1.0 NEED FOR POWER AND THE PROPOSED FACILITES

1.1 Introduction

This section of the Site Certification Application (SCA) provides an introduction to the applicant, Florida Power Corporation, dba Progress Energy Florida, Inc. (PEF), discusses the proposed Crystal River Unit 3 Uprate Project and the need to uprate the Crystal River Nuclear Unit 3 (CR3).

Progress Energy Florida, a subsidiary of Progress Energy, provides electricity and related services to more than 1.6 million customers in the state of Florida. Progress Energy's retail service area in Florida spans about 20,000 square miles in central Florida, In Florida, the company maintains more than 43,600 miles of distribution and transmission lines in serving 1.6 million customers and a population of more than five million people. In 2005, the company also received the prestigious J.D. Power and Associates Founder's Award for dedication, commitment and sustained improvement in customer service.

1.2 The Project

PEF plans to add 180 MW (megawatts) of electrical generation resources to its system in order to continue to provide reliable, safe, and cost-effective service to its customers.

Following PEF's request, the Florida Public Service Commission (PSC) has determined that a power uprate is an economical option to add capacity and power output to the existing nuclear unit, CR3. The CR3 Uprate Project will result in economic benefits to customers and the community by providing additional clean energy at lower cost to consumers. An increase in the plant's gross output from 900 MW to 1,080 MW can serve the equivalent of an additional 110,700 homes. Studies have demonstrated that in order to reduce PEF's total fuel cost, increased efficiencies can be realized from technological advancements and system modifications to increase generation capacity from the company's lowest cost fuel source. The need for the project is based on an economic need to provide fuel savings for consumers. The CR3 Uprate Project is expected to save customers more than $2.6 billion in gross fuel costs through 2036.

The CR3 Uprate Project will occur over two phases. The first phase (Phase I) will occur during a 2009 planned refueling outage and scheduled steam generator replacement. The improvement to the

turbine center line components will increase the efficiency of power production resulting in decreasing consumer costs. The existing steam turbines were designed in the 1960s and are less efficient than current technology. Main feed-water heat exchangers and main steam re-heaters will also be modified or replaced. The low pressure turbines and electrical generator will be replaced. The net impact of these modifications is a substantially more efficient secondary plant. Thus, while the Nuclear Regulatory Commission (NRC) licensed power level will remain constant; the net generation increase from current levels through Phase I is expected to be approximately 40 MW.

Phase II will take place during the 2011 planned refueling outage of CR3. The second phase will result in an additional 140 MW of power and will require a large number of smaller yet substantial modifications to assure long term reliability of all plant systems at the conditions necessary to support this higher licensed power level.

Leading up to 2011, CR3 will obtain modification to the NRC license to allow operation at the increased output. The higher licensed power level is currently anticipated to result in an increase in the NRC licensed net electrical generation capability of 180 MW or more above current levels.

No alternative generation option exists that can supply the benefits of additional, reliable, base load, nuclear generation at a net savings to PEF customers. The CR3 Uprate Project will also increase the level of nuclear production in the fuel supply mix of PEF's system, resulting in increased fuel diversity for PEF and the state of Florida. The total cost for the uprate is estimated to be $427 million.

CR3 began operations in 1977. The Power Plant Siting Act (PPSA) SCA was promulgated in 1973. At that time, existing facilities or ones already in construction were not required to seek certification under the PPSA and to file an SCA. Since the uprate project will increase the electrical generating capacity of CR3, an SCA is now required. The SCA will address the layout, history, and associated facilities relevant to the current operation of CR3 as well as the impacts associated with the construction and operation of the CR3 Uprate Project.

CR3 is currently licensed by the NRC. No NRC approvals are required for Phase I of the CR3 Uprate Project. PEF plans to submit a licensed power change to the NRC for Phase II of the CR3 Uprate Project in 2009 and NRC approval for Phase II is expected in 2011. PEF also intends to file to

relicense the plant for an additional 20 years in 2009. It is anticipated that the license now set to expire in 2016 will be extended to 2036.

CR3 provides power into an existing 500 kilovolt (kV) transmission system connected to the site and uses an existing 230 kV system for onsite backup power. No transmission upgrades are required for the project.

1.3 Need for the Project

PEF's petition for a determination of need for the CR3 Uprate Project has been approved by the PSC in accordance with Section 403.519(3) (Attachment 1).

ATTACHMENT 1

BEFORE THE PUBLIC SERVICE COMMISSION

In re: Petition for determination of need for expansion of Crystal River 3 nuclear power plant, for exemption from Bid Rule 25-22.082, F.A.C., and for cost recovery through fuel clause, by Progress Energy Florida, Inc.	DOCKET NO. 060642-EI ORDER NO. PSC-07-0119-FOF-EI ISSUED: February 8, 2007

The following Commissioners participated in the disposition of this matter:

LISA POLAK EDGAR, Chairman
MATTHEW M. CARTER II
KATRINA J. TEW

APPEARANCES:

R. ALEXANDER GLENN, ESQUIRE, Progress Energy Service Company, LLC, 100 Central Avenue, Suite 1D, St. Petersburg, Florida 33701, and JAMES MICHAEL WALLS, and DIANNE M. TRIPLETT, ESQUIRES, Carlton Fields, P. A., Post Office Box 3239, Tampa, Florida 33601-3239
On behalf of Progress Energy Florida, Inc. (PEF).

JOHN W. MCWHIRTER, JR., ESQUIRE, McWhirter, Reeves & Davidson, P. A., 400 North Tampa Street, Suite 2450, Tampa, Florida 33601-3350
On behalf on the Florida Industrial Power Users Group (FIPUG).

ROBERT SCHEFFEL WRIGHT and JOHN R. LAVIA, III, ESQUIRES, Young van Assenderp, P. A., 225 South Adams Street, Suite 200, Tallahassee, Florida 32301
On behalf of the Florida Retail Federation (FRF).

PATRICIA A. CHRISTENSEN, and JOSEPH A. MCGLOTHLIN, ESQUIRES, Office of Public Counsel, c/o The Florida Legislature, 111 West Madison Street, Room 812, Tallahassee, Florida 32399-1400
On behalf of the Citizens of the State of Florida (OPC).

LISA C. BENNETT, and LORENA A. HOLLEY, ESQUIRES, Florida Public Service Commission, 2540 Shumard Oak Boulevard, Tallahassee, Florida 32399-0850
On behalf of the Florida Public Service Commission (Staff).

DOCUMENT NUMBER-DATE
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FPSC-COMMISSION CLERK

FINAL ORDER GRANTING PETITION FOR DETERMINATION OF NEED
FOR PROPOSED EXPANSION OF
CRYSTAL RIVER UNIT 3 NUCLEAR POWER PLANT

BY THE COMMISSION PANEL:

Background

On September 22, 2006, Progress Energy Florida, Inc. (PEF) filed a Petition (petition) for Determination of Need for Expansion of its Crystal River 3 Nuclear Power Plant (CR3) located in Citrus County, Florida. The proposed expansion is an uprate that when completed will increase the power output at CR3 by approximately 180 megawatts ("MWs"). The proposed uprate or expansion will be completed in two phases. The first phase will be accomplished during the planned 2009 refueling outage and the second phase will be completed during the 2011 planned refueling outage. Phase one will be completed during a scheduled steam generator replacement and will include modifications to the turbine line components to take advantage of greater steam efficiencies, with an expected additional 40 MW of power following work completed in phase one. Phase two consists of changes that will allow for use of more highly enriched uranium in the reactor core and will result in an anticipated additional 140 MW of power.

