use of this resource would not result in water-use conflicts. However, groundwater in the Middle Floridan aquifer at this site is a potential source of brackish water for desalinization. If demand for desalinization source water increases, water for the plant may be obtained from deeper, more saline formations.

Blowdown discharge and other wastewater streams would be pumped into the Boulder Zone of the Lower Floridan aquifer. The Boulder Zone is isolated from the APPZ by low-permeability units. Additional low-permeability confining units separate the APPZ from the overlying Upper Floridan aquifer. Construction and operation of the disposal wells would be performed under the conditions of a UIC permit issued by the FDEP.

As indicated in Chapter 3, the consumptive water use due to evaporative losses from cooling two units would be approximately 28,800 gpm (41.5 Mgd). However, the review team assumed that surface water would only be consumed during periods of excess flow, thereby precluding water-use conflicts.

During the operation of two new nuclear units at the Okeechobee 2 site, impacts on surface-water quality would be minimal because wastes would be injected into the Boulder Zone and not released to the surface water. FPL has also indicated it would capture rainfall runoff to use in the cooling-water system (FPL 2013-TN3052), thereby minimizing the amount of discharge to surface water from stormwater runoff. The FDEP would require FPL to develop a SWPPP (FPL 2014-TN4058). These plans would identify measures to be used to control stormwater runoff. All discharges to surface waterbodies would be required to comply with limits established by FDEP in a NPDES permit.

During the operation of the two units at the Okeechobee 2 site, impacts on groundwater quality could result from potential spills. Spills that might affect the quality of groundwater would be prevented and mitigated by BMPs. Like the proposed site, any wastewater at this inland alternative site would be combined with cooling-tower blowdown and discharged into the Boulder Zone with no loss of beneficial uses of the water resource.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operations activities, cumulative analysis considers past, present, and reasonably foreseeable future actions that affect the same water resources.

For the cumulative analysis of impacts on surface water and groundwater at the Okeechobee 2 site, the geographic area of interest is the same as what was considered for building and operational impacts, and was defined earlier in this section.

Actions that have past, present, and future potential impacts on water supply and water quality near the Okeechobee 2 site include existing agriculture and existing and future urbanization in the region.

Cumulative Impacts on Water Use

The impacts of the other projects listed in Table 9-16 are considered in the analysis included above or would have little or no adverse impact on surface-water use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Okeechobee 2 site, use relatively little or no surface water, or have little or no discharge to surface water. Some projects (for example park and forest management) are ongoing, and changes in their operations that would have large impacts on surface-water use appear unlikely.

In 2000, the Florida Legislature passed the Lake Okeechobee Protection Act to establish a restoration and protection program for the lake (SFWMD et al. 2011-TN3087; SFWMD 2010-TN3086). Part of the focus of this act was to restore the natural hydrology of the system after years of altering the natural drainage around the lake to permit development of the land and to reduce flood damage. The State of Florida and the Federal government are spending hundreds of millions of dollars to restore the Lake Okeechobee and other water resources in the watershed; therefore, the review team concluded that the cumulative impact on surface-water use would be MODERATE.

Surface-water use during the building and operation of two units at the Okeechobee 2 site would consist of occasional water use for building and operations. As discussed above, surface water would only be withdrawn during periods of excess flow, such as storm runoff. Therefore, the review team concluded that building and operating the proposed units at the Okeechobee 2 site would not be a significant contributor to the MODERATE impacts on surface-water use.

As stated above, the review team assumed that any use of shallow groundwater to build the units at the Okeechobee 2 site would be regulated by the SFWMD. If this source is not available in sufficient quantity for building activities, brackish groundwater from the APPZ could be used for some building activities. Groundwater impacts from dewatering would be controlled with diaphragm walls and grouting. Brackish groundwater from the APPZ would be used to operate the plant except when excess surface water is available. The APPZ aquifer is not generally used because of the salinity of its water (FPL 2013-TN3052). Because brackish or saline groundwater is not in demand, use of this resource would not result in water-use conflicts.

The impacts of the other projects listed in Table 9-16 are considered elsewhere in this analysis or else would have little or no adverse impact on groundwater use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Okeechobee 2 site, or use relatively little or no groundwater. Some projects (for example park and forest management) are ongoing, and changes in their operations that would have large impacts on groundwater use appear unlikely. Therefore, the review team concludes that cumulative impacts on groundwater use would be SMALL.

Cumulative Impacts on Water Quality

Point and non-point discharges have affected the surface-water quality of the Lake Okeechobee watershed and the Kissimmee River upstream and downstream of the site. Water-quality information presented above for the impacts of building and operating the proposed new units at the Okeechobee 2 site would also apply to evaluation of cumulative impacts. The Kissimmee River appears on Florida's list of impaired waters because of the presence of nutrients, fecal coliform, depressed dissolved oxygen, copper, and mercury in fish tissue (FDEP 2014-TN4139). Lake Okeechobee has been the target of extensive efforts to reduce nutrient loading and improve water quality (SFWMD et al. 2011-TN3087). Therefore, the review team concluded that the cumulative impact on surface-water quality of the receiving waterbody would be MODERATE. During the operation of two new nuclear units at the Okeechobee 2 site, impacts on surface-water quality from the units would be minimal because plant discharges would be injected into the Boulder Zone and not released to the surface water. The State of Florida requires an applicant to develop a SWPPP (FPL 2014-TN4058) and all discharges to surface waterbodies would be required to comply with limits established by FDEP in a NPDES permit. Such permits are designed to protect water quality. The SWPPP would identify measures to be used to control stormwater runoff (FPL 2014-TN4058).

The review team concluded that building and operating the proposed units at the Okeechobee 2 site would not be a significant contributor to the MODERATE impacts on surface-water quality, because industrial and wastewater discharges from the proposed units would be discharged directly to the Boulder Zone and any stormwater runoff from the site during operations would be managed in compliance with the SWPPP (FPL 2014-TN4058).

The APPZ aquifer is not generally used due to the salinity of the water (FPL 2013-TN3052). Because brackish or saline groundwater is not in demand, use of this resource would not result in water-use conflicts. The review team also concludes that with the implementation of BMPs, the impacts on shallow groundwater quality from building and operating two new nuclear units at the Okeechobee 2 site would likely be minimal. Therefore, the cumulative impact on groundwater quality would be SMALL. The impacts of other projects listed in Table 9-16 are either considered in the analysis included above or would have little or no impact on surface-water and groundwater quality.

9.3.4.3 Terrestrial and Wetland Resources

The following section addresses potential impacts on terrestrial resources from siting two new nuclear units on the Okeechobee 2 site and a conceptual transmission line corridor. A new corridor would have to be built crossing Okeechobee and St. Lucie Counties and would tie into an existing corridor that crosses Martin and Palm Beach Counties. Most of the Okeechobee 2 site has been disturbed and is primarily used for pasture. Primary land-cover classes include improved pasture, unimproved pasture, woodland pasture, wet prairie, freshwater marsh, mixed wetland hardwoods, and citrus groves. These major land-cover classes compose most of the proposed footprint for the plant, access road, rail corridor, and pipeline corridor as well as most of the new portion of the conceptual transmission line corridor (FPL 2011-TN59).

Information from the FWS indicates Okeechobee County hosts 11 terrestrial species listed as Federally endangered or threatened. Additional listed species occur in St. Lucie, Martin, and

Palm Beach Counties through which the transmission line would pass. Surveys were not conducted at the Okeechobee 2 site or within conceptual transmission line corridors to determine the presence and distribution of listed species. To develop Table 9-18, the review team determined the likelihood of occurrence of listed species based on the habitat preferences of each species and the land-cover types expected. Habitat preferences for Audubon's crested caracara, the Florida grasshopper sparrow, Everglade snail kite, Florida scrub jay, ivory-billed woodpecker, red-cockaded woodpecker, wood stork, whooping crane, Florida panther, and eastern indigo snake were discussed in the Glades alternative site section. Therefore only Florida bonneted bat (*Eumpos floridanus*) habitat preferences are discussed below.

Table 9-18. Federally Listed Terrestrial Species that May Occur on the Okeechobee 2 Site or within the Conceptual Transmission Line Corridor

Scientific Name	Common Name	Federal Status
Birds		
Polyborus plancus audubonii	Audubon's crested caracara	Threatened
Ammodramus savannarum floridanus	Florida grasshopper sparrow	Endangered
Rostrhamus sociabilis plumbeus	Everglade snail kite	Endangered
Aphelocoma coerulescens	Florida scrub jay	Threatened
Campephilus principalis	Ivory-billed woodpecker	Endangered
Picoides borealis	Red-cockaded woodpecker	Endangered
Mycteria americana	Wood stork	Threatened
Grus americana	Whooping crane	Endangered
Dendroica kirdlandii	Kirtland's warbler[(a)]	Endangered
Charadrius melodus	Piping plover[(a)]	Threatened
Calidris canutus rufa	Red knot[(a)]	Threatened
Mammals		
Eumops floridanus	Florida bonneted bat	Endangered
Puma concolor coryi	Florida panther	Endangered
Peromyscus polionotus niveiventris	Southeastern beach mouse[(a)]	Threatened
Reptiles		
Drymarchon corais couperi	Eastern indigo snake	Threatened
Invertebrates		
Cyclargus thomasi bethunebakeri	Miami blue[(a)]	Endangered
Strymon acis bartrami	Bartram's scrub-hairstreak[(a)]	Endangered
Anaea troglodyte floridalis	Florida leafwing[(a)]	Endangered
Plants		
Jacquemontia reclinata	Beach jacquemontia[(a)]	Endangered
Asimina tetramera	Four-petal pawpaw[(a)]	Endangered
Cucurbita okeechobeensis ssp. okeechobeensis	Okeechobee gourd[(a)]	Endangered
Polygala smallii	Tiny polygala[(a)]	Endangered
Cladonia perforata	Florida perforate cladonia[(a)]	Endangered

(a) Additional listed species occurring in Palm Beach County (FWS 2014-TN3759).

Relatively little is known about habitat preferences of the Florida bonneted bat. This bat species roosts in both natural and artificial structures including hollow trees, palm leaves, rock crevices, and artificial bat houses (78 FR 61004) (TN2659). They forage for flying insects high over freshwater wetlands, streams, and ponds. They are generally associated with pinelands, but have been observed in forested, suburban, and urban landscapes in South Florida.

Recreationally important species observed on the nearby Kissimmee River Public Use Area and expected to occur on the Okeechobee 2 site include white-tailed deer, feral hog, raccoon, turkey, opossum (*Didelphis virginiana*), gray squirrel (*Sciurus carolinensis*), armadillo (*Dasypus novemcinctus*), beaver (*Castor canadensis*), coyote, bobcat, mourning dove, and bobwhite quail (FFWCC 2014-TN3004). Numerous waterfowl species would also be expected to occur in suitable habitats on the Okeechobee 2 site.

Building Impacts

Typical impacts from building nuclear units include permanent and temporary habitat loss from development, habitat fragmentation and degradation, disturbance and displacement of individuals, exposure of wildlife to increased noise levels and human presence, and increased risk of vehicle collision mortality. The conversion of fully developed and stable plant communities to earlier successional communities dominated by lower growing vegetation during development of linear transmission or pipeline corridors often results in a high degree of habitat fragmentation within the landscape.

FPL assumed a 362 ac area within the Okeechobee 2 site for evaluating potential impacts of building two new nuclear power reactors and associated stormwater ponds and other infrastructure plus an additional 3,000 ac for a cooling-water storage reservoir (FPL 2014-TN4058). The review team determined, however, that cooling water could be obtained from groundwater beneath the Okeechobee 2 site and that the cooling-water storage reservoir was unnecessary. FPL stated offsite facilities and development would also be required to construct and operate nuclear power plants at the Okeechobee 2 site. These include a 9.3 mi access road, 3.9 mi rail line, and pipeline corridors connecting the Kissimmee River to the site. The access road would add approximately 112 ac to the project footprint, the rail line would add approximately 47 ac, and the intake/makeup pipeline corridors would add approximately 23 ac. Because impacts from the plant area, access road, rail line, pipeline corridors, and stormwater-retention ponds result in permanent habitat loss they are discussed first.

Plant Facilities

If the plant facilities, access road, rail line, and pipelines were built within the proposed footprint, FPL estimated 543 ac would be affected (Table 9-19). Most of the affected habitat consists of wet prairie, improved pasture, and freshwater marsh (FPL 2011-TN59).

Table 9-19. Acreage within the Conceptual Footprint at the Okeechobee 2 Site

FLUCFCS Code	Description	Site and Non-Transmission (ac)	Transmission (ac)
200-series	Agriculture	190	2,431
300-series	Uplands	5	22
400-series	Forest	1	25
500-600 series	Water and Wetlands	306	545
100, 700, and 800 series	Developed	40	0
Total		542	3,023

Source: FPL 2011-TN59

Surveys of the occurrence, abundance, and distribution of Federally listed species have not been performed for the Okeechobee 2 site. Most of the listed species that occur in Okeechobee County could potentially occur on the Okeechobee 2 site, because suitable habitats are likely present. The exception is the ivory-billed woodpecker because there are no large tracts of old-growth forested wetlands present. The Federally listed species that could be affected most by the building of two nuclear plants at the Okeechobee 2 site are Audubon's crested caracara, Florida grasshopper sparrow, and the whooping crane because of the loss of a combined 403 ac of wet prairie and improved pasture. However, the Florida grasshopper sparrow is only known to occur in Okeechobee County at the Kissimmee Prairie Preserve State Park approximately 20 mi north of the Okeechobee 2 site, so this species may not be affected by habitat loss at the site (FWS 2008-TN2516). Loss of freshwater wetlands could reduce foraging habitat for the wood stork because the Okeechobee 2 site lies within the core foraging area of an active wood stork colony (FWS 2014-TN3732). Loss of freshwater wetlands could also reduce the amount of habitat available to the Everglade snail kite, whooping crane, and the Florida bonneted bat. Dry prairies in the vicinity are interspersed with oak and could be suitable habitat for the Florida scrub jay, but only 2.1 ac of dry prairie would be lost (FPL 2011-TN59). Eastern indigo snakes are habitat generalists, are widely distributed, and likely occur on the Okeechobee 2 site. They would be prone to increased mortality from land clearing and increased traffic during construction and operation. As with use of the Turkey Point site, mitigation requirements by the FFWCC, including staff awareness training and reporting, would minimize negative impacts on the eastern indigo snake. Habitat loss would also affect local populations of wildlife expected to occur within the region in suitable habitat that are not Federally listed. However, these effects are not expected to be noticeable and would not destabilize even local populations of any of these animals.

Transmission Lines and Access Roads

FPL assumed a new 38 mi long conceptual transmission line corridor from the Okeechobee 2 site to an existing corridor would be necessary to service power plants at the Okeechobee 2 site. FPL estimated this corridor would occupy 3,022 ac of additional land (Table 9-19). The conceptual transmission line corridor is dominated by pasture cover; over half is improved pasture, which covers 1,611 ac. Unimproved pasture covers an additional 302 ac, and woodland pastures cover another 281 ac. The sum of these pasturelands is almost 73 percent of the corridor. The remaining area includes additional uplands as well as wetlands. Uplands that are currently used for agriculture include 122 ac of citrus groves, 79 ac of field crops, and 36 ac of dairies. Undeveloped uplands within the corridor include 22 ac of dry prairie, 17 ac of live oak forest, 10 ac of hydric pine flatwoods, 6 ac of hardwood-coniferous forest, 2 ac of pine flatwoods, and a minor amount shrub and brushland. Wetland cover within the corridor includes 196 ac of freshwater marsh, 91 ac of wet prairie, 50 ac of mixed forested wetlands, 13 ac of cypress, and minor amounts of small waterways (ditches and streams). Impacts of the transmission line corridor on habitat are mostly alteration and fragmentation. Trees could be removed from as much as 560 ac of forest cover within the corridor and replaced with low-growing vegetation, including 244 ac of various forested wetland cover types (FPL 2011-TN59).

Because the conceptual transmission line corridor passes through a portion of St. Lucie, Martin, and Palm Beach Counties as well as Okeechobee County, the review team also considered impacts on Federally listed species and those species proposed for Federal listing known to

occur in any of these counties. The piping plover, red knot, Florida grasshopper sparrow, southeastern beach mouse, Miami blue butterfly, Bartram's scrub-hairstreak butterfly (*Strymon acis bartrami*), Florida leafwing butterfly (*Anaea troglodyte floridalis*), beach jacquemontia, Florida perforate cladonia, four-petal pawpaw, tiny polygala, and the Florida prairie-clover are not expected to occur near the conceptual transmission line corridor and would not be affected.

Although a substantial portion of the conceptual transmission line corridor is likely suitable habitat for Audubon's crested caracara, the installation and operation of transmission lines would not result in the permanent loss of all of the pasturelands that could provide habitat for this species. Habitat within the footprint of the tower pads and access road would be permanently lost but represents a small portion of the actual corridor. The likelihood of non-native plants being accidentally introduced would also increase and could result in habitat alteration. Approximately 196 ac of the corridor would be freshwater marsh, the primary habitat for the Everglade snail kite and whooping crane that is also used by wood storks (FPL 2011-TN59). Building a transmission line and access road through marsh habitat could lower habitat value by altering surface-water flow and increasing potential erosion. Removal of trees from the corridor could reduce nest sites within the freshwater marsh habitat for these three species. Elimination of trees from the live oak cover would measurably degrade the value of oak habitat to the Florida scrub jay, but this would only affect 17 ac (FPL 2011-TN59). The removal of trees from 18 ac of hardwood-coniferous forest, hydric pine flatwoods, and pine flatwoods could also lower the value of these habitats for the red-cockaded woodpecker. Removal of trees from the landscape could also result in less roosting habitat for the Florida bonneted bat. The Corbett substation is located southeast of Lake Okeechobee within a FWS Florida panther management zone. The landscape immediately around the substation and toward Lake Okeechobee appears to be used almost exclusively for agriculture. The installation of transmission lines here would likely not fragment potential panther habitat because the land-cover information within the corridor indicated it would not pass through the DuPuis Wildlife and Environmental Area, J.W. Corbett Wildlife Management Area, or the Arthur R. Marshall Loxahatchee National Wildlife Refuge. The eastern indigo snake inhabits many upland habitats. Conversion of habitats from forest to low-growing vegetation would not necessarily decrease habitat suitability for this species, and increased heterogeneity within the landscape may actually increase habitat quality. FPL stated field surveys would be conducted for Federally listed and State-protected species as part of the permitting process before any preconstruction activities would occur at the Okeechobee 2 site (FPL 2014-TN4058). Site-preparation activities would be conducted in accordance with all Federal and State regulations, permit conditions, and BMPs, including the use of directed drainage ditches and silt fencing. Acreage within the conceptual transmission line corridor was minimized to the extent possible by using the most direct route while avoiding areas with important resources and high biological value. FPL also stated that any wetland functions affected within the transmission line corridor would be replaced or restored.

Operations Impacts

Operation of two nuclear units at the Okeechobee 2 site would create noise, fogging and dissolved solid deposition from cooling towers, runoff from increased impermeable surfaces, light pollution, and increased vehicle collision mortality for local wildlife populations. Operation of transmission lines could increase the risk of bird collision and electrocution mortality.

The review team assumed the facility configuration would be similar to building at the Turkey Point site. Operational noise from the cooling towers may displace individual animals from the immediate vicinity of the cooling towers. Salinity within cooling water obtained from groundwater beneath the Okeechobee 2 site is assumed by the staff to be equal to that of seawater. Vapor leaving a cooling tower contains dissolved solids including salt, and some vegetation can be sensitive to salt deposition. The review team also assumed salt deposition from cooling-tower drift at the Okeechobee 2 site would be similar in scale and intensity to deposition at the Turkey Point site. Most of the salt would likely be deposited on developed land near the cooling towers, and concentrations as high as 10 kg/ha/mo that have resulted in observable effects on sensitive plant species could be expected as far as 1.25 mi from the cooling towers. Unlike Turkey Point, the Okeechobee 2 site is located inland, and vegetation growing there would not be expected to be as tolerant to atmospheric-deposited salt. Some sensitive vegetation could be affected by salt drift, but the spatial extent would be limited and the humidity and frequent rainfall typical of South Florida would quickly dissipate salt deposited in the landscape and prevent salt accumulation to levels that could be harmful.

The creation of impermeable surfaces and a stormwater runoff management system at the Okeechobee 2 site would likely result in changes in the surface-water flow pattern. Increases or decreases in the amount and timing of flow could result in changes in vegetative cover but would be limited to areas immediately surrounding developed areas. There is little relief at the site, so the potential for erosion and siltation of surrounding wetlands would be low. However, pollutants could be transported by runoff into the surrounding wetlands.

Light pollution during facility operation could affect wildlife residing on or migrating through the Okeechobee site. Design criteria could include minimization of upward lighting, turning off unnecessary lighting between 11 p.m. and sunrise, and luminary selection and mounting to provide light only where needed (FPL 2014-TN4058). If these actions are taken, the review team expects that impacts from light pollution on wildlife would be minimal.

Whooping cranes, wood storks, and Audubon's crested caracaras have been killed by electric utility structures in Florida (FPL 2011-TN1283) and may be particularly prone to collision and electrocution mortality. A nonmigratory population of endangered whooping cranes has been established at the Kissimmee Prairie in central Florida approximately 20 mi north of the Okeechobee 2 site (58 FR 5647) (TN3324). This population is officially designated as an experimental nonessential population. The Chassahowitzka National Wildlife Refuge approximately 140 mi northwest of the Okeechobee 2 site also supports migratory whooping cranes during the winter. Whooping cranes travel long distances and the conceptual transmission line corridor supporting the Okeechobee 2 site contains suitable whooping crane habitat. Transmission lines connecting the site to the Corbett substation in Palm Beach County would have to pass through core foraging areas of multiple wood stork nesting colonies (FWS 2014-TN3732). However, like the whooping crane, the risk of collision and electrocution mortality for the wood stork increases if transmission lines are operated within their range and there is suitable habitat within the transmission right-of-way. The level of risk is commensurate with the location of the transmission lines and wood stork nesting colonies, foraging habitat, and travel corridors. The review team assumed the FWS would regulate wire installation near wood stork colonies, foraging habitat, and flight corridors as it would at the Turkey Point site, but it

could still affect local wood stork and snail kite populations. Operational effects on other important species would be minimal.

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NRC 2013-TN2654). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NRC 2013-TN2654). The impacts of EMFs on terrestrial flora and fauna are of small significance at operating nuclear power plants, including transmission systems with variable numbers of power lines and lines energized at levels less than 765 kV (NRC 2013-TN2654). Since 1997, more than a dozen studies have been published that looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2005-TN1329). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2005-TN1329). Therefore, the incremental EMF impact posed by operation of existing transmission lines and the addition of new lines for two new nuclear units would be negligible at the Okeechobee 2 alternative site.

Transmission line corridor vegetation-management activities (cutting and herbicide application) and related impacts on floodplains and wetlands in transmission line corridors are of minor significance at operating nuclear power plants, including those with transmission line corridors of variable widths (NRC 2013-TN2654). Consequently, the incremental effects of transmission line corridor maintenance and associated impacts on floodplains and wetlands for two new nuclear units would be negligible at the Okeechobee 2 site.

Cumulative Impacts

The geographic area of interest for the assessment of the potential cumulative impacts of building and operating a new reactor at the Okeechobee 2 site and other past, present, and reasonably foreseeable future actions on terrestrial resources and wetlands is defined as being the 50 mi radius around the Okeechobee 2 site. A list of past, present, and reasonable foreseeable actions within 50 mi of the Okeechobee 2 site is presented in Table 9-16. This list includes a variety of energy-production projects, mining, manufacturing, transportation and infrastructure-development projects, set-aside areas for recreation and conservation, CERP-related projects, and other miscellaneous activities that could affect terrestrial and wetland resources.

Past land use in South Florida, especially agriculture and more recently urbanization, has greatly affected the distribution and abundance of unfragmented plant and wildlife habitats still remaining. Development and urbanization of higher elevation lands has further reduced the amount of valuable upland habitats remaining in the landscape. Ditching and draining created more dry land, reducing the amount of wetlands available as habitat and fragmenting the natural landscape. The continued operation and maintenance of existing facilities would likely not exacerbate the current situation with respect to terrestrial and wetland ecosystems. Mining activities have the potential to expand their footprint and development in general on the landscape, as does continued human population growth in South Florida. Lands set aside for recreation and conservation provide buffers against development, provide habitat for plants and animals, and serve to preserve the ecosystem remaining in South Florida. Projects that

continue to incrementally reverse changes in land cover due to man-made changes in surface-water flow, including CERP-related activities, would continue to benefit the terrestrial and wetland ecology of the region.

As described in Chapter 7, terrestrial and wetland environments in South Florida may also be affected by continued population growth and related development. The overall impact from past, present, and reasonably foreseeable future activities on regional terrestrial and wetland ecology is substantial.

Summary Statement

Fragmentation and loss of natural habitats from agriculture and urbanization have changed and will continue to change the ecology of South Florida. Although much of the landscape around the Okeechobee 2 site has already been converted to pastures, the Okeechobee 2 site is still dominated by wetland habitats. Habitats of significant ecological value in South Florida that would be affected by the construction and operation of new nuclear units at the Okeechobee 2 site include freshwater marsh, wet prairie, and bay swamp. Based on the information provided by FPL and the review team's independent evaluation, the review team concludes that the cumulative impacts on terrestrial and wetland resources of building and operating two new nuclear units at the Okeechobee 2 alternative site, including impacts attributable to permanent conversion of habitat for the facility footprint as well as operation of the cooling tower and transmission lines, would be MODERATE. The incremental effect of the building and operation of two new nuclear units at the Okeechobee 2 site would be a significant contributor to this impact primarily because of the impacts on wetlands and intact upland habitat.

9.3.4.4 Aquatic Resources

What follows is an assessment of the potential impacts on aquatic resources that may occur if the two nuclear units described in FPL (2014-TN4058) were constructed and operated at the Okeechobee 2 site. Based on a review of potential cooling-water sources discussed in Section 9.3.4.2, the review team assumes no cooling ponds or reverse osmosis facilities would be required for the Okeechobee 2 site.

Okeechobee 2 is a 3,000 ac site located in Okeechobee County approximately 8 mi west of the town of Okeechobee (Figure 9-17). The property is not owned by FPL, and is currently used to support cattle and dairy operations, and citrus production. The Kissimmee River is 2 mi west of the site, and Lake Okeechobee is approximately 8 mi southeast. As described by FPL, the proposed facility would occupy approximately 362 ac, and the conceptual transmission line corridor would extend 38 mi and encompass approximately 3,022 ac. The site would also require approximately 112 ac for access roads, 47 ac for a rail line, and 23 ac for a pipeline extending from the plant to the Kissimmee, where cooling water would be withdrawn from a surface-water intake during high-flow events. Groundwater would be used for reactor cooling at other times. Several hundred additional acres may be required to support construction activities, including laydown areas, batch plants, and fill or spoil areas.

As described elsewhere in this EIS, South Florida has undergone significant development and channelization to enable development and industry. Beginning in the 1960s and early 1970s,

the Kissimmee River was channelized, two-thirds of its floodplain was drained, and excavation of the canal and spoils disposal destroyed one-third of the river channel. These actions degraded the natural environment, significantly affected ecosystem function, and resulted in declines of waterfowl, wading birds, and fish. Subsequently, restoration actions by the USACE and others are occurring, with the goal of reestablishing the river's historical hydrological patterns, creating more natural fluctuations of water levels, and enhancing fish and wildlife habitat.

Commercial and Recreational Species

Given its hydrological connection to Lake Okeechobee, aquatic species found in the Kissimmee River in the vicinity of the Okeechobee 2 site will likely be similar to those found in the lake. Thus, aquatic species in the Kissimmee River would likely include smaller bait fish and larger piscivores, including crappie, catfish, and bream, which have recreational and commercial importance. As described above, the goal of current and future restoration actions is to reestablish the river's natural hydrologic patterns to enhance aquatic resource populations.

Important Species

Based on the hydraulic connections described above, the important species present in Lake Okeechobee are likely present in the portion of the Kissimmee River near the lake. These would include a variety of forage fish like Threadfin Shad and Inland Silversides, and larger predators like the Largemouth Bass and Black Crappie (USACE 2013-TN2847; Zhang and Sharfstein 2013-TN2894). Important species are similar to those listed for Glades in Section 9.3.2.4.

Non-Native or Nuisance Species

As noted in the above summaries for the Glades and Martin sites, Lake Okeechobee and the connecting canal and river systems contain a variety of non-native and nuisance species. Many of these species would likely be present in the Kissimmee River near the Okeechobee 2 site.

Federally and State-Listed Species and Critical Habitats

Based on an FNAI search conducted by the review team, the only Federal and State-listed species likely to occur near the Okeechobee 2 site are the American alligator and the Florida manatee (FNAI 2013-TN2901). As described in Section 2.4.2, American alligators are found in swamps, rivers, streams, lakes, and ponds throughout the southeastern United States where fresh or brackish water is present. Florida manatee are found in shallow rivers, bays, estuaries and coastal waters, and have been observed in Lake Okeechobee. No designated critical habitat for either species is found near the Okeechobee 2 site, but the manatee consultation area includes Lake Okeechobee (FWS 2003-TN2916).

Construction Impacts

Based on information provided by FPL, the 362 ac required for the plant would primarily affect the existing farmland and agriculture present in the area. Some existing drainage ditches that support a seasonal population of some of the fish species listed above may be adversely

affected. Construction of the surface-water intake on the Kissimmee River may result in short-term increases in water turbidity, and some disturbance of the shoreline area. Impacts would be temporary, largely mitigable, and minor. Construction of the surface-water intake on the Kissimmee River would result in temporary displacement of aquatic biota in the immediate area, and likely short-term increases in water turbidity. Construction of water pipelines would likely occur in previously disturbed areas, or locations where aquatic resources are not present. Construction of the proposed transmission lines would affect approximately 3,022 ac that would include previously disturbed areas, existing rights-of-way, forests, and agricultural land. FPL has indicated field surveys for Federally or State-listed species would be conducted prior to construction at the site or within transmission line corridors. Impacts would be the same as those described for the Glades site in Section 9.3.2.4.

Operations Impacts

As described in Section 9.3.4.2, the review team assumes groundwater would be the primary source of cooling water, with supplemental water from Lake Okeechobee or the Kissimmee River being available intermittently when excess surface water is available, typically during the wet season. Thus, the effects of impingement and entrainment of aquatic biota would be reduced. Assuming the intake conforms to current EPA standards, through-screen velocities are expected to be protective of the aquatic environment and any impingement or entrainment that does occur should not result in noticeable changes in aquatic biota species composition or abundance. It is assumed impingement and entrainment of biota from the river would not result in a noticeable impact on aquatic resources. Because cooling-tower blowdown would be discharged into the Boulder Zone of the Lower Floridan aquifer, surface-water resources would not be adversely affected. There is no available information about biological communities that may be present in Bounder Zone formations near the Okeechobee 2 site, so it is not possible to determine whether a complete exposure pathway is present or assess potential biological effects. Thus, the potential risk of chemical exposure to aquatic resources resulting from the discharge of cooling-tower blowdown cannot be determined

Based on an NRC assessment of a similar cooling system proposed at the Levy site in western Florida using brackish saltwater for cooling-tower makeup water (NRC 2012-TN1976), cooling-tower drift impacts on aquatic resources would likely be minimal, because deposition would be expected to occur primarily on plant property or adjacent agricultural lands**.** Impacts would be the same as those described for the Glades site in Section 9.3.2.4. No detectable increase in surface-water salinity resulting from salt-drift deposition is anticipated.

Cumulative Impacts

Table 9-16 summarizes the past, present, and reasonably foreseeable projects and other actions in the vicinity of the Okeechobee 2 site. As previously noted, these activities include existing and proposed energy projects, rock-mining activities, transportation projects, parks and aquaculture facilities, and restoration activities funded by CERP or others. Existing or potential energy projects near the Okeechobee 2 site include one nuclear plant (St. Lucie), and a variety of others using fossil fuels, biofuels, or solar technologies. The area also supports numerous general aviation airports that may require limited expansion in response to population increases. Rock mining also occurs within 50 mi of the Okeechobee 2 site and is expected to continue.

This area of South Florida also includes dozens of parks, scenic trails, wildlife refuges, preserves, and environmental areas, which protect natural resources and provide a variety of recreational opportunities. This area will also benefit from a variety of existing or proposed restoration projects that focus on improving surface-water management and water quality, and those enhancing efforts to control invasive species. Ongoing restoration projects on the Kissimmee River north of the Okeechobee 2 site will provide a positive cumulative effect by restoring natural river flow and function that benefit aquatic and terrestrial resources.

In addition to the projects described above that may result in negative, positive, or neutral cumulative impacts on aquatic biota, this part of South Florida will continue to experience increased population growth and development. Overall the review team concludes that the cumulative impacts on aquatic resources in the vicinity of the Okeechobee 2 site would be MODERATE.

Summary Statement

Based on a review of the information provided by FPL and the review team's independent assessment, it is likely the construction and operation of a nuclear power-generating station, as described above for the Okeechobee 2 site, would contribute only minimally to the cumulative effects likely to occur in that portion of South Florida. Although the construction of nuclear units at the Okeechobee 2 site would affect existing agricultural and farm land, adverse effects on aquatic resources would be unlikely. Construction of the surface-water intake on the Kissimmee River may result in temporary, localized impacts that would not adversely affect aquatic resources in the river. The use of water from the Kissimmee River during high-flow events may relieve some of the flooding concerns associated with Lake Okeechobee and the connecting canals, and result in lower discharges into these systems to maintain lake level and protect the Herbert Hoover dike system. Some impingement and entrainment losses are expected, but assuming a closed-cycle cooling system and compliance with the EPA's 316(b) Phase I requirements for intake structures (66 FR 65256) (TN243), the intake is considered protective of aquatic life and the anticipated impacts due to impingement and entrainment are considered minimal. Furthermore, the intakes would likely be only operated intermittently throughout the year when surface water is available. Impingement or entrainment that does occur should not result in noticeable changes in aquatic biota species composition or abundance. Thus, the review team concludes that the cumulative impacts of building and operatiing two new nuclear reactors at the Okeechobee 2 site, combined with the other past, present, or reasonably foreseeable activities on aquatic resources would be MODERATE, but building and operating two new nuclear units at the Okeechobee 2 site would not be a significant contributor to the MODERATE impact.

9.3.4.5 Socioeconomics

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect socioeconomics, including other Federal and non-Federal projects listed in Table 9-16. For the analysis of socioeconomic impacts at the Okeechobee 2 site, the geographic area of interest is considered to be the 50 mi region centered on the Okeechobee 2 site with special consideration of Okeechobee, Glades, Highlands, Palm Beach, Indian River, Martin and St.

Lucie Counties because that is where the review team expects socioeconomic impacts to be the greatest. In evaluating the socioeconomic impacts of site development and operation at the Okeechobee 2 site near Okeechobee in Okeechobee County, the review team used readily obtainable data from the Internet or published sources. Impacts from both building and station operation are discussed.

Physical Impacts

People who work or live around the site would be exposed to noise, fugitive dust, and gaseous emissions from building and operations activities. Noise, dust, and air-pollution emissions generated within the boundaries of the Okeechobee 2 site would be expected to be similar to those at the Turkey Point site. Because the surrounding site is rural and sparsely populated and because noise and air-pollution impacts are attenuated by distance, members of the surrounding population exposed would be relatively few and the impacts would be expected to be negligible. Best practices and applicable regulations would be expected to protect building workers and personnel working onsite. Truck and vehicle traffic related to building and operations would generate noise, fugitive dust, and gaseous emissions offsite. In addition, offsite structures include a transmission line and intake/makeup pipelines (FPL 2014-TN4058). Because the area affected by offsite structures and traffic would also be rural and sparsely populated and because FPL would be expected to implement a dust-control plan similar to that for the Turkey Point site, noise and air-pollution impacts from these offsite activities would be expected to be minor.

Based on FPL's conceptual site layout for the Okeechobee 2 site (FPL 2011-TN59) and on aerial photography, there is one structure within the boundaries of the proposed site. There are also pastures that would be lost. Offsite project-related building activities include widening of 9.3 mi of SR-70 and a 3.9 mi railway. The impact on road quality based on any road improvements made by the applicant to facilitate project-related traffic would only affect a small population base, and therefore that impact would be minor and beneficial. Other offsite project-related building activities include a 38 mi transmission line and intake/makeup pipelines (FPL 2014-TN4058). The conceptual design of these activities routes them, to the extent possible, along existing rights-of-way and avoids populated areas and residences (FPL 2014-TN4058). The physical impacts on existing structures and crops within the proposed site and offsite areas for supporting infrastructure would be minor.

The area around the site is relatively flat, sparsely populated, and is used mainly as farmland. Building would use cranes (which could exceed 400 ft in height) and would alter the regional viewscape. Construction of the transmission lines would pose similar impacts. The power plant and water-intake facilities would likely be visible from several angles and contrast highly with the present viewscape. Building and operation would noticeably alter the aesthetics of the area. Because of the sparse population, the negative impact would likely not interfere with the daily routine of local public around the Okeechobee 2 site and would not destabilize the aesthetic characteristics of the area.

Based on the information provided by FPL (2014-TN4058) and the review team's independent analysis, the review team concludes that the overall physical impacts of building activities and operations would be minor and adverse, with the exceptions of noticeable but not destabilizing

adverse impacts on aesthetics and minor and beneficial impacts on road quality near the Okeechobee 2 site.

Demography

The Okeechobee 2 site is located in Okeechobee County, 1.5 mi west of Okeechobee (2012 population 5,632) and 30 mi west of Port St. Lucie (2012 population 163,748), the closest population center with more than 25,000 residents (FPL 2014-TN4058; USCB 2012-TN4098). The population distribution within and around the Okeechobee 2 site is typically rural with low population densities. There are 14 counties within the 50 mi area, but the review team estimates the areas in which workers would most likely live and from which they would commute are within Okeechobee, St. Lucie, Palm Beach, Highlands, Indian River, Martin, Glades, Broward and Miami-Dade Counties, based on current commuter patterns.(25) For the purposes of assessing potential socioeconomics impacts, the review team excluded Broward and Miami-Dade Counties as potential areas of residence for construction and operation workers: these two counties are outside of the 50 mi region at driving distances approaching 2 hours or more and would be less likely to accommodate workers than closer communities. Because the population of Broward and Miami-Dade Counties would be over 60 percent of the population of the nine counties together, the impacts would be distorted by the inclusion of Broward and Miami-Dade Counties in the potential area of residence. The remainder of the analysis focuses on the seven-county area of Okeechobee, St. Lucie, Palm Beach, Highlands, Indian River, Martin, and Glades.

FPL estimated the peak number of workers during building would be 3,983, including 33 operation workers. The review team assumed that the share of construction and operation workers relocating from outside the seven-county area would be 66 percent of the estimated peak number of workers. This assumption was reached by using the assumption made for the proposed Turkey Point site as a reference and assuming that the share of workers that would come from outside the region is inversely proportional to the population of the region.(26) As in Section 4.4, 70 percent of the construction workforce and 100 percent of the operation workforce that moved into the area were assumed to bring their families. Based on these assumptions, a peak of 2,607 construction and 22 operation workers would relocate to the area during the project construction phase, and 1,847 of these workers would bring their families. Based on an average household size of 3.25 people, the total increase in population attributable to the peak total workforce at the Okeechobee 2 site would be 6,036 people. An influx of 6,036 people represents a 0.3 percent increase in the seven-county 2012 population of 2,038,496.

FPL estimated the total onsite operations workforce to be 806 workers. As explained above, the review team assumed that 66 percent of these workers (532) would relocate from outside the

(25) Over 80 percent of the workers in Okeechobee County currently reside in one of these nine counties (USCB 2011-TN4078).

(26) The proposed Turkey Point site analysis assumed 50 percent of the peak workers would come from outside the 50 mi region and that 83.3 percent of those would reside in Miami-Dade County; i.e., 41.65 percent (0.5 × 0.833) of the peak workers would migrate into Miami-Dade County. Because the population of the seven-county area is approximately 81 percent of that of Miami-Dade County (USCB 2012-TN4098), the review team assumed the share of peak workers migrating into the seven-county area would be 1-(0.81 × 0.4165) ≈ 66 percent.

seven-county area. For this analysis, the review team assumed that 100 percent of operation workers who relocate would bring their families. Based on an average household size of 3.25 people, the total population increase attributable to project operations is 1,729 (532 × 3.25) people. This represents less than a 0.1 percent increase in the seven-county area.

The review team concluded that the impact on local demography would not be noticeable.

Economic Impacts on the Community

Economy

FPL estimated the peak number of workers during building would be 3,983, including 33 operation workers. Employment of 3,983 construction and operation workers would have positive economic impacts in the seven-county area. Based on a multiplier of 1.6260 jobs (direct and indirect) for every construction job and 2.4679 for every operation job, 3,983 new construction and operation jobs would create 2,522 indirect jobs, for a total of 6,505 new jobs in the seven-county area during peak employment (3,950 × 1.6260 + 33 × 2.4679) (FPL 2011-TN56).[27] This represents a 0.7 percent increase in the total employment in the seven-county area.[28] Peak employment would last 1 month and the average employment generated during the 10-year building period would be about half of that of peak employment. This added employment would generate added earnings to the economy of the seven-county area, but the added employment and earnings would not be noticeable to most of those living or working in the area.

An estimated 806 workers would be required for the operation of two nuclear power facilities. Based on a multiplier of 2.4679 jobs (direct and indirect) for every operations job at the new units (FPL 2011-TN56), an influx of 806 workers would create 1,183 indirect jobs for a total of 1,989 new jobs in the region. This represents a 0.2 percent increase in the total employment in the seven-county area. This added employment would also generate added earnings to the economy of the seven-county area, but the added employment and earnings would not be noticeable to most of those living or working in the area.

Taxes

State corporate income taxes and sales and use taxes paid at the Okeechobee 2 site during construction and operations of the proposed units would be similar to those paid by the same units at the proposed Turkey Point site. As discussed in Sections 4.4 and 5.4, State taxes paid by the proposed units would not exceed 2 percent of the annual collected State corporate income and sales and use taxes. The impact would be minor and beneficial. County sales surtax rates in the seven-county area for the 2014 calendar year are zero percent for Martin and Palm Beach Counties, one-half percent for St. Lucie, and 1 percent for the remaining four counties (FDOR 2014-TN3393). County surtax collections from the proposed units would be highest during construction when annual expenses related to the proposed units would be estimated to reach up to $1.56 billion (Section 4.4). A 1 percent sales surtax would generate

(27) Multipliers are for a four-county area (excluding Martin, Indian River, and Palm Beach Counties) and are used as an approximation.
(28) Employment of 892,793 (BLS 2013-TN4085).

$15.6 million in revenues for the seven-county area.[29] This would correspond to less than 1 percent of total county revenues in the seven-county area for 2014.[30] The impact would be minor and beneficial. County and school district governments in Florida may levy taxes up to 10 mills each (1 percent) in property taxes (FDOR 2012-TN459). If the value of property taxes for the two nuclear reactors at the Okeechobee site were the same as the value estimated for Units 6 and 7 at the Turkey Point site in Section 5.4.3.2, FPL would pay $20 million in property taxes to the Okeechobee School District and $20 million to Okeechobee County. These payments would correspond to 46.6 percent of the Okeechobee School District 2011-2012 total revenues ($20 million compared $42.9 million)[31] and 42.6 percent the Okeechobee County 2011-2012 total revenues ($20 million compared to $46.9 million).[32] Because property taxes paid to school districts are reallocated through Florida's Education Finance Program, the benefit to the Okeechobee School District would be diluted to some extent, and the exact amount distributed to each school district is not known at this time. Because of the value of project-related property tax payments relative to current property taxes, the review team considers the impacts on tax revenues to both the Okeechobee School District and Okeechobee County to be substantial and beneficial.

The review team concluded that the economic impact would not be noticeable and would be beneficial, with the exception of property tax revenues to Okeechobee County and to the Okeechobee School District, which would be beneficial and substantially alter current property tax levels in Okeechobee County and the Okeechobee School District.

Infrastructure and Community Service Impacts

Traffic

Workforce access to the Okeechobee 2 site would occur through SR-70 coming from the east and the west. The review team estimated the current LOS (Level of Service) of these roads at two FDOT traffic-monitoring sites based on the peak hour directional traffic and FDOT LOS thresholds. Peak hour directional traffic information was obtained from FDOT Florida Traffic Online (FDOT 2013-TN3558) and consists of the AADT at each traffic-monitoring site, a Standard Peak Hour Factor (K) and a Directional Distribution Factor (D). The multiplication of these three elements (AADT × K × D) provides an estimate of the current peak hour directional traffic volume. The LOS was determined comparing this peak hour directional traffic volume with the maximum thresholds for each LOS in Table 9 (areas less than 5,000 population) of FDOTs Generalized Service Volume Tables (FDOT 2013-TN3297). The review team used FDOT's 2011 LOS Reports by County (FDOT 2011-TN3557) to determine the correct classification of each road for the purposes of identification of the appropriate threshold in the Generalized Service Volume Tables (e.g., whether the road should be considered highway or a freeway; whether the area should be considered rural developed or rural undeveloped). Based on this procedure, the LOS at both traffic-monitoring sites would be B. To estimate the project

(29) To the extent that some of the expenditures would be made in Martin, Palm Beach, and St. Lucie Counties, and assuming the sales surtax rates are unchanged, the total sales surtax collected would be smaller.
(30) $3412 million (FLDFS 2013-TN3392).
(31) FLDOE 2012-TN3391.
(32) FDOR 2014-TN3393.

impact on traffic LOS during the project's peak workforce building period, the review team followed a methodology similar to that described in Section 4.4: The peak workforce of 3,983 construction and operation workers was divided into two shifts; 70 percent were assigned to shift 1 (6:00 a.m. to 4:30 p.m.) and 30 percent to shift 2 (5:00 p.m. to 3:00 a.m.). The hour of peak commute would be 4:30 p.m. to 5:30 p.m. The review team also assumed up to 36 trucks per hour. The project-related directional traffic during the peak commute hour would be 2,824 vehicles (70 percent × 3,983 + 36). The review team assumed that half of the project-related traffic would come from each direction, east and west.[33] The results of this analysis are presented in Table 9-20. The additional building traffic would drop the LOS classification at both traffic-monitoring sites to F. The proposed widening of SR-70 would bring the LOS classification to a C.

Table 9-20. Peak Workforce Traffic LOS Analysis for the Okeechobee 2 Site

Traffic-Monitoring Site	Baseline Peak Hour Directional Traffic	Baseline LOS	Distribution of Project-Related Peak Traffic	Added Peak Hour Directional Traffic	Peak hour Directional Traffic with Project	LOS with Project
SR-70 west of site	246	B	0.50	1,412	1,658	F (C)[a]
SR-70 east of site	393	B	0.50	1,412	1,805	F (C)[a]

(a) LOS classification after widening of SR-70.

Source: Review team calculations based on FDOT 2011-TN3557; FDOT 2013-TN3558; and USCB 2011-TN4078

FPL estimated the total onsite operations workforce to be 806 workers. If access of this workforce to the Okeechobee 2 site were distributed among the two directions equally, the LOS at each of the two monitoring sites would drop to C.

Based on the above analysis, the review team concludes that the impact of the building and operations of the proposed nuclear reactors at the Okeechobee 2 site would be noticeable during building, although not destabilizing, after widening of SR-70.

Recreation

The Okeechobee 2 site is located approximately 4 mi from Lake Okeechobee and the Lake Okeechobee Scenic Trail that circles the lake. The lake is used for boating, fishing, and duck hunting, and the scenic trail is used for hiking and bird watching (Palm Beach County 2013-TN3298). The Taylor Creek/Nubbins Slough Water Conservation Area is located approximately 2 mi from the site. To the east, several recreational areas exist at approximately 2 mi along the Kissimmee River. During building, access to these sites from some directions could be affected by increased traffic. Other parks and recreational areas exist within the county. The influx of project-related population to the seven-county area would increase the number of local users of recreational facilities. Because the in-migrating population would be less than 1 percent of the local population, the review team expects the impact on current recreational infrastructure to be negligible.

(33) Based on U.S. Census Bureau commuter patterns (USCB 2011-TN4078) it was not possible to determine the likely direction of outgoing project-related traffic.

Housing

The review team estimates that 2,629 construction and operation workers would migrate into the seven-county area, and each of these workers would need a place to live. Based on American Community Survey 2008–2012 5-Year estimates, within the seven-county area there are 1,035,416 housing units of which 232,194 are vacant (22.4 percent). This includes housing that is designated as seasonal, recreational, or occasional use (USCB 2012-TN4089). The review team estimates that, in absolute numbers, the available housing would be sufficient to house the construction workforce. The in-migrating construction and operation workforce would occupy no more than 1.2 percent of vacant housing units in the seven-county area. FPL estimated that approximately 806 workers would be needed for operation of two nuclear power facilities at the Okeechobee 2 site, and the review team assumed that 66 percent of these workers (532) would relocate from outside the region and would settle in the seven-county area. Based on these assumptions, the entire operations workforce would occupy no more than 0.3 percent of vacant housing units in the seven counties. The review team concludes that impact on housing would be minor.

Public Services

In-migrating construction workers and plant operations staff would also likely affect local municipal water, wastewater-treatment facilities, police, fire-protection services, and other public services in the region. These impacts would be expected to be in proportion with the demographic impacts experienced in the region. In-migration to the seven-county area would represent an estimated 0.3 percent of the local population (less during operations). The review team concludes that the impact on public services would be minor.

Education

Based on data for the 2011-2012 school year, there are approximately 269,566 full-time equivalent students in public schools in the seven-county area (FLDOE 2013-TN3299).[34] The review team estimated that 2,629 construction and operation workers would migrate into the area, and that 1,847 workers would bring their families. Based on an estimate of 0.8 school-aged children per family (Malhotra and Manninen 1981-TN1430), an estimated 1,478 (1,847 × 0.8) school-aged children would be migrating into the seven-county area. This would yield a 0.5 percent increase in the student population. During operations, the review team assumed that 532 operation workers and their families would relocate from outside the region. This would include an estimated 426 (532 × 0.8) children in the PK-12 school range. This influx of students would increase the student population in the seven-county area by 0.2 percent. The review team concludes that the impact on education would be minor.

Based on the information provided by FPL (2014-TN4058) and the review team's independent analysis, the review team concludes that the overall infrastructure and community service impacts of building activities and operations at the Okeechobee 2 site would be minor except for noticeable, but not destabilizing, adverse impacts on traffic.

(34) FTE is a measure of enrollment based on the number of full-time students that it would take to fill the number of classes offered.

Cumulative Impacts

In addition to the socioeconomic impacts from building and operations of the proposed project at the Okeechobee 2 site, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could have socioeconomic impacts.

The socioeconomic impacts of past and present actions in the affected area are largely captured by the current baseline conditions used for analysis above of project impacts. For example, the impacts of past and present actions on the demography and economy of the area are largely captured by current baseline data on population, employment, and tax revenues and are incorporated in the baseline and trend assessments of the RIMS II multipliers.

Reasonably foreseeable future actions are listed in Table 9-16. Future actions that would be expected to have cumulative socioeconomic impacts with the proposed project at the Okeechobee 2 site would be several that would generate additional employment and earnings in the area. These include the Herbert Hoover Dike Rehabilitation Project and Dam Safety Modification Study, the Florida Southeast Connection pipelines proposed through Highlands, Okeechobee and Martin Counties (construction 2016-2017; FSC 2014-TN3301), the Floridian Natural Gas Storage Facility in Martin County, and various proposed CERP water projects.

Based on the location of the identified future projects and their magnitudes, the cumulative socioeconomic impacts of the projects identified above with the proposed project at the Okeechobee 2 site would be expected to be SMALL and adverse, with the exception of MODERATE and adverse impacts on aesthetics and traffic; SMALL and beneficial physical impacts on road quality; and LARGE and beneficial impacts of property tax revenues to Okeechobee County and to the Okeechobee School District. Building and operating two new nuclear units at the Okeechobee 2 alternative site would be a significant contributor to the MODERATE adverse impacts.

9.3.4.6 Environmental Justice

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that impact EJ, including other Federal and non-Federal projects listed in Table 9-16.

The 2008–2012 American Community Survey block groups were used to identify minority and low-income population distributions in the area (USCB 2012-TN4098). The census data for Florida characterizes 15.9 percent of the population as Black; 0.3 percent as American Indian or Alaskan Native; 2.5 percent as Asian; 0.1 percent as Native Hawaiian or other Pacific Islander; 2.6 percent as other single minorities; 2.2 percent as multiracial; 22.5 percent as Hispanic ethnicity; and 42.2 percent as aggregate minority. There are 526 block groups within 50 mi of the Okeechobee 2 site. Following the criteria described in Section 2.6.1, Black minority populations exist in 57 block groups; American Indian or Alaskan Native minority populations exist in 2 block groups; other race minority populations exist in 12 block groups; multiracial minority populations exist in 2 block groups; Hispanic ethnicity minority populations exist in 38 block groups; and aggregate minority populations exist in 116 block groups. There are no block groups containing Asian minority populations or Native Hawaiian or other Pacific Islander

minority populations within 50 mi of the Okeechobee 2 site. The Brighton Seminole Indian Reservation is approximately 10 mi southwest of the Okeechobee 2 site. The locations of the minority populations within 50 mi of the Okeechobee 2 site and the Brighton Seminole Indian Reservation are shown in Figure 9-19. The locations of Hispanic minority populations and Black minority populations within the 50 mi of the Okeechobee 2 site are shown in Figure 9-20 and Figure 9-21, respectively.

The USCB data characterize 15.3 percent of Florida residents as low income (USCB 2012-TN4098). Out of a possible 526 block groups, 69 block groups contain low-income populations. The locations of the low-income populations within 50 mi of the Okeechobee 2 site are shown in Figure 9-22.

The analyses of the impacts of building and operating new nuclear reactors at the Okeechobee 2 site identified noticeable impacts on land use, terrestrial and wetland ecosystems, aesthetics, and traffic. The review team did not identify any special pathways through which these noticeable impacts would disproportionately affect EJ populations of interest. Therefore, the review team concluded there would be no disproportionately high and adverse impacts on EJ populations of interest.

The NRC's EJ methodology includes an assessment of affected populations of particular interest or with unusual circumstances, such as minority communities that are exceptionally dependent on subsistence resources or identifiable in compact locations (e.g., Native American reservations) and those that have a high density of minority or low-income groups. Based on a literature research, the review team did not identify high-density minority or low-income presence in the proximity of the site, nor differentiated subsistence consumption of natural resources by EJ populations of interest.

Cumulative Impacts

In addition to the EJ impacts from building and operations of the proposed project at the Okeechobee 2 site, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could have EJ impacts. Based on a literature review of past and present actions in the affected area, and based on the reasonably foreseeable actions listed in Table 9-16, the review team found no evidence that the cumulative effects would disproportionately affect EJ populations of interest.

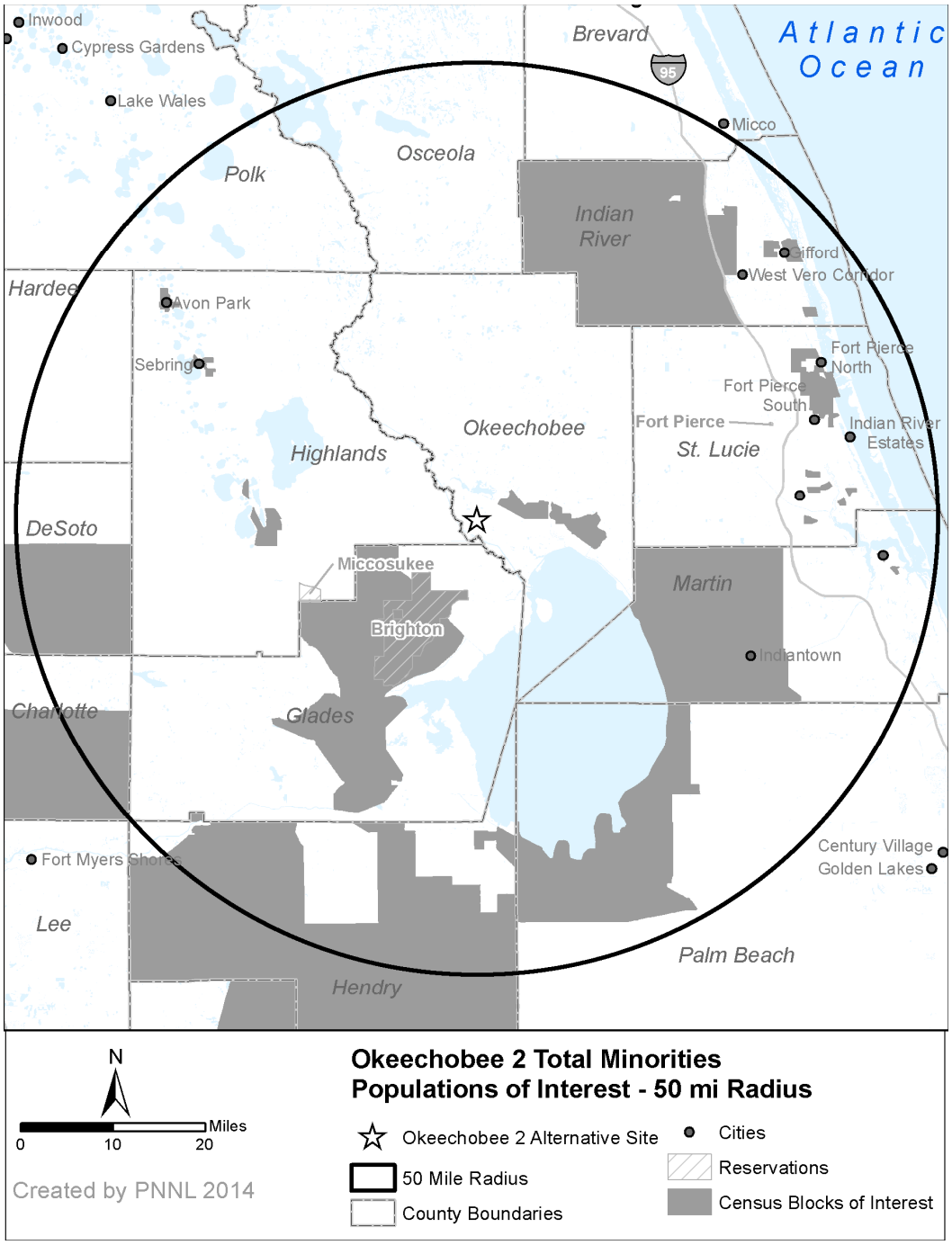

Figure 9-19. Aggregate Minority Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Okeechobee 2 Alternative Site

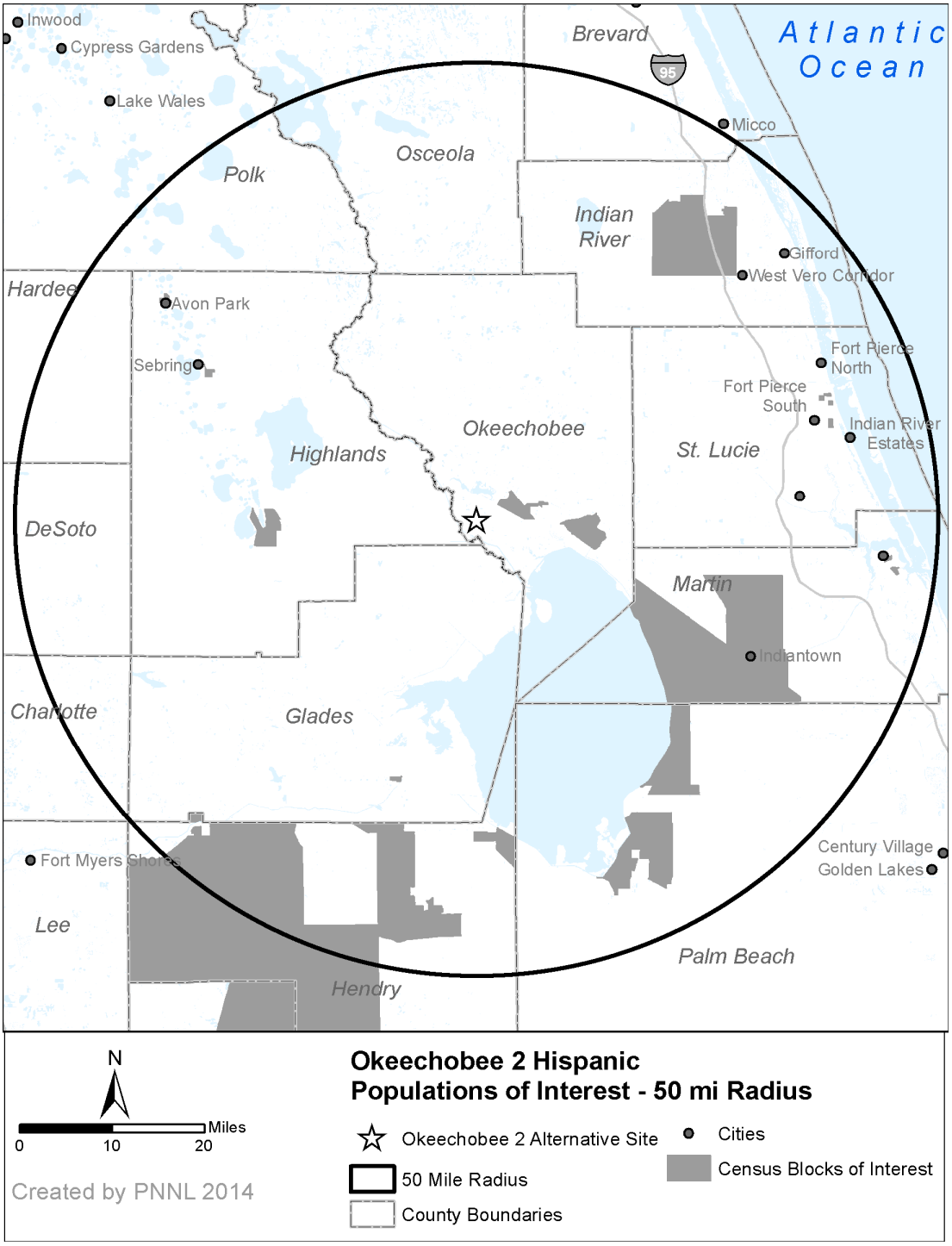

Figure 9-20. Hispanic Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Okeechobee 2 Alternative Site

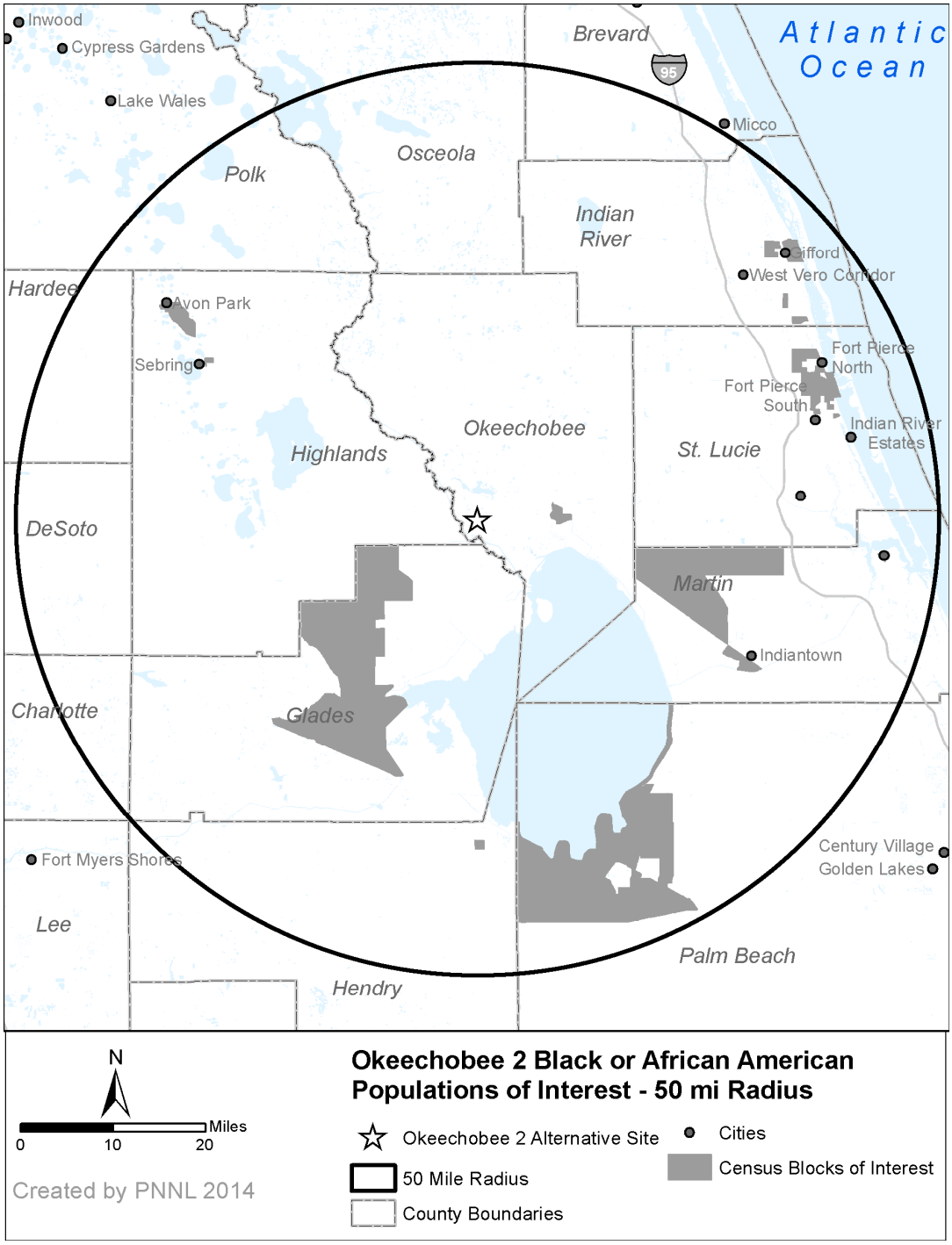

Figure 9-21. African American Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Okeechobee 2 Alternative Site

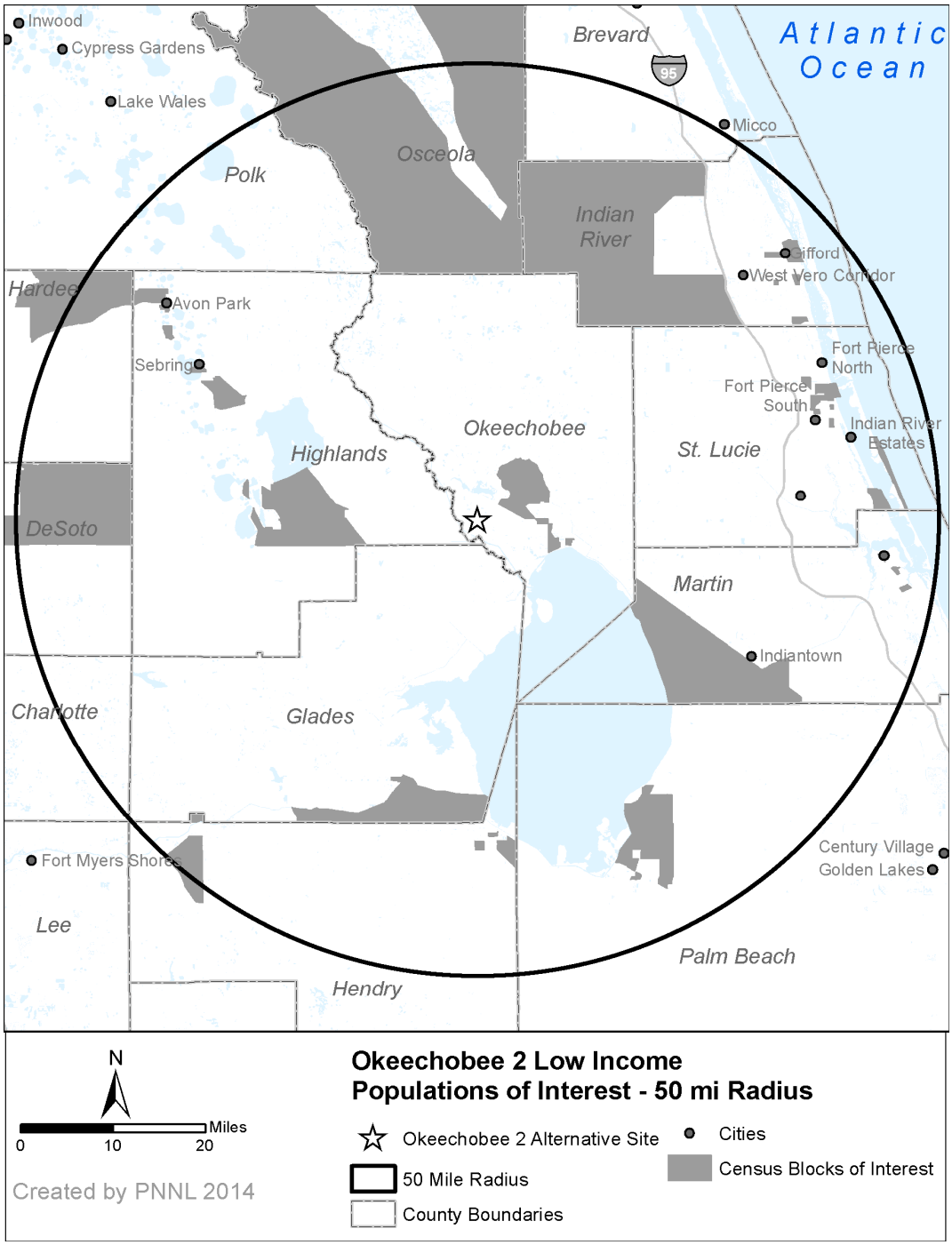

Figure 9-22. Low-Income Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the Okeechobee 2 Alternative Site

9.3.4.7 Historic and Cultural Resources

The following cumulative impact analysis addresses building and operating two new nuclear generating units at the Okeechobee 2 site. The analysis also considers other past, present, and reasonably foreseeable future actions that could affect cultural resources, including the other Federal and non-Federal projects listed in Table 9-16. For the analysis of cultural impacts at the

Okeechobee 2 site, the geographic area of interest is considered to be the APE that would be defined for this site. This includes the direct effects APE, defined as the area physically affected by the site-development and operation activities at the site and within transmission line corridors. The indirect effects APE is defined as the area visually affected and includes an additional 0.5 mi radius APE around the transmission line corridors and a 1 mi radius APE around the cooling towers.

Reconnaissance activities in a cultural resource review have particular meaning. Typically, the activities include preliminary field investigations to confirm the presence or absence of cultural resources. However, in developing this EIS, the review team relied upon reconnaissance-level information to perform its alternative site evaluation in accordance with ESRP 9.3 (NRC 2000-TN614). Reconnaissance-level information consists of data that are readily available from agencies and other public sources. It can also include information obtained through visits to the site area. The following information was used to identify the historic and cultural resources at the Okeechobee 2 site:

- NRC Alternative Sites Visit, July 2010 (NRC 2010-TN3304)
- FPL ER Revision 6 (FPL 2014-TN4058)
- Florida Historical Markers Program (FDHR 2014-TN3877)
- National Register of Historic Places database (NPS 2014-TN3881).

The approximately 3,000 ac Okeechobee 2 site occurs in predominantly agricultural land that is used for cattle, dairy, and citrus operations. Historically, the Okeechobee 2 site and vicinity were largely undeveloped and likely contained intact archaeological sites associated with the past 10,000 years of human settlement. Over time, the area has been disturbed by low-impact development including agriculture, roadways, and low-density rural development. A search of the National Register shows that two significant historic properties are located within 10 mi of the Okeechobee 2 site (FPL 2014-TN4058; NPS 2014-TN3881), as well as several archaeological resources. The two historic properties are the Freedman-Raulerson House and the Okeechobee Battlefield site. The Okeechobee Battlefield is also a National Historic Landmark. A total of 34 properties were found in the four counties in the vicinity of the Okeechobee 2 site (Okeechobee, Glades, Highlands, and St. Lucie Counties). A National Register search of the indirect effects APE for the transmission lines shows that, while no properties are recorded within the APE, these same two historic properties, the Freedman-Raulerson House and the Okeechobee Battlefield site, are located roughly 4 mi and 7 mi to the south, respectively, from the corridor. In addition, the Brighton Seminole Indian Reservation is located roughly 7 mi to the south of the Okeechobee 2 site.

A search of the Florida Historical Markers Program (FDHR 2014-TN3877) by the review team revealed that there is one historic marker in Okeechobee County—a marker near the courthouse in the city of Okeechobee commemorating the founding of the county. The marker is not near the Okeechobee 2 site.

While there are no known historic properties located within the direct effects APE of the Okeechobee 2 site, reconnaissance-level information shows that there are historic properties in the general vicinity of the site, including potentially significant archaeological resources associated with Lake Okeechobee. No archaeological or architectural surveys have been conducted at the Okeechobee 2 site, and locating the nuclear plants there would require formal

cultural resources survey and consultation with SHPO, Tribes, and other interested parties. If any significant cultural, historic, or archaeological resources are identified, those resources could be adversely affected and appropriate mitigation measures would need to be put in place before construction and operation.

Building Impacts

To accommodate the building of two nuclear units and associated facilities at the Okeechobee 2 site, FPL estimates that the total area of land that would be disturbed would be approximately 362 ac for the facility. In addition, a 9.3 mi long road and a 3.9 mi long railroad spur would need to be constructed in the predominantly agricultural land. A portion of SR-70 would need to be widened. An additional 22.5 ac would be disturbed for pipelines and associated facilities (FPL 2014-TN4058). If the Okeechobee 2 site were chosen for the proposed project, identification of cultural resources would be accomplished through additional cultural resource surveys and consultation with the SHPO, Tribes, and interested parties. The results would be used in the site-planning process to address cultural resources impacts. If significant cultural resources were identified by these surveys, the review team assumes that FPL would use the same protective measures used at the Turkey Point site, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land-clearing, excavation, and grading activities could potentially destabilize important attributes of historic and cultural resources.

There are no existing transmission line corridors connecting to the Okeechobee 2 site. Section 9.3.4.1 describes the proposed transmission line corridors, which would consist of new transmission lines extending a total of 38 mi before connecting to an existing network. FPL has stated that consideration would be given to sensitive environmental and built resources in determining a route for the transmission lines (FPL 2014-TN4058), but visual impacts from transmission lines may result in significant alterations to the visual setting of cultural and historic resources within the geographic area of interest, particularly in undeveloped portions of the project area around the nuclear power-generating facility and around the transmission lines in the vicinity of the city of Okeechobee. These indirect effects would be particularly noticeable given that the setting around the Okeechobee 2 site is largely undeveloped, without existing industrial development. If the Okeechobee 2 site were chosen for the proposed project, the review team assumes that FPL would conduct its transmission line−related cultural resource surveys and procedures in a manner similar to that for the Turkey Point site. In addition, the review team assumes that the State of Florida's Final Order on Certification (State of Florida 2014-TN3637) regarding transmission line siting and building activities would also apply, and therefore impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land-clearing, excavation, and grading activities could potentially destabilize important attributes of historic cultural resources. Similarly, both the transmission lines and nuclear power-generating units could indirectly effect cultural and historic resources through visual impacts on the setting of the resources.

Operations Impacts

Impacts on historic and cultural resources from operation of two new nuclear generating units at the Okeechobee 2 site include those associated with the operation of new units and maintenance of transmission lines. The review team assumes that the same procedures

developed by FPL for the Turkey Point site, as well as the State of Florida's Final Order on Certification, would be used for onsite and offsite maintenance activities. Consequently, the incremental effects of the maintenance of transmission line corridors and operation of the two new units and associated impacts on the cultural resources would be negligible for the direct and indirect effects APEs. However, the indirect visual impacts would continue throughout the life of the transmission lines.

Cumulative Impacts

Past actions in the geographic area of interest that have similarly affected historic and cultural resources include rural and agricultural development and activities associated with these land-disturbing activities such as road development. Table 9-16 lists past, present, and reasonably foreseeable projects and other actions that may contribute to cumulative impacts on historic and cultural resources in the geographic area of interest. Projects from Table 9-16 that are relevant to the cultural resources cumulative analysis include the Florida Gas Transmission project, the Highlands Ethanol Facility, the Lake Okeechobee Watershed project, and future urbanization, such as new or expanded roads.

Long linear projects such as new or expanded roads, pipelines, and railway lines may intersect the proposed transmission line corridors. Because cultural resources can likely be avoided by long linear projects, impacts on cultural resources would likely be minimal. If building associated with such activities results in significant alterations of cultural resources in the transmission line corridors, either physical or visual, then cumulative impacts on cultural and historic resources would be greater.

Cultural resources are nonrenewable. Therefore, the impact of the destruction of cultural resources is cumulative. Based on the information provided by FPL and the review team's independent evaluation, the review team concludes that the cumulative impacts from building and operating two new nuclear generating units on the Okeechobee 2 site would be MODERATE. The impacts of building and operating the project at the Okeechobee 2 site would be a significant contributor to the MODERATE impact due primarily to indirect viewshed impacts from the nuclear power-generating plant and transmission lines on historic properties, though direct impacts could occur as well. This impact-level determination is based on reconnaissance-level information and reflects the fact that there are no known cultural resources on the proposed site. It also assumes that, if the Okeechobee 2 site were to be developed, cultural resource surveys and evaluations would be conducted and FPL, in consultation with SHPO, Tribes, and interested parties, would assess and resolve any adverse effects of the undertaking. If cultural or historic resources are present, and if there are adverse effects on those resources, the project could result in greater cumulative impacts.

9.3.4.8 Air-Quality Impacts

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable actions that affect air quality, including other Federal and non-Federal projects listed in Table 9-16. As described in Section 9.3.4, Okeechobee 2 is a greenfield site; there are currently no nuclear facilities on the site. The geographic area of interest for the Okeechobee 2 site is Okeechobee County, which is in the Southeast Florida Intrastate Air Quality Control Region (40 CFR 81.49) (TN255).

Sections 4.7 and 5.7 discuss air-quality impacts during building and operation. The emissions related to building and operating a nuclear power plant at the Okeechobee 2 alternative site would be similar to those at the Turkey Point site. The air-quality attainment status for Okeechobee County, as set forth in 40 CFR Part 81 (TN255), reflects the effects of past and present emissions from all pollutant sources in the region. Okeechobee County is in attainment of all National Ambient Air Quality Standards.

As described in Chapters 4 and 5, the criteria pollutants from building and operation were found to have a SMALL impact on air quality. In Chapter 7, the cumulative impacts of criteria pollutants were evaluated and also determined to be SMALL to MODERATE. Reflecting on the projects listed in Table 9-16, the most significant is the nearby proposed landfill gas-to-energy project (Okeechobee Landfill) because of its proximity to the Okeechobee 2 site. Emissions from a facility such as this are released through stacks and with significant momentum and buoyancy. Other industrial projects listed in Table 9-16 would likely have de minimis impacts due to their distance from the site. Given that these projects are subject to Clean Air Act permitting requirements, it is unlikely that the air quality in the region would degrade to the extent that the region would be in nonattainment of the National Ambient Air Quality Standards.

The air-quality impact from development of the Okeechobee 2 site would be local and temporary. The applicant would develop a dust-control plan that identifies specific measures to minimize fugitive dust emissions during building activities. The distance from building activities to the site boundary would be sufficient to generally avoid significant air-quality impacts. There are no land uses or projects in Table 9-16, including the aforementioned source, that would have emissions during site development that would, in combination with emissions from the Okeechobee 2 site, result in degradation of air quality in the region. Emissions from operation of two new nuclear units at the Okeechobee 2 site would be intermittent and made at low levels with little or no vertical velocity, similar to operational impacts at the Turkey Point site as discussed in Section 5.7. The air-quality impacts of the Okeechobee Landfill Gas-to-Energy project would be similar to the air-quality impacts of a landfill gas facility discussed in Section 9.2.2.8, which would be noticeable but not destabilizing. The cumulative impacts from emissions of effluents from the Okeechobee 2 site and the aforementioned source would be noticeable but not destabilizing.

The cumulative impacts of GHG emissions related to nuclear power are discussed in Section 7.6. The impacts of the emissions are not sensitive to the location of the source. Consequently, the discussion in Section 7.6 is applicable to a nuclear power plant located at the Okeechobee 2 site. The review team concludes that the national and worldwide cumulative impacts of GHG emissions are noticeable but not destabilizing. The review team further concludes that the cumulative impacts would be noticeable but not destabilizing, with or without the GHG emissions of two new nuclear units at the Okeechobee 2 site.

The review team concludes that cumulative impacts from other past, present, and reasonably foreseeable future actions on air-quality resources in the geographic areas of interest would be SMALL to MODERATE for criteria pollutants and MODERATE for GHG emissions. The incremental contribution of impacts on air-quality resources from building and operating two units at the Okeechobee 2 site would not be a significant contributor to the MODERATE impacts for GHG emissions.