Included in PEF's petition was a request for exemption from Rule 25-22.082, Florida Administrative Code, and a request that PEF be permitted to recover the costs of the expansion through the fuel clause. On December 22, 2006, by Order No. PSC-06-1059-PCO-EI, the Prehearing Officer bifurcated the cost recovery issue from the need determination. A formal administrative hearing was held on January 18, 2007 to hear the issues related to the need determination and the requested exemption from Rule 25-22.082, Florida Administrative Code. Intervention was granted to the Office of Public Counsel (OPC), the Florida Industrial Power Users Group (FIPUG), the Florida Retail Federation (FRF), and AARP. AARP has subsequently been excused from this proceeding.

We approve the settlement between the parties and grant PEF's petition for determination of need. This Order reflects that decision and serves as our report under the Power Plant Siting Act, as required by section 403.507(4), Florida Statutes.

Section 403.519(3), Florida Statutes, sets forth those matters that we must consider in a proceeding to determine the need for a proposed expansion of an existing nuclear power plant:

> In making its determination, the commission shall take into account the need for electric system reliability and integrity, the need for adequate electricity at a reasonable cost, the need for fuel diversity and supply reliability, and whether the proposed plant is the most cost-effective alternative available. The commission shall also expressly consider the conservation measures taken by or reasonably available to the applicant or its members which might mitigate the need for the proposed plant and other matters within its jurisdiction which it deems relevant.

Exemption from Requirements of Rule 25-22.082, Florida Administrative Code

We find that the CR3 Uprate satisfies all criteria for exemption from the Bid Rule, pursuant to Rule 25-22.082(18), Florida Administrative Code (F.A.C.). PEF has shown that the CR3 Uprate will likely result in a lower cost supply of electricity to its general body of ratepayers and will also serve the public welfare. Because the CR3 Uprate provides customers additional generation at a net savings, not a net cost, from a more environmentally beneficial source that enhances fuel diversity, no request for proposal is needed. No generation alternative can supply 180 MW of additional power at a net savings to customers comparable to the economic, environmental, and fuel diversity benefits provided by the CR3 Uprate. Other available supply-side generation alternatives will likely have higher fuel costs and, therefore, increase the net cost to customers.

In making our decision whether to grant a determination of need, we have necessarily relied on the representations of the proposed power plant's cost effectiveness made by PEF. This reliance is especially critical where, as in PEF's petition before us in this case, there are no request for proposal results or other market-based checks on the utility's representations. Accordingly, while we grant PEF's requested exemption, PEF is on notice that we will closely scrutinize the reasonableness and prudence of any capital cost greater than those represented by PEF through its testimony and exhibits.

Need for Electric System Reliability and Integrity

In determining the need for the CR3 Uprate, we have taken into account the need for electric system reliability and integrity. The need for the CR3 Uprate is an economic need, not reliability need. The CR3 Uprate will displace higher cost fossil fuel and purchased power generation with low cost nuclear generation, resulting in substantial fuel savings that provide a net benefit to customers. The CR3 Uprate's substantial economic benefits satisfy the statutory need requirements under our prior precedent and Rule 25-22.081(3), F.A.C., recognizing an economic or socio-economic need for new generation.

Need for Adequate Electricity at a Reasonable Cost

We find that the CR3 Uprate will displace higher cost fossil fuel and purchased power generation with low cost nuclear generation, resulting in substantial fuel savings that provide a net benefit to customers. Nuclear energy is the lowest cost energy available on PEF's system. Producing additional nuclear energy from the CR3 Uprate, therefore, will produce energy at the lowest possible generation fuel cost.

Need for Fuel Diversity and Supply Reliability

We find that the proposed CR3 Uprate will displace fossil fuel and purchased power generation with nuclear generation, resulting in increased fuel diversity and supply reliability. The CR3 Uprate provides a stable source of additional base load power. Nuclear generation is

not subject to the same supply interruptions or changes in price volatility that can affect generation with fossil fuels. Rather, the supply of nuclear fuel is relatively plentiful and stable in price. PEF's customers, and the State, thus, will benefit from increased price stability, enhanced fuel diversity, and decreased reliance on foreign fuel sources resulting from the addition of nuclear capacity to PEF's system.

No Mitigating Conservation Measures

We find that expanding conservation programs cannot displace the CR3 Uprate. PEF is currently exceeding its Commission-approved numeric conservation goals. Further, PEF has recently expanded its demand side management program offerings, resulting in a projected additional 388 MW of summer demand savings. The CR3 Uprate will produce more incremental energy into the system than an equivalent amount of conservation can save. If the comparison were to be done on equivalent energy alone, it would take more MWs of conservation to save an amount of energy equivalent to the energy produced by the CR3 upgrade, which would result in higher costs to customers.

Most Cost-Effective Alternative Available

We find that the CR3 Uprate displaces higher cost generation on PEF's system, yielding substantial fuel savings to the net benefit of PEF's customers. PEF's customers will receive additional generation at a net savings of approximately $327 million on a cumulative net present value basis. This means that no entity offering a supply-side generation alternative can likely propose a lower cost alternative for the same amount of power, and certainly not from relatively clean nuclear power. The CR3 Uprate, because of the net fuel savings benefits driving the project, is the lowest cost supply of electricity for PEF's customers.

Conclusion

Based on the foregoing, we grant PEF's petition for a determination of need for the proposed expansion of the Crystal River Unit 3 Nuclear Power Plant because it fills an economic need. It will provide adequate electricity at a reasonable cost to customers. CR3 will displace higher cost fossil fuel and purchased power generation with low cost nuclear generation, resulting in substantial fuel savings that provide a net benefit to customers. Although it is not needed for reliability it does meet the need for fuel diversity and supply reliability. The proposed CR3 Uprate will displace fossil fuel and purchased power generation with nuclear generation, resulting in increased fuel diversity and supply reliability. PEF's customers, and the State, thus, will benefit from increased price stability, enhanced fuel diversity, and decreased reliance on foreign fuel sources resulting from the addition of nuclear capacity to PEF's system. There are no cost-effective demand-side management measures available to offset the need. Because the CR3 uprate displaces higher cost generation on PEF"s system, yielding fuel savings to the net benefit of PEF"s customer, there can be no less costly supply-side generation alternative available.

Upon further consideration, we exempt PEF from the requirements of Rule 25-22.082, (F.A.C.), as it applies to CR3 uprate. In granting the exemption, we do so upon the considerations listed above.

Based on the foregoing, it is

ORDERED by the Florida Public Service Commission that Progress Energy Florida's petition for determination of need for its proposed expansion of Crystal River Unit 3 nuclear power plant is granted. It is further

ORDERED that Progress Energy Florida is exempted from the requirements of Rule 25-22.082, Florida Administrative Code. It is further

ORDERED that this docket shall be closed.