9.3.4.9 Nonradiological Health

The following analysis considers nonradiological health impacts from building and operating two new nuclear units at the Okeechobee 2 site. The analysis also includes past, present, and reasonably foreseeable future actions that could contribute to cumulative nonradiological health impacts on site workers (construction and operation workers) and members of the public, including other Federal and non-Federal projects and the projects listed in Table 9-16 within the geographic area of interest. Nonradiological health impacts at the Okeechobee 2 site are estimated based on information provided by FPL and the review team's independent evaluation. For the analysis of nonradiological health impacts at the Okeechobee 2 site, the geographic area of interest is the site and the immediate vicinity (~2 mi radius) and the associated road and transmission line corridors. This geographic area of interest is based on the localized nature of nonradiological health impacts and is expected to encompass all nonradiological health impacts.

Building activities with the potential to affect the health of members of the public and workers at the Okeechobee 2 site include exposure to dust and vehicle exhaust, occupational injuries, noise, and increased traffic associated with the transport of construction materials and personnel to and from the site. The operations-related activities that have the potential to affect the health of members of the public and workers include exposure to etiological (disease-causing) agents, noise, EMFs, occupational injuries, and impacts from the transport of workers to and from the site.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the Okeechobee 2 site would be similar to those evaluated in Section 4.8 for the Turkey Point site. During the site-preparation and building phase, FPL would comply with applicable Federal and State regulations on air quality and noise (FPL 2014-TN4058). The Okeechobee 2 site is a greenfield site located in a rural area, and building impacts would likely be negligible on the surrounding area, which is classified as a medium- and low-population area. The incidence of construction worker accidents would be the same as that for the Turkey Point site.

The review team concludes that nonradiological health impacts on construction workers and the public from building two new nuclear units and associated transmission lines at the Okeechobee 2 site would be minimal. Nonradiological health impacts associated with traffic accidents during building activities at the Okeechobee 2 alternative site were evaluated in Section 4.8.3 and the review team concludes that the impacts would be minimal.

Operations Impacts

Nonradiological health impacts on operation workers and members of the public would include those associated with the operation of cooling towers and transmission lines as described in Section 5.8. Based on the configuration of the proposed new units at the Okeechobee 2 site (see Chapter 3 for a detailed site layout description), etiological agents would not be an issue with regard to members of the public because cooling-tower blowdown would be discharged into deep-injection wells not into surface waters. Impacts on workers' health from occupational injuries, noise, and EMFs would be similar to those described in Section 5.8 for the Turkey Point site. Noise and EMF exposure would be monitored and controlled in accordance with

applicable OSHA regulations. Although no detailed noise modeling has been performed for the Okeechobee 2 site, it is likely that noise impacts would be similar to those predicted for operations at the Turkey Point site. The effects of EMFs on human health would be controlled and minimized by conformance with National Electrical Safety Code criteria and adherence to the standards for transmission systems regulated by the FDEP.

The review team concludes that nonradiological health impacts on workers and the public from operating two new nuclear units and associated transmission lines at the Okeechobee 2 site would be minimal. Impacts associated with traffic accidents during operations at the Okeechobee 2 alternative site were evaluated in Section 5.8.6 and the review team concludes that the impacts would be minimal.

Cumulative Impacts

There are no past or present projects identified in Table 9-16 within the geographic area of interest that could affect nonradiological human health in a way similar to the building of two nuclear units at the Okeechobee 2 site. All of the projects that could apply are more than 10 mi from the Okeechobee 2 site.

Reasonably foreseeable projects in Table 9-16 that could affect nonradiological human health in a way similar to the building of two nuclear units at the Okeechobee 2 site include various transportation (roads, traffic, pedestrian) and mining/quarry projects that are planned throughout the region.

There are no past, present, or reasonably foreseeable projects planned within the geographic area of interest that would affect nonradiological human health in a way similar to operating two nuclear units at the Okeechobee 2 site.

The review team concludes that the cumulative impacts on nonradiological health from building and operating two new nuclear units and associated road and transmission lines at the Okeechobee 2 site would be minimal.

Summary Statement

Impacts on nonradiological health from building and operation of two new units at the Okeechobee 2 site are estimated based on the information provided by FPL and the review team's independent evaluation. Although there could be some future activities in the geographical area of interest that could affect nonradiological health in ways similar to the building and operation of two new units at the Okeechobee 2 site and associated offsite facilities, those impacts would be localized and managed through adherence to existing regulatory requirements. The review team concludes that nonradiological health impacts on workers and the public resulting from the building of two new nuclear units and associated road and transmission lines at the Okeechobee 2 site would be minimal. The review team expects that the nonradiological health impacts on the operations employees and the public of two new nuclear units at the Okeechobee 2 site would be minimal. Finally, the review team concludes that cumulative impacts on nonradiological health from past, present, and reasonably foreseeable actions in the geographic area of interest would be SMALL.

9.3.4.10 Radiological Impacts of Normal Operations

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable actions that affect radiological health, including other Federal and non-Federal projects listed in Table 9-16. As described in Section 9.3.4, Okeechobee 2 is a greenfield site; there are currently no nuclear facilities on the site. The geographic area of interest is the area within a 50 mi radius of the Okeechobee 2 site. St. Lucie Units 1 and 2 (i.e., two nuclear power plants) are the only major facilities within this geographic area of interest that potentially affect radiological health within the 50 mi radius of the Okeechobee 2 site. In addition, there are likely to be medical, industrial, and research facilities within 50 mi of the Okeechobee 2 site that use radioactive materials.

The radiological impacts of building and operating the two proposed Westinghouse AP1000 nuclear power units at the Okeechobee 2 site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. These impacts are expected to be similar to those estimated for the Turkey Point site.

The radiological impacts of St. Lucie Units 1 and 2 include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways result in low doses to people and biota offsite that are well below regulatory limits as demonstrated by the ongoing radiological environmental monitoring program conducted around St. Lucie Units 1 and 2. The NRC staff concludes that the dose from direct radiation and effluents from hospitals and industrial facilities that use radioactive material would be an insignificant contribution to the cumulative impact around the Okeechobee 2 site. This conclusion is based on data from the radiological environmental monitoring programs conducted around currently operating nuclear power plants.

Based on the information provided by FPL and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed Westinghouse AP1000 nuclear power units and other existing and planned projects and actions in the geographic area of interest around the Okeechobee 2 site would be SMALL.

9.3.4.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from the operation of two nuclear units at the Okeechobee 2 alternative site. The analysis also considers other past, present, and reasonably foreseeable actions that affect radiological health from postulated accidents, including other Federal and non-Federal projects and the projects listed in Table 9-16. As described in Section 9.3.4, the Okeechobee 2 site is a greenfield site; there are currently no nuclear facilities at the site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Okeechobee 2 alternative site. Facilities potentially affecting radiological accident risk within this geographic area of interest are the existing two units of St. Lucie, Units 1 and 2.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the Turkey Point site would be minimal for AP1000 reactors. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet NRC safety criteria. The environmental consequences of DBAs depend on the plant design and the atmospheric

dispersion. The AP1000 design is independent of site conditions and the differences in meteorology of the Okeechobee 2 alternative and Turkey Point sites are not significant with regard to the conditions that are important to assessing DBAs. Therefore, the NRC staff concludes that the environmental consequences of DBAs at the Okeechobee 2 alternative site would be minimal.

With a lower population density and land-use values for the Okeechobee 2 alternative site, the NRC staff expects the risks from a severe accident for an AP1000 reactor located at the Okeechobee 2 alternative site to be similar to or lower than those analyzed for the proposed Turkey Point site. The risks for the proposed Turkey Point site were presented in Tables 5-19 and 5-20 and are well below the median value for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028) (TN594). For existing plants within the geographic area of interest (St. Lucie Units 1 and 2), the Commission has determined that the probability-weighted consequences of severe accidents are small (10 CFR Part 51 [TN250], Appendix B, Table B-1). On this basis, the NRC staff concludes that the cumulative risks from severe accidents at any location within 50 mi of the Okeechobee 2 alternative site would be SMALL.

9.3.5 St. Lucie Site

This section covers the review team's evaluation of the potential environmental impacts of siting a new two-unit nuclear power plant at the St. Lucie alternative site on the eastern coast of central Florida. The site is bordered by the Atlantic Ocean to the east and the Indian River Lagoon to the west. The nearest municipalities are Fort Pierce, approximately 7 mi northwest; Port St. Lucie, approximately 4.5 mi to the west; and Stuart, approximately 8 mi to the south. The nominal site elevation is 0 to 5 ft above sea level, which falls within the 100-year floodplain. The 1,130 ac St. Lucie site is an FPL-owned nuclear power-generation station on Hutchinson Island in St. Lucie County. St. Lucie Units 1 and 2 and associated support facilities occupy less than half of the 1,130 ac site (FPL 2014-TN4058). The location of the St. Lucie site is shown in Figure 9-23.

FPL assumed the facility footprint, including the power units, support buildings, switchyard, storage areas, stormwater-retention ponds, and other structures, would require an estimated 357 ac. Building at the St. Lucie site would also require the creation of a transmission line corridor of approximately 63 mi (2,187 ac), widening of 22 mi of SR-A1A (266.8 ac [a two-lane roadway parallel to the dunes on the barrier island]), a heavy-haul road 0.5 mi (6.3 ac), and an intake/makeup pipeline (10.5 ac) (Figure 9-24). Additional area would be temporarily disturbed for activities such as laydown areas, a batch plant, and for fill and spoil deposition (FPL 2014-TN4058).

The following sections include a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if implemented at the St. Lucie site and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction and operations and impacts of preconstruction activities. Also included in the assessment are past, present, and reasonably foreseeable future Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together

with the proposed action if implemented at the St. Lucie site. Other actions and projects considered in this cumulative analysis are described in Table 9-21.

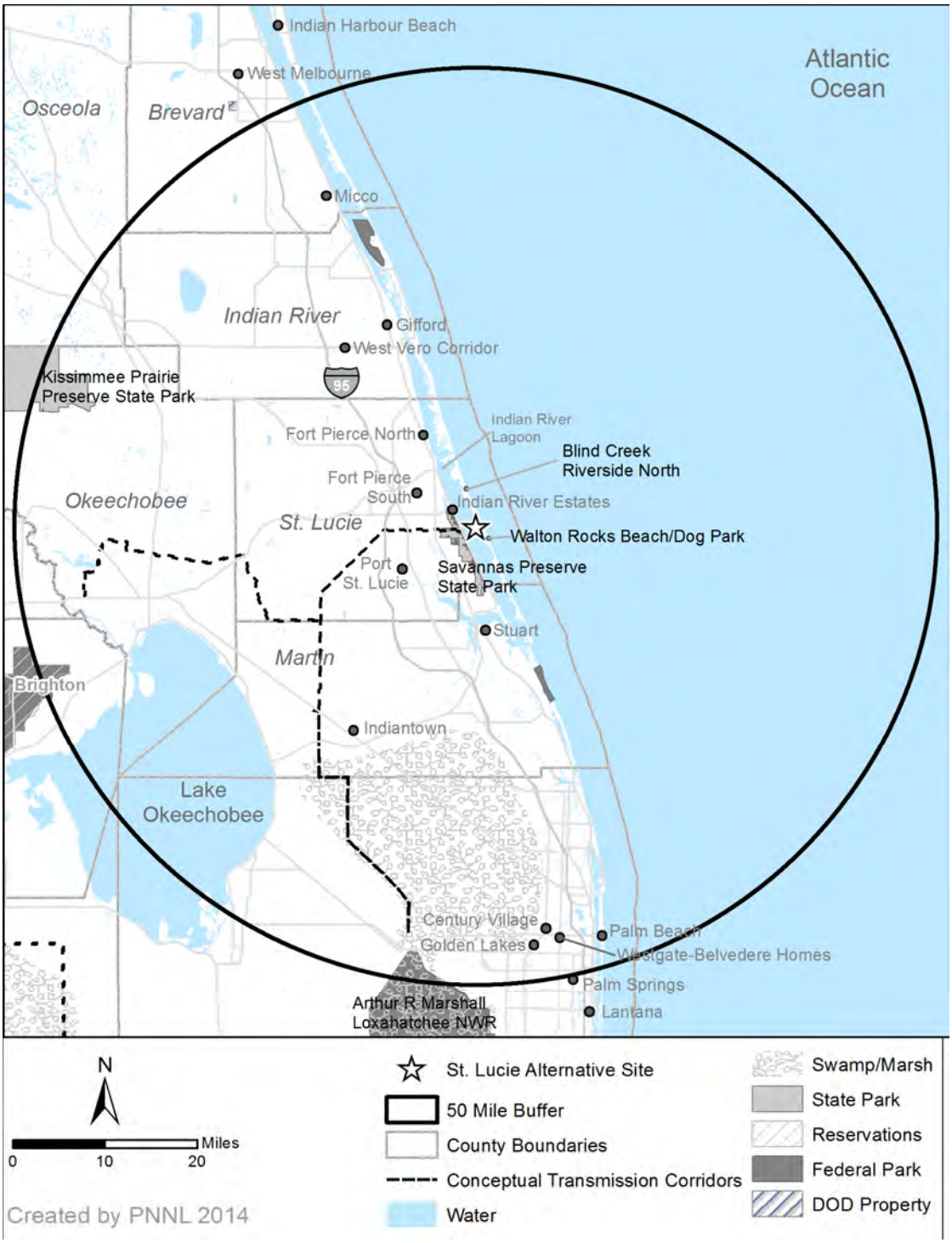

Figure 9-23. St. Lucie Site Region

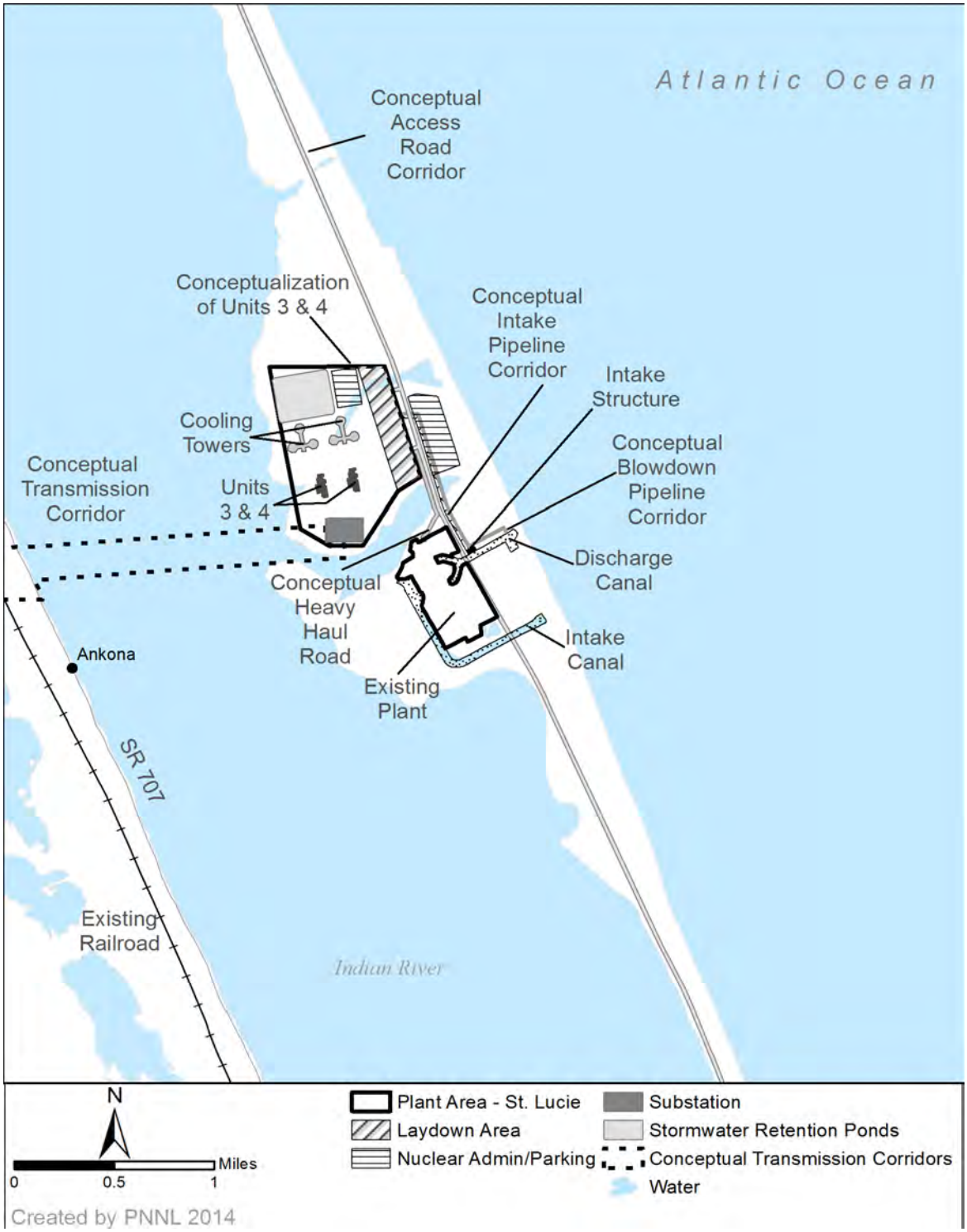

Figure 9-24. St. Lucie Site Footprint

Table 9-21. Past, Present, and Reasonably Foreseeable Projects and Other Actions in the Vicinity of the St. Lucie Site

Project Name	Summary of Project	Location	Status
Energy Projects			
St. Lucie	Two 3,020 MW(t) nuclear power reactors	Adjacent	Operational, Units 1 and 2 underwent license renewal in 2003. Units 1 and 2 completed 320 MW(t) power uprates in 2013 (NRC 2012-TN1668; FPL 2014-TN3360)
West County Energy Center	Three 1,250 MW natural-gas−powered units	28 mi SW of the St. Lucie alternative site	Operational (FDEP 2013-TN2965)
Martin	Approximately 4,300 MW from 5 units, 3 natural-gas and 2 oil units with a solar thermal facility generating supplemental steam	28 mi SW of the St. Lucie alternative site	Operational (FPL 2016-TN4579)
Indiantown Cogeneration Company	330 MW coal-power plant	26 mi SW of the St. Lucie alternative site	Operational (FDEP 2013-TN2967)
FPL pipeline	126 mi pipeline from Sabal Trail's Central Florida Hub to FPL's Martin Clean Energy Center	Throughout region	Proposed, construction set to begin 2016 (FPL 2014-TN2975)
Floridian Natural Gas Storage Company – Natural Gas Storage Facility	Storage of natural gas	26 mi SW of the St. Lucie alternative site	Proposed, FERC Order amending Certificate issued (FERC 2015-TN4599) with associated Environmental Assessment (FERC 2015-TN4600)
Treasure Coast Energy Center	300 MW natural-gas power plant	9 mi SW of the St. Lucie alternative site	Operational (FMPA 2014-TN3029)
INEOS New Planet Bioenergy Center	6.3 MW bioenergy facility	22 mi NW of the St. Lucie alternative site	Operational (EPA 2014-TN3032)
Riviera Beach Energy Center	1,250 MW gas-fired plant	41 mi S of the St. Lucie alternative site	Operational, completed in 2014 (FPL 2014-TN3360)
Okeechobee Landfill Energy	Waste-to-energy facility	27 mi W of the St. Lucie alternative site	Operational (Waste Management 2014-TN3034)
Sea Gen St. Lucie Project	A generation farm containing 20 to 40 submerged SeaGen twin rotor machine generating units having a total installed capacity of 20 to 40 MW	Offshore of St. Lucie County	Proposed, preliminary permit submitted to FERC in 2004. (69 FR 61829) (TN3097)

Table 9-21. (contd)

Project Name	Summary of Project	Location	Status
Mining Projects			
Five Stone Mining	Stone/quarry mining	35 mi SW of the St. Lucie alternative site	Operational (EPA 2013-TN2959)
Daniel Shell Pit, Phase 6	Stone/quarry mining	41 mi W of the St. Lucie alternative site	Operational (EPA 2013-TN2956)
Florida Rock Industries/Fort Pierce	Stone/quarry mining	18 mi W of the St. Lucie alternative site	Operational (EPA 2014-TN3038)
Hammond Sand Mine	Sand/quarry mining	29 mi NW of the St. Lucie alternative site	Operational (EPA 2014-TN3044)
Various other mine and quarry projects	Stone/quarry mining	Throughout region	Operational (FDEP 2010-TN2966)
Transportation Projects			
Various transportation projects	Road, traffic, pedestrian projects	Throughout region	Ongoing (FDOT 2012-TN1132)
Parks and Aquaculture Facilities			
DuPuis Wildlife and Environmental Area	Activities include bicycling, camping, hunting, fishing, and hiking	33 mi SW of the St. Lucie alternative site	Development likely limited within this area (FFWCC 2014-TN2977)
Okeechobee Battlefield State Park	Hiking, camping	35 mi SW of the St. Lucie alternative site	Development likely limited within this area (FDEP 2010-TN2971)
Lake Okeechobee	730 mi^2 freshwater lake, restoration and protection plan	31−54 mi SW of the St. Lucie alternative site	Ongoing, Florida Legislature in 2007 expanded the Lake Okeechobee Protection Act (SFWMD 2014-TN2988)
Johnathan Dickinson State Park	Activities include bicycling, camping, boating, horseback riding, picnicking, fishing, and hiking	23 mi S of the St. Lucie alternative site	Development likely limited within this area (Florida State Parks 2014-TN3048)
Savannas Preserve State Park	Activities include bicycling, boating, horseback riding, picnicking, fishing, and hiking	2 mi W of the St. Lucie alternative site	Development likely limited within this area (Florida State Parks 2014-TN3050)
Fort Pierce Inlet State Park	Activities include bicycling, camping, boating, swimming, picnicking, fishing, and hiking	10 mi N of the St. Lucie alternative site	Development likely limited within this area (Florida State Parks 2014-TN3053)
Pepper Beach State Recreation Area	Activities include swimming,	11 mi N of the St. Lucie alternative site	Development likely limited within this area (St. Lucie County 2014-

Table 9-21. (contd)

Project Name	Summary of Project	Location	Status
	picnicking, fishing, and hiking		TN3054)
St. Sebastian River Preserve State Park	Activities include bicycling, camping, boating, picnicking, fishing, and hiking	34 mi NW of the St. Lucie alternative site	Development likely limited within this area (Florida State Parks 2014-TN3055)
Hobe Sound National Wildlife Refuge	Activities include fishing, and hiking	16−26 mi NW of the St. Lucie alternative site	Development likely limited within this area (FWS 2013-TN3056)
John D. Macarthur Beach State Park	Activities include boating, swimming, picnicking, fishing, and hiking	38 mi NW of the St. Lucie alternative site	Development likely limited within this area (Florida State Parks 2014-TN3057)
Peanut Island Park	Activities include boating, picnicking, fishing, and hiking	41 mi NW of the St. Lucie alternative site	Development likely limited within this area (Palm Beach County 2014-TN3058)
Blue Cypress Conservation Area	Activities include boating, fishing, and wildlife viewing	37 mi NW of the St. Lucie alternative site	Development likely limited within this area (SJRWMD 2014-TN3100)
Pelican Island National Wildlife Refuge	Activities include boating, fishing, and wildlife viewing	33 mi NW of the St. Lucie alternative site	Development likely limited within this area (FWS 2011-TN3101)
Sebastian Inlet State Park	Activities include boating, swimming, picnicking, fishing, bicycling, camping, surfing, wildlife viewing, and hiking	37 mi N of the St. Lucie alternative site	Development likely limited within this area (Florida State Parks 2014-TN3102)
Archie Carr National Wildlife Refuge	Activities include Hiking, fishing, and wildlife viewing	40−50 mi N of the St. Lucie alternative site	Development likely limited within this area (FWS 2011-TN3103)
Indian River Lagoon Preserve State Park	Activities include hiking, swimming, picnicking, fishing, bicycling, and wildlife viewing	43 mi N of the St. Lucie alternative site	Development likely limited within this area (FDEP 2014-TN3104)
Other State nature preserves and wildlife management areas	Public recreational activities	Throughout region	Development likely limited within these areas (FFWCC 2014-TN2981)
Everglades Ecosystem Restoration and/or Comprehensive Everglades Restoration Plan Projects (DOI 2016-TN4589**)**			
Indian River Lagoon – South	Project purpose is to improve surface-	16 mi SW of the St. Lucie alternative site	Proposed, project in preconstruction, engineering and

Table 9-21. (contd)

Project Name	Summary of Project	Location	Status
	water management in the C-23/C-24, C-25, and C-44 basins for habitat improvement in the Saint Lucie River Estuary and southern portions of the Indian River Lagoon.		design phase (USACE and SFWMD 2014-TN3013)
Everglades Agricultural Area Storage Reservoirs	The purpose of this project is to improve the timing of environmental deliveries to the Water Conservation Areas, including reducing damaging flood releases from the Everglades Agricultural Area to the Water Conservation Areas.	Throughout region	Proposed, Final Project Implementation Report submitted 2012 (USACE and SFWMD 2014-TN3011)
Lake Okeechobee Aquifer Storage and Recovery	A series of aquifer storage and recovery wells adjacent to Lake Okeechobee	30 mi SW of the St. Lucie alternative site	Proposed, project in preconstruction, engineering and design phase (USACE and SFWMD 2014-TN3014)
Lake Okeechobee Watershed Project	Project to increase aquatic and wildlife habitat, regulate extreme highs and lows in lake staging, reduce phosphorus loading and reduce damaging releases to the surrounding estuaries.	Throughout Okeechobee County	Proposed, project in preconstruction, engineering and design phase (USACE and SFWMD 2014-TN3015)
Melaleuca eradication and other exotic plants	The project includes (1) upgrading and retrofitting the current quarantine	Throughout region	Operational, facility completed in 2013 (USACE and SFWMD 2014-TN3020)

Table 9-21. (contd)

Project Name	Summary of Project	Location	Status
	facility in Gainesville, and (2) large-scale rearing of approved biological control organisms for release at multiple sites within the South Florida ecosystem to control Melaleuca, Brazilian pepper, Australian pine, and Old World climbing fern.		
Palm Beach County Agriculture Reserve Aquifer Storage and Recovery	Supplement water supplies for central and southern Palm Beach County by capturing and storing excess water currently discharged to the Lake Worth Lagoon.	Palm Beach County	Proposed, project in preconstruction, engineering and design phase (USACE and SFWMD 2014-TN3019)
Herbert Hoover Dike Major Rehabilitation Project	Rehabilitation Project and Dam Safety Modification Study	30−60 mi W of the St. Lucie alternative site	Proposed - Environmental Assessment and FONSI issued in 2015 (USACE 2015-TN4598), Draft Environmental Report issued (DOI 2016-TN4589)
Comprehensive Shoreline Stabilization Project in Palm Beach County	Discharge fill for the purpose of shoreline stabilization	Shoreline of Palm Beach County	USACE submitted Notice of Intent in 2013 (78 FR 40128) (TN3059); EIS completed (CB&I 2014-TN4015)
Lake Worth Inlet Project	Deepening and widening of the Lake Worth Inlet	41 mi S of the St. Lucie alternative site	USACE developed integrated feasibility report in 2013 (USACE 2014-TN4016)
Kissimmee River Restoration	When restoration is completed in 2017, more than 40 mi^2 of river-floodplain ecosystem will be restored, including almost 20,000 ac of wetlands and 44	Along Kissimmee River	Ongoing (USACE 2014-TN3061; DOI 2016-TN4589)

Table 9-21. (contd)

Project Name	Summary of Project	Location	Status
	mi of historic river channel.		
Other Actions/Projects			
Harbor Branch Oceanographic Institute	Oceanic Science and Research	15 mi N of the St. Lucie alternative site	Operational (EPA 2014-TN3071)
Pratt & Whitney	Aircraft engine and engine parts manufacturing	30 mi SW of the St. Lucie alternative site	Operational (EPA 2014-TN3062)
Maverick Boat Company	Fiberglass boat manufacturing	12 mi N of the St. Lucie alternative site	Operational (EPA 2014-TN3063)
Tropicana Products, Inc.	Citrus and animal feed	10 mi W of the St. Lucie alternative site	Operational (EPA 2014-TN3068)
S2 Yachts, Inc.	Fiberglass boat manufacturing	12 mi N of the St. Lucie alternative site	Operational (EPA 2013-TN3069)
Twin Vee, Inc.	Fiberglass boat manufacturing	7 mi N of the St. Lucie alternative site	Operational (EPA 2013-TN3070)
Various wastewater-treatment plant facilities	Sewage treatment	Throughout region	Operational
Various hospitals using nuclear material	Medical and other industrial isotopes	Throughout region	Ongoing
Various water/flood-management projects	Water and flood management	Throughout region	Ongoing (USACE 2012-TN1133)
Future urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; construction of water-treatment and/or wastewater-treatment and distribution facilities and associated pipelines, as described in local land-use planning documents	Throughout region	Construction would occur in the future, as described in State and local land-use planning documents

The geographic area of interest for cumulative impacts considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the St. Lucie site (Figure 9-23). An accident at a nuclear plant within 100 mi of the St. Lucie site could increase this risk. Other nuclear plants in Florida, Alabama, and Georgia are more than 100 mi from the St. Lucie site and are therefore not included in the cumulative impact analysis.

9.3.5.1 Land Use

The following analysis includes land-use impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect land use, including other Federal and non-Federal projects listed in Table 9-21. For the analysis of land-use impacts at the St. Lucie site and the area within the transmission line corridors, the review team determined that a 10 mi radius, similar to that used for the proposed Turkey Point plant site, would encompass an effective geographic area of interest for cumulative impact assessment for land use, because it would include the site and associated facilities and the nearby urban area surrounding the city of Port St. Lucie. In evaluating the land-use impacts of using the St. Lucie site, the review team used, in addition to the project application, readily obtainable data from the Internet or published sources, including aerial photographs of the site and vicinity, USDA soils information, local zoning and planning documents, and FLUCFCS data. Impacts from both building and station operation are discussed.

Building and Operations Impacts

The St. Lucie alternative site is the site of an existing nuclear power-generating station situated on a barrier island. Approximately 103.8 ac of the alternative plant site are currently devoted to developed uses associated with the existing electrical power-generation facility. FPL states in its application (FPL 2014-TN4058) that the undeveloped land area at the St. Lucie alternative site is adequate for construction and operation of another power plant, but that there would be site-planning constraints related to the site being located on a long and narrow island. In addition, widening of SR-A1A would be required, and as stated in Section 9.3.5.5, the conceptual design route of the access road and widening of SR-A1A would lead to the displacement of approximately 202 structures, based on aerial view of rooftops (FPL 2011-TN59). Thus, the road widening would have land-use impacts that would be noticeable and would alter considerably the physical attributes of the residential neighborhoods they cross.

Existing land uses in the vicinity of the St. Lucie alternative site, in addition to developed areas of the city of Port St. Lucie, consist predominantly of water, because it is adjacent to the Atlantic Ocean and Indian River Lagoon, mangrove swamps, and many State and Federal parks and preserves. The St. Lucie alternative site is located within the Coastal Zone (FPL 2014-TN4058). The closest population center with more than 25,000 population are Port St. Lucie, 4.5 mi to the west and Fort Pierce 7 mi northwest (FPL 2014-TN4058).

No soils classified as Prime or Unique farmlands are found at the site, which is situated on a barrier island. Areas in agriculture in the vicinity of the site are classified as Unique farmlands (USDA 2014-TN3354; USDA 2014-TN3355). No commercial mineral resources are identified in the site and vicinity (Calver 1956-TN3752; Spencer 1993-TN3753). Many wildlife management areas and recreational areas are located in the vicinity of the alternative site, including the

Savannas Preserve State Park, which is a 5,400 ac freshwater marsh preserve and park that includes multi-use recreational areas (Florida State Parks 2014-TN3050); Blind Creek Riverside North, a 50 ac wetland preserve on Indian River Lagoon (St. Lucie County 2014-TN4017); and Walton Rocks Beach/Dog Park, a 24 ac public park at the beach with multi-use recreational facilities (St. Lucie County 2014-TN4017).

The alternative site is located within the 100-year flood zone (St. Lucie County 2010-TN4020), and FPL states (FPL 2014-TN4058) that development of the site would require approximately 15 ft of fill to bring the site to 20 ft msl. The review team believes that such extensive fill could substantially alter localized coastal flooding patterns. The effect could be exacerbated by the substantial loss of tidal wetlands.

The St. Lucie County Comprehensive Plan Future Land Use Element refers to the St. Lucie alternative site as follows: "…two miles of oceanfront property are owned by the Florida Power & Light Company, and are to be maintained in their present natural state in conjunction with the operation of the St. Lucie Power Plant facilities." The Comprehensive Plan designates the site as Transportation/Utilities (T/U) and states that "the purpose of this district is to recognize the Transportation or Utility use of property."

Therefore, use of the St. Lucie alternative site for a power plant could be considered to be compatible with the St. Lucie County Comprehensive Plan designations for the site, if it did not interfere with the preservation of the oceanfront area identified by the Comprehensive Plan in a natural state. The review team expects that, if built in accordance with FPL's present concept, the project would not interfere with ongoing preservation of the oceanfront area in a mostly natural state.

St. Lucie County zoning for the alternative plant site and some area to the north and south is U, Utilities. The St. Lucie County zoning code describes this zone as follows:

> U UTILITIES
>
> Purpose. The purpose of this district is to provide and protect an environment suitable for utilities, transportation, and communication facilities, together with such other uses as may be compatible with utility, transportation, and communication facility surroundings

The zoning designation for the lands to the north and south of the industrially zoned lands is R/C, Residential/Conservation. The St. Lucie County zoning code describes this zone as follows:

> R/C RESIDENTIAL/CONSERVATION.
>
> Purpose. The purpose of this district is to provide and protect an environment suitable for single-family dwellings at a maximum gross density of one (1) dwelling unit per five (5) gross acres, together with such other uses as may be necessary for and compatible with low density residential surroundings.

Therefore, the use of the St. Lucie alternative site for a power plant would be compatible with the zoning for the site and nearby lands.

Building and operation of the project at the St. Lucie site would result in the conversion of approximately 536 ac of undeveloped land to power-generation uses (Table 9-22). It would also require the reuse of approximately 104 ac of existing developed land, for a total land commitment of approximately 640 ac for the new plant.

Table 9-22. St. Lucie Alternative Site Land-Use Impacts (Acres)

	Agricultural Lands (FLUCFCS 200 Land Use Series)	Urban Developed Lands (other than roads and pipelines)[(a)]	All Other non-Agricultural Lands (all other FLUCFCS designations)	Total
Plant Site	0	0	320	320
Access Roads	0	104	163	267
Rail Corridor	0	0.2	6	6
Intake Pipeline Corridor	0	0	4	4
Makeup Pipeline Corridor	0	0.1	6	6
Stormwater-Retention Ponds	0	0	37	37
Total[(b)]	0	104	536	640
Transmission Line Corridor	507	20	2,167	2,187
Grand Total	507	124	2,704	2,827

(a) Includes power-generation uses
(b) Totals may not add due to rounding

Sources: FPL 2011-TN59 and FPL 2014-TN4058

Additional land-use impacts include possible additional growth and land conversions in the vicinity to accommodate new workers and services. Because the alternative site is located near the urban area of Port St. Lucie and other urban and suburban areas along the coast, and the workforce would be dispersed over larger geographic areas in the labor supply region, the impacts from land conversion for residential and commercial buildings induced by new workers relocating to the local area could be absorbed in the wider region. Therefore, the review team concludes that such impacts would be minimal.

Approximately 63 mi of new transmission system infrastructure would have to be built to serve the plant. Given the location of the alternative site, and as FPL states in its ER (FPL 2014-TN4058), the transmission lines would pass through the Coastal Zone. Approximately 2,187 ac of land would be at least temporarily affected. Of this land, approximately 507 ac are in agricultural uses, 20 ac are currently devoted to urban uses, including electrical power generation, and the remainder is primarily open lands and roadways. The agricultural land within the transmission line corridors would be converted from agricultural use to transmission line use, although FPL states in its ER (FPL 2014-TN4058) that agriculture could continue within and along the transmission line rights-of-way. The land uses along the conceptual corridors for new transmission lines to serve the St. Lucie alternative site are identified in Table 9-22.

Under the Florida Site Certification Application process explained in Chapter 4.1, the State approves a corridor and the applicant chooses a specific right-of-way within the approved corridor. The objective of this process, as stated in the electrical power plant and transmission line statute (FDEP 2013-TN2629) is “that the location of transmission line corridors and the construction, operation, and maintenance of electric transmission lines produce minimal adverse effects on the environment and public health, safety, and welfare” and “to fully balance

the need for transmission lines with the broad interests of the public in order to effect a reasonable balance between the need for the facility as a means of providing reliable, economical, and efficient electric energy and the impact on the public and the environment resulting from the location of the transmission line corridor and the construction, operation, and maintenance of the transmission lines." FPL states in its application that, in its development of the conceptual transmission line corridor for the St. Lucie alternative site, it attempted to select corridors that would allow collocation with existing transmission line corridors and avoided populated areas or residential land uses to some extent (FPL 2014-TN4058). The State certification review process also includes a determination of land-use consistency with local land-use plans and zoning ordinances (Fla. Stat. 29-403.50665-TN1470).

The review team concludes that the land-use impacts from building and operating two new nuclear units at the St. Lucie alternative site would be noticeable, but not destabilizing.

Cumulative Impacts

Within the geographic area of interest, the only reasonably foreseeable activities shown on Table 9-21 that would have the potential to affect cumulative land-use impacts is future urbanization. The existing St. Lucie Units 1 and 2 contribute to the cumulative land-use impacts.

In the area affected by the transmission lines, other linear projects are proposed, including the Florida Gas Transmission Phase VIII Expansion Project, as shown in Table 9-21. The review team expects that these corridors, if combined with building and operating the proposed transmission lines for nuclear plants at the St. Lucie site, would have a minimal cumulative land-use impact on the local area.

Summary Statement

Based on the information provided by FPL and the review team's independent review, the review team concludes that the cumulative land-use impacts of building and operating the power plant at the St. Lucie alternative site would be MODERATE. This conclusion primarily reflects the project's use of the St. Lucie alternative site, specifically the extensive modification needed to a narrow barrier island setting subject to coastal flooding and the potential for site-planning constraints related to a major industrial development on a long and narrow island. The conclusion also reflects the need to widen a 22 mi segment of SR-A1A, a two-lane roadway parallel to the dunes on the barrier island, to provide access for building and operation of the subject nuclear plant. Past, present, and reasonably foreseeable urban development in relative confined yet environmentally sensitive barrier island setting also contribute to the MODERATE conclusion. The incremental effect of building and operating the new nuclear units at the St. Lucie site would however be a significant contributor to the MODERATE conclusion.

9.3.5.2 Water Use and Quality

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that could affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-21. The St. Lucie site is located on Hutchinson Island in St. Lucie County.

The geographic area of interest for surface water at the St. Lucie site includes the Atlantic Ocean, Indian River watershed and the small watershed on Hutchinson Island in the vicinity of the site and for groundwater, the surficial aquifer at the site and the Upper Floridan aquifer within 20 mi of the site. These regions are of interest because they represent the water resource potentially affected by building and operating the proposed project at the St. Lucie site.

Building Impacts

Consistent with the proposed water use at the Turkey Point site, the review team assumed that no surface water would be used to build the units at the St. Lucie site. Therefore, the review team determined that there would be no impacts on surface-water use. Water for building activities would be obtained from the City of Fort Pierce and the Fort Pierce Utilities Authority. Potable water for service uses (totaling 131,500 gpd) at St. Lucie Units 1 and 2 currently comes from this source (FPL 2014-TN4058). The Fort Pierce Utilities Authority draws water from 41 wells completed in the surficial aquifer and 9 wells completed in the Floridan aquifer. The utilities authority has a water-use permit from the SFWMD district to withdraw up to 21.13 Mgd of groundwater (FPUA 2013-TN2978).

Groundwater use for building activities at the St. Lucie site would be similar to the proposed water use for building activities for the Turkey Point site. During building, water use is estimated to be 565 gpm (0.8 Mgd) (see Table 3-4). This would represent approximately 3 percent of the current capacity of the Fort Pierce Utilities Authority water-supply system.

Surface-water quality would most likely be affected by surface-water runoff during site preparation and the building of the facilities. The FDEP would require FPL to develop an erosion and sediment control plan and a SWPPP (FPL 2014-TN4058). These plans would be developed before initiation of site-disturbance activities and would identify measures to be used during site-preparation activities to mitigate erosion and control stormwater runoff (FPL 2014-TN4058).

The plans would identify BMPs to control the impacts of stormwater runoff. The review team anticipates that FPL would construct new detention/infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to onsite waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and the stormwater would infiltrate into the shallow aquifer. Implementation of BMPs should minimize impacts on surface waterbodies near the St. Lucie site. Therefore, the surface-water-quality impacts near the St. Lucie site would be temporary and minimal.

While building new nuclear units at the St. Lucie site, groundwater quality may be affected by leaching of spilled effluents into the subsurface. The review team assumes that the BMPs FPL has proposed for the Turkey Point site would be in place during building activities and therefore the review team concludes that any spills would be quickly detected and remediated. In addition, groundwater impacts would be limited to the duration of these activities, and therefore, would be temporary. The review team reviewed the general BMPs that could be expected to be required at such a site (State of Florida 2014-TN3637). Because any spills related to building activities would be quickly remediated under BMPs, and the activities would be temporary, the review team concludes that the groundwater-quality impacts from building at the St. Lucie site would be minimal.

Operations Impacts

FPL has indicated that a closed-cycle cooling system would be used for new units at the St. Lucie site. The system would use cooling towers with the makeup water coming from the Atlantic Ocean and blowdown water being returned to the Atlantic Ocean. The review team assumed that the makeup-water withdrawal rate and the blowdown discharge rate would be the same as that at the Turkey Point site when the proposed units at that site were operating on the backup water system, specifically 86,400 gpm (124 Mgd) and 58,922 gpm (85 Mgd), respectively.

Because the Atlantic Ocean is a virtually unlimited source of water, the review team determined that the use of Atlantic Ocean waters for cooling the additional units at the St. Lucie site would have a minimal impact. Therefore, the impact on surface-water resources due to plant use during operations would not be noticeable.

During operations of the new units at the St. Lucie site, potable water and water for service uses would come from the City of Fort Pierce and the Fort Pierce Utilities Authority. The review team assumed that the water consumed for the two new units would be equivalent to the amount used at the existing plants or 131,500 gpd. As mentioned above, this water comes from groundwater wells and the anticipated consumption is approximately 0.6 percent of the current authorized withdrawal for the Fort Pierce system. Therefore, the impact on groundwater resources due to plant use during operations would not be noticeable.

During the operation of the additional units at the St. Lucie site, impacts on surface-water quality could result from stormwater runoff, discharges of treated sanitary and other wastewater, and blowdown from cooling towers into the Atlantic Ocean. The FDEP would require FPL to develop a SWPPP (FPL 2014-TN4058). The plan would identify measures to be used to control stormwater runoff (FPL 2014-TN4058). The blowdown would be regulated by FDEP pursuant to 40 CFR Part 423 (TN253), and all discharges would be required to comply with limits established by FDEP in an NPDES permit.

During the operation of the additional units at the St. Lucie site, impacts on groundwater quality could result from accidental spills. Because BMPs would be used to quickly remediate spills and no intentional discharge to groundwater would occur, the review team concludes that the groundwater-quality impacts from operation of the additional units at the St. Lucie site would be minimal.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operations activities, cumulative analysis considers past, present, and reasonably foreseeable future actions that affect the same water resources.

The geographic area of interest for surface water includes the Atlantic Ocean in the vicinity of the St. Lucie site. The geographic area of interest for groundwater includes the surficial aquifer and the Upper Floridan aquifer in the region. These areas are of interest because they represent the water resource potentially affected by building and operating the additional units at the St. Lucie site. Key actions that have past, present, and future potential impacts on water

supply and water quality near the St. Lucie site include the operation and decommissioning of the existing units at the St. Lucie site and existing and future urbanization in the region.

Cumulative Impacts on Water Use

The only surface-water−use impacts of building and operating the additional units at this site are the water demands occurring during operation. Because the Atlantic is a virtually unlimited source of water supply compared to the makeup-water requirements for additional units at the site and the makeup-water requirements for the other units at the St. Lucie site the review team determined that the use of water from the Atlantic Ocean would have essentially no impact on surface-water use. Therefore, the review team concludes that cumulative impacts on surface-water use would be SMALL.

Groundwater supplied by the City of Fort Pierce and the Fort Pierce Utilities Authority would be used during the building and operation of additional units at the St. Lucie site. Groundwater would continue to be used by the existing units at the site for potable and service-water systems. There is increasing demand for potable water in St. Lucie County because of continuing development, population growth, and urbanization. Most of the population growth is occurring along the coast and the I-95 corridor. To meet this demand, the County plans to build additional water-treatment plants (St. Lucie County 2010-TN4020). Most of the potable water in the area has historically come from the surficial aquifer. However, brackish water from the deeper Floridan aquifer is now being withdrawn and desalinated to provide additional supplies of potable water. As mentioned above, the City of Fort Pierce and the Fort Pierce Utilities Authority currently have permits to withdraw 21.13 Mgd. Water use at the St. Lucie site while operating Units 1 and 2 (131,500 gpd or 0.13 Mgd) and building the two proposed units (565 gpm or 0.81 Mgd) would be 0.94 Mgd. This is less than 4.4 percent of the permitted withdrawal for the Fort Pierce Utilities Authority. Groundwater use with the existing and new units operating would be 263,000 gpd (0.26 Mgd), which is approximately 1 percent of the permitted withdrawal for the Fort Pierce Utilities Authority. Therefore, the review team concludes that cumulative impacts on groundwater use would be SMALL. The impacts of other projects listed in Table 9-21 are either considered in the analysis included above or would have little or no impact on surface-water and groundwater use.

Cumulative Impacts on Water Quality

As described above, the impacts from building and operating two additional units at the St. Lucie site on surface-water quality would be minimal. Other present and reasonably foreseeable future actions in the geographic area of interest of the St. Lucie site include the operation of existing units at the site. The areal extent of the influence of these facilities on water quality is small, and the influence of these facilities would be limited to Hutchinson Island. The FDEP, under the Clean Air Act Section 305(b) (33 U.S.C. § 1251 et seq.) (TN662), prepares a statewide Water Quality Inventory. The FDEP also identifies impaired waterbodies during this process and lists them on the Clean Water Act 303(d) list impaired and threatened waters.

The Atlantic Ocean in areas of southern Florida has been listed on the 303(d) list as impaired because of the presence of mercury in fish, bacteria in shellfish, and fecal coliform. Therefore,

the review team concludes that past and present actions in the region have noticeably affected the water quality adversely. Based on its evaluation, the review team concludes that the cumulative surface-water−quality impacts would be MODERATE. Building and operating the proposed units at the St. Lucie alternative site would not be a significant contributor to these impacts on surface-water quality, because industrial and wastewater discharges from the proposed units would comply with NPDES permit limitations and any stormwater runoff from the site during operations would comply with the SWPPP (FPL 2014-TN4058). Like many areas of southeast Florida, groundwater quality in St. Lucie County has been affected by saltwater intrusion from the Atlantic because of (1) the channeling of surface runoff to the ocean through drainage canals, and (2) the pumping of groundwater. The water quality of the surficial aquifer in some areas of the county has also been degraded by the infiltration of brackish water used for irrigation (St. Lucie County 2010-TN4020). However, these issues are being addressed by service providers and local agencies, and would not make the cumulative impacts on groundwater greater than small. The review team also concludes that with the implementation of BMPs, the impacts on groundwater quality from building and operating two additional units at the St. Lucie site would likely be minimal, and therefore, the cumulative impact on groundwater quality would be SMALL. The impacts of other projects listed in Table 9-21 are either considered in the analysis included above or would have little or no impact on surface-water and groundwater quality.

9.3.5.3 Terrestrial and Wetland Resources

The following section addresses potential impacts on terrestrial and wetland resources from siting two new nuclear units at the St. Lucie site in South Florida and within a conceptual transmission line corridor, which begins in St. Lucie County and passes through portions of Martin and Palm Beach Counties. The St. Lucie site is an 1,130 ac site that already contains two operating nuclear power units. It is located on Hutchinson Island formed by the Atlantic Ocean to the east and the Indian River Lagoon to the west. The site lies within the 100-year floodplain and, other than sand dunes, topography does not vary considerably over the site (FPL 2014-TN4058).

Information from the FWS indicates St. Lucie County hosts multiple terrestrial species that are listed as Federally endangered or threatened (Table 9-23). Surveys were conducted in the past at the St. Lucie site in conjunction with license renewal activities (NRC 2003-TN3152). Although the eastern indigo snake was not observed on the site, it has been observed on Hutchinson Island and suitable habitat is present within site boundaries so it was assumed to be present. Wood storks have also been occasionally observed at the site (NRC 2003-TN3152). The Florida scrub jay is known to inhabit the existing transmission line corridor near Savannas State Preserve (on the mainland west of Hutchinson Island) and Audubon's crested caracara and the Everglade snail kite are suspected to occur there as well (NRC 2003-TN3152). Habitat preferences for all of the species except the fragrant prickly-apple (*Cereus eriphorus* var. *fragrans*) were discussed in previous alternative site sections, so habitat preferences for only this species are discussed here. The fragrant prickly-apple is a tree cactus that grows in coastal hammocks along the east side of the Atlantic Coastal Ridge (FWS 1999-TN136). It was listed as potentially occurring within the existing transmission line corridor (NRC 2003-TN3152) and is confirmed to occur in only 10 locations, 9 of which are in the Savannas Preserve State Park immediately across the Indian River Lagoon from the St. Lucie site (FWS 2010-TN3049).

Although it is not known to occur on Hutchinson Island, future management actions call for surveys for it on the south part of the island. The four-petal pawpaw may also occur within the existing transmission line corridor (NRC 2003-TN3152).

Table 9-23. Federally Listed Terrestrial Species that May Occur on the St. Lucie Site or within the Conceptual Transmission Line Corridor

Scientific Name	Common Name	Federal Status
Birds		
Polyborus plancus audubonii	Audubon's crested caracara	Threatened
Rostrhamus sociabilis plumbeus	Everglade snail kite	Endangered
Aphelocoma coerulescens	Florida scrub jay	Threatened
Campephilus principalis	Ivory-billed woodpecker	Endangered
Dendroica kirtlandii	Kirtland's warbler	Endangered
Charadrius melodus	Piping plover	Threatened
Picoides borealis	Red-cockaded woodpecker	Endangered
Calidris canutus rufa	Red knot[(a)]	Threatened
Mycteria americana	Wood stork	Threatened
Grus americana	Whooping crane	Endangered
Mammals		
Puma concolor coryi	Florida panther	Endangered
Peromyscus polionotus niveiventris	Southeastern beach mouse	Threatened
Reptiles		
Drymarchon corais couperi	Eastern indigo snake	Threatened
Invertebrates		
Cyclargus thomasi bethunebakeri	Miami blue	Endangered
Strymon acis bartrami	Bartram's scrub-hairstreak[(a)]	Endangered
Anaea troglodyte floridalis	Florida leafwing[(a)]	Endangered
Plants		
Cereus eriphorus var. *fragrans*	Fragrant prickly-apple	Endangered
Decerandra immaculate	Lakela's mint	Endangered
Polygala smallii	Tiny polygala	Endangered
Jacquemontia reclinata	Beach jacquemontia[(a)]	Endangered
Asimina tetramera	Four-petal pawpaw[(a)]	Endangered
Cucurbita okeechobeensis ssp. okeechobeensis	Okeechobee gourd[(a)]	Endangered

(a) Additional listed species occurring in Martin and/or Palm Beach County (FWS 2014-TN3731; FWS 2014-TN3759).

Source: FWS Natural Resources of Concern Information, Planning, and Conservation System Website (FWS 2014-TN3762).

FPL assumed the facility footprint, which would include the power units, support buildings, switchyard, storage areas, parking areas, water intake and discharge canals, and other structures, would require approximately 357 ac, mostly on the west side of SR-A1A (Table 9-22). Building at the St. Lucie site would also require approximately 267 ac to widen a stretch of SR-A1A, 6.3 ac for a heavy-haul road from the barge slip, and 10.5 ac for

intake/blowdown pipeline corridors. There is no current rail access to the St. Lucie site, but rail access would not be needed. Additional acreage would be temporarily required for laydown areas, a batch plant, and spoil deposition.

The conceptual transmission line corridor was assumed to be 63 mi long to connect the St. Lucie site with the Corbett substation in Palm Beach County. This corridor would vary from approximately 200−660 ft in width and require an additional 2,187 ac of land.

The following sections describe a cumulative impact assessment conducted for terrestrial and wetland resources. The review team assessed the specific resources that could be affected by the incremental effects of the proposed action if it were sited at the St. Lucie site as well as other actions in the same geographic area. This assessment includes the impacts from building activities and operations. Also included are other past, present, and reasonably foreseeable future Federal, non-Federal, and private actions that could have meaningful cumulative impacts along with the proposed action. Other actions and projects considered in this cumulative analysis are described in Table 9-21.

Most of the St. Lucie site that would be developed for new nuclear units is classified as either wetlands or previously developed lands. Mangrove swamp is the most abundant wetland type and the most predominant land cover found on the site. Embayments within the Indian River Lagoon are also a prominent land cover. Significant amounts of previously developed lands are also present. Land cover within the conceptual transmission line corridor differs from the site and includes more uplands than wetlands as well as lands used for agriculture.

Building Impacts

FPL estimated that 2,827 ac of land would be affected if two new nuclear units were built at the St. Lucie site (Table 9-24). Preconstruction and construction activities would include clearing, grading, excavation, and spoil deposition and dewatering. Typical impacts from nuclear unit preconstruction and construction to terrestrial resources and wetlands include permanent and temporary habitat loss from development, habitat fragmentation and degradation, disturbance and displacement of individual wildlife, and increased risk of vehicle collision mortality to local wildlife populations. The conversion of fully developed and stable plant communities to earlier successional communities dominated by lower growing vegetation during development of linear transmission or pipeline corridors often results in a high degree of habitat fragmentation within the landscape. FPL included 2,187 ac of land within a conceptual transmission line corridor, including 1,525 ac of uplands and 684 ac of wetlands (FPL 2011-TN59). The conceptual transmission line corridor includes approximately 392 ac of dry prairie, 261 ac of pine flatwoods, and lesser amounts of shrub and brushland, mixed rangeland, hydric pine flatwoods, palmetto prairie, and woodland pasture. Wetlands within the conceptual transmission line corridor include approximately 283 ac of freshwater marsh, 157 ac of embayments, 78 ac of wet prairie, 63 ac of mixed wetland hardwoods, 41 ac of coastal scrub, 32 ac of emergent aquatic vegetation, and 15 ac of mangrove swamp. Impacts from transmission line corridor development and operation on habitat are mostly from alteration and fragmentation rather than complete and permanent loss and are discussed in a separate section below.

Table 9-24. Acreage within the Conceptual Footprint at the St. Lucie Site

FLUCFCS Code	Description	Site and Non-Transmission (ac)	Transmission (ac)
200-series	Agriculture	0	507
300-series	Uplands	8	643
400-series	Forest	35	311
500-600 series	Water and Wetlands	478	684
100, 700, and 800 series	Developed	120	42
Total[(a)]		640	2,187

(a) The review team acknowledges a discrepancy of approximately 23 ac in the terrestrial versus land-use figures and has determined that this discrepancy is inconsequential to the analyses and conclusions.

Source: FPL 2011-TN59

Plant Facilities

If the nuclear power units, access road, rail line, and pipeline were built within the proposed footprint, an estimated total of 640 ac would be affected (Table 9-24). Much of the area within the St. Lucie conceptual footprint is currently classified as mangrove swamp (FPL 2011-TN59). FPL anticipated 246 ac of mangrove swamp would be permanently developed by building within the plant area, and an additional 110 ac would be permanently developed by widening SR-A1A. Other wetlands affected include embayments and coastal scrub. The sum of lost wetland habitat from development of the plant area, immediate surrounding area, and the SR-A1A corridor is approximately 478 ac. Approximately 39 ac of upland habitat would also be permanently lost, including 21 ac of upland hardwood forest and minor amounts of cabbage palm, dry prairie, and areas of non-native tree cover. Preconstruction activities would be conducted in accordance with all Federal and State regulations, permit conditions, and BMPs, including the use of directed drainage ditches and silt fencing. Acreage within the conceptual transmission line corridor was minimized to the extent possible by using the most direct route while avoiding areas with important resources and high biological value. FPL also stated that any wetland functions affected within the transmission line corridor would be replaced or restored (FPL 2014-TN4058).

The supplement for relicensing of the existing St. Lucie Nuclear Power Plant did not report the occurrence of Federally listed species on the site (NRC 2003-TN3152). The distribution and abundance of species on the site are however unknown, and there may still be some Federally listed threatened or endangered species onsite (FPL 2014-TN3792). No part of Hutchinson Island has been designated as critical habitat for any listed species, but much of the island including the St. Lucie site is located within the core foraging area of two nearby wood stork colonies, so loss of shallow-water habitats could reduce forage available to wood storks. The loss of mangrove swamps and embayments could eliminate stopover habitat used by the red knot during migration. Loss of upland habitats containing gopher tortoise (*Gopherus polyphemus*) burrows could eliminate eastern indigo snake habitat. The southeastern beach mouse (*Peromyscus polionotus niveiventris*) occurs in sand dune habitat. Although sand dune habitat is present at the St. Lucie site on the east side of SR-A1A and elsewhere on Hutchinson Island, the southeastern beach mouse is not known to occur anywhere on Hutchinson Island

and may have been locally extirpated (NRC 2003-TN3152). The nearest known population is at Fort Pierce Inlet State Park located roughly 9 mi north across Fort Pierce Inlet on North Hutchinson Island (FWS 2008-TN3073). The unique setting and habitats on a barrier island would preclude most of the other Federally listed species known to occur in St. Lucie County from actually occurring at the St. Lucie site or being noticeably affected by proposed actions at the site or immediate vicinity. However, impacts from the development and operation of a transmission line corridor could affect listed species.

Transmission Lines and Access Roads

Field surveys dated 2001 report the occurrence or expected occurrence of certain Federally listed species in the transmission line corridor for those units but not on the site (NRC 2003-TN3152). The new units may use this existing transmission line corridor. Approximately 720 ac of habitat potentially suitable for Audubon's crested caracara is contained within the conceptual transmission line corridor. Habitats preferred by the Everglade snail kite total almost 315 ac within the corridor. Approximately 169 ac of scrub habitat is also within the corridor. The Florida scrub jay thrives in scrub habitat, but it is not known whether the potentially affected scrub habitats also contain oak that is favored by this bird species. Kirtland's warbler uses scrub habitat in Florida, and the alteration of scrub within the corridor could result in less available habitat. Loss and degradation of mangroves, freshwater marsh, and embayments within the conceptual corridor could reduce the amount of migratory stopover habitat for the red knot. Wet prairie and freshwater marsh habitats frequented by whooping cranes total approximately 361 ac. Wood stork nesting colonies are located along the North Fork of the St. Lucie River and at Sewall's Point, approximately 7 mi southwest and 11 mi south-southeast from the St. Lucie site. Approximately 402 ac of land cover suitable for wood stork foraging exists within the conceptual transmission line corridor, and an unknown portion of this would lie within the 18.6 mi core foraging area of both of these colonies and possibly others (FWS 2010-TN3080). A considerable amount of upland cover would also be suitable for the eastern indigo snake, including more than 1,000 ac within the conceptual transmission line corridor. The existing corridor passes through portions of a red-cockaded woodpecker occurrence area (FWS 2014-TN3734). The removal of trees from a portion of the 544 ac of forested land cover within the corridor could result in the loss of red-cockaded woodpecker habitat. Changes in habitats within the conceptual transmission line corridor, including ground clearing, elimination of woody vegetation, and planting and maintenance of low-growing vegetation such as grass, would affect the habitat suitability of these areas to the aforementioned Federally listed species and could increase the likelihood of non-native plants being accidentally introduced.

Because the conceptual transmission line corridor also passes through Martin County and a portion of Palm Beach County, the review team also considered impacts on additional Federally listed species and those species proposed for Federal listing known to occur in those counties. Bartram's hairstreak, the Florida leafwing, Florida perforate cladonia, Florida prairie-clover, four-petal pawpaw, and Okeechobee gourd would not be affected by the transmission line. Either they do not occur in the vicinity, or the habitats that they prefer are not represented in land-cover information FPL stated could be affected.

Increased traffic on transmission access roads could also contribute to the spread of non-native plant or animal species within these habitats. Increased traffic could also increase the risk of

vehicle strike mortality to the eastern indigo snake. The snake would be prone to increased mortality from off-road vehicle use during land clearing and increased traffic during construction and operation. As with construction and operation at the Turkey Point site, mitigation requirements by the FFWCC including staff awareness training and reporting would minimize negative impacts on the eastern indigo snake. Habitat fragmentation and loss would also affect local populations of plants and wildlife expected to occur within the region in suitable habitat that are not Federally listed. However, these effects are not expected to be noticeable and would not destabilize even local populations of any of these animals. Additional Federally listed species not expected to be affected are the ivory-billed woodpecker, Miami blue butterfly, Florida panther, fragrant prickly-apple, Lakela's mint, and tiny polygala. The St. Lucie site lies outside all designated management zones for the Florida panther. The Corbett substation is approximately 2 mi inside of the outermost management zone, and habitats between the substation and the zone boundary are either already developed or highly fragmented. Locations at which all of the other species are known to occur would not be affected.

Operations Impacts

Operation of two nuclear units at the St. Lucie site would create noise, fogging and dissolved solid deposition from cooling towers, runoff from increased impermeable surfaces, light pollution, and increased vehicle collision mortality to local wildlife populations. Operation of transmission lines could increase the risk of bird collision and electrocution mortality.

Operational noise from the cooling towers may displace individual animals from the immediate vicinity of the cooling towers. Salinity levels within cooling water would be equal to seawater. Vapor leaving a cooling tower contains dissolved solids including salt, and some vegetation can be sensitive to salt deposition. The review team assumed salt deposition from cooling-tower drift at the St. Lucie site would be similar in scale and intensity to deposition at the Turkey Point site. Most of the salt would likely be deposited on developed land near the cooling towers, and concentrations as high as 10 kg/ha/mo that have resulted in observable effects to sensitive plant species could be expected as far as 1.25 mi from the cooling towers. Like the Turkey Point site, the St. Lucie site is a coastal site and the vegetation in the vicinity would already be adapted to a high-salt environment, so the effects from additional salt deposition from the cooling towers on vegetation would likely not be noticeable beyond the boundaries of the site.

The creation of impermeable surfaces and a stormwater runoff management system at the St. Lucie site would likely result in changes in surface-water flow patterns into the Indian River Lagoon. Increases or decreases in the amount and timing of flow could result in changes in vegetative cover but would be limited to areas immediately surrounding developed areas. Erosion and sedimentation of wetlands could result during facility building activities. Pollutants could also be transported by runoff into the surrounding wetlands. BMPs would be expected to be followed with respect to protecting wetlands.

Light pollution during facility operation could affect wildlife residing on or migrating through the St. Lucie site. The St. Lucie site already has operating power units and the incremental increase in light would not be expected to noticeable alter local wildlife distribution or abundance.

EMFs are unlike other agents that have an adverse impact (e.g., toxic chemicals and ionizing radiation) in that dramatic acute effects cannot be demonstrated and long-term effects, if they exist, are subtle (NRC 2013-TN2654). A careful review of biological and physical studies of EMFs did not reveal consistent evidence linking harmful effects with field exposures (NRC 2013-TN2654). The impacts of EMFs on terrestrial flora and fauna are of small significance at operating nuclear power plants, including transmission systems with variable numbers of power lines and lines energized at levels less than 765 kV (NRC 2013-TN2654). Since 1997, more than a dozen published studies have looked at cancer in animals that were exposed to EMFs for all or most of their lives (Moulder 2005-TN1329). These studies have found no evidence that EMFs cause any specific types of cancer in rats or mice (Moulder 2005-TN1329). Therefore, the incremental EMF impact posed by operation of existing transmission lines and the addition of new lines for two new nuclear units would be negligible at the St. Lucie alternative site.

Transmission line corridor vegetation-management activities (cutting and herbicide application) and related impacts on floodplains and wetlands in transmission line corridors are of minor significance at operating nuclear power plants, including those with transmission line corridors of variable widths (NRC 2013-TN2654). The presence of overhead wires above and guy wires within habitat potentially suitable for the whooping crane, wood stork, Audubon's crested caracara, and the Everglade snail kite could increase their risk of electrocution and collision mortality. The existing transmission line corridor from the St. Lucie site exits the site westward across the Indian River Lagoon, then turns south and eventually southeast to the Corbett substation. The wood stork colony at Sewall's Point lies southwest between the St. Lucie site and the Corbett substation, but if the conceptual corridor follows the existing path, wires would not pass within approximately 5 mi of an existing wood stork colony. Transmission lines connecting the St. Lucie site to the Corbett substation would pass through core foraging areas of multiple wood stork colonies (FWS 2014-TN3732). The risk of collision and electrocution mortality for the wood stork increases if transmission lines are operated within their range and there is suitable habitat within the transmission right-of-way. The level of risk is commensurate with the location of the transmission lines and wood stork nesting colonies, foraging habitat, and travel corridors. The review team assumed the FWS would regulate wire installation in proximity to wood stork colonies, foraging habitat, flight corridors (Section 9.3.2.3), and important snail kite habitats as it does at the Turkey Point site, but wire installation could still affect local wood stork, whooping crane, crested caracara, and snail kite populations. Operational effects on other important species would be minimal.

Cumulative Impacts

The geographic area of interest for the assessment of the potential cumulative impacts of building and operating a new reactor at the St. Lucie site and other past, present, and reasonably foreseeable future actions on terrestrial resources and wetlands is defined as the 50 mi radius around the St. Lucie site. A list of past, present, and reasonably foreseeable actions within 50 mi of the St. Lucie site is presented in Table 9-21. This list includes a variety of energy-production projects, mining, manufacturing, infrastructure-development projects, set-aside areas for recreation and conservation, CERP-related projects, and other water-management actions. Other miscellaneous activities that could affect terrestrial and wetland resources in the region include the creation of the 2,700 ac stormwater-treatment area 1E.

Past land use in South Florida, especially agriculture and more recently urbanization, has greatly affected the distribution and abundance of unfragmented plant and wildlife habitats still remaining. Development and urbanization of higher elevation lands has drastically reduced the amount of pine flatwoods, coastal scrub, and other remaining upland habitat. Ditching and draining created more dry land, reducing the amount of wetlands available as habitat. The continued operation and maintenance of existing facilities would likely not exacerbate the current situation with respect to terrestrial and wetland ecosystems. Numerous mining projects exist in the vicinity, and expansion of these as well as the creation of the Lake Point Mine has the potential to increase their footprint and development in general on the landscape, as does continued human population growth in South Florida. Lands set aside for recreation and conservation would continue to provide buffers against development, provide habitat for plants and animals, and serve to preserve the remaining ecosystem of South Florida. Projects that incrementally reverse changes in land cover due to man-made changes in surface-water flow, including CERP-related activities, would also continue to benefit both terrestrial and wetland ecology of the region.

As described in Chapter 7, terrestrial and wetland environments in South Florida have been affected by continued population growth and related development. The overall impact from past, present, and reasonably foreseeable future activities on regional terrestrial and wetland ecology is substantial.

Summary Statement

The loss of more than 600 ac of habitat, much of it mangrove forest, on the ecologically sensitive barrier island containing the St. Lucie site would be noticeable. Furthermore, the building and operation of a 63 mi long transmission line corridor to service two new units at the St. Lucie site would produce noticeable impacts on terrestrial ecological resources and wetlands both on the barrier island and on the mainland landscape to the west. Approximately 482 ac of wetland habitats including more than 400 ac of mangrove swamp and smaller areas of freshwater marsh would be permanently lost to build the transmission line. FPL included over 2,187 ac of land within a 63 mi long conceptual transmission line corridor that was 200−660 ft wide. The corridor contained 986 ac of uplands as well as 607 ac of forested cover. These figures do not account for uplands that have been developed or are currently used for agriculture or pasture. Although the entire corridor would not be developed and all lands would not be lost as habitat, some portion would be lost to pole installation, road development, or altered to low-growing vegetation. Habitats of significant ecological value in South Florida that could be affected include mangrove swamp, freshwater marsh, herbaceous prairie, and pine flatwoods. Impacts on Federally listed terrestrial species and their habitats would be noticeable and would require mitigation.

Based on the information provided by FPL and the review team's independent evaluation, the review team concludes that the cumulative impacts on terrestrial and wetland resources of building and operating two new nuclear units at the St. Lucie alternative site, including impacts attributable to permanent conversion of habitat for the facility footprint as well as operation of the cooling tower and transmission lines would be MODERATE. The incremental effect of the building and operation of two new nuclear units at the St. Lucie site would be a significant

contributor to this impact, primarily because of effects on mangroves and the proposed transmission line corridor impacts on forest habitat.

9.3.5.4 Aquatic Resources

What follows is an assessment of the potential impacts on aquatic resources that may occur if the two nuclear units described by FPL (2014-TN4058) were constructed and operated at the St. Lucie alternative site. It is also assumed the existing infrastructure at the St. Lucie site, including the intake and discharge structures systems and components used by the existing nuclear units at this location, would have sufficient excess capacity to support two additional closed-cycle cooling units. Unless otherwise noted, the information presented in this section was obtained from FPL's ER, Revision 6 (FPL 2014-TN4058).

The St. Lucie alternative site is an 1,130 ac industrial site owned by FPL and located on Hutchinson Island in St. Lucie County, Florida (Figure 9-24). The site currently supports two operating nuclear units that were relicensed in 2003 for an additional 20 years of operation after completion and publication of a supplemental EIS by the NRC (2003-TN3152). The site is situated between two major aquatic ecosystems: the Atlantic Ocean to the east and the Indian River Lagoon to the west. The site is approximately 7 mi southeast of Fort Pierce, and 4 mi east of the city of St. Lucie, and is situated on the west side of SR-A1A. Two county parks with beach access (Blind Creek Pass Park and Walton Rocks Park) are within the St. Lucie Units 1 and 2 property boundary. The Indian River Lagoon to the west of the St. Lucie site is a long, shallow estuary that extends along the central east coast of Florida. Near the St. Lucie site, the lagoon is approximately 7,200 ft wide. The Jensen Beach to Jupiter Island Aquatic Preserve is adjacent to the site. To the east, the ocean floor is composed of unconsolidated sediment containing quartz and calcareous sand, and shell fragments. Water depths approximately 1 mi from shore are less than 40 ft. A complete description of the existing units is found in NRC (2003-TN3152). The existing Units 1 and 2 use a once-through cooling-water system that withdraws from and discharges into the Atlantic Ocean via offshore intake and discharge structures. The plant can withdraw water for station cooling from the Indian River Lagoon via Big Mud Creek under emergency conditions (NRC 2003-TN3152). For the purpose of this review, it is assumed that water for the closed-cycle cooling system proposed for the new reactors would use the existing intake and discharge canals that support Units 1 and 2. The review team also assumes the facility footprint would require 357 ac, and the conceptual transmission line corridor to support the new units would be 63 mi long and occupy 2,187 ac.

As described in NUREG–1437, Supplement 11 (NRC 2003-TN3152), extensive environmental studies were conducted in the Atlantic Ocean and the Indian River Lagoon near the St. Lucie site prior to construction and operation of Units 1 and 2. What follows is a brief description of the information presented by the NRC (2003-TN3152) and more recent studies conducted by FPL, as described in ER Revision 6 (FPL 2014-TN4058).

Commercial and Recreational Species

Based on the information presented by the NRC (2003-TN3152), invertebrate species with commercial or recreational value present in the Atlantic Ocean in the vicinity of St. Lucie included the Atlantic calico scallop (*Argopecten gibbus*), various shrimp of the family Penaeidae, and the blue crab (*Callinectes sapidus*). These species were generally collected infrequently

and in small numbers. Fish species with commercial or recreational value included the Bluefish (*Pomatomus saltatrix*), Spanish Mackerel (*Scomberomorus maculatus*), and King Mackerel (*Scomberomorus cavalla*). These species are highly migratory, spawn in coastal waters from late summer into winter (depending on species), and migrate northward along the East Coast during the warmer season. Recreationally important fish species present near the St. Lucie site included Ladyfish (*Elops saurus*), Common Snook (*Centropomus undecimalis*), and various billfish species. As reported by FPL (2014-TN4058), tilefish (*Caulolatilus* spp.) and Swordfish (*Xiphias gladius*) are also present near the St. Lucie site.

Important Species

Atlantic Ocean

Extensive environmental baseline studies conducted at Atlantic Ocean sites near St. Lucie included surveys of zooplankton, phytoplankton, benthic invertebrates, and fish communities. The results of some of these studies are described in detail by the NRC (2003-TN3152), and additional discussion is provided by FPL (2014-TN4058). Initial baseline monitoring established that there were three subtidal microhabitats near the plant: shallow beach terrace, offshore shoal, with a deep trough between the two. These microhabitats contained different sediment compositions, which influence invertebrate and fish abundance and diversity. Phytoplankton communities were dominated by diatoms; zooplankton communities were generally dominated by copepods and reflected species that spend their entire lifecycle in the water column. Baseline data described 127 species of arthropods and nearly 300 species of mollusks. As described above, the calico scallop, blue crab, and a variety of shrimp were of commercial value. Baseline studies also identified more than 900 taxa of benthic macroinvertebrates in ocean waters near St. Lucie. Fish sampling methods during baseline studies included bottom trawls and beach seines. Bottom trawls during early baseline studies were generally ineffective, catching fewer than 40 fish during one eight-month sampling effort. Beach seines collected over 11,500 fish in November 1971, and Cuban and Longnose Anchovies (*Anchoa cubana* and *A. nasuta*) dominated the samples. As noted by the NRC (2003-TN3152), offshore fish communities were generally transitional assemblages of temperate and tropical forms. To avoid affecting species attracted to reef structures, FPL sited the intake and discharge structures for St. Lucie Unit 1 and 2 in areas where reef systems were not present.

Indian River Lagoon

As described by the NRC (2003-TN3152), environmental studies were conducted in the Indian River Lagoon from the late 1960s to the 1980s near the site of St. Lucie Units 1 and 2. This portion of the estuary contains extensive growths of manatee grass (*Syringodium filiforme*) that supports a variety of species, including amphipods, shrimp, isopods, crab, and juvenile fish. A diverse assemblage of fish species are present in the area, including Red Drum, Spotted Seatrout, Common Snook, Sheepshead Minnows, and Gray Snapper.

Essential Fish Habitats

A variety of managed species under the jurisdiction of the South Atlantic Fishery Management Council (SAFMC) are present near the St. Lucie site (Table 9-25). Although there is no designated essential fish habitat (EFH) for Coastal Marine Pelagics near the St. Lucie site,

SAFMC has identified habitats of particular concern (HAPCs) in the Atlantic Ocean and Indian River Lagoon near the site. Coral/Coral Reef EFH is identified in the Atlantic Ocean near the site, and HAPC is designated in ocean and lagoon areas near the site. Snapper-Grouper EFH and HAPC are present in both waterbodies, and Spiny Lobster EFH is also present at both locations. Shrimp EFH is designated in both Atlantic and Indian River Lagoon areas near the site, and HAPC is designated in the Indian River Lagoon.

Table 9-25. Essential Fish Habitat and Habitat Areas of Particular Concern Present near the St. Lucie Site

	Atlantic Ocean		Indian River Lagoon	
Applicable Fishery Management Plan	**EFH**	**HAPC**	**EFH**	**HAPC**
Coastal Marine Pelagic	No	Yes	No	Yes
Coral/Coral Reef	Yes	Yes	No	Yes
Snapper/Grouper	Yes	Yes	Yes	Yes
Spiny Lobster	Yes	No	Yes	No
Shrimp	Yes	No	Yes	Yes

Source: SAFMC EFH Viewer (SAFMC 2014-TN2946)

Non-Native or Nuisance Species

Non-native or nuisance species that have been observed in the Indian River Lagoon near St. Lucie include the Brown Hoplo (*Hoplosternum littorale)* and green mussel (*Perna viridis*) (FISP 2009-TN3064). In addition, the FFWCC has identified the Lionfish (*Pterois volitans*), which is known to occur along the coast of Florida, as a threat to saltwater fish and wildlife (FFWCC 2014-TN3065).

Federally and State-Listed Species and Critical Habitats

Federal or State-listed species and Species of Concern that could be present near the St. Lucie site are listed in Table 9-26. Large whales are known to occur along the coast of South Florida, and may, on occasion, occur close to the St. Lucie facility. The five species of sea turtles listed in Table 9-26 have been reported on Hutchinson Island, where the loggerhead sea turtle is the most common. As described by the NRC (2003-TN3152), between 5,000 and 8,000 loggerhead nests have been reported on Hutchinson Island. Green and leatherback turtle nests have also been documented on the island. FPL (2014-TN4058) indicated Kemp's ridley and hawksbill sea turtle nests have not been reported near St. Lucie. The discovery of a Smalltooth Sawfish in the St. Lucie intake canal on May 16, 2005, during the course of normal sea turtle netting activities prompted the development of a biological assessment that was submitted to National Marine Fisheries Service (NMFS) in November 2005 (FPL 2005-TN3156). A biological assessment related to sea turtle capture during normal operations at St. Lucie was developed by the NRC in 2007 (NRC 2007-TN3074) and consultation with NMFS was concluded and a biological opinion was issued on March 24, 2016 (NMFS 2016-TN4778). The NRC also provided an EFH assessment in 2012 related to the power uprate proposed by FPL for Units 1 and 2 (NRC 2012-TN3155). Additional information about the operation of St. Lucie Units 1 and 2 may be found in FPL (2014-TN3917).

Table 9-26. Federally or State-Listed Species and Species of Concern Likely to Occur at or near the St. Lucie Site

Common Name	Scientific Name	Classification	Federal Designation	State Designation
Sei whale	*Balaenoptera borealis*	Mammal	Endangered[(a)]	Endangered[(a)]
Finback whale	*Balaenoptera phusalus*	Mammal	Endangered[(a)]	Endangered[(a)]
North Atlantic right whale	*Eubalaena glacialis*	Mammal	Endangered[(a)]	Endangered[(a)]
Humpback whale	*Megaptera novaeaniae*	Mammal	Endangered[(a)]	Endangered[(a)]
Sperm whale	*Physetercatodon*	Mammal	Endangered[(a)]	Endangered[(a)]
Florida manatee	*Trichechus manatus latirostris*	Mammal	Endangered[(b)]	Endangered[(b)]
Green sea turtle	*Chelonia mydas*	Reptile	Endangered[(b)]	Endangered[(b)]
Hawksbill sea turtle	*Eretmochlys imbricata*	Reptile	Endangered[(b)]	Endangered[(b)]
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptile	Endangered[(b)]	Endangered[(b)]
Loggerhead sea turtle	*Caretta caretta*	Reptile	Endangered[(b)]	Endangered[(b)]
Leatherback sea turtle	*Dermochelys coriacea*	Reptile	Endangered[(b)]	Endangered[(b)]
American alligator	*Alligator mississippiensis*	Reptile	Threatened[(c)] SOA[(d)]	Threatened[(c)] SOA[(d)]
Smalltooth Sawfish	*Pristis pectinata*	Fish	Endangered[(c)]	Endangered[(c)]
Mangrove Rivulus	*Rivulus marmoratus*	Fish	Species of Concern[(b)]	Species of Special Concern[(b)]
Johnson's Seagrass	*Halophila johnsonii*	Plant	Threatened[(a)]	-

(a) ML031360705, St. Lucie Relicensing SEIS (NRC 2003-TN3152)
(b) FNAI 2013-TN3066
(c) FFWCC 2013-TN3075
(d) SOA = similarity of appearance to American crocodile

Building Impacts

Based on the information provided by FPL, a total of 357 ac would be required for the main power plant site, and an additional 2,187 ac would be required to support transmission lines. The facility footprint would primarily affect mangrove swamp habitat, resulting in a permanent loss of resource. Transmission line construction would likely affect existing agricultural activities, and would likely require water crossings that could temporarily affect aquatic resources during tower construction. Because the review team assumes that the existing intake and discharge canal structures used by St. Lucie Units 1 and 2 would support the cooling of the new units, building impacts on nearshore areas would be greatly reduced, and would likely be primarily associated with stormwater management that would be mitigated through BMPs and compliance with NPDES permits. As noted by FPL, Coastal Zone Management certification would be required, given the proximity of the St. Lucie site to the Atlantic Ocean. Building activities would be mainly confined to the western portions of the existing site and are not expected to affect nesting turtles or turtle movements in the Atlantic or Indian River Lagoon. FPL has indicated field surveys for Federally or State-listed species would be conducted prior to building activities at the site or within transmission line corridors.