By ORDER of the Florida Public Service Commission this 8th day of February, 2007.

Blanca S. Bayó

BLANCA S. BAYÓ, Director
Division of the Commission Clerk
and Administrative Services

(SEAL)

LCB

NOTICE OF FURTHER PROCEEDINGS OR JUDICIAL REVIEW

The Florida Public Service Commission is required by Section 120.569(1), Florida Statutes, to notify parties of any administrative hearing or judicial review of Commission orders that is available under Sections 120.57 or 120.68, Florida Statutes, as well as the procedures and time limits that apply. This notice should not be construed to mean all requests for an administrative hearing or judicial review will be granted or result in the relief sought.

Any party adversely affected by the Commission's final action in this matter may request: 1) reconsideration of the decision by filing a motion for reconsideration with the Director, Division of the Commission Clerk and Administrative Services, 2540 Shumard Oak Boulevard, Tallahassee, Florida 32399-0850, within five (5) days of the issuance of this order in the form prescribed by Rule 25-22.060, Florida Administrative Code; or 2) judicial review by the Florida Supreme Court in the case of an electric, gas or telephone utility or the First District Court of Appeal in the case of a water and/or wastewater utility by filing a notice of appeal with the Director, Division of the Commission Clerk and Administrative Services and filing a copy of the notice of appeal and the filing fee with the appropriate court. This filing must be completed within thirty (30) days after the issuance of this order, pursuant to Rule 9.110, Florida Rules of Appellate Procedure. The notice of appeal must be in the form specified in Rule 9.900(a), Florida Rules of Appellate Procedure.

2.0 SITE AND VICINITY CHARACTERISTICS

2.1 Site and Associated Facilities Delineation

2.1.1 Site Location

Progress Energy Florida's CR3 is part of the larger Crystal River Energy Complex (CREC) located in Citrus County, Florida. The CREC is comprised of 4,738 acres and includes a single nuclear unit (CR3) and four coal-fired units, CR 1, 2, 4, and 5. CR3 and the four coal-fired units lie in the developed area of the site.

CR3 is in the southern (and center) part of CREC and comprises approximately 26.86 acres. This 26.86 acre site and certain related facilities are the subject of this application. These CR3 facilities are shown on Figure 2.1.2-2. CR 1 and 2 are located along the southern boundary of the CREC in between the intake and discharge canals. CR 4 and 5 are located approximately 0.5 mile north of CR3. CR 1, 2, 4 and 5 are not affected by this application.

The CREC is located in all or portions of Sections 31, 32, 33, 34, and 35, Township 17, Range 16. CR3 is located in Section 33, Township 17, Range 16 (Figure 2.1.1-1). CR 1 and 2 are located in Section 33, Township 17, Range 16, and CR 4 and 5 are located in or portions of Sections 28 and 33, Township 17, Range 16.

2.1.2 Existing CREC Site Uses

CR3 is an 838 MW pressured water reactor which began commercial operation in 1977. CR3 is not currently certified under the PPSA. CR 1 and 2 were built in the 1960s and produce 379 and 486 MW, respectively. CR 4 and 5 were built in the early 1980s and produce 717 and 720 MW, respectively. CR 4 and 5 were certified under the PPSA in 1980. The CREC also contains office buildings, warehouses, coal storage areas, ash storage, transmission, and substation facilities which support the various units (Figure 2.1.2-1).

Cooling water for CR 1, 2, and 3 is withdrawn from an intake canal which connects to Crystal Bay and the Gulf of Mexico (Figure 2.1.2-2). Florida Department of Environmental Protection (FDEP) National Pollution Discharge Elimination System (NPDES) permit FL0000159 (Appendix 10.1.2)

limits the combined condenser flow from CR 1, 2, and 3 to 1,898 million gallons per day (MGD) during the period of May 1 through October 31, and 1,613.2 MGD during the remainder of the year.

CR 1 and 2

The cooling water intake structures for CR 1 and 2 are located on the north bank of the intake canal. The design intake flow for CR 1 and 2 is 638,000 gallons per minutes (gpm), or 919 MGD.

CR3

The cooling water intake structure for CR3 is located approximately 400 ft east of the intake for CR 1 and 2. A chain link fence extends across the entire width of the intake canal upstream of the intakes for CR 1 and 2. The fence restricts access to CR3 and collects floating or partially submerged debris. CR3 has four pump bays and seven traveling screen bays separated from the pump bays by a common plenum. An eighth traveling screen bay provides service water. Similar to CR 1 and 2, the traveling screen trays are three meters wide and have 9.5 millimeter (mm) (3/8 inch) mesh. They are operated once every eight hours and cleaned by a front spray wash system. The screenwash trough slopes to the west were material is collected in a sump prior to discharge to the intake canal. The trough receives combined wash water from all screens.

CR3 operates with four circulating water pumps, each rated 170,000 gpm. The design intake flow for CR3 is 680,000 gpm or 979 MGD. The three units have a maximum permitted flow of 1,898 MGD and a total nameplate rating of 1,854.8 MW. Additionally, CR3 has a low flow nuclear services water pumping capacity of 10,000 to 20,000 gpm, depending on system demand.

Cooling water for CR 1, 2, and 3 is withdrawn by a common intake canal south of the units that extends into the Gulf of Mexico. The 14-mile-long intake canal is dredged to a depth of approximately 20 feet (ft) to also accommodate coal barges which unload and dock on the south side of the canal, just west of the intakes for CR 1 and 2 (Figure 2.1.2-2). The intake canal is defined by northern and southern dikes. The northern dike continues along the channel for another 5.3 miles. There are openings in the dikes at irregular intervals to allow north-south boat traffic in the area of CREC. Movement of water into the canal is tidally influenced; at the mouth of the canal, current velocities ranged from 0.6 to 2.6 feet per second (fps) when last measured in 1983-1984 (Golder 2005).

The head of the common discharge canal for all units is located just north of the discharge from CR3. The canal extends west for approximately 1.6 mile to the point of discharge, where it opens into a bay. The dredged channel, bordered to the south by a spoil bank, continues for another 1.2 miles. Water in the discharge canal is maintained by dredging to a depth of approximately 10 ft.

Helper cooling towers currently line the northern bank of the discharge canal and receive a portion of the circulating water flow from CR 1, 2, and 3 including cooling tower blowdown from CR 4 and 5. The helper cooling towers are operated as necessary to ensure that the discharge temperature does not exceed 96.5°F (as a three-hour rolling average) at the point of discharge into the Gulf of Mexico. In February 2006, PEF received approval from the state of Florida to install modular cooling towers which CR 1 and 2 operate during the warmest times of the year. CR 4 and 5 are closed-cycle units that withdraw water for cooling tower makeup from the discharge canal, downstream of CR 1, 2, and 3 and discharge cooling tower blowdown to the discharge canal (Figure 2.1.2-2).

CR 1, 2, and 3 are authorized to operate via several common environmental permits issued by the FDEP and other agencies (Appendices 10.1.2 and 10.4). Figure 2.1.2-1 depicts the site layout and Figure 2.1.2-2 is an aerial photograph of CR3.

2.1.3 Adjacent Properties

CR3 is located within the CREC and is adjacent to CR 1 and 2. The intake canal is located south of CR3 and the discharge canal is located north of CR3. PEF operates a mariculture center approximately one mile east of CR3. The Crystal River Mariculture Center is a multi-species marine hatchery originally established in the early 1990s to mitigate fisheries impacts related to the once-through cooling water system at Crystal River Units 1, 2, and 3. The Mariculture Center operations focus on the successful husbandry, culture, grow-out, harvest, and release into local waters of those selected species. Land use surrounding the CREC is predominantly undeveloped land. Active mines are located to the north and east of CREC.

. The Central Florida Barge Canal is located approximately 3.2 miles north of CR3. There is relatively low-density residential housing north of the Central Florida Barge Canal and east of U.S. Highway 19

Uses within the Project Area

Figure 2.1.2-1 provides the site layout for the facilities that support the operation of CR3 (identified within the red boundary) and the facilities that are located adjacent to CR3. The existing CR3 facilities and their approximate land areas are shown in Figure 2.1.2-1.

2.1.4 100-Year Flood Zone

According to the Federal Emergency Management Agency (FEMA) and the FDEP, CR3 and CREC are located within Zone VE. VE is an area inundated by 100-year flooding with velocity hazard (wave action) in which base flood elevations have been determined (Figure 2.1.5-1). The main CR3 power block is located on a concrete berm with wave steps to mitigate flood and wave impacts.

2.2 Socio-Political Environment

2.2.1 Governmental Jurisdictions

CR3 is located in unincorporated northwest Citrus County, Florida. Yankeetown, Inglis, and the city of Crystal River are municipalities located within five miles of CR3. Yankeetown is located approximately four and a half miles northwest of CR3 in Levy County and Inglis is located approximately five miles northeast of CR3 in Levy County. The city of Crystal River is located approximately four miles southeast of CR3 in Citrus County (Figure 2.2.1-1).

There are three state parks (Crystal River Preserve State Park, Crystal River Archeological State Park, and Felbrun Park Trailhead/Withlacoochee Bay Trail), one aquatic preserve (St. Martin's Marsh Aquatic Preserve), and two outstanding Florida waters (Crystal River and Withlacoochee River System) within five miles of CR3 (Figures 2.2.1-2, 2.2.1-3, and 2.2.1-4). There are no national parks within five miles of CR3. The mouth of Crystal River is located within two miles of CR3 (Figure 2.2.1-3). These properties are discussed further in Section 2.2.5.

2.2.2 Zoning and Land Use Plans

2.2.2.1 Zoning

The Citrus County Land Development Code (Code) has been adopted to implement the policies and objectives of the Citrus County Comprehensive Plan and to regulate land development within the

unincorporated portions of Citrus County. The Code incorporates a zoning map that depicts the zoning categories of lands lying within unincorporated Citrus County. CR3 and CREC are zoned as a Transportation, Communication, and Utilities (TCU) (Figure 2.2.2-2) (Appendix 10.2).

The TCU category is described in the Code Chapter 4 (4634) as follows:

> *This category allows for those uses directly related to transportation, communications, and utilities. It also accommodates service, repair, maintenance, and storage related facilities necessary to support such uses.*

Electrical power plants are an allowed use in this zoning district.

2.2.2.2 *Future Land Use*

CR3 is located in unincorporated Citrus County, Florida. The county has adopted a comprehensive plan, which is updated on a periodic basis. The county comprehensive plan incorporates a future land use map that depicts the future land use categories of all property falling within the unincorporated portions of the county.

CR3 and CREC Future Land Use category is designated as TCU according to the Citrus County Future Land Use Map (Figure 2.2.2-1). The TCU category is described in the Citrus County Comprehensive Plan Future Land Use Element (II)(3)(d) as follows (Appendix 10.3):

> *This land use category comprises three types of uses: Transportation, Communication, and Utilities (TCU). Transportation land uses include airports, railroad lines, and major shipping channels. Communication land uses include telephone, radio, and television facilities, including transmission towers. Public utilities include major utility transmission rights-of-way (230 KV or greater), water supply plants, sewage treatment plants, and electrical power facilities. There are 5,416 acres designated as TCU in Citrus County. This land use category comprises 1.42 percent of the County land area. The majority of this allocation consists of Florida Power's Crystal River Power Plant, the major transmission lines, the Crystal River Airport, and the Inverness Airport.*

CR3 is an allowed use under this land use designation.

2.2.3 Demography and Ongoing Land Use

CR3 and CREC are located in a rural unincorporated area of Citrus County. Yankeetown, Inglis, and the city of Crystal River are incorporated municipalities located within five miles of the CR3 (Figure 2.2.1-1).

According to the University of Florida's 2006 Florida Statistical Abstract, Citrus County was estimated to have 132,635 residents in 2005, a 12.32 percent increase from 2000. The medium population projections for all of Citrus County depict continued growth, with an estimated population of 184,600 in 2025. Census counts and population estimates for the three municipalities within five miles of CR3 are listed below:

Municipality	Census 2000	Estimates 2005	Percentage Change
Crystal River	3,485	3,710	6.46
Yankeetown	629	743	18.2
Inglis	1,491	1,676	12.41

University of Florida's 2006 Statistical Abstract Table 1.25

Existing land use patterns near CR3 are depicted on Figure 2.2.3-1. The predominant existing land uses within the vicinity of CR3 are undeveloped and industrial. This pattern of land use is anticipated to remain the same for the current planning period as reflected in the county's Future Land Use Map. Policy 17.3.24 of the Citrus County Comprehensive Plan Future Land Use Element discourages new residential development in the vicinity of the CREC and no increase in residential density shall be approved within five miles of the nuclear power plant facility. The code shows a five mile overlay zone around the nuclear power plant in which further residential density increases are prohibited. Scattered residential clusters are located north of the Central Florida Barge Canal and east of U.S. Highway 19.

2.2.4 Easements, Title, Agency Works

No easements, titles, or agency works are required for the CR3 Uprate Project.

2.2.5 Regional Scenic, Cultural and Natural Landmarks

Crystal River Preserve State Park is approximately one and a half miles southeast of CR3 and adjacent to CREC's southern boundary. The park borders 20 miles of the northern Gulf Coast between the two cities of Yankeetown and Homosassa. Crystal River Preserve State Park offers hiking, bicycling, kayaking, and canoeing. The park is located west of U.S. Highway 19 in the city of Crystal River.

The Crystal River Archaeological State Park is approximately five miles southeast of CR3. The park is a 61-acre pre-Columbian and Native American National Historic Landmark. The park has burial mounds, temple/platform mounds, a plaza area, and a substantial midden. The six-mound complex is one of the longest continuously occupied site in Florida. The park is also a part of the Great American Birding Trail and offers boat tours of Crystal River.

The Feldburn Park Trailhead (Withlacoochee Bay Trail) is managed as a unit of the 90,000 acre Marjorie Harris Carr Cross Florida Greenway located approximately 4.32 miles northeast of CR3. Felburn Park was formerly a approximately 140-acre limerock mine. Remnants of the mining activity include the 40-acre Phil's Lake that was formed as a result of the mining activity intersecting the water table. The Withlacoochee Bay Trail traverses five miles west from the Felburn Park Trailhead to the Gulf of Mexico along the southern side of the former Cross Florida Barge Canal. The trail offers hiking, biking, rollerblading, horseback riding, bird watching, and fishing. The park is a part of the FDEP Greenways and Trails program.