Operations Impacts

Assuming the cooling systems used at the St. Lucie site for the new reactors would be similar to those described in Section 3.4.5 for proposed Units 6 and 7 at Turkey Point when saltwater is used, the maximum water withdrawal rate would be approximately 86,400 gpm and the maximum blowdown discharge would be approximately 58,922 gpm. The existing St. Lucie Units 1 and 2 once-through cooling system requires between 800,000 to 1,120,000 gpm, depending on condenser cleanliness (NRC 2003-TN3152), and these units received license renewals by the NRC on November 2, 2003 (NRC 2013-TN3079). The recent extended power uprate granted in 2012 for these units increased water discharge temperatures by approximately 3°C, but did not increase flow (NRC 2012-TN3153). Comparing the maximum water withdrawal rate for the proposed to units to the range of once-through water flow for the existing units shows the new units would increase the existing intake flow rate by between 7.7 and 10.8 percent. This would likely result in some increase in impingement and entrainment losses related to the existing intake. Blowdown contributions to the existing discharge canal and outfall would represent increases in flow rates ranging from approximately 5 to 7 percent, depending on actual water flow of the Unit 1 and 2 cooling system. Blowdown discharges may contribute to both discharge water temperature and contaminant load, and would be subject to NPDES permitting. Assuming a closed-cycle cooling system and compliance with the EPA's 316(b) Phase I requirements for intake structures (66 FR 65256) (TN243), the intake is considered protective of aquatic life. The review team considers the anticipated impacts of impingement and entrainment to be minimal.

Also, operation of the cooling towers may increase nearby salt deposition. The effects of additional salt deposition are likely to not be significant for surface-water habitats near the area, because the salt content of the air is already high at this coastal location and biota are preadapted to high salt depositional rates.

Operational impacts associated with the St. Lucie site after Unit 1 and 2 license expiration (2036 and 2043, respectively) would likely decrease, because intake and discharge water volumes through the existing infrastructure would be significantly reduced when once-through cooling is no longer required. The review team assumed FPL would obtain a revised NPDES permit at that time for continued operation of the new units.

Cumulative Impacts

Table 9-21 presents past, present, and reasonably foreseeable projects and other actions in the vicinity of the St. Lucie alternative site. As described in previous sections, a variety of energy, transportation, mining, and infrastructure improvement projects are occurring or may occur. These projects may place increasing demands on groundwater and surface-water resources, temporarily or permanently alter wetland and surface-water habitats, or require additional protection from storm events or sea-level rise in the coming decades. Table 9-21 also provides a list of parks and preserves that will continue to exist during that time, providing protected habitat for terrestrial and aquatic biota, and recreational opportunities for residents of South Florida and visiting tourists. It is expected that limited development will occur near these protected areas, providing an overall positive cumulative ecological benefit. In addition, a variety of restoration projects currently under way or planned are intended to restore historical

hydrologic connectivity, enhance habitats that promote species diversity, improve water quality and water management, and control exotic or invasive species that threaten native plants and biota.

As discussed in Section 7.3.2, aquatic environments in this region of South Florida may also be affected by continued population growth. Overall, the review team concludes that the cumulative impacts on aquatic resources in the vicinity of the St. Lucie site would be SMALL to MODERATE.

Summary Statement

Based on a review of the information provided by FPL and its independent assessment, the review team concludes that the operation of two nuclear units at the St. Lucie site, in addition to the existing units, would contribute minimally to adverse cumulative effects on aquatic resources. The presence of two new units would result in some detectable increases in impingement and entrainment, but would not result in a noticeable change in aquatic resources. Cooling-tower blowdown would contribute minimally to water temperature or contaminant levels of water discharged into the Atlantic Ocean, and would be regulated via an NPDES permit. Thus, the review team concludes that the cumulative impacts of the building and operation of two new nuclear reactors at the St. Lucie site, combined with the other past, present, or reasonably foreseeable activities on aquatic resources would be SMALL to MODERATE. Building and operating two new nuclear units at the St. Lucie site would not be a significant contributor to the MODERATE impact.

9.3.5.5 Socioeconomics

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect socioeconomics, including other Federal and non-Federal projects listed in Table 9-21. For the analysis of socioeconomic impacts at the St. Lucie site, the geographic area of interest is considered to be the 50 mi region centered on the St. Lucie site with special consideration of St. Lucie, Martin, Indian River, and Palm Beach Counties, because that is where the review team expects socioeconomic impacts to be the greatest. In evaluating the socioeconomic impacts of site development and operation at the St. Lucie site near Port St. Lucie in St. Lucie County, the review team used readily obtainable data from the Internet or published sources.

Physical Impacts

People who work or live around the St. Lucie site would be exposed to noise, fugitive dust and gaseous emissions from building and operations activities. Noise, dust, and air-pollution emissions generated within the boundaries of the St. Lucie site would be expected to be similar to those for the Turkey Point site. The two closest residential areas lie to the west and south of the proposed location. The first is approximately 1.5 mi west of the proposed site across the Indian River Lagoon, and the second is approximately 2 mi south of the proposed site boundary. Because noise and air-pollution impacts are attenuated by distance, the noise and air-pollution impacts would be minor. Best practices and applicable regulations would be expected to protect building workers and personnel working onsite. Offsite structures include widening of a

transmission line, and intake/makeup pipelines (FPL 2014-TN4058). Building of these offsite structures would generate noise, fugitive dust, and gaseous emissions. The impact would be temporary and best practices would minimize the impacts on the public. Truck and vehicle traffic related to building and operations would also generate noise, fugitive dust, and gaseous emissions offsite. Vehicle traffic would be concentrated during the commute hours of the day. Truck traffic would be up to 36 trucks per hour during the building period and would traverse urban residential areas to the north and south of the site. The review team expects best practices to keep emissions within regulations, which would result in minor impacts on the community.

The St. Lucie site is owned by FPL. Offsite project-related building activities include the widening of a 22 mi long portion of SR-A1A and a 0.5 mi heavy-haul road connecting the barge access location to the project site (FPL 2014-TN4058). The conceptual design route of the access road and widening of SR-A1A would lead to the displacement of approximately 202 structures, based on aerial view of rooftops (FPL 2011-TN59). Such displacement would constitute a noticeable and destabilizing adverse impact on buildings in the St. Lucie area. While other physical impact analyses in this EIS consider only the impacts of changes in road quality, the new roads near the St. Lucie site would alter considerably the demographic characteristics of the residential neighborhoods they cross. Therefore, the review team must also consider the demographic impacts caused by the relocation of over two hundred households. The physical impacts from road quality changes would be noticeable and beneficial near the St. Lucie site. The demographic impacts from those roads are discussed below under *Demography*.

Other offsite project-related activities include, a 63 mi transmission line and intake/makeup pipelines. The new nuclear plants would be visible from the surrounding area, including recreational areas next to the site and the residential areas on the coast across from the Indian River Lagoon. However, because of the distance from the residential areas, and because of the already existing nuclear plants on the St. Lucie site, the new nuclear plants would not contrast with current viewscape, which would result in minor impacts on the community.

Based on the information provided by FPL (2014-TN4058) and the review team's independent analysis, the review team concludes that the overall physical impacts of building activities would be minor, with the exceptions of noticeable and destabilizing adverse impacts on buildings, a noticeable and beneficial impact on road quality, and minor adverse impacts for all other physical impact categories at the St. Lucie site.

Demography

The St. Lucie site is located in St. Lucie County, 4.5 mi east of Port St. Lucie (2012 population 163,748) the closest population center with more than 25,000 residents (FPL 2014-TN4058; USCB 2012-TN4098). Fort Pierce, also with a population larger than 25,000, is 7 mi northwest of the site (2012 population 42,350; USCB 2012-TN4098). There are 10 counties within the 50 mi area, but the review team estimates the areas in which workers would most likely live and from which they would commute are within St. Lucie, Martin, Indian River, and Palm Beach

Counties, based on current commuter patterns of the FPL staff working on the existing St. Lucie nuclear power Units 1 and 2.[35]

FPL estimated the peak number of workers during building would be 3,983, including 33 operation workers. The review team assumed that the share of construction and operation workers relocating from outside the four-county area would be 69 percent of the estimated peak number of workers. This assumption was reached by using the assumption made for the proposed Turkey Point site as a reference and assuming that the share of workers that would come from outside the region is inversely proportional to the population of the region.[36] As stated in Section 4.4, 70 percent of the construction workforce and 100 percent of the operations workforce that moved to the area were assumed to bring their families. Based on these assumptions, a peak of 2,726 construction and 23 operation workers would relocate to the area during the project building phase, and 1,932 of these workers would bring their families. Based on an average household size of 3.25 people, the total increase in population attributable to the peak total workforce at the St. Lucie site would be 6,279 people. An influx of 6,279 people represents a 0.3 percent increase in the four-county 2012 population of 1,887,031.

FPL estimated the total onsite operations workforce to be 806 workers, and that 69 percent of these workers (557) would relocate from outside the four-county area. For this analysis, the review team assumed that 100 percent of operation workers who relocate would bring their families. Based on an average household size of 3.25 people, the total population increase attributable to project operations would be 1,811 (557 × 3.25) people. This represents less than a 0.1 percent increase in the four-county area.

Building and operations would require widening SR-A1A and would displace an approximate 202 structures located north of the site, approaching the town of Fort Pierce, and south of the site, approaching the town of Stuart (FPL 2014-TN4058). The presence of high-density dwellings suggests the number of households displaced would be considerably larger, because many buildings would house more than one household. Residential displacements would noticeably alter the affected residential neighborhoods.

The review team concluded that the impact on local demographic resources would not be noticeable and would be minor, except for the impact on the displaced residents along SR-A1A, which would have a noticeable and destabilizing effect on a substantial number of households.

(35) Approximately 97 percent of the workforce of these power units lives in this four-county area (FPL 2014-TN4058).

(36) The proposed Turkey Point site analysis assumed 50 percent of the peak workers would come from outside the 50 mi region and that 83.3 percent of those would reside in Miami-Dade County, i.e., 41.65 percent (0.5 × 0.833) of the peak workers would migrate into Miami-Dade County. Because the population of the four-county area is approximately 75 percent of that of Miami-Dade County (USCB 2012-TN4098), the review team assumed the share of peak workers migrating into the four-county area would be 1-(0.75 × 0.4165) ≈ 69 percent.

Economic Impacts on the Community

Economy

FPL estimated the peak number of workers during building would be 3,983, including 33 operation workers. Employment of 3,983 construction and operation workers would have positive economic impacts in the four-county area. Based on a multiplier of 1.7136 jobs (direct and indirect) for every construction job and 2.2500 for every operation job, 3,983 new construction and operation jobs would create 2,860 indirect jobs, for a total of 6,843 new jobs in the four-county area during peak employment (3,950 × 1.7136 + 33 × 2.2500) (FPL 2011-TN56). This represents a 0.8 percent increase in the total employment in the four-county area.[37] Peak employment would last 1 month and the average employment generated during the 10-year building period would be about half of that of peak employment. This added employment would generate added earnings to the economy of the four-county area, but the added employment and earnings would not be noticeable to most of those living or working in the area.

An estimated 806 workers would be required for the operation of two nuclear power facilities. Based on a multiplier of 2.2500 jobs (direct and indirect) for every operations job at the new units (FPL 2011-TN56), an influx of 806 workers would create 1,008 indirect jobs for a total of 1,814 new jobs in the region. This represents a 0.2 percent increase in the total employment in the four-county area. This added employment would also generate added earnings to the economy of the four-county area, but the added employment and earnings would not be noticeable to most of those living or working in the area.

Taxes

State corporate income taxes and sales and use taxes paid at the St. Lucie site during construction and operations of the proposed units would be similar to those paid by the same units at the proposed Turkey Point site. As discussed in Sections 4.4 and 5.4, State taxes paid by the proposed units would not exceed 2 percent of the annual collected State corporate income and sales and use taxes. The impact would be minor and beneficial. County sales surtax rates in the four-county area for the 2013 calendar year were zero percent for Martin and Palm Beach Counties, one-half percent for St. Lucie, and 1 percent for Indian River County (FDOR 2014-TN3393). County surtax collections from the proposed units would be highest during construction when annual expenses related to the proposed units would be estimated to reach up to $1.56 billion (Section 4.4). A 1 percent sales surtax would generate $15.6 million in revenues for the four-county area.[38] This would correspond to less than 1 percent of total county revenues in the four-county area for 2014.[39] The impact would be minor and beneficial. County and school district governments in Florida may levy taxes up to 10 mills each (1 percent) in property taxes (FDOR 2012-TN459). If the value of property taxes for the two nuclear reactors at the St. Lucie site were the same as the value estimated for Units 6 and 7 at the

(37) Employment of 834,072 (BLS 2013-TN4085).
(38) To the extent that some of the expenditures would be made in Martin, Palm Beach, and St. Lucie Counties, and assuming the sales surtax rates are unchanged, the total sales surtax collected would be smaller.
(39) $3,598 million (FLDFS 2013-TN3392).

Turkey Point site in Section 5.4.3.2, FPL would pay $20 million in property taxes to the St. Lucie School District and $20 million to St. Lucie County. These payments would correspond to 7.6 percent the St. Lucie School District 2011-2012 total revenues ($20 million compared $262.5 million)[40] and 6.3 percent of the St. Lucie County 2011-2012 total revenues ($20 million compared to $320 million).[41] Because property taxes paid to school districts are reallocated through Florida's Education Finance Program, the benefit to the St. Lucie School District would be diluted to some extent, and the exact amount distributed to each school district is not known at this time. Because of the value of project-related property tax payments relative to current property taxes, the review team considers the impacts on tax revenues to both the St. Lucie School District and St. Lucie County to be minor and beneficial.

The review team concluded that the economic impact would not be noticeable and would be minor and beneficial.

Infrastructure and Community Service Impacts

Traffic

Workforce access to the St. Lucie site would occur via SR-A1A coming from the north and the south. The review team estimated the current LOS (Level of Service) of these roads at two FDOT traffic-monitoring sites based on the peak hour directional traffic and FDOT LOS thresholds. Peak hour directional traffic information was obtained from FDOT Florida Traffic Online (FDOT 2013-TN3558) and consists of the AADT at each traffic-monitoring site, a Standard Peak Hour Factor (K) and a Directional Distribution Factor (D). The multiplication of these three elements (AADT × K × D) provides an estimate of the current peak hour directional traffic volume. The LOS was determined comparing this peak hour directional traffic volume with the maximum thresholds for each LOS in Table 7 (urbanized areas) of FDOTs Generalized Service Volume Tables (FDOT 2013-TN3297). Based on this procedure, the LOS at both traffic-monitoring sites is C. To estimate the project impact on traffic LOS during the project's peak workforce building period, the review team followed a methodology similar to that described in Section 4.4: The peak workforce of 3,983 construction and operation workers was divided into two shifts, with 70 percent assigned to shift 1 (6:00 a.m. to 4:30 p.m.) and 30 percent to shift 2 (5:00 p.m. to 3:00 a.m.). The hour of peak commute would be 4:30 p.m. to 5:30 p.m. The review team also assumed up to 36 trucks per hour. The project-related directional traffic during the peak commute hour would be 2,824 vehicles (70 percent × 3,983 + 36). The review team assumed that half of the project-related traffic would come from each direction, north and south.[42] The results of this analysis are presented in Table 9-27 below. The additional building traffic would drop the LOS classification at both traffic-monitoring sites to F. Widening of SR-A1A would bring the LOS classification to a C north of the site and to a D south of the site.

(40) FLDOE 2013-TN3299
(41) FLDFS 2013-TN3392
(42) Based on U.S. Census Bureau commuter patterns (USCB 2011-TN4078) it was not possible to determine the likely direction of outgoing project-related traffic.

Table 9-27. Peak Workforce Traffic LOS Analysis for the St. Lucie Site

Traffic-Monitoring Site	Baseline Peak Hour Directional Traffic	Baseline LOS	Distribution of Project-Related Peak Traffic	Added Peak Hour Directional Traffic	Peak Hour Directional Traffic with Project	LOS with Project
SR-A1A north of site	562	C	0.50	1,412	1,974	F (C)[(a)]
SR-A1A south of site	811	C	0.50	1,412	2,223	F (D)[(a)]

(a) LOS classification after widening of SR-A1A

Source: Review team calculations based on FDOT 2013-TN3297 and FDOT 2013-TN3558

FPL estimated the total onsite operations workforce to be 806 workers. If access of this workforce to the St. Lucie site were distributed among the two directions equally, the LOS at traffic-monitoring site north of the St. Lucie site would drop to D, and the LOS at the traffic-monitoring site south of the St. Lucie site would drop to E. Widening of SR-A1A would bring the LOS classification to C north and south of the site.

Based on the above analysis, the review team concludes that the impact of the building and operations of the proposed nuclear reactors at the St. Lucie site would be noticeable during both building and operations, although not destabilizing, after widening of SR-A1A.

Recreation

Blind Creek Park, Big Mud Creek Park, and the stretch of lagoon designated as the Jensen Beach to Jupiter Inlet Aquatic Preserve are adjacent to the site. The Savannas Preserve State Park is located approximately 2 mi west of the site, across the lagoon. Other parks and recreational areas exist within the county. The influx of project-related population to the four-county area would increase the number of local users of recreational facilities. Because the in-migrating population would be less than 1 percent of the local population, the review team expects the impact on current recreational infrastructure to be negligible.

Housing

The review team estimates that 2,749 construction and operation workers would migrate into the four-county area, and each of these workers would need a place to live. Based on American Community Survey 2008−2012 5-Year estimates, within the four-county area, there are 954,759 housing units of which 208,508 are vacant (21.8 percent). This includes housing that is designated as seasonal, recreational, or occasional use (USCB 2012-TN4089). The review team estimates that, in absolute numbers, the available housing would be sufficient to house the construction workforce. The in-migrating construction and operations workforce would occupy no more than 1.4 percent of vacant housing units in the four-county area. FPL estimated that approximately 806 workers would be needed for operation of two nuclear power facilities at the St. Lucie site, and assumed that 69 percent of these workers (557) would relocate from outside the region and would settle in the four-county area. Based on these assumptions, the entire operations workforce would occupy no more than 0.3 percent of vacant housing units in the four counties. The review team concludes that impact on housing would be minor.

Public Services

In-migrating construction workers and plant operations staff would also likely affect local municipal water, wastewater-treatment facilities, police and fire-protection services, and other public services in the region. These impacts would be expected to be in proportion with the demographic impacts experienced in the region. In-migration to the four-county area would represent an estimated 0.3 percent of the local population (less during operations). The review team concludes that the impact on public services would be minor.

Education

Based on data for the 2011-2012 school year, there are approximately 249,523 full-time equivalent students in public schools in the four-county area[43] (FLDOE 2013-TN3299). The review team estimated that 2,749 construction and operation workers would migrate into the area, and that 1,932 workers would bring their families. Based on an estimate of 0.8 school-aged children per family (Malhotra and Manninen 1981-TN1430), an estimated 1,546 (1,932 × 0.8) school-aged children would be migrating into the four-county area. This would yield a 0.6 percent increase in the student population. During operations, the review team assumed that 557 operation workers and their families would relocate from outside the region. This would include an estimated 446 (557 × 0.8) children in the PK-12 school range. This influx of students would increase the student population in the four-county area by 0.2 percent. The review team concludes that the impact on education would be minor.

Based on the information provided by FPL (2014-TN4058) and the review team's independent analysis, the review team concludes that the overall infrastructure and community service impacts of building activities and operations at the St. Lucie site would be minor except for noticeable, but not destabilizing, adverse impacts on traffic.

Cumulative Impacts

In addition to the socioeconomic impacts from the building and operations of the proposed project at the St. Lucie site, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could have socioeconomic impacts.

The socioeconomic impacts of past and present actions in the affected area are largely captured by the current baseline conditions used for analysis above of project impacts. For example, the impacts of past and present actions on the demography and economy of the area are largely captured by current baseline data on population, employment, and tax revenues.

Reasonably foreseeable future actions are listed in Table 9-21. Several of these future actions would be expected to have cumulative socioeconomic impacts with the proposed project at the St. Lucie site. Other proposed projects that would generate employment and earnings during construction and operations include the proposed Floridian Natural Gas Storage Facility in Martin County, the Florida Southeast Connection pipelines proposed through Highlands, Okeechobee and Martin Counties, the Riviera Beach Next-Generation Clean Energy Center in Palm Beach County and several CERP Projects.

(43) FTE is a measure of enrollment based on the number of full-time students that it would take to fill the number of classes offered.

Based on the location of the identified future projects and their magnitudes, the cumulative socioeconomic impacts of the projects identified above with the proposed project at the St. Lucie site would be expected to be SMALL and adverse, with the exception of MODERATE and adverse impacts on traffic, LARGE and adverse physical impacts on buildings, and a LARGE demographic impact on displaced residents due to the widening of SR-A1A. However, areas adjacent to the St. Lucie site would experience MODERATE beneficial impacts on road quality due to the wideing of SR-A1A near the St. Lucie site. Building and operating two new nuclear units at the St. Lucie alternative site would be a significant contributor to the adverse impacts that are greater than SMALL.

9.3.5.6 Environmental Justice

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect EJ, including other Federal and non-Federal projects listed in Table 9-21.

The 2008–2012 American Community Survey block groups were used to identify minority and low-income population distributions in the area (USCB 2012-TN4098). The census data for Florida characterizes 15.9 percent of the population as Black, 0.3 percent as American Indian or Alaskan Native; 2.5 percent as Asian, 0.1 percent as Native Hawaiian or other Pacific Islander, 2.6 percent as other single minorities, 2.2 percent as multiracial, 22.5 percent as Hispanic ethnicity; and 42.2 percent as aggregate minority. There are 801 block groups within 50 mi of the St. Lucie site. Following the criteria described in Section 2.6.1, Black minority populations exist in 103 block groups, American Indian or Alaskan Native minority populations exist in 2 block groups; Asian minority populations exist in 2 block groups; other race minority populations exist in 9 block groups; multiracial minority populations exist in 2 block groups; Hispanic ethnicity minority populations exist in 66 block groups; and aggregate minority populations exist in 207 block groups. There are no block groups containing Native Hawaiian or other Pacific Islander populations within 50 mi of the St. Lucie site. A portion of the Brighton Seminole Indian Reservation is 50 mi west-southwest of the St. Lucie site. The locations of the minority populations within 50 mi of the St. Lucie site and the Brighton Indian Reservation are shown in Figure 9-25. The locations of Hispanic minority populations and Black minority populations within the 50 mi of the St. Lucie site are shown in Figure 9-26 and Figure 9-27, respectively.

The USCB data characterize 15.3 percent of Florida households as low income (USCB 2012-TN4098). Out of a possible 801 block groups, 72 block groups contain low-income populations. The locations of the low-income populations within 50 mi of the St. Lucie site are shown in Figure 9-28.

The analyses of the impacts of building and operating new nuclear reactors at the St. Lucie site identified noticeable adverse impacts on land use, terrestrial and wetland ecosystems, and traffic, and substantial adverse impacts on buildings and people through displacements. The review team did not identify any special pathways through which any impacts would disproportionately affect EJ populations of interest. Therefore, the review team concluded there would be no disproportionately high and adverse impacts on EJ populations of interest.

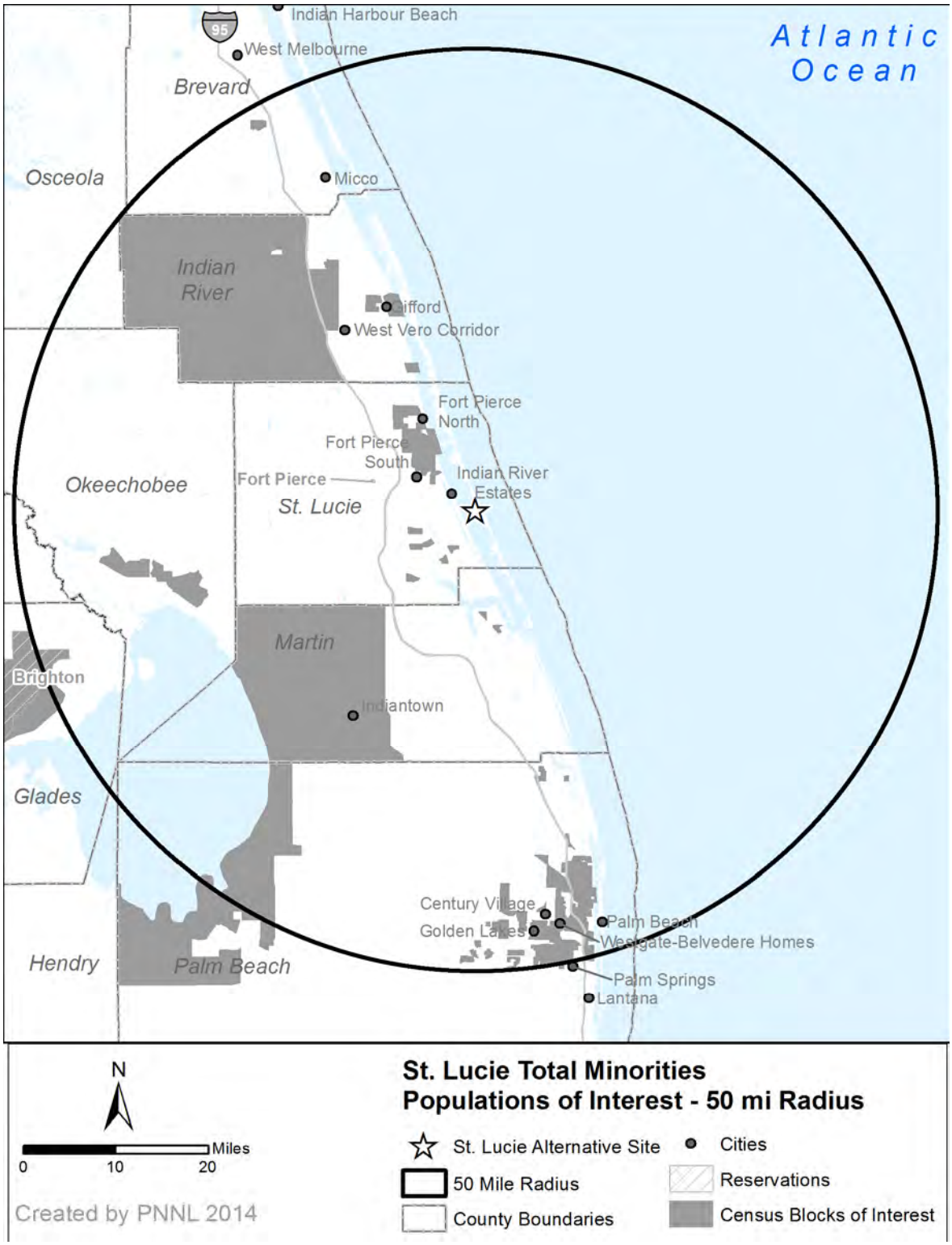

Figure 9-25. Aggregate Minority Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the St. Lucie Alternative Site

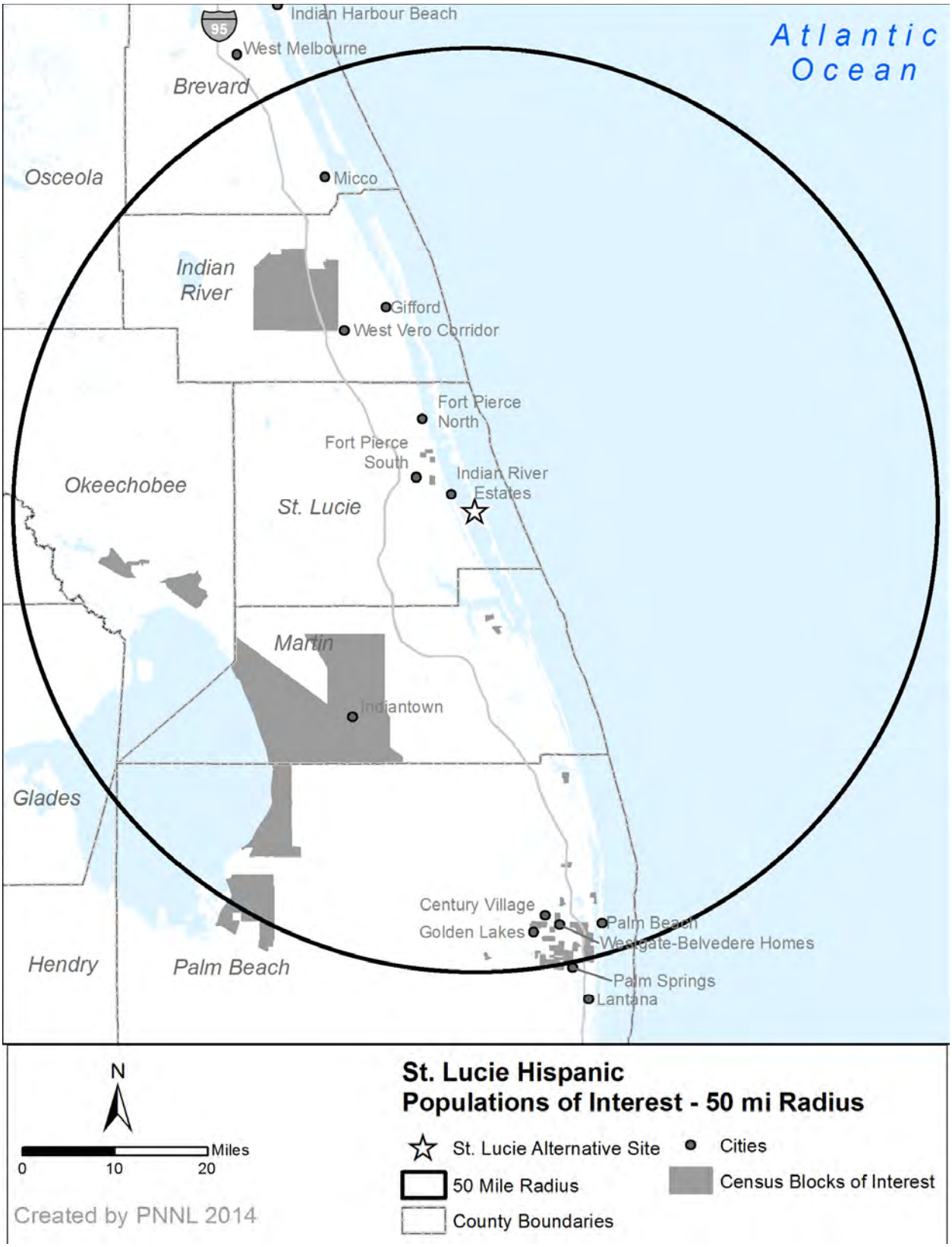

Figure 9-26. Hispanic Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the St. Lucie Alternative Site

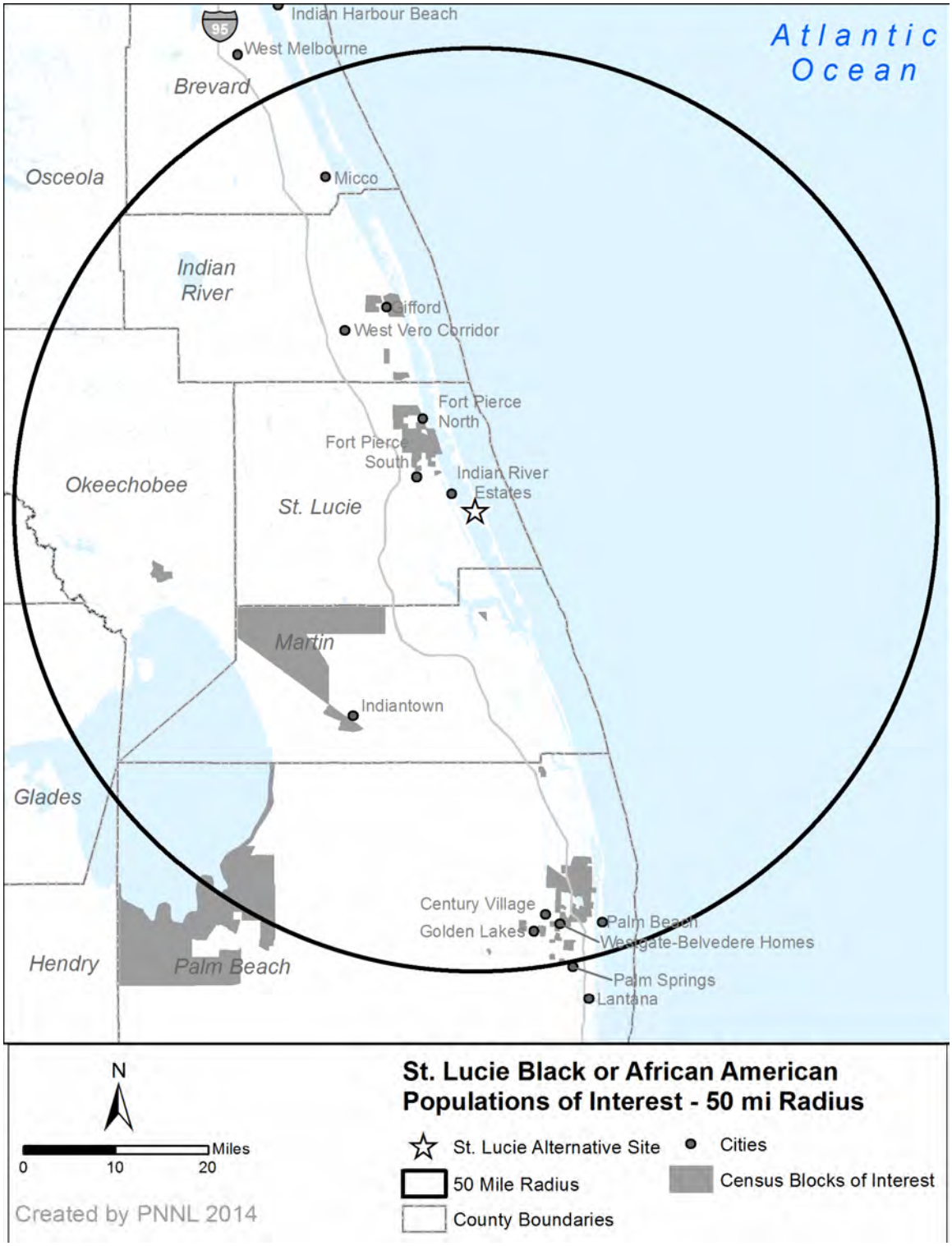

Figure 9-27. African American Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the St. Lucie Alternative Site

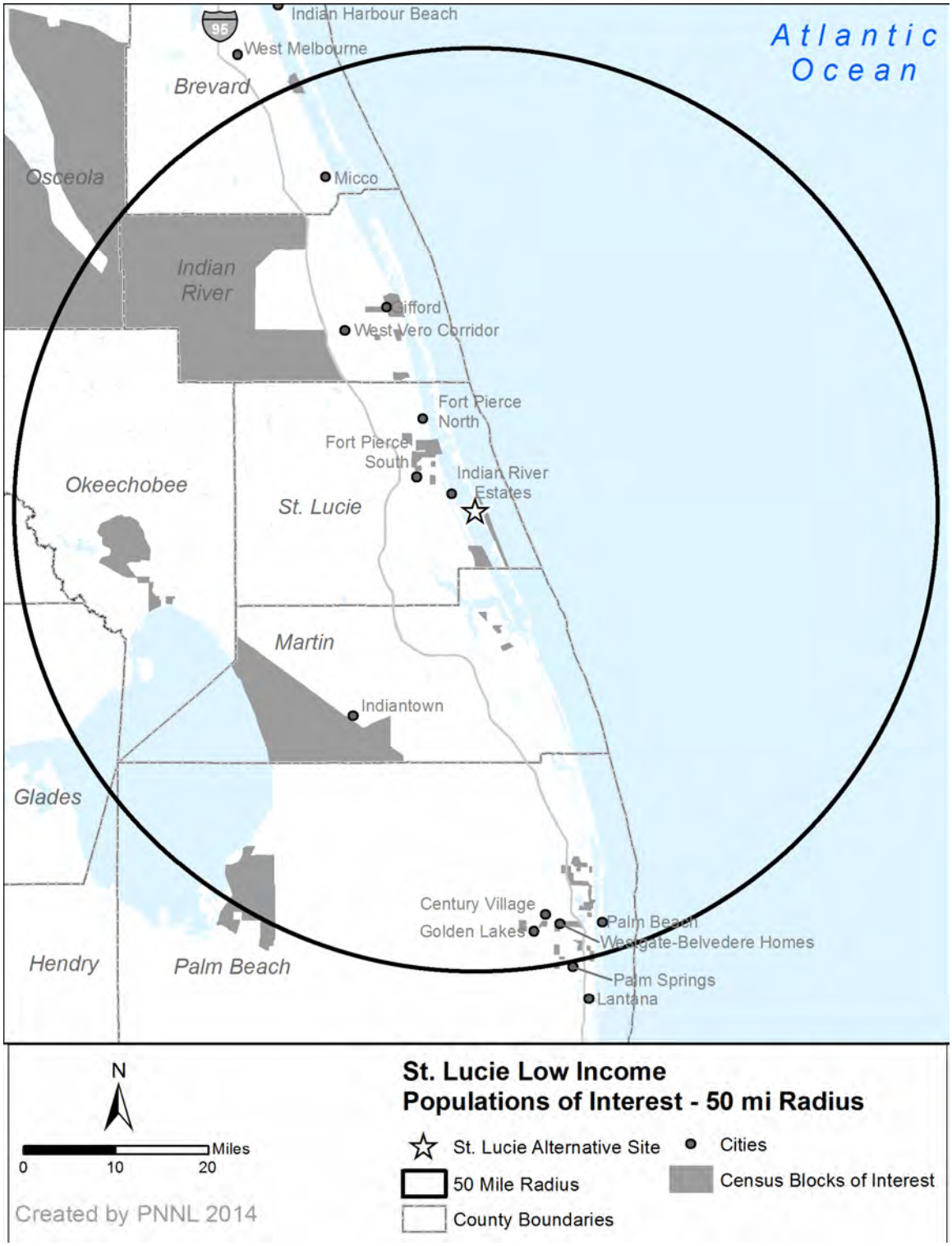

Figure 9-28. Low-Income Populations in Block Groups that Meet the Environmental Justice Selection Criteria within 50 mi of the St. Lucie Alternative Site

The NRC's EJ methodology includes an assessment of affected populations of particular interest or with unusual circumstances, such as minority communities that are exceptionally dependent on subsistence resources or identifiable in compact locations (e.g., Native American reservations) and those that have a high density of minority or low-income groups. Based on a literature research, the review team did not identify high-density minority or low-income presence in the proximity of the site, nor differentiated subsistence consumption of natural resources by EJ populations of interest.

Cumulative Impacts

In addition to the EJ impacts from building and operations of the proposed project at the St. Lucie site, the cumulative analysis also considers other past, present, and reasonably foreseeable future actions that could have EJ impacts. Based on a literature review of past and present actions in the affected area, and based on the reasonably foreseeable actions listed in Table 9-21, the review team found no evidence that the cumulative effects would disproportionately affect EJ populations of interest.

9.3.5.7 Historic and Cultural Resources

The following cumulative impact analysis addresses building and operating two new nuclear generating units at the St. Lucie site. The analysis also considers other past, present, and reasonably foreseeable future actions that could affect cultural resources, including other Federal and non-Federal projects and the projects listed in Table 9-21. For the analysis of cultural impacts at the St. Lucie site, the geographic area of interest is considered to be the APE that would be defined for this site. This includes the direct effects APE, defined as the area physically affected by the site-development and operation activities at the site and within transmission line corridors. The indirect effects APE is defined as the area visually affected and includes an additional 0.5 mi radius APE around the transmission line corridors and a 1 mi radius APE around the cooling towers.

Reconnaissance activities in a cultural resource review have particular meaning. Typically, they include preliminary field investigations to confirm the presence or absence of cultural resources. However, in developing this EIS, the review team relied upon reconnaissance-level information to perform its alternative site evaluation in accordance with ESRP 9.3 (NRC 2000-TN614). Reconnaissance-level information consists of data that are readily available from agencies and other public sources. It can also include information obtained through visits to the site area. The following information was used to identify the historic and cultural resources at the St. Lucie site:

- NRC Alternative Sites Visit, July 2010 (NRC 2010-TN3304)
- FPL ER Revision 6 (FPL 2014-TN4058)
- Florida Historical Markers Program (FDHR 2014-TN3878)
- National Register of Historic Places database (NPS 2014-TN3882).

The approximately 1,130 ac St. Lucie site is an FPL-owned property with an existing nuclear power-generation station, located adjacent to the shoreline and a lagoon on Hutchinson Island. Two county parks are located within the property. The two existing units occupy less than half of the site. Historically, the St. Lucie site and vicinity were largely undeveloped and likely

contained intact archaeological sites associated with human settlement dating back millennia. Over time, the area has been heavily disturbed by impacts related to industrial and urban development. In 2001, as part of the license renewal for the existing St. Lucie reactors, the Florida SHPO indicated that undeveloped portions of the plant site have a moderate to high probability for containing significant archaeological resources, particularly since there are known archaeological remains along the northern end of the facility property, approximately 1 mi from the St. Lucie site (FPL 2014-TN4058; NRC 2003-TN3152).

A search of the National Register shows that 15 significant historic properties are located within 10 mi of the St. Lucie site (FPL 2014-TN4058; NPS 2014-TN3882). None, however, occurs on Hutchinson Island, where the St. Lucie site is located. A total of 124 properties were found in the four counties in the vicinity of the St. Lucie site—St. Lucie, Palm Beach, Martin, and Indian River Counties.