The St. Martin's Marsh Aquatic Preserve is approximately four miles south of CR3. The aquatic preserve covers open water areas from Crystal River to the Homosassa River in coastal Citrus County. Adjacent roads to the preserve include U.S. Highway 19, State Route 44, and County Route 488. The St. Martin's Marsh Aquatic Preserve is composed of open water, several inlet bays, tidal rivers and creeks, salt marshes, and adjoins upland hammock islands. Species found in the preserve include amphibians, fish, birds, mammals, plants, and reptiles. The preserve is also a protected area for many commercially, recreationally, and important species.

The Crystal River and Withlacoochee River System are designated as Outstanding Florida Waters (OFW). They are waters designated worthy of special protection because of their natural attributes. This special designation is applied to certain waters and is intended to protect existing, good, water quality, and is managed by state or federal governments. Crystal River is located approximately two

miles south of CR3. The Withlacoochee River System is located approximately four miles northwest of CR3. CREC does not interact directly or indirectly with these OFWs.

The CR3 Uprate Project will not directly or indirectly impact these regional scenic, cultural, and natural landmarks.

2.2.6 Archaeological and Historic Sites

In December 2006, New South Associates conducted a background search on behalf of Tetra Tech NUS to support the license renewal for CR3 (Appendix 10.3-1). A review of the relevant data was conducted in order to provide a synthesis of known archaeological sites within a six-mile radius of the facility. According to the report, the Florida Master Site File data indicates that there are currently 195 archaeological sites, nine structures, and three cemeteries within a six-mile radius of the 4,738-acre CREC. Of these, Citrus County contains 174 of the known sites, eight of the known structures, and two recorded cemeteries. The Levy County portion of the six-mile radius includes 21 known sites, one recorded structure, and one recorded cemetery. Only two sites are listed in the National Register of Historic Places and both are prehistoric: the Crystal River Indian Mound site complex (8CI00001) and Mullet Key (8CL00022) (New South Associates 2006). The NRC license renewal includes no plans for new construction and therefore will have no effect on the cultural resources in the identified review area.

The Crystal River Indian Mound site complex (8CI00001) is two miles northwest of the city of Crystal River on U.S. Highway 19 and is classified as prehistoric. The ceremonial center site contains two temple mounds, a conical burial mound, a shell midden ridge, and a shell midden mound. On September 29, 1970, it was added to the U.S. National Register of Historic Places. The site was excavated by C.B. Moore in 1903, 1906, and 1917; Florida State University in 1951; and Florida State Museum in 1964 (National Register Information Systems 2007).

The Mullet Key is a historic island near the city of Crystal River. It is located three miles south of the main mouth of the Crystal River, and was inhabited by Native Americans in pre-Columbian times. On July 3, 1986, it was added to the U.S. National Register of Historic Places. Mullet Key is located approximately 5.27 miles southwest of CR3.

No archaeological or historical sites are located within the CR3 project area.

2.2.7 Socioeconomics and Public Services

2.2.7.1 Labor Force

The total labor force in Citrus County for 2005 was 49,093 with employment of 47,136. Unemployment in 2005 was 1,957 or 4.0 percent in Citrus County. For the state of Florida, the unemployment rate was 3.8 percent and the U.S. unemployment rate was 5.1 percent (University of Florida 2006).

Average monthly private-sector employment by major industry group in Citrus County for September 2006 is depicted below:

Major Industry Group	Employment
Agriculture, Forestry, Fishing and Hunting	92
Mining	57
Utilities	Not Available
Construction	4,334
Manufacturing	934
Transportation and Warehousing	162
Wholesale Trade	594
Retail Trade	5,500
Finance and Insurance	775
Information	532
Real Estate and Rental and Leasing	551
Professional Scientific and Technical Services	1,020
Management Companies and Enterprises	35
Administration and Support and Waste Management and Remediation Services	2,043
Educational Services	125
Health Care and Social Assistance	6,405
Arts, Entertainment & Recreation	491
Accommodation and Food Services	2,796
Other Services	1,440
Unclassified	29

Source: State of Florida, Labor Market Statistics, "Quarterly Census of Employment and Wages" (ES-202), Annual NAICS files.

The health care and social assistance groups and retail trade industry provided the most employment in Citrus County with about 43 percent of the total employment between the two groups. The construction industry provided about 4,334 jobs.

Employment projections for construction and extraction trades in Florida have been estimated for the year 2013. Statewide, construction employment is estimated to increase from 546,810 in 2005 to 660,509 in 2013 (University of Florida 2006).

2.2.7.2 General Income

Citrus County had a per capita personal income of $24,278 for 2004 compared to state of Florida and U.S. per capita personal income of $31,469 and $33,050, respectively (U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information 2004). This income level ranked 35 out of the 67 counties in Florida.

The median household income in Citrus County was $31,895 in 2003. When compared to the 2000 median household income, this income level is a 1.7 percent increase. Florida had a median household income of $38,985 in 2003, which was an increase of 0.5 percent from 2000 (University of Florida 2006). The average wage and salary earnings in Citrus County in 2004 were $28,343, approximately 19 percent lower than the statewide average of $34,935 (BEA 2004).

2.2.7.3 Housing

The table below identifies the total number of housing units in Citrus County by occupancy type according to the U.S. Census Bureau:

Renter Occupied	11,301
Owner Occupied	46,530
Total Occupied	**57,831**

The average, house purchase-price in Citrus County in 2005 was $196,322 (University of Florida 2006).

A total of 71 licensed lodgings existed in 2006, representing 2,259 lodging units. This includes 1,001 apartment building units, nine rooming house units, 140 rental condominiums, and 117 transient apartment building units (University of Florida 2006).

2.2.8 Area Public Service and Utilities

2.2.8.1 Education

Primary public education in Florida is operated on a countywide basis. Each county's respective school district establishes educational policies and staffing requirements. According to the Florida Department of Education, Statistical Brief, Citrus County had a total student membership in preschool

through twelfth grade of 16,077 in the fall of 2006. Citrus County schools employed approximately 1,028 teachers in the fall of 2005.

There are seven schools located in the city of Crystal River and one school located in Yankeetown. The Academy of Environmental Science is located five miles southeast of CR3 and the Marine Science Station is located 5.1 miles southeast of CR3 (Figure 2.2.8-1). The Academy of Environmental Science is a charter school focused on environmental and natural resource education. The Marine Science Station provides marine education to students through the county and state.

2.2.8.2 *Transportation*

U.S. Highway 19 is the major north-south route in the western portion of the County, traveling through the city of Crystal River and Homosassa Springs, connecting Levy County to the north with Hernando County to the south. In the area of the CREC, U.S. Highway 19 is a four-lane divided arterial (Citrus County 2006).

The main entrance to the CR3 is West Powerline Street, located off U.S. Highway 19, approximately 3.7 miles west of U.S. Highway 19/U.S. Highway 98. All CREC employees use Powerline Street to enter and exit the facility (Figure 2.2.8-2). The existing peak hour traffic volumes are presented in Figure 2.2.8.3 for the a.m. and p.m. peak hours.

U.S. Highway 19/U.S. Highway 98 is a state maintained, northbound-southbound principle rural arterial. At the intersection with West Powerline Street, the U.S. Highway 19/U.S. Highway 98 northbound approach consists of one exclusive left lane, and two through lanes and the southbound approach consists of two through lanes and one dedicated right turn lane. The traffic signal control at the intersection with West Powerline Street is actuated-uncoordinated with a variable cycle length.

West Powerline Road is an eastbound-westbound local roadway and is used exclusively for access to and from the existing power plant. At U.S. Highway 19/U.S. Highway 98, the West Powerline Street eastbound approach consists of one left turn and one right lane. The traffic signal control at the intersection with U.S. Highway 19/U.S. Highway 98 is actuated-uncoordinated with a variable cycle length.

There is one railroad serving Citrus County, the Seaboard Coast Railroad, owned by CSX Transportation. A spur from this line runs just south of West Powerline Street, the CR3 access road and terminates on the CR3 property.

There are two public and six private airports within Citrus County. The CREC has its own private heliport onsite. The Crystal River Airport is the closest public airport to CR3, which is approximately 9.95 miles from CR3. J.R.'s Stolport Airport is the closest private airport to CR3, which is approximately 9.18 miles from CR3.

The Florida Department of Transportation (FDOT) is currently conducting a Project Development and Environment (PD&E) study in support of a new four-lane (toll) turnpike. The new Citrus County portion of the Suncoast Parkway turnpike will extend from U.S. Highway 98 to U.S. 19 Highway, alleviating congestion along U.S. Highway 19 and around the city of Crystal River and other towns along the west coast of Citrus County.

2.2.8.3 Medical Facilities

Citrus County has two hospitals, which contain approximately 326 licensed beds. Licensed medical practitioners in Citrus County include 200 physicians, 180 dentists, dental hygienists, and dental radiographers, 268 health practitioners, 1,929 registered and practical nurses, 23 opticians, and 96 pharmacists and pharmacist interns (University of Florida 2006).

The closest medical facility to CR3 is Seven Rivers Regional Medical Center, located approximately four miles east of CR3. Seven Rivers Regional Medical Center services include an ambulatory surgery center, cardiovascular care, the Dunnellon Diagnostic Center, emergency services, endoscopy services, imaging services, impatient services, an intensive care/coronary care unit, laboratory services, an orthopedic center of excellence, rehabilitation services, the Seven Rivers Rehab & Wound center, a sleep disorder center, surgical services, a women's and family center, wound care and hyperbaric medicine services. If Seven Rivers Regional Medical Center is not available for emergency care, Citrus Memorial Hospital in Inverness, Florida is located approximately 23 miles southeast of CR3.

The Nature Coast Emergency Medical Services (EMS) provides emergency medical transportation within Citrus County. EMS is licensed to operate by the Office of Emergency Medical Services, Florida Department of Health and Rehabilitative Services and functions according to Chapter 401,

F.S., and Chapter 10D-66, Florida Administrative Code (F.A.C). EMS operates the county rescue units.

2.2.8.4 *Firefighting Facilities*

Citrus County Fire Rescue is responsible for providing fire rescue, fire prevention, hazardous materials, and technical rescue services to Citrus County. The Citrus County Fire Rescue has over 200 career and volunteer members working out of 22 fire and rescue stations.

CR3 has an onsite fire brigade that provides onsite response in the event of an emergency. Additionally, numerous response organizations and sub-organizations are available to respond to emergencies. These emergency response organizations may be drawn from local, state, federal, and private sectors.

2.2.8.5 *Police Protection*

The Citrus County Sheriff's Office serves a population of about 132,635 people (University of Florida, 2006). The Citrus County Sheriff's Office provides law enforcement in the vicinity of CR3. The Florida Highway Patrol provides service to U.S. Highway 19.

During an emergency at CR3 in which all available assistance is required, numerous response organizations and sub-organizations are available. These emergency response organizations may be drawn from local, state, federal, and private sectors. They are cited in Table 2.2.8-1 (RERP 2007).

2.2.8.6 *Emergency Response and Preparedness*

PEF has developed an integrated preparedness program to respond to potential emergencies at CR3. The plan has been developed to 1) provide reasonable assurance that appropriate measures can and will be taken to protect health and safety in the event of an emergency; 2) assure that CREC personnel are protected to the maximum extent practicable; and 3) to provide timely dissemination of accurate information to local, State and Federal authorities and to the public (Progress Energy, Radiological Emergency Response Plan, 2007).

2.2.8.7 *Recreation Facilities*

There are four known public recreation areas within five miles of CR3 located in Citrus and Levy Counties (Figure 2.2.8-1).

Fort Island Gulf Beach is located approximately 3.3 miles south of CR3 off west Fort Island Road. Fort Island Gulf Beach amenities include barbecue grills, beach, boat ramp, fishing pier, lighting detector, parking, picnic tables, restrooms, showers (outdoor), and swimming.

Bird Creek County Park is approximately five miles northwest of CR3 located in Yankeetown at the end of U.S. Highway 40. Bird Creek Park is a little park located where the Withlacoochee River flows into the Gulf of Mexico in Levy County, providing both freshwater and saltwater fishing. It also offers activities and facilities such as canoeing, swimming, fishing, picnic sites, and boat ramps.

Wilderness Addition Park and Masnola Park/Garden Club are local recreation facilities located in Yankeetown approximately five miles north of CR3.

2.2.8.8 *Electricity and Gas*

PEF and Withlacoochee River Electric Coop, Inc. provide electricity to Citrus County businesses and residents. Central Florida Gas provides natural gas service in the area.

2.2.8.9 *Water Supply Facilities*

The Citrus County Utilities Division is responsible for the operation of six county owned water facilities. The Division supplies potable water directly to over 5,000 customers and to the Ozello Water Association and Apache Shores through bulk water agreements. Agreements have also been made to supply potable water to the city of Crystal River and Beverly Hills/Rolling Oaks Utilities during emergency situations. The Charles A. Black II (aka Meadowcrest Water Treatment Facility) is located in the city of Crystal River, which is the closest water treatment facility to CR3.

There are seven active freshwater groundwater wells located on PEF's CREC property. Three of the seven groundwater wells supply an existing water treatment plant. CR3 receives and meters its intake supply from this existing water treatment plant. This facility is capable of serving the CR3 Uprate Project.

2.2.8.10 Sewage Treatment Facilities

The Citrus County Utilities Division is responsible for the operation of four, county-owned wastewater treatment facilities and provides wastewater treatment for over 2,000 customers.

One of the following types of wastewater facilities serves Citrus County businesses and residents: septic tanks, package plants, or regional facilities. Septic tanks provide service to individual residences or small businesses within unincorporated Citrus County. Regional facilities are large systems that serve areas of densely populated developments. The Brentwood Wastewater Treatment Facility located in Lecanto is the closest facility to CR3.

The existing CR3 is not connected to the regional wastewater system. The CR3 Uprate Project will be self-sufficient and facility-specific sanitary and process wastewater collection, treatment, and disposal needs will be met by the existing and permitted CR 1, 2, and 3 wastewater treatment plant (Appendix 10.4.2).