A search of the Florida Historical Markers Program (FDHR 2014-TN3878) revealed that there is one historic marker in St. Lucie County—a marker in Fort Pierce commemorating the founding of the county and Fort Pierce, the county seat. The marker is not near the St. Lucie site.

A National Register search of the indirect effects APE for the proposed transmission line corridor shows that, while no historic properties occur within the APE, two fall within several miles (NPS 2014-TN3882). The Captain Hammond House, in White City, lies roughly 1 mi to the north of the transmission line corridor as it proceeds east from the St. Lucie site. The Seminole Inn, in Indiantown, lies approximately 4 mi to the east of the corridor as it passes southward through Martin County.

While reconnaissance-level information indicates that there are no known historic properties located within the physical APE of the new plant, reconnaissance-level information shows that historic properties within 10 mi of the site and within 1 mi of the transmission line corridor are listed in the National Register. From previous studies on plant property, archaeological resources are known to occur approximately 1 mi to the north of the site. That said, no archaeological or architectural surveys have been conducted at the St. Lucie site for the current project, and locating the nuclear plants there would require formal cultural resources survey and consultation with SHPO, Tribes, and other interested parties. If any significant cultural, historic, or archaeological resources were identified, appropriate mitigation measures would need to be put in place before construction and operation.

Building Impacts

To accommodate the building of two nuclear units and associated facilities at the St. Lucie site, FPL estimates that the total area of land that would be disturbed would be approximately 357 ac for the facility itself. Because the site is within the 100-year floodplain of the Indian River Lagoon, FPL assumed in its ER that it would be necessary to import fill material from offsite. In addition, a 0.5 mi long heavy-haul road would need to be constructed, and a 22 mi long portion of SR-A1A would need to be widened. Cooling water would be drawn from the Atlantic Ocean, adjacent to the property, and would require approximately 10.5 ac of disturbance for required facilities. If the St. Lucie site were chosen for the proposed project, identification of cultural resources would be accomplished through additional cultural resource surveys and consultation

with the SHPO, Tribes, and interested parties. The results would be used in the site-planning process to address cultural resources impacts. If significant cultural resources were identified by these surveys, the review team assumes that FPL would use the same protective measures used at the Turkey Point site, and therefore the impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land-clearing, excavation, and grading activities could potentially destabilize important attributes of historic and cultural resources.

Section 9.3.5.1 describes the proposed transmission line corridors, which will extend for a distance of 63 mi, following existing corridors whenever possible. FPL has stated that consideration would be given to sensitive environmental and built resources in determining a route for the transmission lines (FPL 2014-TN4058), but visual impacts from transmission lines may result in significant alterations of the visual setting of cultural and historic resources within the geographic area of interest. Two properties listed in the National Register fall along the proposed transmission line corridor, though none occurs within the indirect effects APE. The Captain Hammond House lies roughly 1 mi from the transmission line corridor and the Seminole Inn lies roughly 4 mi from the corridor. In both of these areas, the proposed transmission line follows an existing transmission line corridor and any impacts stemming from the addition of another transmission line likely would be minor. If the St. Lucie site were chosen for the proposed project, the review team assumes that FPL would conduct its transmission line-related cultural resource surveys and procedures in a manner similar to that for the Turkey Point site. In addition, the review team assumes that the State of Florida's Final Order on Certification (State of Florida 2014-TN3637) regarding transmission line siting and building activities would also apply, and therefore impacts would be minimal. If direct effects on significant cultural resources could not be avoided, land-clearing, excavation, and grading activities could potentially destabilize important attributes of historic cultural resources. Similarly, both the transmission lines and nuclear power-generating units could indirectly affect cultural and historic resources through visual impacts on the setting of the resources. However, because the St. Lucie site is an existing power plant in an urban setting, and the transmission line corridor would follow an existing corridor where possible, construction of the new units at the St. Lucie site would not alter land use and likely would have a minimal impact on the industrial and urban character of the immediate area. While an estimated 202 structures would be displaced for the widening of SR-A1A, as discussed in Section. 9.3.5.5, none of these structures has been identified as a significant historic resource based on reconnaissance-level data.

Operations Impacts

Impacts on historic and cultural resources from the operation of two new nuclear power-generating units at the St. Lucie site include those associated with the operation of new units and maintenance of transmission lines. The review team assumes that the same procedures developed by FPL for the Turkey Point site, as well as the State of Florida's Final Order on Certification, would be used for onsite and offsite maintenance activities. Consequently, the incremental effects of the maintenance of transmission line corridors and operation of the two new units and associated impacts on the cultural resources would be negligible for the direct and indirect effects APEs.

Cumulative Impacts

Past actions in the geographic area of interest that have similarly affected historic and cultural resources include rural and agricultural development and activities associated with these land-disturbing activities such as road development. Table 9-21 lists past, present, and reasonably foreseeable projects and other actions that may contribute to cumulative impacts on historic and cultural resources in the geographic area of interest. Projects from Table 9-21 that are relevant to the cultural resources cumulative analysis include the High Speed Intercity Passenger Rail and future urbanization, such as new or expanded roads. These projects may significantly affect historic and cultural resources in a manner similar to those associated with the building and operation of two new nuclear power-generating units.

Long linear projects such as new or expanded roads and railway lines may intersect the proposed transmission line corridors. Because cultural resources can likely be avoided by long linear projects, impacts on cultural resources would likely be minimal. If building associated with such activities results in significant alterations of cultural resources in the transmission line corridors, either physical or visual, then cumulative impacts on cultural and historic resources would be greater.

Summary Statement

Cultural resources are nonrenewable. Therefore, the impact of the destruction of cultural resources is cumulative. Based on the information provided by FPL, and the review team's independent evaluation, the review team concludes that the cumulative impacts from building and operating two new nuclear generating units on the St. Lucie site would be SMALL. This impact-level determination is based on reconnaissance-level information and reflects the fact that there are no known cultural resources on the proposed site, and that the proposed transmission line corridor would follow an existing corridor, meaning indirect impacts on the visual setting would be negligible. It also assumes that, if the St. Lucie site were to be developed, cultural resource surveys and evaluations would be conducted and FPL, in consultation with SHPO, Tribes, and interested parties, would assess and resolve any adverse effects of the undertaking. If cultural or historic resources are present, including any of the buildings that would be removed by the widening of SR-A1A, and if there are adverse effects on those resources, the project could result in greater cumulative impacts.

9.3.5.8 Air Quality Impacts

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable actions that affect air quality, including other Federal and non-Federal projects listed in Table 9-21. As described in Section 9.3.5, the St. Lucie site area includes two current nuclear power plants—St. Lucie Units 1 and 2. The geographic area of interest for the St. Lucie site is St. Lucie County, which is in the Southeast Florida Intrastate Air Quality Control Region (40 CFR 81.49) (TN255).

Section 4.7 and 5.7 discuss air-quality impacts during building and operations. The emissions related to building and operating an additional nuclear power plant at the St. Lucie alternative site would be similar to those at the Turkey Point site. The air-quality attainment status for St. Lucie County, as set forth in 40 CFR Part 81 (TN255), reflects the effects of past and present

emissions from all pollutant sources in the region. St. Lucie County is in attainment of all National Ambient Air Quality Standards.

As described in Chapters 4 and 5, the criteria pollutants from building and operation were found to have a SMALL impact on air quality. In Chapter 7, the cumulative impacts of criteria pollutants were evaluated and also determined to be SMALL to MODERATE. Reflecting on the projects listed in Table 9-21 the most significant is the 300 MW natural-gas−fired plant (Florida Municipal Power – Treasure Coast Energy Center) operating 9 mi to the southwest of the St. Lucie alternative site. Emissions from power plants such as these are released through stacks and with significant momentum and buoyancy. Other industrial projects listed in Table 9-21 would likely have de minimis impacts because of their distance from the site. Given that these projects are subject to Clean Air Act permitting requirements, it is unlikely that the air quality in the region would degrade to the extent that the region would be in nonattainment of the National Ambient Air Quality Standards.

The air-quality impact from development of the St. Lucie site would be local and temporary. The applicant would develop a dust-control plan that identifies specific measures to minimize fugitive dust emissions during building activities. The distance from building activities to the site boundary would be sufficient to generally avoid significant air-quality impacts. There are no land uses or projects in Table 9-21, including the aforementioned sources, that would have emissions during site development that would, in combination with emissions from the St. Lucie site, result in degradation of air quality in the region. Emissions from operation of two new nuclear units at the St. Lucie site would be intermittent and made at low levels with little or no vertical velocity, similar to operational impacts at the Turkey Point site, as discussed in Section 5.7. The air-quality impacts of the Florida Municipal Power natural-gas−fired plant are included in the baseline air-quality status. The cumulative impacts from emissions of effluents from the St. Lucie site and the aforementioned sources would be noticeable but not destabilizing.

The cumulative impacts of GHG emissions related to nuclear power are discussed in Section 7.6. The impacts of the emissions are not sensitive to the location of the source. Consequently, the discussion in Section 7.6 is applicable to a nuclear power plant located at the St. Lucie site. The review team concludes that the national and worldwide cumulative impacts of GHG emissions are noticeable but not destabilizing. The review team further concludes that the cumulative impacts would be noticeable but not destabilizing, with or without the GHG emissions of two new nuclear units at the St. Lucie site.

The review team concludes that cumulative impacts from other past, present, and reasonably foreseeable future actions on air-quality resources in the geographic areas of interest would be SMALL to MODERATE for criteria pollutants and MODERATE for GHG emissions. The incremental contribution of impacts on air-quality resources from building and operating two units at the St. Lucie site would not be a significant contributor to the MODERATE impacts.

9.3.5.9 Nonradiological Health

The following analysis considers nonradiological health impacts from building and operating two new nuclear units at the St. Lucie site. The analysis also includes past, present, and reasonably foreseeable future actions that could contribute to cumulative nonradiological health impacts on site workers (construction and operation workers) and members of the public, including other

Federal and non-Federal projects and the projects listed in Table 9-21 that are within the geographic area of interest. Nonradiological health impacts at the St. Lucie site are estimated based on information provided by FPL and the review team's independent evaluation. For the analysis of nonradiological health impacts at the St. Lucie site, the geographic area of interest is the site and the immediate vicinity (~2 mi radius) and the associated road and transmission line corridors. This geographic area of interest is based on the localized nature of nonradiological health impacts and is expected to encompass all nonradiological health impacts.

Building activities that have the potential to affect the health of members of the public and workers at the St. Lucie site include exposure to dust and vehicle exhaust, occupational injuries, noise, and increased traffic associated with the transport of construction materials and personnel to and from the site. The operations-related activities that have the potential to affect the health of members of the public and workers include exposure to etiological (disease-causing) agents, noise, EMFs, occupational injuries, and impacts from the transport of workers to and from the site.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the St. Lucie site would be similar to those evaluated in Section 4.8 for the Turkey Point site. During the site-preparation and building phase FPL would comply with applicable Federal and State regulations on air quality and noise (FPL 2014-TN4058). The St. Lucie site is located in the vicinity of residential and commercial area. The distance between the site activities and the nearest residences (Section 9.3.5.5) is great enough that there should be no nonradiological health impacts from building and operating the units. The incidence of construction worker accidents would be the same as that for the Turkey Point site.

The review team concludes that nonradiological health impacts on construction workers and the public from building two new nuclear units and associated transmission lines at the St. Lucie site would be minimal. Nonradiological health impacts associated with traffic accidents during building activities at the St. Lucie alternative site were evaluated in Section 4.8.3 and the review team concludes that the impacts would be minimal.

Operations Impacts

Nonradiological health impacts on operation workers and members of the public would include those associated with the operation of cooling towers and transmission lines. Based on the configuration of the proposed new unit at the St. Lucie site (see Section 9.3.5), etiological agents may increase in the thermal plume area. The blowdown would be regulated by FDEP pursuant to 40 CFR Part 423 (TN253), and all discharges would be required to comply with limits established by FDEP in an NPDES permit. Impacts on workers' health from occupational injuries, noise, and EMFs would be similar to those described in Section 5.8 for the Turkey Point site. Noise and EMF exposure would be monitored and controlled in accordance with applicable OSHA regulations. Although no detailed noise modeling has been performed for the St. Lucie site, it is likely that noise impacts would be similar to those predicted for operations at the Turkey Point site. Effects of EMFs on human health would be controlled and minimized by conformance with National Electrical Safety Code criteria and adherence to the standards for transmission systems regulated by the FDEP.

The review team concludes that nonradiological health impacts on workers and the public from operating two new nuclear units and associated transmission lines at the St. Lucie site would be minimal. Impacts associated with traffic accidents during operations at the St. Lucie alternative site were evaluated in Section 5.8.6 and the review team concludes that the impacts would be minimal.

Cumulative Impacts

The past project identified in Table 9-21 within the geographic area of interest that could affect nonradiological human health in a similar way to the building of two nuclear units at the St. Lucie site is the two existing nuclear power reactors located adjacent to the proposed St. Lucie alternative site. There are no current construction projects occurring within the geographical area of interest that would affect nonradiological human health in a way similar to the building of two new nuclear units.

Reasonably foreseeable projects identified in Table 9-21 that could affect nonradiological human health at the St. Lucie site include various transportation (roads, traffic, pedestrian) projects that are planned throughout the region.

The past and present project within the geographic area of interest that could affect nonradiological human health in a way similar to operating two nuclear units at the St. Lucie site that was identified in Table 9-21 is the two existing and operational nuclear power reactors located adjacent to the proposed St. Lucie alternative site. There are no reasonably foreseeable future projects planned within the geographic area of interest that would affect nonradiological human health in a way similar to the operation of two new nuclear units at the St. Lucie site.

The review team concludes that the cumulative impacts on nonradiological health from building and operating two new nuclear units and associated road and transmission lines at the St. Lucie site would be minimal.

Summary Statement

Impacts on nonradiological health from the building and operation of two new units at the St. Lucie site are estimated based on the information provided by FPL and the review team's independent evaluation. Although there could be some future activities in the geographical area of interest could affect nonradiological health in ways similar to the building and operation of two new units at the St. Lucie site and associated offsite facilities, those impacts would be localized and managed through adherence to existing regulatory requirements. The review team concludes that nonradiological health impacts on workers and the public resulting from the building of two new nuclear units and associated transmission lines at the St. Lucie site would be minimal. The review team expects that the nonradiological health impacts on the operations employees and the public of two new nuclear units at the St. Lucie site would be minimal. Finally, the review team concludes that cumulative impacts on nonradiological health from past, present, and reasonably foreseeable actions in the geographic area of interest would be SMALL.

9.3.5.10 Radiological Impacts of Normal Operations

The following impact analysis includes impacts from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable actions that affect radiological health, including other Federal and non-Federal projects listed in Table 9-21. As described in Section 9.3.5, St. Lucie is a nuclear power plant site; St. Lucie 1 and 2 are currently the two nuclear facilities (i.e., nuclear power plants) on the site. The geographic area of interest is the area within a 50 mi radius of the St. Lucie site. St. Lucie Units 1 and 2 are the only major facilities within this geographic area of interest that potentially affect radiological health within the 50 mi radius of the St. Lucie site. However, there are likely to be medical, industrial, and research facilities within 50 mi of the St. Lucie site that use radioactive materials.

The radiological impacts of building and operating the two proposed Westinghouse AP1000 nuclear power units at the St. Lucie site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. These impacts are expected to be similar to those estimated for the Turkey Point site.

The radiological impacts of St. Lucie Units 1 and 2 include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways result in low doses to people and biota offsite that are well below regulatory limits as demonstrated by the ongoing radiological environmental monitoring program conducted around St. Lucie Units 1 and 2. The NRC staff concludes that the dose from direct radiation and effluents from hospitals and industrial facilities that use radioactive material would be an insignificant contribution to the cumulative impacts around the St. Lucie site. This conclusion is based on data from the radiological environmental monitoring programs conducted around currently operating nuclear power plants.

Based on the information provided by FPL and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed Westinghouse AP1000 nuclear power units and other existing and planned projects and actions in the geographic area of interest around the St. Lucie site would be SMALL.

9.3.5.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from the operation of two nuclear units at the St. Lucie alternative site. The analysis also considers other past, present, and reasonably foreseeable actions that affect radiological health from postulated accidents, including other Federal and non-Federal projects and the projects listed in Table 9-21. As described in Section 9.3.5, the St. Lucie site is a brownfield site; two nuclear units are currently located at the site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase the probability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the St. Lucie alternative site. Facilities potentially affecting radiological accident risk within this geographic area of interest are the existing two units—St. Lucie Units 1 and 2.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the Turkey Point site would be minimal for AP1000 reactors. DBAs are addressed

specifically to demonstrate that a reactor design is robust enough to meet NRC safety criteria. The environmental consequences of DBAs depend on the plant design and the atmospheric dispersion. The AP1000 design is independent of site conditions and the meteorology of the St. Lucie alternative and Turkey Point sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the St. Lucie alternative site would be minimal.

Because the meteorology, population density, and land values for the St. Lucie alternative site are similar to those of the proposed Turkey Point site, risks from a severe accident for an AP1000 reactor located at the St. Lucie alternative site are expected to be similar to those analyzed for the proposed Turkey Point site. The risks for the proposed Turkey Point site were presented in Tables 5-19 and 5-20 and are well below the median value for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028) (TN594). For existing plants within the geographic area of interest (St. Lucie Units 1 and 2), the Commission has determined that the probability-weighted consequences of severe accidents are small (10 CFR Part 51) (TN250), Appendix B, Table B-1). On this basis, the NRC staff concludes that the cumulative risks from severe accidents at any location within 50 mi of the St. Lucie alternative site would be SMALL.

9.3.6 Comparison of the Impacts of the Proposed Action and the Alternative Sites

This section summarizes the review team's characterization of the cumulative impacts related to locating a two-unit AP1000 nuclear power facility at the proposed Turkey Point site and at each alternative site. The four sites selected for detailed review as part of the alternative sites environmental analysis included the Glades site in Glades County, the Martin site in Martin County, the Okeechobee 2 site in Okeechobee County, and the St. Lucie site in St. Lucie County. Comparisons are made between the proposed site and alternatives to evaluate whether one of the alternative sites is environmentally preferable to the proposed site. The NRC's determination is independent of the USACE's determination under the 404 Guidelines of whether the Turkey Point site is the least environmentally damaging practical alternative (LEDPA). The USACE will conclude its analysis of both offsite and onsite alternatives in its Record of Decision. The need to compare the proposed site with alternative sites arises from the requirement in NEPA Section 102(2)(C)(iii) (42 U.S.C. § 4332 et seq.) (TN661) that EISs include an analysis of alternatives to the proposed action. The NRC criterion to be used in assessing whether a proposed site is to be rejected in favor of an alternative site is based on whether the alternative site is "obviously superior" to the site proposed by the applicant (NRC 1977-TN3867). An alternative site is "obviously superior" to the proposed site if it is "clearly and substantially" superior to the proposed site (NRC 1978-TN2636). The standard of obviously superior "...is designed to guarantee that a proposed site will not be rejected in favor of an alternate unless, on the basis of appropriate study, the Commission can be confident that such action is called for" (NECNP v. NRC 1978-TN2632).

The "obviously superior" test is appropriate for two reasons. First, the analysis performed by the NRC in evaluating alternative sites is necessarily imprecise. Key factors considered in the alternative site analysis, such as population distribution and density, hydrology, air quality, aquatic and terrestrial ecological resources, aesthetics, land use, and socioeconomics are difficult to quantify in common metrics. Given this difficulty, any evaluation of a particular site

must have a wide range of uncertainty. Second, the applicant's proposed site has been analyzed in detail, with the expectation that most of the adverse environmental impacts associated with the site have been identified. The alternative sites have not undergone a comparable level of detailed study. For these reasons, a proposed site may not be rejected in favor of an alternative site when the alternative site is marginally better than the proposed site, but only when it is obviously superior (NRC 1978-TN2636). NEPA does not require that a nuclear plant be constructed on the single best site for environmental purposes. Rather, "...all that NEPA requires is that alternative sites be considered and that the effects on the environment of building the plant at the alternative sites be carefully studied and factored into the ultimate decision" (NECNP v. NRC 1978-TN2632).

Section 9.3.6.1 discusses the process the review team used to compare cumulative impacts of the alternative sites to the proposed Turkey Point site and provides the final cumulative impact for each resource category. Cumulative impact levels from Chapter 7 (for the Turkey Point site), and the four alternative sites (from Sections 9.3.2 through 9.3.5) are listed in Table 9-28. Section 9.3.6.2 discusses the cumulative impacts of the proposed project located at the Turkey Point site and at the alternative sites as they relate to a determination of environmental preference or obvious superiority.

9.3.6.1 Comparison of Cumulative Impacts at the Proposed and Alternative Sites

The following section summarizes the review team's independent assessment of the proposed and alternative sites. The team characterized the expected cumulative environmental impacts of building and operating two new units at the Turkey Point site and alternative sites; these impacts are summarized by category in Table 9-28. Full explanations of the specific impact characterizations are provided cumulatively in Chapter 7 for the proposed site and in Sections 9.3.2, 9.3.3, 9.3.4, and 9.3.5 for each of the alternative sites. The review team's impact category levels are based on professional judgment, experience, and consideration of controls likely to be imposed under Federal, State, or local permits that would be acquired throughout the course of the COL application and review process. The considerations and assumptions were similarly applied at each of the alternative sites to provide a common basis for comparison. In the following discussion, the review team compares the impact levels between the proposed site and each alternative site.

The cumulative environmental impact areas listed in the table have been evaluated using the NRC's three-level standard of significance: SMALL, MODERATE, or LARGE. These levels were developed using CEQ guidelines and are set forth in the footnotes to Table B-1 of 10 CFR Part 51 (TN250), Subpart A, Appendix B:

- SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize important attributes of the resource.
- LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Table 9-28. Comparison of Cumulative Impacts at the Turkey Point and Alternative Sites

Resource Category	Turkey Point Site	Glades	Martin	Okeechobee 2	St. Lucie
Land Use	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Water-Related					
Surface-water use	SMALL	MODERATE	MODERATE	MODERATE	SMALL
Groundwater use	SMALL	SMALL	SMALL	SMALL	SMALL
Surface-water quality	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Groundwater quality	SMALL	SMALL	SMALL	SMALL	SMALL
Ecology					
Terrestrial and wetland ecosystems	MODERATE to LARGE	MODERATE	MODERATE	MODERATE	MODERATE
Aquatic ecosystems	MODERATE	MODERATE	MODERATE	MODERATE	SMALL to MODERATE
Socioeconomics					
Physical impacts	SMALL adverse except for MODERATE beneficial impacts on road quality	MODERATE adverse to SMALL beneficial impacts on road quality	MODERATE adverse to MODERATE beneficial impacts on road quality	MODERATE adverse to SMALL beneficial impacts on road quality	LARGE adverse to MODERATE beneficial impacts on road quality
Demography	SMALL	SMALL	SMALL	SMALL	SMALL, except for LARGE residential displacement impacts
Economic impacts on the community	SMALL and beneficial	SMALL and beneficial, except for LARGE and beneficial property tax revenues for Glades County and School District	SMALL and beneficial, except for MODERATE and beneficial property tax revenues for Martin County and School District	SMALL and beneficial, except for LARGE and beneficial property tax revenues for Okeechobee County and School District	SMALL and beneficial
Infrastructure and community services	SMALL except for MODERATE adverse impacts on traffic.	SMALL except for MODERATE adverse impacts on traffic.	SMALL except for MODERATE adverse impacts on traffic.	SMALL except for MODERATE adverse impacts on traffic.	SMALL except for MODERATE adverse impacts on traffic.
Environmental Justice	None[(a)]	None[(a)]	None[(a)]	None[(a)]	None[(a)]
Historic and Cultural Resources	MODERATE	MODERATE	SMALL	MODERATE	SMALL
Air Quality					
Criteria pollutants	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Greenhouse gas emissions	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Nonradiological Health	SMALL	SMALL	SMALL	SMALL	SMALL
Radiological Health	SMALL	SMALL	SMALL	SMALL	SMALL
Postulated Accidents	SMALL	SMALL	SMALL	SMALL	SMALL

(a) A determination of "NONE" for Environmental Justice analyses does not mean there are no adverse impacts on minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, the impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

9.3.6.2 Environmentally Preferable Sites

As shown in Table 9-28, the cumulative impacts of building and operating two new units at the proposed site and the alternative sites are characterized as SMALL for many resource areas. The resource areas for which the impact level at an alternative site is the same as that for the proposed site do not contribute to the alternative site being judged to be environmentally preferable to the proposed site. Therefore, these resource areas are not discussed further in determining whether an alternative site is environmentally preferable to the proposed site. The resource areas for which an alternative site has a different impact level than the proposed site are discussed further to determine whether an alternative site is environmentally preferable to the proposed site. Where there is a range of impacts for a resource, the upper value of the impacts is used for the comparison. In addition, for the cases in which the cumulative impacts for a resource are greater than SMALL, consideration is given to those cases in which the impacts of the project at the specific site do not make any significant contribution to the cumulative impact level. As shown in Table 9-28, there are some differences in impacts among the sites.

Glades Site

The cumulative impacts of building and operating two new nuclear units at the Glades site shown in Table 9-28 are similar to those for the Turkey Point site with six exceptions. The cumulative impacts for surface-water use are MODERATE at the Glades site, and SMALL at the Turkey Point site. However, building and operating new nuclear units at the Glades site would not be a significant contributor to the cumulative surface-water use impacts. Regarding the impacts on terrestrial ecology and wetlands, the impacts at the Glades site are shown as MODERATE, while the impacts at the Turkey Point site are shown as MODERATE to LARGE. However, the impacts directly attributable to the new plants at the Turkey Point site would be MODERATE. LARGE impacts, if they occur, would be as a result of impacts from other projects, and would occur regardless of whether Units 6 and 7 are built. Aesthetic impacts would be MODERATE at the Glades site because of the contrast with the surrounding environment, but they would be SMALL at the Turkey Point site. The post-construction physical impacts on road quality would be SMALL and beneficial at the Glades site but MODERATE and beneficial at the Turkey Point site. Regarding economic impacts on the community, the impacts at the Glades site are shown as SMALL and beneficial in the region, but LARGE and beneficial for the county and school district. For the Turkey Point site, the impacts are shown as SMALL and beneficial. The amount of taxes contributed by the new plants at the two sites would be the same and the difference occurs because the beginning tax base in Glades County is much smaller than in Miami-Dade County. Regarding the impacts of criteria pollutants, the impacts at the Glades site are shown as SMALL, while the impacts at the Turkey Point site are shown as SMALL to MODERATE. But the potential MODERATE impacts at the Turkey Point site are related to the existing gas-fired Unit 5, and are not related to the new nuclear units. Based on all of the information above, the NRC staff concludes that the differences between the two sites do not support a determination that the Glades site is environmentally preferable to the Turkey Point site. As discussed in Section 9.3.1.7, if it turns out that a water-storage reservoir would be required at the Glades site, then the impacts on some resources, particularly land use and terrestrial ecology, would be increased.

Martin Site

The cumulative impacts of building and operating two new nuclear units at the Martin site shown in Table 9-28 are similar to those for the Turkey Point site with six exceptions. The cumulative impacts for surface-water use are MODERATE at the Martin site, and SMALL at the Turkey Point site. However, building and operating new nuclear units at the Martin site would not be a significant contributor to the cumulative surface-water use impacts and, therefore, there is little real difference between these sites for this resource area. Regarding the impacts on terrestrial ecology and wetlands, the impacts at the Martin site are shown as MODERATE, while the impacts at the Turkey Point site are shown as MODERATE to LARGE. However, the impacts directly attributable to the new plants at the Turkey Point site would be MODERATE. LARGE impacts, if they occur, would be a result of impacts from other projects and would occur regardless of whether Units 6 and 7 are built. Aesthetic impacts would be MODERATE at the Martin site because of the contrast with the surrounding environment, but they would be SMALL at the Turkey Point site. Regarding economic impacts on the community, the impacts at the Martin site are shown as SMALL and beneficial in the region, but MODERATE and beneficial for the county and school district. For the Turkey Point site, the impacts are shown as SMALL and beneficial. The amount of taxes contributed by the new plants at the two sites would be the same and the difference occurs because the beginning tax base in Martin County is much smaller than in Miami-Dade County. The impacts of traffic at the Martin site are MODERATE to LARGE (depending on the timing of other projects in the area), while the impacts at the Turkey Point site are MODERATE. Finally, impacts on cultural and historic resources at the Turkey Point site are MODERATE because of visual impacts along the eastern corridor, while the impacts at the Martin site are SMALL because the new transmission lines are expected to follow the path of existing lines. Based on all of the information above, the NRC staff concludes that the differences between the two sites do not support a determination that the Martin site is environmentally preferable to the Turkey Point site. As discussed in Section 9.3.1.7, if it turns out that a water-storage reservoir would be required at the Martin site, then the impacts on some resources, particularly land use and terrestrial ecology, would be increased.

Okeechobee 2 Site

The cumulative impacts of building and operating two new nuclear units at the Okeechobee 2 site shown in Table 9-28 are similar to those for the Turkey Point site with five exceptions. The cumulative impacts for surface-water use are MODERATE at the Okeechobee 2 site, and SMALL at the Turkey Point site. However, building and operating new nuclear units at the Okeechobee 2 site would not be a significant contributor to the cumulative surface-water use impacts and, therefore, there is little real difference between these sites for this resource area. Regarding the impacts on terrestrial ecology and wetlands, the impacts at the Okeechobee 2 site are shown as MODERATE, while the impacts at the Turkey Point site are shown as MODERATE to LARGE. However, the impacts directly attributable to the new plants at the Turkey Point site would be MODERATE and would occur regardless of whether Units 6 and 7 are built. LARGE impacts, if they occur, would be a result of impacts from other projects. Aesthetic impacts would be MODERATE at the Okeechobee 2 site because of the contrast with the surrounding environment, but they would be SMALL at the Turkey Point site. The post-construction physical impacts on road quality would be SMALL and beneficial at the Okeechobee 2 site, but MODERATE and beneficial at the Turkey Point site. Regarding

economic impacts on the community, the impacts at the Okeechobee 2 site are shown as SMALL and beneficial in the region, but LARGE and beneficial for the county and school district. For the Turkey Point site, the impacts are shown as SMALL and beneficial. The amount of taxes contributed by the new plants at the two sites would be the same and the difference occurs because the beginning tax base in Okeechobee County is much smaller than in Miami-Dade County. Based on all of the information above, the NRC staff concludes that the differences between the two sites do not support a determination that the Okeechobee 2 site is environmentally preferable to the Turkey Point site. As discussed in Section 9.3.1.7, if it turns out that a water-storage reservoir would be required at the Okeechobee 2 site, then the impacts on some resources, particularly land use and terrestrial ecology, would be increased.

St. Lucie Site

The cumulative impacts of building and operating two new nuclear units at the St. Lucie site shown in Table 9-28 are similar to those for the Turkey Point site with five exceptions.

Regarding the impacts on terrestrial ecology and wetlands, the impacts at the St. Lucie site are shown as MODERATE, while the impacts at the Turkey Point site are shown as MODERATE to LARGE. However, the impacts directly attributable to the new plants at the Turkey Point site would be MODERATE and would occur regardless of whether Units 6 and 7 are built. LARGE impacts, if they occur, would be a result of impacts from other projects. Aquatic ecology impacts at the Turkey Point site would be MODERATE in comparison to the SMALL to MODERATE determination at St. Lucie. This primarily reflects the uncertainty related to the magnitude and extent of coastal environmental stressors that may occur in the future. All of the impacts that are greater than SMALL for these resource areas are a result of building and operating new units at these sites and so reflect a real difference in impacts. Regarding physical impacts on buildings, because of the extensive road widening on SR-A1A, impacts at the St. Lucie site would be LARGE and adverse, while there would be no similar impacts at the Turkey Point site. Regarding economic impacts on the community, the impacts at the St. Lucie site are shown as SMALL and beneficial in the region, but LARGE and beneficial for the county and school district. For the Turkey Point site, the impacts are shown as SMALL and beneficial. The amount of taxes contributed by the new plants at the two sites would be the same and the difference occurs because the beginning tax base in St. Lucie County is much smaller than in Miami-Dade County. Finally, the impacts on cultural and historic resources at the Turkey Point site are MODERATE because of visual impacts along the eastern corridor, while the impacts at the St. Lucie site are SMALL because the new transmission lines are expected to follow the path of existing lines. Based on all of the information above, the NRC staff concludes that the differences between the two sites do not support a determination that the St. Lucie site is environmentally preferable to the Turkey Point site.

9.3.6.3 Obviously Superior Sites

Because NRC staff determined that none of the alternative sites is environmentally preferable to the proposed site, none could be obviously superior, and no additional evaluations in that regard are required.

9.4 System Design Alternatives

The review team considered a variety of heat-dissipation systems and circulating-water system (CWS) alternatives. While other heat-dissipation systems and water systems are part of a nuclear power plant, the largest and most capable of causing environmental impacts is the CWS that cools and condenses the steam for the turbine generator. Other water systems, such as the service-water system, are much smaller than the CWS. As a result, the review team only considers alternative heat-dissipation and water-treatment systems for the CWS. The proposed CWS for Turkey Point Units 6 and 7 is a closed-cycle system that uses mechanical draft cooling towers for heat dissipation (FPL 2014-TN4058). The proposed system is discussed in detail in Chapter 3.

9.4.1 Heat-Dissipation Systems

About two-thirds of the heat from a commercial nuclear reactor is rejected as heat to the environment. The remaining one-third of the reactor-generated heat is converted into electricity. Normal heat-sink cooling systems transfer the rejected heat load into the atmosphere and/or nearby waterbodies, primarily as latent heat exchange (evaporating water) or sensible heat exchange (warmer air or water). Different heat-dissipation systems rely on different exchange processes. The following sections describe alternative heat-dissipation systems considered by the review team for proposed Turkey Point Units 6 and 7.

In its ER, FPL considered a range of CWS heat-dissipation systems, including a once-through cooling system and several closed-cycle cooling systems. In addition to the closed-cycle mechanical draft cooling towers selected, FPL considered natural draft cooling towers, once-through cooling into Biscayne Bay, cooling ponds, spray ponds, dry cooling towers, fan-assisted natural draft cooling towers, and a hybrid (combination wet-dry) cooling-tower system (FPL 2014-TN4058). In addition, the review team considered mechanical draft cooling towers with plume abatement.

9.4.1.1 Natural Draft Cooling Towers

Natural draft cooling towers, which use about the same amount of water as the proposed mechanical draft cooling towers, induce airflow up through large (e.g., 600 ft tall and 400 ft in diameter) towers by cascading warm water downward in the lower portion of the cooling tower. As heat transfers from the water to the air in the tower, the air becomes more buoyant and rises. This buoyant circulation induces more air to enter the tower through its open base. The environmental aspects of natural draft cooling towers and mechanical draft cooling towers are very similar (FPL 2014-TN4058). Because both rely on evaporation to dissipate the heat, water use is similar between natural and mechanical draft cooling towers; therefore, intake and discharge effects on aquatic biota would be similar. Notable differences include the fact that the natural draft cooling towers can be seen from a great distance and that the additional height increases the potential for avian collisions and bat collisions (NRC 2013-TN2654). It is unclear whether salt deposition from natural draft cooling towers would be greater than the deposition from mechanical draft cooling towers. However, the review team expects that all or most of the deposition would take place over nearby mangrove forests, which are adapted to high levels of sea spray. Therefore, the review team has determined that it is unlikely that the terrestrial impacts would be noticeably different.

Turkey Point Units 6 and 7 would be located adjacent to Biscayne National Park and natural draft cooling towers would impose a greater aesthetic impact. Also, the energy savings from using natural draft versus mechanical draft cooling towers are minimal. Therefore, the review team determined that natural draft cooling towers would not be an environmentally preferable alternative for the Turkey Point site.

9.4.1.2 Fan-Assisted Natural Draft Cooling Towers

Fan-assisted natural draft cooling towers are smaller than natural draft cooling towers but are designed to obtain a natural draft effect. The movement of air through the water being cooled is enhanced by fans arranged around the circumference of the cooling-tower shell. FPL indicates that for the Turkey Point site, fan-assisted natural draft cooling towers are a feasible alternative to the proposed design, although the power consumption to operate the towers would be higher and the noise levels generated would be slightly higher (FPL 2014-TN4058). Notable differences include the fact that the natural draft cooling towers can be seen from a greater distance and that the additional height increases the potential for avian collisions and bat collisions (NRC 1996-TN288). It is unclear whether salt deposition from fan-assisted natural draft cooling towers would be greater than the deposition from mechanical draft cooling towers. However, the review team expects that all or most of the deposition would take place over nearby mangrove forests, which are adapted to high levels of sea spray. Therefore the review team has determined that it is unlikely that the terrestrial impacts would be noticeably different. The review team concludes that, because the impacts of mechanical draft and fan-assisted natural draft cooling towers are similar, fan-assisted natural draft cooling towers would not be an environmentally preferable alternative for the Turkey Point site.

9.4.1.3 Once-Through Cooling

Once-through cooling systems withdraw water from the source waterbody and return virtually the same volume of water to the receiving waterbody at an elevated temperature. Typically the source waterbody and the receiving waterbody are the same body, and the intake and discharge structures are separated to limit recirculation. While there is essentially no consumptive use of water in a once-through heat-dissipation system, the elevated temperature of the receiving waterbody would result in some induced evaporative loss that decreases the net water supply. The elevated temperature can also adversely affect the biota of the receiving waterbody. The large intake flows would result in impingement and entrainment losses. Based on recent changes to implementation plans to meet Section 316(b) of the Clean Water Act (33 U.S.C. § 1344 et seq.) (TN1019), the review team has determined that once-through cooling systems for new nuclear reactors are unlikely to be permitted in the future, except in rare and unique situations.

If proposed Turkey Point Units 6 and 7 were to use once-through cooling with two AP1000 reactors, the review team determined that the water-supply needs for the two units would be approximately 1,700,000 gpm (FPL 2014-TN4058). FPL has determined that the only waterbody in the vicinity of Units 6 and 7 that could supply this quantity of water is Biscayne Bay, which is a National Park and has been designated as an aquatic preserve. For this reason, in addition to the Clean Water Act 316(b) considerations (33 U.S.C. § 1251 et seq.)

(TN662), the review team determined that once-through designs were not a feasible alternative design and eliminated them from further consideration as part of the Turkey Point Units 6 and 7 cooling system.

9.4.1.4 Cooling Pond

Existing Units 1 through 4 at the Turkey Point site use cooling canals to meet condenser cooling needs. The existing canals cover 5,900 ac. A pond approaching the size of the existing canals would be needed to support the proposed units (FPL 2014-TN4058). The dedication of an area of this size was weighed against the environmental impact from the selected design of the Turkey Point Units 6 and 7 cooling system. The review team determined that because of the impact of the loss of land and natural habitat, including designated critical habitat, associated with development of additional cooling ponds, a cooling system using a recirculating cooling pond was not an environmentally preferable alternative at the Turkey Point site.

9.4.1.5 Spray Ponds

Spray-pond cooling systems use manufactured ponds to cool water and enhance evaporative cooling by spraying water into the atmosphere. In addition to evaporation, heat transfer from the spray ponds to the atmosphere occurs through black-body radiation and conduction. A spray-pond system alternative was evaluated for cooling proposed Turkey Point Units 6 and 7, and it would require a 160 ac pond (FPL 2014-TN4058). Based on the additional land and natural habitat, including designated critical habitat, requirements to build the spray pond, and the possible impact from spray drift, the review team concludes that use of a spray pond would not be an environmentally preferable alternative for the Turkey Point site.

9.4.1.6 Dry Cooling Towers

Dry cooling towers have never been used to cool nuclear or fossil-fuel facilities of this size (i.e., approximately 2,400 MW(e). Dry cooling towers would eliminate virtually all water-related impacts from the cooling-system operation. No makeup water would be needed for cooling, and no blowdown water would be generated. This alternative could reduce water-use impacts. Dry cooling systems would be larger than the proposed cooling-tower systems, and would require more onsite land to accommodate the large dry cooling structures. Dry cooling systems can result in a significant loss of dependable electrical generation capacity, particularly during higher ambient temperature conditions, because the theoretical approach temperature is limited to the dry-bulb temperature and not the lower wet-bulb temperature. In other words, the temperature of the cooling water going back to the condenser can be no lower than the ambient air temperature. The review team determined that historical local air temperatures would result in the loss of generation at critical times of high demand for electricity due to the loss of sufficient condenser vacuum. The dry cooling-system design would not allow the plant to meet its stated goal as a baseload power source. Additional electrical losses occur with dry cooling because of the parasitic energy requirements of the large array of fans involved. This loss in generation efficiency translates into increased impacts on the fuel cycle. The review team therefore determined that building and operation of dry cooling towers would not be an environmentally preferable alternative for the Turkey Point site because of the loss of dependable electrical

generation capacity, particularly during higher ambient temperature conditions and reduced capacity, as well as inefficiencies in energy-production resulting in higher fuel-cycle impacts.