2.2.8.11 Solid Waste Disposal

The Citrus County Solid Waste Management Division is responsible for solid waste collection, transport, and disposal in unincorporated portions of the county. It operates the central landfill that accepts household, commercial, and industrial waste. Over 104,000 tons of material per year is buried, and approximately three million gallons of leachate is treated annually at a specialized facility on-site.

CREC currently provides for facility-specific solid waste collection and disposal. No change in solid waste management and disposal practices are anticipated.

2.3 Bio-Physical Environment

2.3.1 Geohydrology

The information presented in this section draws upon previous information submitted in the CREC CR 4 and 5 SCA (March 1979) and provides a brief summary of the geohydrologic baseline information applicable to the CR3 Uprate Project.

The general geology of Citrus County was derived from the "Text to Accompany the Geologic Map of Florida" (Scott 2001). Site-specific, subsurface information was obtained by a geotechnical investigation performed within the CREC site as referenced in Dames and Moore 1995.

2.3.1.1 Geologic Description of the Site Vicinity

The generalized geology and hydrogeology for northern Florida, in the vicinity of the site, is shown in Figure 2.3.1-1. Based upon review of the U.S. Geological Survey (USGS) map for Red Level, Florida, dated 1954 and revised 1992; the area in the vicinity of the CREC has a natural ground surface elevation less then five feet (ft) above mean sea level (msl) with respect to the National Geodetic Vertical Datum (NGVD) of 1929. CREC was occupied by Ocala Limestone prior to development. Under natural conditions, the water table (i.e., absent drainage improvements) was near the ground surface. Geologic structures in the state of Florida are shown in Figure 2.3.1-2.

The primary geomorphologic feature located within the area of the site is coastal swamp (Florida Geologic Survey 1992) (Figure 2.3.1-3). Seismic activity near the site is minimal. There is 0.04 g (gravitational force) of peak ground acceleration with a two percent probability of exceedance in 50 years (Figure 2.3.1-4).

Rock units ranging in age from Paleocene to late Eocene age underlay the site. Formations and groups discussed in this report include (from oldest to youngest): the Cedar Keys Formation of Paleocene age, Avon Park Formation of middle Eocene age, and Ocala Limestone of late Eocene age (Scott et al. 2001). Figure 2.3.1-5 depicts a stratigraphic column showing lithostratigraphic units for the state of Florida. Figure 2.3.1-6 depicts a regional geologic cross section.

The Cedar Keys Formation is subdivided by lithologic character and corresponding geophysical log characteristics into six units (Winston 1994). In descending order, they are:

- Unit A, characterized by a preponderance of anhedral and cryptocrystalline dolomite, euhedral dolomite is subordinate;
- Unit B, characterized by the presence of numerous relic grain textures in chalky to microcrystalline euhedral dolomite;
- Unit C, predominately anhydrite, with subordinate chalky to very fine microcrystalline euhedral dolomite;
- Unit D, characterized by a predominance of relic grains in a chalky to very fine

microcrystalline euhedral dolomite, with few thin-bedded anhydrites; and

- Units E and F, similar in texture to Unit D, but contain fewer beds of relic grain texture.

The Avon Park Formation contains carbonate sediments of peninsular Florida. The formation consists of cream to light-brown or tan, poorly indurated to well indurated, variably fossiliferous limestone. The limestone is interbedded with dolostones (Scott 2001).

The Ocala Limestone consists of nearly pure limestone with occasional dolostones. The formation can be subdivided into two facies on the basis of lithography. The lower consists of white to cream colored, fine to medium grained, poor to medium indurated, and fossiliferous limestone. The upper facies consist of a white, poor to well indurated, poorly sorted, fossiliferous limestone. The permeable, highly transmissive carbonates of the Ocala Limestone form an important part of the Floridan Aquifer System (Scott 2001)

2.3.1.2 Detailed Site Lithologic Description

Detailed site lithology is available for the CREC Groundwater Monitoring Plan (Dames and Moore 1995). A generalized stratiographic column for the site is shown on Figure 2.3.1-7.

Soils on and around the site are nearly level and poorly drained. The eastern portion of the site is comprised mainly of the Broward-Boca association. These are sandy soils underlain by limestone. To the west, the soils are extremely wet and classified as freshwater or saltwater swamp (FPC 1979). The property is underlain by poorly graded sand five ft below ground surface (bgs). The sand is underlain by limestone.

The site is located in the Ocala Uplift District, Big Bend Karst Division and the Chassahowitzka Coastal Strip Subdivision physiographic division (Brooks, 1981). The Ocala Uplift District is the "Lime Sink Region" of the pioneers. Early Tertiary limestones are at or near the surface in most places. Structurally, this is a broad uplift that occurred in Middle and Late Tertiary time. The most distinctive features of the Ocala Uplift District are the low-rolling limestone plains, but the landscape is varied. The Big Bend Karst Division is an erosional limestone plain with some low hills consisting of surficial sand. Beaches are rare; salt marshes give way to the open water of the Gulf of Mexico. Some mangroves occur southward of the Cedar Keys. The low coastal plain is comprised predominantly of flatwoods and swamps. The Chassahowitzka Coastal Strip Subdivision is a very low coastal strip of limestone rocklands, mostly covered by hardwoods and swamps; there are some

flatwoods. Elevations are typically 10 ft and less. Mangroves become increasingly significant along the rocky, flat coast.

2.3.1.3 Bearing Strength

The generalized profile consists of 5-10 ft of unconsolidated sediments over limestone. The overburden shows a "draped" effect in the area. There are three, broad, geotechnical layers. The first is a sand extending to approximately 5 ft bgs. The second is a very porous, limestone layer. The third is a very dense, impervious layer.

The CREC is suitable for the CR3 Uprate Project from a geotechnical standpoint. Lightly loaded structures can be supported on shallow foundations. Since the groundwater table is relatively high and upper sand is highly permeable. Major excavation will not be required for the CR3 Uprate Project.

2.3.2 Subsurface Hydrology

2.3.2.1 Subsurface Hydrologic Data

The CREC site is underlain by one principal hydrogeologic unit, the Floridan Aquifer System (FAS). In the vicinity of the site, the Floridan Aquifer is unconfined.

Floridan Aquifer

The FAS within the CREC site consists of the Upper Floridan Aquifer (UFA), middle confining unit, and Lower Floridan Aquifer (LFA). The UFA is approximately 10 ft bgs and 600 ft thick (FGS 1991) and consists mainly of limestone (calcium carbonate). Included at its top is Ocala Limestone, with the majority of the aquifer comprised of the Avon Park and Oldsmar Formations (FGS 1992). Groundwater storage and movement in the Floridan aquifer occurs through a complex network of fractures, solution cavities, and secondary porosity. Therefore, aquifer properties – such as hydraulic conductivity and transmissivity – are non-homogeneous and anisotropic.

Brackish groundwater is expected to be found in the coastal portion of the Floridan aquifer in the vicinity of the CREC site. The sub-Floridan confining unit occurs within the Cedar-Keys Unit.