9.4.1.7 Combination Wet/Dry Cooling-Tower System

Combination wet/dry hybrid cooling towers have never been used to cool nuclear or fossil-fuel facilities of the size proposed by FPL (i.e., approximately 2,400 MW(e)). A mechanical draft wet/dry hybrid cooling-tower system uses both wet and dry cooling cells to limit consumption of cooling water, often with the added benefit of reducing plume visibility. Water used to cool the turbine generators generally passes first through the dry portion of the cooling tower where heat is removed by drawing air at ambient temperature over tubes through which the water is moving. Cooling water leaving the dry portion of the tower then passes through the wet tower where the water is sprayed into a moving air stream and additional heat is removed through evaporation and sensible heat transfer. When ambient air temperatures are low, the dry portion of these cooling towers may be sufficient to meet cooling needs. The use of the dry portion of the system would result in a loss in generating efficiency that would translate to increased impacts on the fuel cycle. As discussed in Chapter 5, the impacts of operating the proposed cooling system (mechanical draft tower) for aquatic ecology, water use, and water quality are SMALL. While a combination wet/dry cooling system would reduce water use, there would be an increase in fuel-cycle impacts because of the increased use of resources to generate electricity. Therefore, the review team concludes that the building and operation of a combined wet/dry cooling-tower system would not be an environmentally preferable alternative for the Turkey Point site.

9.4.1.8 Mechanical Draft Towers with Plume Abatement

Adding additional heat to a saturated cooling-tower exhaust, without adding additional water, would result in subsaturated water vapor. Subsaturated water vapor reduces the potential for a visible plume. The concept behind a mechanical draft cooling tower with plume abatement is similar to the wet/dry hybrid cooling system described above; the design parameters are focused on reducing the visual plume. Such designs may also result in slightly less consumptive water use. However, there is sufficient water at Turkey Point site for use of a mechanical draft cooling system without plume abatement. The aesthetic impacts at the Turkey Point site with a mechanical draft cooling tower without plume abatement were determined to be SMALL; therefore, a mechanical draft tower with plume abatement offers no significant advantage. These towers often have a larger footprint and require additional energy to operate, resulting in a net loss of energy available to meet the demand for power. For these reasons, the review team concludes that the building and operation of mechanical draft cooling towers with plume abatement would not be an environmentally preferable alternative for the Turkey Point site.

9.4.2 Circulating-Water Systems

The review team also evaluated alternatives to the proposed intakes and discharges for the normal heat-sink cooling system, based on the proposed heat-dissipation system water requirements. The capacity requirements of the intake and discharge system are defined by the proposed heat-dissipation system. For Turkey Point Units 6 and 7, the proposed heat-dissipation system is a closed-loop system that uses mechanical draft cooling towers for heat dissipation.

As indicated in Table 3-5, the maximum makeup water taken from the South District Wastewater Treatment Plant (SDWWTP) for two AP1000 units at the site would be 50,481 gpm (112 cfs) if reclaimed water is used (FPL 2014-TN4058) and the maximum makeup water withdrawn from radial collector wells would be 86,400 gpm (193 cfs) if saltwater is used (FPL 2014-TN4058).

9.4.2.1 Water Supplies

The proposed water supplies for Turkey Point Units 6 and 7 are described in detail in Chapter 3. Reclaimed water from the Miami-Dade Water and Sewer Department (MDWASD) would provide raw water to the CWSs of the proposed units under normal conditions. Saltwater obtained through radial collector wells with laterals extending beneath Biscayne Bay would provide raw water when water of sufficient quantity or quality is not available from the MDWASD (FPL 2014-TN4058). The impacts associated with the proposed water sources are discussed in Sections 4.2, 4.3, 5.2, and 5.3. As discussed in these sections, the overall impacts of the selected water-supply options would be SMALL.

Alternatives to the Primary Cooling-Water Supply

As mentioned above, reclaimed water from the MDWASD would provide raw water to the CWSs of the proposed units under normal conditions. In addition to the MDWASD, a broad range of water sources have been considered including marine sources, other surface-water sources, and groundwater sources.

Withdrawal of water from marine sources, including Biscayne Bay, Card Sound, and the Atlantic Ocean (including locations such as the barge-turning basin or Card Sound Canal), using conventional intake structures would result in some impingement and entrainment of aquatic species. In addition, activities associated with building a surface-water intake including dredging would also result in environmental disturbance and would be in conflict with Rule 62-4.242, “Antidegradation Permitting Requirements; Outstanding Florida Waters; Outstanding National Resource Waters; Equitable Abatement,” of the Florida Administrative Code (Fla. Admin. Code 62-4 -TN1084). As a result, the review team determined that these water sources are not environmentally preferable to the selected water source for the primary cooling-water supply.

Other surface-water sources, including the cooling canals of the industrial wastewater facility (IWF), and offsite sources such as a new freshwater reservoir were also considered. Withdrawal of cooling water from the cooling canals would induce groundwater from the Biscayne aquifer to flow into the cooling canals (FPL 2014-TN4058). In addition this would likely be considered to be in violation of Miami-Dade County Resolution Z-56-07, which requires that the operation of the proposed units does not withdraw any water from the Biscayne aquifer (Miami-Dade County 2007-TN1085). Use of fresh surface water from a new offsite reservoir or existing freshwater sources would likely have a greater environmental impact than the proposed alternative and is unlikely because SFWMD plans and Comprehensive Everglades Restoration Projects require use of freshwater for public water supply and environmental restoration. As a result it is unlikely that the required water volume would be permitted for industrial use.

Therefore, the review team determined that there were no alternative fresh surface-water sources that would be environmentally preferable to the proposed primary cooling-water source.

The review team considered several groundwater sources, including the Biscayne aquifer, the Upper Floridan aquifer, and the zone of the Lower Floridan aquifer that is commonly referred to as the Boulder Zone. Withdrawal of the large volumes of water needed to meet primary cooling-water needs for the proposed units from either the Biscayne aquifer or the Upper Floridan aquifer would certainly have an impact on water supply available to local users of these two resources and could potentially affect the quality of water in these aquifers. These impacts would exceed the impacts associated with the proposed primary cooling-water source and would be in violation of Miami-Dade County Resolution Z-56-07, which requires that the operation of the proposed units does not withdraw any water from the Biscayne aquifer or affect current users of the Floridan aquifer (Miami-Dade County 2007-TN1085).

The APPZ is a productive aquifer over 500 ft thick in some parts of Florida. However, the APPZ is thinner and less permeable near Turkey Point, where Reese and Richardson (2008-TN3436) show the APPZ being less than 100 ft thick and pinching out to the east. Therefore, the APPZ does not appear to be a viable option as a water source at the Turkey Point site.

The Boulder Zone is a zone of highly transmissive, cavernous limestone and dolomites located approximately 3,000 ft below land surface at the Turkey Point site. Water in the Boulder Zone has a salinity near that of seawater and approximately 37,000 mg/L total dissolved solids. FPL indicates that a well field would be constructed adjacent to the nuclear island if this alternative were selected (FPL 2014-TN4058).

The high transmissivities and cavernous nature of Boulder Zone indicate that 100 percent of the cooling-tower makeup water could be obtained from this source. No other withdrawals are made from this zone within 5 mi of the Turkey Point site, but this zone is used for wastewater disposal by the SDWWTP located 9 mi north of the site (FPL 2014-TN4058). Because FPL is planning to dispose of blowdown water to the Boulder Zone, sufficient separation between the deep-injection UIC wells and the withdrawal wells would need to be considered to prevent drawing the wastewater into the cooling-water intake wells. The construction of the pipelines needed to provide that separation and the disturbance of the land surface to construct either the UIC or withdrawal well field some distance from the site of Units 6 and 7 would have an environmental impact that would need to be considered. Use of the Boulder Zone as the primary water source would eliminate the environmental benefit of reducing direct ocean discharge that comes with the use of water from the MDWASD. Use of water from the Boulder Zone as the primary source of cooling water would be in violation of Miami-Dade County Resolution Z-56-07, which requires that the primary source of cooling water for the proposed units be reclaimed water from the MDWASD (Miami-Dade County 2007-TN1085). There is also a strong likelihood of recirculation occurring between the UIC wells used for disposal of blowdown and water-supply wells in the Boulder Zone and a likelihood of extracting water from the Boulder Zone containing contaminants injected through other UIC wells in the vicinity (FPL 2011-TN52). Withdrawal of water from either of these sources would be problematic for the cooling-water system. Therefore, the review team determined that there were no alternative groundwater sources that would be environmentally preferable to the proposed primary cooling-water source.

Alternatives to the Backup Cooling-Water Supply

As mentioned above, saltwater obtained through radial collector wells with laterals (horizontal collector lines) extending beneath Biscayne Bay would provide raw water when sufficient water is not available from the MDWASD. The review team considered a broad range of sources for water, including marine sources, other surface-water sources, and groundwater sources. Based on the analysis presented above for the primary cooling-water sources, the only sources identified for further consideration as backup water sources are the Boulder Zone and alternative locations for radial collector wells. Alternative locations of radial collector wells would require installation of a longer pipeline to transport cooling water to Units 6 and 7 with the associated environmental impacts. Neither of these options was identified by the review team as environmentally preferable to the use of radial collector wells as a backup water supply.

9.4.2.2 Intake Alternatives

The proposed systems to supply raw water for Turkey Point Units 6 and 7 are described in detail in Section 3.2.2.1. Reclaimed water from the MDWASD would provide raw water to the CWSs of the proposed units under normal conditions. Saltwater obtained through radial collector wells with laterals extending beneath Biscayne Bay would provide raw water when water of sufficient quality or quantity is not available from the MDWASD (FPL 2014-TN4058). These proposed raw water sources do not require cooling-water intake structures as defined by 40 CFR 125.83 (TN254). The environmental impacts of installing and operating these systems are discussed in Chapters 4 and 5.

Surface-Water Intake Structures

In addition to the radial collector well system selected by FPL, two alternative intake systems were considered: a shoreline intake structure and a passive offshore intake.

Shoreline Intake Structure

FPL identified the east bank of Card Sound Canal just south of the existing cooling canal system as a possible location for a conventional shoreline intake structure. The intake structure would be a conventional intake with a trash rack and traveling screens to keep material out of the pump forebays. The structure would include two forebays, each of which would contain three pumps. Two pumps from each set would supply water to one of the proposed units; the third pump in each bay would be on standby (FPL 2014-TN4058). Intake velocity would be less than 0.5 fps and the intake structure would have fish-return capability. The intake system would meet the requirements of Section 316(b) of the Clean Water Act related to impingement, entrainment, and aquatic monitoring (FPL 2014-TN4058). The structure would be approximately 60 ft wide and extend 50 ft back from the openings to Card Sound Canal (FPL 2014-TN4058). FPL indicates that excavation and installation of an intake structure at the Card Sound Canal location would affect wetlands (FPL 2014-TN4058).

Passive Offshore Intake

Generally, an offshore intake alternative has advantages if existing shoreline structures would conflict with a shoreline intake or if bathymetry or vegetation considerations make a shoreline intake less desirable. At the Turkey Point site, the conditions that would make an offshore intake advantageous in this way do not occur. However, the offshore intake design proposed by

FPL has certain advantages. FPL describes the proposed offshore intake system in the following way, “An alternate intake system on Card Sound Canal would consist of passive panel screens with polyhedron-shaped screens supported on a stainless steel frame and an air backwash unit. The polyhedron sides that are directed to the water surface are equipped with the screen panels made with special cling-free elements. The sides that are directed to the canal bed remain closed to avoid debris (sediment) ingress from the bed and for the optimum performance of air backwash. Air spray nozzles are arranged inside the polyhedron enabling a particularly effective screen backwash by pressurized air pulses” (FPL 2014-TN4058). Water would move from the offshore screen system to a wet well onshore that would house the pumps for pumping the water to proposed Turkey Point Units 6 and 7. The wet well structure would also contain the compressor for the air backwash system. The onshore structure associated with this intake design would be approximately the same size as the shoreline intake structure described above.

Environmental impacts from installation of the intakes and pipelines for the shoreline intake and the passive offshore intake would be equivalent because of the similar size of the onshore structure. Impacts on aquatic species due to entrainment and impingement may be less if the passive offshore intake were to be used, but in either case compliance with Section 316(b) of the Clean Water Act (33 U.S.C. § 1251 et seq.) (TN662) related to impingement, entrainment, and aquatic monitoring would result in minor impacts because of operation of either of these designs. The review team determined that neither of these intake designs would be environmentally preferable to the radial collector well system proposed by FPL because the land disturbance required for the radial collector well system is less than the land disturbance required to build the pipelines and intake structures associated with either the shoreline intake or the passive offshore intake located on Card Sound Canal.

9.4.2.3 Discharge Alternatives

FPL proposes to discharge blowdown from Turkey Point Units 6 and 7 to the Boulder Zone of the Lower Floridan aquifer through a series of UIC wells. A detailed description of the proposed discharge system is presented in Section 3.2.2.2. The impacts associated with the proposed discharge system are discussed in Sections 4.2, 4.3, 5.2, and 5.3. As discussed in these sections, the overall impacts of the deep-well injection discharge option would be SMALL.
A broad range of discharge alternatives for the cooling-water system have been considered, including discharge to the Atlantic Ocean, Biscayne Bay, Card Sound, the barge-turning basin, Card Sound Canal, the cooling canals of the IWF, rehydration of wetlands, and returning the water to the SDWWTP for disposal. Alternatives including discharge to the Atlantic Ocean, Biscayne Bay, and Card Sound are not considered environmentally preferable because of the anticipated environmental impacts of building and operating discharge facilities in these environments including the disturbance to the seafloor required to build the discharge facilities. In addition, Rule 62-4.242 of the Florida Administrative Code (Fla. Admin. Code 62-4 -TN1084) prohibits activities such as the dredging required to construct a shoreline or offshore diffuser that would degrade the water quality of Outstanding Florida Waters. Discharge to Card Sound Canal and the barge-turning basin are not considered environmentally preferable to the selected alternative because these waterbodies discharge directly to Card Sound or Biscayne Bay and the discharge of heated water to these waterbodies would likely have a greater environmental impact than the selected alternative. When saline water from the radial collector wells is used

for cooling, the blowdown water would also have a salinity higher than the receiving water, which would likely contribute to a higher environmental impact than the selected alternative. Blowdown water would likely not meet acceptance criteria for rehydration of wetlands or return of the water to the SDWWTP, especially when saltwater was being used as the source of cooling water (FPL 2014-TN4058).

Discharge of cooling water to the cooling canals of the IWF would contribute to existing concerns that hypersaline water from the cooling canals is degrading water quality in the Biscayne aquifer in the vicinity of the Turkey Point site. Therefore, the review team determined that there were no alternative discharge designs that would be environmentally preferable to the proposed discharge design.

9.4.2.4 Water Treatment

Both inflow and effluent water may require treatment to ensure that they meet plant water needs and effluent water standards. As described in Section 3.4.2.2, FPL proposes to add chemicals to plant water to meet appropriate water-quality process needs. Deep-injection well discharge would be subject to the provisions of the UIC Rule in 62-528 of the Florida Administrative Code (Fla. Admin. Code 62-528 -TN556) and the conditions of the UIC permit (FPL 2014-TN4058).

The largest chemical inputs are required to maintain the appropriate chemistry in the cooling towers to preclude biofouling. Mechanical treatment is generally not a viable option in cooling-tower designs. Other alternatives to preclude biofouling, such as ultraviolet treatment, are feasible, but would not eliminate the need for some chemical treatment. Chemical treatment is a reliable and well-established engineering practice that has been shown to provide minimal impacts in a variety of settings. The review team identified no environmentally preferable alternative to FPL's proposed chemical water treatment.

9.4.3 Summary Statement

The review team considered various alternative systems designs, including eight alternative heat-dissipation systems and multiple alternative intake, discharge, and water-supply systems. The review team identified no alternatives that were environmentally preferable to the proposed Turkey Point Units 6 and 7 plant systems design.

9.5 U.S. Army Corps of Engineers Alternatives Evaluation

The 404(b)(1) Guidelines (40 CFR Part 230) (TN427) require that no discharge of dredged or fill material into waters of the United States (including jurisdictional wetlands) shall be permitted if there is a practicable alternative that would have a less adverse impact on the aquatic environment, as long as the alternative does not have other significant adverse environmental consequences. An alternative is practicable if it is available and capable of being implemented after taking into consideration cost, existing technology, and logistics in light of overall project purposes. If it is otherwise a practicable alternative, an area not presently owned by the applicant that could reasonably be obtained, used, expanded, or managed in order to fulfill the basic purpose of the proposed activity may be considered. Thus, this analysis is necessary to determine which alternative is the LEDPA (least environmentally damaging practicable alternative) that meets the project purpose and need. Even if an applicant's proposed

alternative is determined to be the LEDPA, the USACE must still determine whether the LEDPA is contrary to the public interest. The USACE Public Interest Review, described in 33 CFR 320.4 (TN424) (and further discussed in Appendix I), directs the USACE to consider a number of factors in a balancing process to determine whether a proposed project is contrary to the public interest. A permit would not be issued for an alternative that is not the LEDPA, nor would a permit be issued for an activity that is determined to be contrary to the public interest. The USACE will conclude its Clean Water Act Section 404(b)(1) Guidelines and public interest analyses in its Record of Decision.

10.0 Conclusions and Recommendations

By letter dated June 30, 2009 (FPL 2009-TN1229), as supplemented by a letter dated August 7, 2009 (FPL 2009-TN1230), the Florida Power & Light Company (FPL) applied to the U.S. Nuclear Regulatory Commission (NRC or the Commission) for two combined construction permits and operating licenses (combined licenses or COLs) for the proposed Turkey Point Units 6 and 7 (COL application). The NRC review team's evaluation of the environmental impacts of the proposed action is based on the October 29, 2014 revision of the COL application (FPL 2014-TN4102), including the Environmental Report (ER) (FPL 2014-TN4058), responses to requests for additional information, and supplemental information. Documents supporting the review team's evaluation are listed as references where appropriate.

The site proposed by FPL for the two new nuclear units is the Turkey Point site in southeastern Miami-Dade County, Florida. The Turkey Point site is an approximately 9,460 ac site that includes five existing power plants. Units 1 and 2 have been operated as natural-gas/oil steam-generating units. Unit 2 was converted to operate in synchronous condenser mode. Unit 1 will be converted to operate in synchronous condenser mode in late 2016 (FPL 2016-TN4579). In the synchronous condenser mode, the generators help stabilize and optimize grid performance but do not generate power. Units 3 and 4 are nuclear pressurized water reactors, and Unit 5 is a natural-gas combined-cycle steam-generating unit. The proposed plant area is south of Turkey Point Units 3 and 4 on approximately 218 ac of the Turkey Point site property (FPL 2014-TN4058). The proposed Turkey Point Units 6 and 7 would be owned by FPL (2014-TN4058). With the exception of the transmission systems needed to route power from the proposed units, and the pipelines needed to bring reclaimed water to the Turkey Point site, all of the construction and operation related to proposed Turkey Point Units 6 and 7 would be completely within the confines of the Turkey Point site (FPL 2014-TN4058).

On June 30, 2009, the U.S. Army Corps of Engineers (USACE) received a Department of the Army (DA) permit application from FPL to construct the proposed Turkey Point Units 6 and 7, reclaimed-water facility, access roads, radial collector wells, pipelines, transmission lines, and other related infrastructure. The proposed work would result in the alteration of waters of the United States, including wetlands. The USACE is participating as a cooperating agency with the NRC in preparing this environmental impact statement (EIS). The USACE published a public notice of FPL's DA permit application on March 9, 2015. The USACE's consideration of public comments received in response to this public notice will be reflected in the public interest review and Clean Water Act (CWA) Section 404(b)(1) analysis in the USACE's Record of Decision.

On June 30, 2009, FPL submitted a Site Certification Application (SCA) to the State of Florida Department of Environmental Protection for the proposed Turkey Point Units 6 and 7 and ancillary facilities (FPL 2010-TN1231). The SCA process provides a Certification that encompasses all licenses and permits needed for affected Florida State, regional, and local agencies. It also includes any regulatory activity that would be applicable under these agencies' regulations for proposed Turkey Point Units 6 and 7 (FDEP 2013-TN2629). On May 19, 2014, the State of Florida issued final Conditions of Certification to FPL authorizing construction, operation, and maintenance of proposed Turkey Point Units 6 and 7 and associated facilities

(State of Florida 2014-TN3637). The final Conditions of Certification issued are binding and subject to the requirements listed in State of Florida (2014-TN3637). Although the opinion remands the Conditions of Certification to the Florida Siting Board for consideration of the possibility of burying a portion of the transmission lines and reconsideration of the specified mitigation measures, the NRC staff understands that the court's opinion is not yet final as of this writing (October 3, 2016). Accordingly, for the purposes of the FEIS evaluation of impacts, the NRC staff considers the transmission line route and conditions reviewed and approved by the Florida Siting Board as the most current information regarding the transmission line and associated potential mitigation measures. Even if the Conditions of Certification are revisited, the NRC staff considers it reasonable to expect that Conditions of Certification similar to or no less effective than those originally issued will be in place before construction and operation of the proposed units begins.

Section 102 of the National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. § 4321 et seq.) (TN661) directs that an EIS is required for a major Federal action that significantly affects the quality of the human environment. Section 102(2)(C) of NEPA requires that an EIS include information about the following:

- the environmental impact of the proposed action
- any adverse environmental effects that cannot be avoided should the proposal be implemented
- alternatives to the proposed action
- the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity
- irreversible and irretrievable commitments of resources that would be involved if the proposed action is implemented.

NRC has included regulatory provisions for meeting NEPA in Title 10 of the *Code of Federal Regulations* (CFR) Part 51. In 10 CFR 51.20 (TN250), the NRC requires preparation of an EIS for issuance of a COL. Subpart C of 10 CFR Part 52 (TN251) contains the NRC regulations related to applications for COL's.

The proposed actions related to the Units 6 and 7 application are (1) the NRC issuance of COLs for construction and operation of two new nuclear units at the Turkey Point site in Miami-Dade County, Florida, and (2) DA authorization pursuant to Section 404 of the Federal Water Pollution Control Act (Clean Water Act), as amended (33 U.S.C. § 1344) (TN662), Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 403) (TN4768), and Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 408) (TN4769). The DA permit application requests authorization to discharge fill into approximately 1,000 ac of waters of the United States, including jurisdictional wetlands, to construct structures beneath navigable waters of the United States such as radial collector wells, and to expand the existing barge-unloading area in navigable waters of the United States. The environmental review described in this EIS was conducted by a review team consisting of NRC staff, its contractor's staff, and staff from the USACE. During the course of preparing this EIS, the review team reviewed the ER submitted by FPL (FPL 2014-TN4058) and supplemental documentation; consulted with Federal, State,

Tribal, and local agencies; and followed the guidance set forth in NUREG–1555, *Environmental Standard Review Plans* (NRC 2000-TN614), and NUREG–0800, *Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants* (NRC 2007-TN613). In addition, the NRC considered the public comments related to the environmental review received during the scoping process. The public comments are provided in Appendix D.

Included in this EIS are (1) the results of the NRC staff's analyses, which consider and weigh the environmental effects of the proposed action and of constructing and operating two new nuclear units at the Turkey Point site; (2) mitigation measures for reducing or avoiding adverse effects; (3) the environmental impacts of alternatives to the proposed action; and (4) the NRC staff's recommendation regarding the proposed action based on its environmental review. The COL application references a specific reactor design.

The USACE is a cooperating agency with the NRC, which is serving as the lead agency in the development of this EIS. The USACE has participated as a member of the review team. In carrying out its regulatory responsibilities, the USACE will complete an independent evaluation of the applicant's DA permit application to determine whether to issue, issue with modifications, or deny a DA permit for this project. This decision will be documented in the USACE's Record of Decision (ROD). The decision about whether to issue a DA permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended effect on the public interest. Evaluation of the probable impacts that the proposed activities may have on the public interest requires a careful weighing of all of the factors relevant in each particular case. A decision by the USACE to authorize this proposal, and if so, the conditions under which it will be allowed to occur, are therefore determined by the outcome of this general balancing process.

By acting as a cooperating agency on the development of the EIS, USACE plans to adopt the EIS in its ROD. The USACE will also include any additional information and analyses required to support its permit decision to issue the DA permit, deny the DA permit, or issue the DA permit with modifications. The USACE's role as a cooperating agency in the preparation of this EIS is to ensure to the maximum extent practicable that the information presented is adequate to fulfill the requirements of USACE regulations. The Clean Water Act, Section 404(b)(1) "Guidelines for Specification of Disposal Sites for Dredged or Fill Material" (40 CFR Part 230) (TN427), contains the substantive environmental criteria used by USACE in evaluating proposed discharges of dredged or fill material into waters of the United States. USACE's Public Interest Review (PIR) (33 CFR § 320.4) (TN424) directs the USACE to consider a number of factors as part of a balanced evaluation process in order to determine whether the proposed project is contrary to the public interest. USACE's Section 404(b)(1) analysis and PIR will be part of its ROD and will not be addressed in this EIS. The following general criteria are considered in the evaluation of every application:

- the relative extent of the public and private need for the proposed structure or work;
- where there are unresolved conflicts about resource use, the practicability of using practicable and reasonable alternative locations and methods to accomplish the objective of the proposed structure or work; and
- the extent and permanence of the beneficial and/or detrimental effects that the proposed structure or work is likely to have on the public and private uses to which the area is suited.

As part of the USACE public comment process, USACE published a public notice on March 9, 2015 to solicit comments from the public regarding FPL's DA permit application for proposed work at the Turkey Point site. The USACE's consideration of the public comments received in response to this public notice will be reflected in the PIR and CWA Section 404(b)(1) analysis in the USACE's ROD.

Environmental issues are evaluated using the three-level standard of significance—SMALL, MODERATE, or LARGE—developed by the NRC based on the Council on Environmental Quality (CEQ) guidelines (40 CFR 1508.27) (TN428). Table B-1 of 10 CFR Part 51 (TN250), Subpart A, Appendix B, provides the following definitions of the three significance levels:

> SMALL – Environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.
>
> MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
>
> LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Mitigation measures were considered for each environmental issue and are discussed in the appropriate sections. During its environmental review, the review team considered planned activities and actions that FPL indicates it and others would likely take if FPL receives the COLs. In addition, FPL provided estimates of the environmental impacts resulting from the building and operation of two new nuclear units on the Turkey Point site.

10.1 Impacts of the Proposed Action

In a final rule dated October 9, 2007 (72 FR 57416) (TN260), the Commission limited the definition of "construction" to those activities that fall within its regulatory authority (10 CFR 51.4) (TN250). Many of the activities undertaken to build a nuclear power plant do not have any effect on nuclear safety issues, are not within the NRC's licensing authority over nuclear power reactors and, therefore, are not part of the NRC action to license the plant Turkey Point Units 6 and 7. The activities associated with building the plant that are not within the purview of the NRC are grouped under the term "preconstruction." Preconstruction activities include clearing and grading, excavating, erection of support buildings and transmission lines, and other associated activities. To at least some extent, these activities would be necessary to build any thermal power plant. Because preconstruction activities are not part of the NRC action, their impacts are not reviewed as a direct effect of the NRC action. Rather, the impacts of the preconstruction activities are considered in the context of cumulative impacts. Although the preconstruction activities are not part of the NRC action, certain preconstruction activities require permits from the USACE, as well as other Federal, State, and local agencies.

Chapter 4 describes the relative magnitude of impacts related to preconstruction and construction activities and provides a summary of impacts in Table 4-19. Impacts associated with operation of the proposed facilities are discussed in Chapter 5 and are summarized in Table 5-24. Chapter 6 describes the impacts associated with the fuel cycle, transportation, and

decommissioning. Chapter 7 describes the impacts associated with preconstruction and construction activities and operation of Turkey Point Units 6 and 7 when considered along with the cumulative impacts of other past, present, and reasonably foreseeable future projects in the geographical region around the Turkey Point site.

10.2 Unavoidable Adverse Environmental Impacts

Section 102(2)(C)(ii) of NEPA (42 U.S.C. § 4321 et seq.) (TN661) requires that an EIS include information about any adverse environmental effects that cannot be avoided if the proposal is implemented. Unavoidable adverse environmental impacts are the potential impacts of the NRC and USACE actions that cannot be avoided and for which no practical means of mitigation are available.

The unavoidable adverse environmental impacts associated with the granting of the COLs for Turkey Point Units 6 and 7 would include impacts of both construction and operation.

10.2.1 Unavoidable Adverse Impacts during Construction and Preconstruction Activities

Chapter 4 discusses in detail the potential impacts from construction and preconstruction of the proposed Units 6 and 7 at the Turkey Point site and presents mitigation and controls intended to lessen the adverse impacts. Table 10-1 presents adverse impacts associated with construction and preconstruction activities on each of the resource areas evaluated in this EIS as well as the mitigation measures that would reduce the impacts. The impacts remaining after mitigation has been applied are identified in the table as the unavoidable adverse impacts. Unavoidable adverse impacts are the result of both construction and preconstruction activities, unless otherwise noted. The impact determinations in Table 10-1 are for the combined impacts of construction and preconstruction, but the impact determinations for NRC-regulated construction are the same for water use, water quality, aquatic ecology, socioeconomic and environmental justice, air quality, and nonradiological and radiological health resource areas. The impact determinations for preconstruction activities and NRC-related construction are different for land use, terrestrial and wetland ecosystems, and historic and cultural resources. For the impact determinations that differ for the NRC-regulated activities, the impacts from the NRC-regulated activities are discussed below the table.

The unavoidable adverse impacts are primarily attributable to preconstruction activities due to the initial land disturbance from clearing the land, land use, excavation, excavation dewatering, filling wetlands and waterways, adding impervious surfaces, and dredging. NRC-authorized construction activities partially contribute to most of the unavoidable adverse impacts. Approximately 585 ac within the Turkey Point Units 6 and 7 project boundary would be permanently disturbed. Areas disturbed to build these project features would be permanently converted to structures, pavement, and intensively maintained exterior grounds. These onsite disturbances would be in close proximity to, and visible from, portions of Biscayne National Park. Building and operating offsite facilities such as transmission lines, pipelines, and access roads would require the loss and fragmentation of mangrove forests, pine rocklands, and other natural habitats offsite, and these linear facilities could interfere with urban land uses adjacent to or traversed by the rights-of-way.

Table 10-1. Unavoidable Adverse Environmental Impacts from Construction and Preconstruction Activities

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
Land Use	MODERATE (NRC-authorized construction impact level is SMALL)	Comply with requirements of applicable Federal, State, and local permits and the State final Conditions of Certification.	The project would require a permanent commitment (through decommissioning) of approximately 585 ac of land on the Turkey Point site. Additional areas of land offsite would be occupied by rights-of-way accommodating various pipelines, transmission lines, and access roads. Land uses not related to facility operation (e.g., agriculture) in the rights-of-way would be limited but not necessarily precluded.
Water Use	SMALL	Comply with requirements of applicable Federal, State, and local permits and the State final Conditions of Certification.	Limited withdrawal of small amounts of groundwater from the Biscayne aquifer from excavation dewatering when building the plants.
Water Quality	SMALL	Comply with requirements of applicable Federal, State, and local permits and the State final Conditions of Certification.	
Ecological (Terrestrial)	MODERATE (NRC-authorized construction impact level is SMALL)	Compensatory mitigation for unavoidable wetland impacts through Federally approved mitigation bank, in-lieu fee program, or permittee responsible mitigation. Additional mitigation measures tailored to specific species listed under the Endangered Species Act are expected to be required by the U.S. Fish and Wildlife Service.	Permanent loss of mangroves and other wetland habitats and pine rockland and other upland habitats, habitat fragmentation by pipelines and transmission lines, and increased mortality risk to certain listed species.
Ecological (Aquatic)	SMALL to MODERATE	Follow FPL and other agency protocols and requirements for protecting American crocodile, Smalltooth Sawfish, Nassau Grouper, manatees, and sea turtles.	Permanent loss of some onsite aquatic environments, some disturbance, and possible disturbance of manatees, Smalltooth Sawfish, Nassau Grouper, and sea turtles. 270 ac of permanent critical habitat loss and 211 ac that would be adversely affected for resident American crocodiles.

Table 10-1. (contd)

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
Socioeconomics			
Physical Impacts	SMALL (adverse) to MODERATE (beneficial)	Physical impacts attenuate rapidly with distance, intervening foliage, and terrain. No mitigation beyond that identified by the applicant would be warranted.	All adverse physical impacts would be minor.
Demography	SMALL	Impacts would be minor and no mitigation would be warranted.	Minor impacts on the demographics of Miami-Dade County, and the communities of Homestead and Florida City.
Economic Impacts on Community	SMALL (beneficial)	None.	None.
Infrastructure and Community Services	SMALL (adverse) to MODERATE (beneficial)	Road improvements would mitigate but not eliminate adverse traffic-related impacts during construction. Those impacts would stop when construction is complete, so no further mitigation beyond that identified by the applicant would be warranted.	Noticeable but not destabilizing impacts on traffic near the plant during construction. All other infrastructure impacts would be minor.
Environmental Justice	NONE[(a)]	Mitigation would not be warranted, given the lack of environmental justice impacts.	There are no pathways by which minority or low-income populations would receive a disproportionately high and adverse impact.
Historic and Cultural Resources	MODERATE (NRC-authorized construction impact level is SMALL)	Construction-related impacts on cultural resources likely would consist of indirect visual impacts on historic built resources within the APEs for the transmission line corridors. The USACE would develop mitigation measures in consultation with the Florida (FL) SHPO. Further, in consultation between FPL and the FL SHPO, FPL has agreed to develop a work plan for additional cultural resources studies that are required for the transmission line	Based on NRC's evaluation, it is anticipated that there would be indirect visual impacts on National Register-eligible built resources in the transmission line corridor. Specific impacts are to be determined, based on USACE evaluation of impacts of transmission lines on cultural resources.

Table 10-1. (contd)

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
		corridors and other offsite facilities. Prior to construction, FPL has also agreed to develop an unanticipated discovery plan for the treatment of cultural resources inadvertently discovered during construction or maintenance.	
Meteorology and Air Quality	SMALL	Implement a dust-control plan prior to site preparation. Obtain required air-quality permits.	None
Nonradiological Health	SMALL	Comply with Federal, State, and local regulations governing construction activities and construction vehicle emissions; comply with Federal and local noise-control ordinances; comply with Federal and State occupational safety and health regulations; and implement traffic management plan.	Dust emissions, noise, occupational injuries, traffic accidents.
Radiological Health	SMALL	Maintain doses to construction workers below NRC public dose limits.	Small doses to construction workers that would be less than NRC public dose limits.
Nonradioactive Waste	SMALL	Manage hazardous and nonhazardous solid wastes according to county, State, and Federal handling and transportation regulations; implement recycling and BMPs to minimize waste generation.	Minor decrease in available capacity of waste treatment and disposal facilities. Minor stormwater, wastewater, and atmospheric discharges.

APE = Area of Potential Effect
BMP = Best Management Practice
SHPO = State Historic Preservation Office.
SWPPP = Stormwater Pollution Prevention Plan.
(a) A determination of “NONE” for environmental justice analyses does not mean there are no adverse impacts on minority or low-income populations from the proposed project. Instead, an indication of “NONE” means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

Unavoidable adverse impacts on terrestrial resources and wetlands include permanent loss of wetlands and uplands. Both Federally and State-listed species would be affected, in addition to other important species such as wading birds. Transmission line construction would fragment

habitat and permanently affect pine rocklands that are designated as critical habitat for listed species. Preconstruction surveys would be conducted to determine final effects as well as to support appropriate minimization and avoidance activities.

Adverse impacts on aquatic resources are generally minor with exceptions of noticeable changes in the critical habitat of the American crocodile. Additional crocodile takes also could occur during preconstruction and construction. All other adverse impacts, such as noise and vibration affecting sea turtles, would likely be undetectable, temporary, or so minor that they would not noticeably alter the resource. Mitigation would be required by the State (State of Florida 2014-TN3637) and other Federal agencies.

Adverse socioeconomic impacts are generally minor for all categories, with the exceptions of noticeable but not destabilizing traffic-related impacts near the site (primarily at construction worker shift change). Traffic impacts without mitigation as described by the applicant would be destabilizing. The review team identified no pathways by which any minority or low-income populations would experience a disproportionately high and adverse impact, so there are no environmental justice impacts warranting mitigation.

Anticipated impacts on cultural resources would likely result from indirect visual impacts on above-ground resources within or within the vicinity of the transmission lines corridors. Because building of transmission lines is not an NRC-regulated activity, and because no cultural resources have been identified within the Units 6 and 7 plant area, impacts on historic and cultural resources from NRC-regulated activities would be small, and no mitigation beyond FPL's commitment to develop an unanticipated discoveries plan would be warranted.

Air-quality impacts include temporary degradation due to vehicle emissions and fugitive dust emissions during ground clearing, grading, excavation activities, and operation of other temporary sources. Fugitive dust from land disturbances and building activities would be mitigated by the dust-control plan.

10.2.2 Unavoidable Adverse Impacts during Operation

Chapter 5 provides a detailed discussion of the potential impacts from operation of proposed Units 6 and 7 at the Turkey Point site and presents anticipated mitigation and controls intended to lessen the adverse impacts. Table 10-2 presents the adverse impacts on each of the resource areas evaluated in this EIS associated with operation of the two proposed units, and the anticipated mitigation measures that would reduce the impacts. The impacts remaining after mitigation is applied are identified in the table as the unavoidable adverse impacts.

The unavoidable adverse impacts from operation for land use would be minimal and are associated with making land unavailable for other uses until after decommissioning of the two proposed units.

Unavoidable adverse impacts on land use resulting from operation of proposed Turkey Point Units 6 and 7 would be minimal because the land to be used for operations is land that has been previously disturbed and established for power-generation purposes and associated

activities. Operation and maintenance of permanent site-access roadways and pipelines would be compatible with the current land uses and would not affect any existing or planned land uses.

Operation and maintenance of transmission lines would also be generally compatible with the current land uses and would not substantially affect any existing or planned land uses. However, Miami-Dade County and cities within the county have raised issues related to the aesthetic compatibility of parts of the proposed new transmission lines with some urban areas. In addition, the National Park Service has raised compatibility questions regarding where parts of the proposed transmission lines would be situated adjacent to Everglades National Park.

Table 10-2. Unavoidable Adverse Environmental Impacts from Operation

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
Land Use	MODERATE	Comply with requirements of applicable Federal, State, and local permits and the State final Conditions of Certification.	Transmission lines in urban areas and near the Everglades National Park could conflict with existing land uses. Onsite facilities would be in close proximity to Biscayne National Park.
Water Use	SMALL	Comply with requirements of applicable Federal, State, and local permits and the State final Conditions of Certification.	Additional demand for potable water from the Miami-Dade Water and Sewer Department. Limited withdrawal of small amounts of groundwater from the Biscayne aquifer when radial collector wells are operated.
Water Quality	SMALL	Comply with requirements of applicable Federal, State, and local permits and the State final Conditions of Certification.	Cooling-tower drift deposition of small amounts of chemical contaminants on portions of Biscayne Bay.
Ecological (Terrestrial)	MODERATE	Prescribed listed species-specific management. Transmission line marking and wood stork behavioral observation.	Right-of-way maintenance activities in or near wetlands and proposed critical habitat. Increased vehicle collision risk mortality to the Florida panther, vegetation-control effects on listed plants, and transmission system impacts on wood storks and Everglade snail kites.
Ecological (Aquatic)	SMALL	Comply with requirements, including those for protected species and habitats, of applicable Federal, State, and local permits and the State final Conditions of Certification.	During limited radial collector well operation, there would not be noticeable increases in salinity above normal background variation. Additional crocodile takes may occur, and cooling-tower drift deposition effects are expected to be minor.

Table 10-2. (contd)

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
Socioeconomic			
Physical impacts	SMALL (adverse) to MODERATE (beneficial)	Physical impacts attenuate rapidly with distance, intervening foliage, and terrain. No mitigation beyond that which the applicant has identified is warranted.	All adverse physical impacts would be minor.
Demography	SMALL	Impacts would be minor and no mitigation would be warranted.	Minor impacts on the demographics of Miami-Dade County, and the communities of Homestead, and Florida City.
Economic Impacts on Community and Taxes	SMALL (beneficial)	None	None
Infrastructure and Community Services	SMALL (adverse) to MODERATE (beneficial)	Road improvements would mitigate but not eliminate adverse traffic-related impacts during operations.	All infrastructure and community service impacts would be minor during operations, except for noticeable impacts on traffic.
Environmental Justice	NONE[(a)]	Mitigation would not be warranted, given the lack of environmental justice impacts.	None. (There are no pathways by which minority or low-income people would receive a disproportionately high and adverse impact.)
Historic and Cultural	SMALL	Operation-related impacts on cultural resources likely would consist of inadvertent discoveries during maintenance activities. The USACE would develop mitigation measures in consultation with the FL SHPO. Further, in consultation between FPL and the FL SHPO, FPL has agreed to develop an unanticipated discovery plan for the treatment of cultural resources inadvertently discovered during construction or maintenance.	None

Table 10-2. (contd)

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
Meteorology and Air Quality	SMALL	Compliance with Federal, State, and local air-quality permits and regulations.	Slight increases in certain criteria pollutants and greenhouse gas emissions due to plant auxiliary combustion equipment (e.g., standby diesel generators), and plumes and drift deposition from cooling towers.
Nonradiological Health	SMALL	Monitor chemical and etiological agents in cooling tower and condenser, maintain reclaimed water (i.e., tertiary) -treatment facility, use physical and administrative controls on exposure to cooling system discharge, comply with Federal and local noise regulations, comply with OSHA standards for Turkey Point operational workers, and transmission line design would be compliant with Electric Safety Code standards.	Cooling tower and pump noise, minor increases in the potential for occupational injuries and traffic accidents.
Radiological Health	SMALL	Doses to members of the public would be maintained below NRC and EPA standards; worker doses would be maintained below NRC limits and ALARA; doses to biota other than humans would be maintained below NCRP and IAEA guidelines.	Small radiation doses to members of the public, below NRC and EPA standards; ALARA doses to workers; and biota doses less than NCRP and IAEA guidelines.
Fuel cycle, Transportation, and Decommissioning	SMALL	Comply with the NRC and DOT regulations.	Small impacts from fuel cycle as presented in Table S-3, 10 CFR Part 51 (TN250). Small impacts from carbon dioxide, radon, and technetium-99. Small radiological doses that are within the NRC and DOT regulations for transportation of fuel and radioactive waste. Small impacts from decommissioning as presented in NUREG–0586 (NRC 2002-TN665).

Table 10-2. (contd)

Resource Area	Impacts	Mitigation Measures	Unavoidable Adverse Impacts
Nonradioactive Waste	SMALL	Manage all waste in compliance with applicable Federal, State, and local requirements. Implement recycling and waste minimization program.	Minor decrease in the available capacity of waste treatment and disposal facilities. Minor discharges to atmosphere and minor impacts on groundwater from UIC well discharges.

ALARA = as low as is reasonably achievable
DOT = U.S. Department of Transportation
EAB = exclusion area boundary
EPA = U.S. Environmental Protection Agency
IAEA = International Atomic Energy Agency
NCRP = National Council on Radiation Protection and Measurements
OSHA = Occupational Safety and Health Administration
SHPO = State Historic Preservation Office
SWPPP = Stormwater Pollution Prevention Plan
UIC = Underground Injection Control
(a) A determination of "NONE" for environmental justice analyses does not mean there are no adverse impacts on minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

Unavoidable, but small, adverse impacts on groundwater users would occur from additional demand for potable water from the Miami-Dade Water and Sewer Department (MDWASD). The increased demand would be about 1.5 Mgd based on normal use of 936 gpm with an occasional maximum use of 2,553 gpm for operating the proposed units (FPL 2014-TN4069). Nearly all of this water comes from the Biscayne aquifer in Miami-Dade County. Use of reclaimed water from the MDWASD for cooling makeup water would cause no new withdrawals from groundwater, so there would be no impact on groundwater users from the use of reclaimed water. Operation of the radial collector wells would also result in withdrawal of small amounts of groundwater from the Biscayne aquifer. However, based on the staff's evaluation of the reliability of the reclaimed-water system, the radial collector wells are expected to be used infrequently as a backup water supply and for durations much shorter than the 60 days allowed per year by the Florida Department of Environmental Protection final Conditions of Certification (State of Florida 2014-TN3637). Therefore, the impact on groundwater users would be minor.

Unavoidable adverse impacts on terrestrial ecology resources would include increased risks of bird collisions with structures and transmission lines—notably wood storks, Everglade snail kites, and wading birds. Other impacts of operations would include reduced wildlife use or avoidance of some habitats due to noise and disturbance, and vegetation-control effects on listed plants. Increased vehicle collision risk mortality to the Florida panther is anticipated. Post-construction research, monitoring, and mitigation would be conducted to determine final effects and to offset adverse impacts.

Adverse impacts on aquatic resources would be generally minor. However, additional crocodile takes could occur during operation. All other adverse impacts, such as cooling-tower drift deposition, are so minor that they would not create unsuitable aquatic habitat or noticeably

affect populations. Mitigation and monitoring would be required by State (State of Florida 2014-TN3637) and Federal agencies.

Adverse socioeconomic impacts during operations are generally minor for all categories, with the exceptions of a noticeable but not destabilizing impacts on traffic near the site. The review team identified no pathways by which any minority or low-income populations would experience a disproportionately high and adverse impact, so there would be no environmental justice impacts warranting mitigation.

Unavoidable adverse impacts from operation on cultural resources likely would involve the inadvertent discovery of cultural resources during maintenance activities. For other potential operation-related impacts, FPL has agreed to develop an unanticipated discovery plan for the treatment of cultural resources inadvertently discovered during construction or maintenance, thereby providing mitigation to avoid adverse impacts.

Air-quality impacts are expected to be negligible, and pollutants emitted during operations would be insignificant. Nonradiological and radiological health impacts would be minimal. Nonradiological health impacts on members of the public from operation, including etiological agents, noise, electromagnetic fields, occupational health, and transportation of materials and personnel would be minimal because FPL would apply controls and measures to ensure compliance with Federal and State regulations. Radiological doses to members of the public from operation of the proposed Turkey Point Units 6 and 7 would be below annual exposure limits set to protect the public. Doses to biota other than humans would be maintained below National Council on Radiation Protection and Measurements and International Atomic Energy Agency guidelines.

10.3 Relationship between Short-Term Uses and Long-Term Productivity of the Human Environment

Section 102(2)(C)(iv) of NEPA (42 U.S.C. § 4321 et seq.) (TN661) requires that an EIS include information about the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.

The local use of the human environment by the proposed project can be summarized in terms of the unavoidable adverse environmental impacts of construction and operation and the irreversible and irretrievable commitments of resources. With the exception of the consumption of depletable resources as a result of plant construction and operation, these uses may be classified as short term. The principal benefit of the plant is represented by the production of electrical energy. The benefit of electricity production would be significantly greater than the benefits of agriculture or other probable uses for the site.

Most long-term impacts resulting from land-use preemption by plant structures can be eliminated by removing these structures or by converting them to other productive uses. Once the plants are shut down, they would be decommissioned according to NRC regulations. Once decommissioning is complete and the NRC licenses are terminated, the site would be available for other uses. The greatest adverse impact on productivity would result between plant closure

and the completion of decommissioning, when the land occupied by the plant structures would not be available for any other use.

The review team concludes that the positive long-term enhancement of regional productivity through the generation of electrical energy would outweigh any negative aspects of plant construction and operation as they affect the human environment.

10.4 Irreversible and Irretrievable Commitments of Resources

Section 102(2)(C)(v) of NEPA (42 U.S.C. § 4321 et seq.) (TN661) requires that an EIS include information about any irreversible and irretrievable commitments of resources that would occur if the proposed actions are implemented. The term "irreversible commitments of resources" refers to environmental resources that would be irreparably changed by the new units and that could not be restored at some later time to the resource's state before the relevant activities. "Irretrievable commitments of resources" refers to materials that would be used for or consumed by the new units in such a way that they could not, by practical means, be recycled or restored for other uses. The resources discussed in this section are the environmental resources discussed in Chapters 4, 5, and 6.

10.4.1 Irreversible Commitments of Resources

Irreversible commitments of environmental resources resulting from Turkey Point Units 6 and 7, in addition to the materials used for the nuclear fuel, are described below.

10.4.1.1 Land Use

Although the review team's analysis considers land uses attributable to Units 6 and 7 to be effectively permanent for the foreseeable time horizon, none of the land used for Units 6 and 7 is irreversibly committed because once the units cease operations and are decommissioned in accordance with NRC requirements, the land could be returned to other industrial and non-industrial uses.

10.4.1.2 Water Use

Because the water in the Biscayne aquifer is replenished by infiltration of precipitation, the withdrawals of groundwater from the aquifer are reversible.

10.4.1.3 Ecological Resources

Construction activities would cause temporary and long-term changes to both the aquatic and terrestrial biota at the plant site and facilities.

10.4.1.4 Socioeconomic Resources

The NRC staff expects no irreversible socioeconomic commitments would be made because resources would be reallocated for other purposes once the plant is decommissioned.

10.4.1.5 Historical and Cultural Resources

There are no known irreversible commitments of historical or cultural resources due to the building and operation of Turkey Point Units 6 and 7. Visual impacts could be reversed if the intrusive visual elements (e.g., transmission lines) were removed.

10.4.1.6 Air and Water

Dust and other emissions such as vehicle exhaust would be released to the air during construction and preconstruction. During operations, vehicle exhaust emissions would continue and other air pollutants and chemicals, including very low concentrations of radioactive gases and particulates, would be released from the facility to the air and surface water. The review team expects no irreversible commitment to air or water resources because all proposed releases at Turkey Point Units 6 and 7 would be made in accordance with duly issued permits.

10.4.2 Irretrievable Commitments of Resources

FPL states in Table 10.2-1 of its ER that construction of the proposed two new units at Turkey Point would involve 154,400 yd^3 of concrete, 20,000 T of rebar, 12,800 T of structural steel, 1.6 million feet of power cable, 460,000 ft of small (less than 3 in. in diameter) piping, and 136,000 ft of large bore piping (FPL 2014-TN4058). Construction would also use small quantities of aluminum, copper, other metals and alloys, and large quantities of quarry materials (nuclear and construction grade fill material, aggregate, sand, etc.). The review team expects that the use of construction materials in the quantities associated with those expected for Turkey Point Units 6 and 7, while irretrievable, would be of small consequence with respect to the availability of such resources.

The main resource that would be irretrievably committed during operation of the new nuclear units would be uranium, which FPL states would amount to about 25.35 T/yr, or 1,014 T over the life of the permit. The World Nuclear Association claims the world's known and recoverable stockpile of uranium is over 5.3 million tons (WNA 2012-TN1498). Given a current world-wide consumption of uranium of about 68,000 T/yr and known reserves, there is about 80 years' worth of uranium available. Therefore, the review team concludes that while irreversible, the consumption of uranium for the proposed Units 6 and 7 at Turkey Point would have a negligible impact on known reserves.

10.5 Alternative to the Proposed Actions

Alternatives to the proposed action are discussed in Chapter 9 of this EIS. Alternatives considered include the no-action alternative, energy alternatives that do not require additional generating capacity, energy production alternatives, system design alternatives, and alternative sites.

The no-action alternative, described in Section 9.1, refers to a scenario in which the NRC would deny the request for COLs or USACE would deny FPL's permit request. In either case, construction of the two new units would not proceed as proposed. If no other power plants were built or electrical power supply strategy was implemented to replace the proposed action, the electrical capacity to be provided by the project would not become available. In that case, the need for power would not be met, the benefits (electricity generation) associated with the

completed project would not occur, and the Florida Reliability Coordinating Council region would become vulnerable to grid instability, brownouts, and blackouts. Failure to supply the needed electricity would have significant adverse impacts within the region of interest and the staff expects that the Florida Public Service Commission would take steps to confirm that the need for power would be met.

Alternative energy sources are described in Section 9.2 of this EIS. Alternatives not involving additional generating capacity are described in Section 9.2.1. Alternatives requiring new generating capacity, including detailed analyses of coal-fired and natural-gas–fired alternatives, are provided in Section 9.2.2. Other energy sources, including renewable energy sources, are discussed in Section 9.2.3, and a combination of energy alternatives (involving a combination of fossil fuel and renewable energy generation sources) is discussed in Section 9.2.4. The review team concluded by comparative analysis presented in Section 9.2.5 that none of the alternative power production options are environmentally preferable to the proposed action.

Alternative sites are discussed in Section 9.3 of this EIS. Cumulative impacts in the vicinity of the Turkey Point site, including the proposed Turkey Point Units 6 and 7, are compared with the cumulative impacts from building and operating the same physical facilities and adequate support facilities at each of the alternative sites. Section 9.3.6 (Table 9-28) summarizes the NRC staff's characterization of cumulative impacts at the proposed and alternative sites. Based on this review, the NRC staff concludes that none of the alternative sites are environmentally preferable or obviously superior to the Turkey Point site. The NRC's determination is independent of USACE's determination of whether there is a least environmentally damaging practicable alternative pursuant to Clean Water Act Section 404(b)(1) Guidelines. USACE will conclude its analysis of both offsite and onsite alternatives in its ROD.

Alternative system designs, focusing on alternative cooling-system designs, are discussed in Section 9.4 of this EIS. The staff determined that none of the alternative system designs is environmentally preferable to the proposed design.

10.6 Benefit-Cost Balance

NEPA requires that all agencies of the Federal Government prepare detailed environmental statements on proposed major Federal actions that can significantly affect the quality of the human environment. A principal objective of NEPA is to require each Federal agency to consider, in its decision-making process, the environmental impacts of each proposed major action and the available alternative actions. In particular, Section 102 of NEPA (42 U.S.C. § 4321 et seq.) (TN661) requires all Federal agencies to the fullest extent possible:

> (B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by Title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations. (42 U.S.C. § 4321 et seq. [TN661]; CEQ 1997-TN452)

However, neither NEPA nor CEQ requires the costs and benefits of a proposed action be quantified in dollars or any other common metric.

The purpose of this section is not to identify and quantify all of the potential societal benefits of the proposed actions and compare these to the potential costs of the proposed actions. Instead, this section focuses on only those benefits and costs of such magnitude or importance that their inclusion in this analysis can inform the decision-making process. This section compiles and compares the pertinent analytical conclusions reached in earlier chapters of this EIS. It gathers all of the expected impacts from building and operations of the proposed Turkey Point Units 6 and 7 and aggregates them into two final categories: (1) the expected environmental and economic costs and (2) the expected benefits to be derived from approval of the proposed action. As such, costs and benefits include the costs and benefits of preconstruction activities and NRC-authorized construction and operations activities.

Although the analysis in this section is conceptually similar to a purely economic benefit-cost analysis, which determines the net present dollar value of a given project, the purpose of this section is to identify all potential societal benefits of the proposed actions and compare them to the potential internal (i.e., private) and external (i.e., societal) costs of the proposed actions. The purpose of this assessment is to generally inform the COL process by gathering and reviewing information that demonstrates the likelihood that the benefits of the proposed actions outweigh the aggregate costs.

Whether FPL is profitable and other similar issues are outside NRC's mission and authority and, thus, would not be considered in this EIS. Issues related to the financial qualifications of FPL, however, will be addressed in the NRC staff's Safety Evaluation Report. It is not possible to quantify and assign a value to all benefits and costs associated with the proposed action. This analysis, however, attempts to identify, quantify, and provide monetary values for benefits and costs when reasonable estimates are available.

Section 10.6.1 discusses the benefits associated with the proposed action. Section 10.6.2 discusses the costs associated with the proposed action. A summary of benefits is shown in Table 10-3. Section 10.6.3 provides a summary of the impact assessments, bringing previous sections together to establish a general impression of the relative magnitude of the proposed actions' costs and benefits.

10.6.1 Benefits

The most apparent benefit from a power plant is that it generates power and provides thousands of residential, commercial, and industrial consumers with electricity. Maintaining an adequate supply of electricity in any given region has social and economic importance because adequate electricity is the foundation for economic stability and growth and fundamental to maintaining our current standard of living. Because the focus of this EIS is on the proposed expansion of Turkey Point's generating capacity, this section focuses primarily on the relative benefits of the Turkey Point option rather than the broader, more generic benefits of electricity supply.

10.6.1.1 Societal Benefits

For the production of electricity to be beneficial to a society, there must be a corresponding demand, or "need for power," in the region. Chapter 8 defines and discusses the need for power in more detail. From a societal perspective, nuclear power offers two primary benefits relative to most other generating systems: (1) long-term price stability and (2) energy security through fuel diversity. These benefits are described in this subsection.

Table 10-3. Summary of the Benefits of the Proposed Action

Benefit Category	Description	Monetized Value or Impact Assessment
	Benefits	
Electricity generated	16,400,000 to 17,900,000 MWh/yr for the 40-year life of the plant (assuming capacity factors in the range of 85–93 percent).	
Generating capacity	2,200 MW(e) (two units at 1,100 MW(e) each).	
Employment	At peak employment, the review team estimates there would be 3,290 new workers moving into the local area and would generate economic activity that would support an additional 3,137 indirect jobs during the entire building period. Of the 806 operations workers, 671 would move into the local area and support an additional 1,456 indirect jobs in their communities.	
Fuel diversity and energy security	Nuclear power provides diversity to the FRCC inventory, which consists primarily of fossil-fuel-powered baseload generation. Reduces exposure to supply and price risk associated with reliance on any single fuel source.	
Tax revenues	FPL would pay corporate income taxes to the State of Florida upon operation of Turkey Point Units 6 and 7. In addition, the State and Miami-Dade County would collect sales and use taxes on locally purchased goods and services during construction and from construction and operations worker purchases. Finally, Units 6 and 7 would generate property taxes over the 40-year life of the plant, which would be paid to Miami-Dade County, the Miami-Dade Public School District and possibly to special taxing units.	Approximately $50 million in property taxes annually (Miami-Dade County would receive the majority of this tax revenue); $12.5 million in sales taxes statewide annually over a 12-year licensing and construction period.
Local economy	Building the two proposed units would require the short-term addition of up to 3,983 workers (3,950 construction workers and 33 operations workers) and a 40-year operations workforce of 806 workers. The increase in local indirect jobs created by the presence of these workers and the contribution of these workers to the tax base of Miami-Dade County and the local school district and communities would benefit the area economically and stimulate the economy of the region (see Sections 4.4.3.1 and 5.4.3.1).	806 operations workers and over 1,456 indirect jobs added over 40-year life of plant; $140 million income per year in the region during 40-year life of plant.
Price volatility	Nuclear power has the lowest portion of its variable cost attributed to fuel costs. In addition, nuclear fuel has the most stable long-term price. In combination, these characteristics would help stabilize the market price of electricity and mitigate future electricity price volatility.	
Electrical reliability	Nuclear power plants provide the most power per unit of any baseload unit and run at some of the highest capacity factors. These characteristics enhance the stability and reliability of the electricity supply.	

FRCC = Florida Reliability Coordinating Council

Long-Term Price Stability

Because of its relatively low and nonvolatile fuel costs, nuclear energy is a dependable generator of electricity that can provide electricity to the consumer at relatively stable prices over a long period of time. Unlike some other energy sources, nuclear energy is generally not subject to unreliable weather or climate conditions, unpredictable cost fluctuations, and is less dependent on potentially unstable foreign suppliers than other energy sources. Nuclear power plants are generally not subject to fuel price volatility like natural gas and oil power plants. In

addition, uranium fuel constitutes only 3 percent to 5 percent of the cost of a kilowatt-hour of nuclear-generated electricity. Doubling the price of uranium increases the cost of electricity by about 9 percent; while doubling the price of gas would add about 66 percent to the price of electricity, and doubling the cost of coal would add about 31 percent to the price of electricity (WNA 2014-TN4111).

Energy Security through Fuel Diversity

Currently, more than 70 percent of the electricity generated in the United States is generated with fossil-based technologies; thus, non-fossil-based generation, such as nuclear generation, is essential to maintaining diversity in the aggregate power-generation fuel mix (DOE/EIA 2006-TN718). Nuclear power contributes to the diverse U.S. energy mix, hedging the risk of shortages and price fluctuations for any one power-generation system and reducing the nation's dependence on imported fossil fuels.

A diverse fuel mix helps to protect consumers from contingencies such as fuel shortages or disruptions, price fluctuations, and changes in regulatory practices. FPL's 2006 fuel mix was made up of 50 percent natural gas, 21 percent nuclear power, and 18 percent coal (FPL 2014-TN4058). Chapter 8 of this EIS discusses the State of Florida's finding that a need exists for Units 6 and 7 as proposed by FPL. The proposed Turkey Point Units 6 and 7 would generate approximately 2,200 MW(e) net, which would help meet this baseload need in the region. Assuming a reasonably low capacity factor of 85 percent, the plant's average annual electrical energy generation would be about 16,400,000 MWh. A reasonably high-capacity factor of 93 percent would result in slightly more than 17,900,000 MWh of electricity.

10.6.1.2 Regional Benefits

Regional benefits of the proposed construction and operation of Units 6 and 7 include enhanced tax revenues, regional productivity, and community impacts.

Tax Revenue Benefits

As discussed in Section 4.4.3.2, the staff determined that the annual sales and use taxes for local purchases of nonexempt materials for use in the construction of Turkey Point Units 6 and 7 for the State of Florida and Miami-Dade County would be about $12.5 and $2.1 million, respectively. These revenues would not be expected to provide significant local revenues in the affected region. Florida does not collect income taxes.

As discussed in Section 5.4.3.2, the staff also determined that once both units become operational, Miami-Dade County would receive approximately $50 million in property tax revenues collected annually over the 40-year license period, and an additional $1.5 million to $2 million in sales and use taxes from FPL for operations related materials and supplies annually. This stream of revenue represents a less than 1 percent increase over recent Miami-Dade County total revenue levels.

Regional Productivity and Community Impacts

The new units would employ an operating workforce of 806, of whom 671 would reside in Miami-Dade County and support 1,456 indirect jobs (Section 5.4) within the local area that would be maintained throughout the life of the plant. The economic multiplier effect of the increased spending by the direct and indirect workforce created as a result of two new units

would increase the economic activity in the region, most noticeably in the communities near the proposed site. Sections 4.4.3.1 and 5.4.3.1 provide additional information about the economic impacts of constructing and operating proposed Turkey Point Units 6 and 7.

10.6.2 Costs

Internal costs to FPL of proposed Units 6 and 7 as well as external costs to the surrounding region and environment would be incurred during the construction, preconstruction, and operation of two new units at the site. A summary of the costs is shown in Table 10-4.

Table 10-4. Summary of the Costs of Preconstruction, Construction, and Operation

Cost Category	Description	Impact Assessment[a]
	Internal Costs[b]	
Overnight Cost of Construction[c]	$7.9 to $11.4 billion (2012$)	NA
Total Estimated Project Cost[c]	$12.8 to $18.7 billion (2012$)	NA
Operating cost	$743.8 to $994.7 million per year (8.3 to 11.1 cents per kWh levelized cost of electricity in 2007$. Includes fuel cost at about 0.7 cents per kWh)[d]	NA
Spent fuel management[e]	$8.9 million per year	NA
Decommissioning[f]	$8.9 to $17.9 million per year Approximately one- to two-tenths of one cent per kWh	NA
	External Costs	
Land use	Approximately 585 ac of land on a site already established for the purpose of accommodating electric generation facilities would be occupied on a long-term basis. Additional offsite lands would be occupied on a long-term basis as rights-of-way for transmission lines, pipelines, and access roads. While the land-use impacts from building the proposed facilities on the Turkey Point site would generally be minimal and compatible with FPL's existing and other reasonably foreseeable uses of property on the site, some of the proposed associated offsite work may noticeably affect adjoining land uses. In particular, new transmission lines built in the East corridor would traverse densely developed urban areas, and new transmission lines built in the West corridor come close to the eastern boundary of Everglades National Park.	MODERATE

Table 10-4. (contd)

Cost Category	Description	Impact Assessment[a]
Air quality	Emissions from diesel generators, auxiliary boilers and equipment, cooling towers, and vehicles to the air would have a small impact on workers and local residents. With the exception of the cooling towers, emissions sources would be operated intermittently. Emissions from all sources would be within Federal, State, and local air-quality limits. Negligible impacts of sulfur dioxide, nitrogen oxide, carbon monoxide, carbon dioxide, and particulate emissions relative to other baseload fossil-fired generation (see Sections 4.7 and 5.7).	SMALL
Terrestrial Ecology	Construction and preconstruction activities would noticeably affect wetlands, wildlife, and Federally and State-listed plant and animal species at the Turkey Point site, in the vicinity of the site, and at or in the vicinity of all associated offsite facilities. Operation of Units 6 and 7 may increase vehicle collision mortality to the Florida panther, vegetation-control effects on listed plants, and transmission system impacts on wood storks and Everglade snail kites.	MODERATE
Aquatic Ecology	Construction and preconstruction activities would result in permanent loss of and impact on critical habitat for the American crocodile; possible takes of American crocodile and may affect manatees, Smalltooth Sawfish, and sea turtles. During radial collector well operation salinity fluctuations at nearshore areas immediately north of the Turkey Point site would not be noticeable above normal background variation.	SMALL to MODERATE
Socioeconomics	Most adverse socioeconomic impacts from the proposed Units 6 and 7 would be minor, with the exception of traffic-related noticeable impacts during construction and operations.	SMALL to MODERATE
Environmental Justice	The review team identified no pathways by which a minority or low-income population would receive a disproportionately high and adverse impact	NONE[g]
Nonradioactive waste	Minor, localized, and temporary air emissions from construction equipment and temporary stationary sources. Creation of solid wastes, causing minor consumption of local or regional landfill space, offset by payment of tipping fees for waste disposal. Generation of small amounts of hazardous and mixed wastes leading to minor consumption of regional hazardous waste treatment or disposal capacity, offset by treatment, recycling, and disposal costs (see Sections 4.10 and 5.10)	SMALL

Table 10-4. (contd)

Cost Category	Description	Impact Assessment[(a)]
Uranium fuel cycle	Minor impacts distributed across multiple locations throughout the United States from the mining, milling, and enrichment of uranium, from fuel fabrication, from transportation of radioactive material, and from management of radioactive wastes (see Chapter 6).	SMALL
Historic and cultural resources	Construction of offsite transmission lines would result in potential visual impacts on National Register-eligible built resources, including buildings and historic districts. The impact of operation would be SMALL	MODERATE
Health impacts (nonradiological and radiological)	Radiological doses and nonradiological health hazards to the public and occupational workers would be monitored and controlled in accordance with regulatory limits (see Sections 4.8, 4.9, 5.8, and 5.9).	SMALL
Materials, energy, and uranium	Irreversible and irretrievable commitments of materials and energy, including depletion of uranium. Construction materials include concrete, aggregate, rebar, conduit, cable, piping, building supplies, and tools. Equipment needs include cranes, cement trucks, excavation equipment, dump trucks, and graders.	SMALL
Hazardous and radioactive waste	Mixed waste stored, transported, treated, and disposed in compliance with both NRC and EPA regulations would consume some regional or national waste treatment or disposal capacity, offset by treatment and disposal costs (see Sections 4.10 and 5.10).	SMALL
Water use and water quality	Water usage during construction and operations would have a minor impact on the availability and quality of the water resources in the area. Reclaimed water from the Miami-Dade Water and Sewer Department would be used as cooling water for normal operations. Approximately 29,230 gpm would be lost through evaporation and drift. An additional 12,461 gpm would be discharged to the Boulder Zone as blowdown from the cooling system. Onsite groundwater withdrawals would be limited to temporary dewatering during construction. Water for potable and sanitary uses would be from a municipal supply (see Sections 4.2 and 5.2).	SMALL

(a) Impact assessments are listed for all impacts evaluated in detail as part of this EIS. The details on impact assessments are found in the indicated sections of this EIS.
(b) Internal costs are those incurred by FPL to implement proposed building and operation of the Turkey Point site. Note that no impact assessments are provided for these private financial impacts.
(c) FPL 2014-TN4058; overnight construction costs include transmission line construction costs; total project costs include finance costs

Table 10-4. (contd)

Cost Category	Description	Impact Assessment[(a)]

(d) Review team calculation of price per kilowatt-hour based on MIT 2009-TN448.
(e) The U.S. used-fuel program is funded by a 0.1 cent/kWh charge.
(f) USA experience (WNA 2014-TN4111).
(g) A determination of "NONE" for environmental justice analyses does not mean there are no adverse impacts on minority or low-income populations from the proposed project. Instead, an indication of "NONE" means that while there are adverse impacts, those impacts do not affect minority or low-income populations in any disproportionate manner, relative to the general population.

Internal costs include all of the costs included in a total capital cost assessment—the direct and indirect cost to physically build the power plant (capital costs), plus the annual costs of operation and maintenance, fuel costs, waste disposal, and decommissioning costs. In accordance with the NRC staff's guidance in NUREG–1555 (NRC 2000-TN614), the internal costs of the proposed project are presented in monetary terms. External costs include all costs imposed on the environment and region surrounding the plant that are not internalized by the company and may include such things as a loss of regional productivity, environmental degradation, or loss of wildlife habitat. The external costs listed in Table 10-4 summarize environmental impacts on resources that could result from preconstruction, construction, and operation of the proposed Units 6 and 7.

10.6.2.1 Internal Costs

The most substantial monetary cost associated with nuclear energy is the cost of capital. Nuclear power plants have relatively high capital costs for building the plant but low operating costs relative to alternative power-generation systems. Fluctuations in the real prices of key heavy construction commodities, such as cement, steel, and copper, can have a significant impact on nuclear plant capital costs (although it should be noted that these price changes would change construction costs for non-nuclear power plants as well). Construction delays can add significantly to the cost of a plant. Because of the large capital costs for nuclear power, and the relatively long construction period before revenue is returned, servicing the capital costs of a nuclear power plant also is a key factor in determining the economic competitiveness of nuclear energy. Because a power plant does not yield profits during construction, longer construction times mean a longer time before any costs can be offset by revenues. Furthermore, the longer it takes to build the plant, the higher would be the interest expenses on borrowed construction funds.

Construction Costs

In evaluating monetary costs related to constructing proposed Units 6 and 7, FPL reviewed recent published literature, vendor information, internally generated financial information, and internally generated, site-specific information. The review team also compared recent cost estimates with FPL's. These estimates are based on a number of studies that were conducted by government agencies, universities, and other entities; the estimates include a significant contingency to account for uncertainty. Capital costs are costs incurred during construction, including preconstruction, when the actual outlays for equipment and construction and engineering are made. "Overnight capital costs" include engineering, procurement, and

construction costs; however, it is presumed that the plant is constructed overnight; thus, interest is not included. FPL based its estimates of overnight capital costs for construction and preconstruction on analysis of four comprehensive studies of nuclear plant costs (University of Chicago 2004-TN719; MIT 2003-TN720; Dominion et al. 2004-TN721; OECD 2005-TN722), in which estimates ranged from $1,100 per kilowatt to $2,500 per kilowatt (in 2002 dollars). FPL estimates that overnight cost range to be $3,570 to $5,190 per kilowatt in 2012 dollars. On this basis, FPL estimates an overnight capital cost for the two Turkey Point units of between $7.9 billion and $11.4 billion in 2012 dollars (FPL 2014-TN4058). In addition to the studies FPL used, the review team also considered more recent studies: construction costs from other applicants and a 2009 update to the 2003 Massachusetts Institute of Technology (MIT) study on the cost of nuclear power (MIT 2009-TN448).

- Tennessee Valley Authority estimated its per kilowatt cost of construction for two new proposed AP1000 units at its Bellefonte site in Alabama between $2,850 and $3,200/kW (TVA 2008-TN4140), which if applied to proposed Units 6 and 7 at FPL (installed capacity of 2,200 MW(e)), would yield an overnight capital cost of $6.2 to $7 billion.
- Southern Nuclear Operating Company estimated the overnight cost of construction for two AP1000 units at its Vogtle site in Georgia to be between $3,200 and $3,500/kW (SNC 2008-TN4141), which if applied to proposed Units 6 and 7 at FPL would yield an overnight capital cost of $7 billion to $7.7 billion.
- The MIT Update (MIT 2009-TN448) estimated the overnight construction cost at $4,000/kW in 2007 dollars or about $8.8 billion for 2,200 MW(e) in 2008 dollars.

Except for the Keystone study, the general studies do not present the total cost of construction (i.e., overnight costs do not include interest expense). Keystone presented a range of approximately $4,300 to $4,800/kW in 2007 dollars (Keystone 2007-TN724). FPL's estimated "all-in" construction cost for Units 6 and 7 ranges from $5,823 to $8,497/kW in 2012 dollars leading to total construction costs of $12.8 to $18.7 billion (FPL 2014-TN4058).

Operation Costs

Operation costs are frequently expressed as levelized cost of electricity, which is the lowest price per kilowatt-hour of producing electricity that covers operating costs, maintenance costs, fuel expenditures, and annualized capital costs over the life of the project. For nuclear power plants, overnight capital costs typically account for a third of the levelized cost, and interest costs on the overnight costs account for another 25 percent (University of Chicago 2004-TN719). FPL noted that the four studies mentioned above estimate levelized cost for Turkey Point Units 6 and 7 to be in the range of $36 to $83/MWh (3.6 to 8.3 cents/kWh) (FPL 2014-TN4058; University of Chicago 2004-TN719; MIT 2003-TN720; Dominion et al. 2004-TN721; OECD 2005-TN722). In addition, the review team examined the update to the MIT study (MIT 2009-TN448) which re-evaluated the overnight levelized cost of electricity at 8.4 cents/kWh (2007$). However, the Keystone study estimates the levelized cost for their low and high construction-cost estimates to range from $0.083 to $0.111/kWh (Keystone 2007-TN724). Factors affecting the range include choices for discount rate, construction duration, plant life span, capacity factor, cost of debt and equity, and split between debt and equity financing, depreciation time, tax rates, and premium for uncertainty. Estimates include decommissioning

but, because of the effect of discounting a cost that would occur as much as 40 years or more in the future, decommissioning costs have relatively little effect on the levelized cost.

Fuel Costs

The cost of fuel is included in the calculation of levelized cost. Based on the 2009 MIT study (MIT 2009-TN448), the review team estimates nuclear fuel costs to be 0.7 cents/kWh.

Waste Disposal

The back-end costs of nuclear power contribute a very small share of the total cost because of both the long lifetime of a nuclear reactor and the fact that provisions for waste-related costs can be accumulated over that time. Spent fuel management costs are estimated to be one-tenth of a cent per kilowatt-hour (WNA 2014-TN4111; DOE 2008-TN725). It should be recognized, however, that radioactive nuclear waste poses unique disposal challenges for long-term management. While spent fuel and radioactive nuclear waste are being stored successfully in onsite facilities, the United States has yet to implement final disposition of spent fuel or high-level radioactive waste streams created at various stages of the nuclear fuel cycle.

Decommissioning

The NRC has requirements for licensees at 10 CFR 50.75 (TN249) to provide reasonable assurance that funds would be available for the decommissioning process. Because of the effect of discounting a cost that would occur as much as 40 years in the future, decommissioning costs have relatively little effect on the levelized cost of electricity generated by a nuclear power plant. Decommissioning costs are about 9 to 15 percent of the initial capital cost of a nuclear power plant. However, when discounted, they contribute only a few percent to the investment cost and even less to generation cost. In the United States, these costs account for one to two-tenths of a cent per kilowatt-hour (WNA 2014-TN4111).

10.6.2.2 External Costs

External costs are related to the social and/or environmental effects that would be caused by the construction of and generation of power by two new reactors at the Turkey Point site. This EIS includes the review team's analysis that considers and weighs the environmental impacts of building and operating new nuclear units at the Turkey Point site or at alternative sites and mitigation measures available for reducing or avoiding these adverse impacts. It also includes the NRC staff's recommendation to the Commission regarding the proposed action.

Environmental and Social Costs

Chapter 4 describes the impacts of building proposed Units 6 and 7 on the environment with respect to the land, water, ecology, socioeconomics, radiation exposure to construction workers, and measures and controls to limit adverse impacts during building of the proposed new units at the Turkey Point site. Chapter 5 examines environmental issues associated with operation of the proposed new nuclear Units 6 and 7 for an initial 40-year period. Potential operational impacts on land use, air quality, water, terrestrial and aquatic ecosystems, socioeconomics, historic and cultural resources, environmental justice, nonradiological and radiological health

effects, postulated accidents, and applicable measures and controls that would limit the adverse impacts of station operation during the 40-year operating period are considered. In accordance with 10 CFR Part 51 (TN250), all impacts identified in Chapters 4 and 5 have been analyzed, and a significance level of potential adverse impacts (i.e., SMALL, MODERATE, or LARGE) has been assigned.

Chapter 6 addresses the environmental impacts from (1) the uranium fuel cycle and solid-waste management, (2) the transportation of radioactive material, and (3) the decommissioning of nuclear units at the Turkey Point site. Chapter 9 includes the review team's review of alternative sites and alternative power-generation systems.

Unlike generation of electricity from coal and natural gas, normal operation of a nuclear power plant does not result in any emissions of criteria (e.g., oxides of nitrogen or sulfur dioxide), methyl mercury, or greenhouse gases associated with global warming and climate change. Chapter 9 analyzes coal-fired and natural-gas–fired alternatives to the building and operation of proposed Turkey Point Units 6 and 7. Air emissions from these alternatives and nuclear power are summarized in Chapters 5 and 9 of this EIS.

10.6.3 Summary of Benefits and Costs

FPL's business decision to pursue generating capacity by adding two nuclear reactors at the Turkey Point site is an economic decision based on private financial factors subject to regulation by the Florida Public Utility Commission. Florida Public Utility Commission's issuance of a determination of need provides great weight to the NRC's decision regarding whether there is a need for the power that would be generated by the construction and operation of the two proposed units at the Turkey Point site. The internal costs to construct additional units appear to be substantial; however, FPL's decision to pursue this expansion implies that it has concluded that the internal benefits of the proposed facility (production of 16,400,000 to 17,900,000 MWh/yr for the 40-year life of the plant and 2,200 MW of baseload capacity) outweigh the internal costs. In comparison, the external socio-environmental costs imposed on the region appear to be relatively minor. Although no specific monetary values could reasonably be assigned to the identified societal benefits, the review team determined it is not unreasonable to conclude that the potential societal benefits of the proposed Units 6 and 7, including the primary benefit of the generated power and baseload capacity, outweigh the potential social and private costs of the proposed action.

Table 10-4 includes a summary of both internal and external costs of the proposed activities at the Turkey Point site for Units 6 and 7, and Table 10-3 identifies the benefits. The tables include a reference to other sections of this EIS where more detailed analyses and impact assessments are available for specific topics.

On the basis of the assessments summarized in this EIS, the review team concludes that building and operating the proposed Units 6 and 7, with the anticipated mitigation measures identified by the review team, would have accrued benefits that most likely would outweigh the economic, environmental, and social costs. For the NRC-proposed action (NRC-authorized construction and operation) the accrued benefits would also outweigh the costs of construction and operation of Units 6 and 7.

10.7 NRC Staff Recommendation

The NRC staff's recommendation to the Commission related to the environmental aspects of the proposed action is that the COLs should be issued. The NRC staff's evaluation of the safety aspects of the proposed action will be addressed in the Safety Evaluation Report that is anticipated to be published in November 2016 (NRC 2016-TN4619).

The staff's recommendation is based on (1) the ER submitted by FPL (2014-TN4058); (2) consultation with Federal, State, Tribal, and local agencies; (3) the review team's independent review; (4) the consideration of public comments received on the environmental review and; (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and this EIS. In addition, in making its recommendation, the NRC staff determined that none of the alternative sites assessed is obviously superior to the Turkey Point site.

The NRC's determination is independent of the USACE's permit decision, which will be documented in the USACE's ROD.

11.0 References

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11. ABSTRACT (200 words or less)
This environmental impact statement (EIS) has been prepared in response to an application submitted to the U.S. Nuclear Regulatory Commission (NRC) by Florida Power and Light Company (FPL) for two combined construction permits and operating licenses) combined licenses or COLs). The proposed actions related to the FPL application are (1) NRC issuance of COLs for two new power reactor units (Units 6 & 7) at the Turkey Point Nuclear Power Plant site in Miami-Dade County, Florida, and (2) U.S. Army Corps of Engineers (USACE) decision to issue, deny, or issue with modifications a Department of the Army (DA) permit to perform certain dredge and fill activities in waters of the United States and to construct structures in navigable waters of the United States related to the project.

This EIS documents the review team's analysis, which considers and weighs the environmental impacts of constructing and operating two new nuclear units at the Turkey Point site and at alternative sites, including measures potentially available for reducing or avoiding adverse impacts.

After considering the environmental aspects of the proposed action before the NRC, the NRC staff's recommendation to the Commission is that the COLs be issued as proposed. This recommendation is based on (1) the application, including the Environmental Report (ER), submitted by FPL; (2) consultation with Federal, State, Tribal, and local agencies; (3) the review team's independent review; (4) the consideration of public comments received on the environmental review; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and this EIS.

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