2.3.2.2 *Karst Hydrogeology*

Karst terrains develop in areas underlain by carbonate rocks such as limestone. They often have drainage systems that are reflected on the surface as sinkholes, springs, disappearing streams, or even caves (http://www.dep.state.fl.us/geology/geologictopics/sinkhole.htm).

According to Map Series No. 110, "Sinkhole Type, Development, and Distribution in Florida," (William C. Sinclair and J. W. Stewart USGS), the site is located in Area I, where sinkholes are few, generally shallow and broad, and develop gradually. Shallow-solution sinkholes are the type of sinkholes found in this area (Figure 2.3.2-1). The FDEP's sinkhole database lists 334 sinkholes in Citrus County with the nearest one greater than three miles from the site.

2.3.3 Site Water Budget and Area Users

2.3.3.1 *Site Water Budget*

Below is a table summarizing the USGS Estimated Use of Water in the U.S. County-Level Data for 2000 for Citrus County (http://water.usgs.gov/wateuse/).

Water Use	Million Gallon per Day
Public supply, ground-water withdrawals, fresh	13.97
Public supply, surface-water withdrawals, fresh	0.00
Public supply, total withdrawals, fresh	13.97
Total, ground-water withdrawals, fresh	29.99
Total, ground-water withdrawals, saline	0.00
Total, ground-water withdrawals, total	29.99
Total, surface-water withdrawals, fresh	1.30
Total, surface-water withdrawals, saline	393.90
Total, surface-water withdrawals, total	395.20
Total withdrawals, fresh	31.29
Total withdrawals, saline	393.90
Total withdrawals, total	**425.19**

2.3.3.2 *Water Supply*

Groundwater is withdrawn regionally from the Surficial, Intermediate, and UFA for various purposes, including industrial, agricultural and potable/public supply. Water for public supplies in the vicinity of Crystal River and most of the water used by municipalities and industries in the area are obtained

from wells in the Floridan aquifer. Recharge to the groundwater table occurs as a result of approximately 55 inches of annual rainfall, most of which occurs during the summer months. At the plant site, the groundwater table is approximately 10 feet bgs and is influenced by tidal variations. Numerous springs, lakes, and ponds exist in the area of the CREC. The primary uses for these waterbodies are fresh water sport fishing and water livestock.

2.3.3.3 Area Users

The Southwest Florida Water Management District (SWFWMD) through the issuance of water use permits and well construction permits regulates ground water use in the vicinity of the CREC (Appendix 10.4.1). CREC is authorized to withdraw brackish and fresh groundwater from the UFA via 12 production wells; nine are active and three are currently inactive (Appendix 10.4.1).

The CREC maintains nine active production groundwater wells located linearly eastward away from the complex. The closest of the fresh water production wells is approximately three miles east of the complex. These wells provide raw water to the water treatment plants which serve CR 1, 2, and 3 and CR 4 and 5. CR 1, 2, and CR3 are served by the five most western wells (PW1-A, PW1-B, SPW-3, SPW-4, and SPW-5). Wells SPW-3, SPW-4, and SPW-5 are permitted to withdraw an average of 380,000 gpd, 285,000 gpd, and 285,000 gpd, respectively. The brackish water wells, PW1-A and PW1-B are permitted to withdraw and average of 25,000 gpd. The wells are installed in the Floridan aquifer at depths ranging from 42 to 125 feet.

Figures 2.3.3-1 provides the location of the permitted water use wells within five miles of the CREC.

2.3.4 Surficial Hydrology

2.3.4.1 Site Description

The CREC is located on Crystal Bay, a shallow embayment of the Gulf of Mexico and midway between the Withlacoochee/Cross Florida Barge Canal and Crystal River, and approximately four miles from each.

As far out as Fisherman's Pass, approximately three miles west of the site, the depth of the Crystal Bay is less than 10 ft (SWEC 1985 page 3-1). Shallow inshore areas are characterized by oyster bars (or oyster "reefs") oriented parallel to shore that are visible at low tide and covered by water at high

tide. These oyster bars, composed mostly of broken shell, create numerous small basins with north-south orientation in the area of the intake and discharge canals.

The Withlacoochee River watershed covers approximately 2,100 square miles. The 157 mile long Withlacoochee River originates in the Green Swamp in Polk County and extends northward, discharging into the Gulf of Mexico near Yankeetown, Florida. In 1989, the river was designated an OFW by the Florida Department of Environmental Regulation. Connected lakes and tributaries are also included in this designation. It traverses eight counties (Polk, Lake, Sumter, Pasco, Hernando, Citrus, Marion, and Levy counties), with a watershed in six physiographic regions. Within the Green Swamp, at a location near U.S. Highway 98, the Withlacoochee River runs close to the headwaters of the Hillsborough River. A natural saddle occurs between the two rivers at an elevation of 78.5 ft. The Withlacoochee River can discharge to the Hillsborough River during high flows, but overflow seldom occurs. West of Lake Rousseau, the Withlacoochee River flows to the Gulf of Mexico where it discharges into the Withlacoochee Bay estuary. The area of the river from Inglis to the mouth has been greatly altered by the construction of the lock, dam, and bypass canal.

The Cross-Florida Barge Canal located south of the Levy/Citrus County border was originally constructed as a transportation waterway that would connect the Gulf of Mexico on the west coast to the Atlantic Ocean on the east coast. The original project was constructed and managed by the Army Corps of Engineers prior to the cancellation of the project. The Florida Board of Trustees now owns the unfinished portions of the project and the land. The 100-mile corridor is now designated as the Marjorie Harris Carr Cross-Florida Greenway. The greenway is administrated by the Board of Trustees as conservation and recreation lands.

Crystal River is located in Citrus County and runs from the city of Crystal River west seven miles toward the Gulf of Mexico. Crystal River Springs is a cluster of 30 springs and is the second largest springs group in Florida. Many of the river's springs are 20 to 30 ft deep. The tidally influenced Kings Bay is the headwater of Crystal River that forms at the northwest corner of the bay.

The CREC is served by an intake and a discharge canal, both of which were constructed with CR 1, 2, and 3. The intake canal is approximately 20 ft deep, and is diked westward on both sides for approximately 3.4 miles. The north dike extends for another 5.3 miles, but has openings for navigation. Velocities in the intake canal, assuming CR 1, 2, and 3 are all operating their cooling water systems at maximum pumping capability (1,318,000 gpm or 1897.9 MGD), are estimated to be

about 1.3 fps at low tide. The discharge canal is approximately 14 ft deep, and is diked approximately 1.6 miles west-northwest to the designated NPDES point of discharge (POD). The discharge canal was dredged for about another 1.2 miles offshore (Figure 2.3.4-1).

Velocities in the discharge canal when CR 1, 2, and 3 are all operating at maximum pumping capability are estimated to be about 2.4 feet per second at low tide. CERC performs cooling water flow monitoring as part of its NPDES permit, and reports the data as part of its Discharge Monitoring Reports (DMRs). The current permit, which was issued on May 9, 2005, limits this flow to 1,897.9 MGD during the period from May 1 through October 31 each year and to 1,613.2 MGD during the remainder of the year. Figure 2.3.4-5 shows the reported C.W. rates for CR 1, 2, and 3 during the period January 2003 through January 2007.

2.3.4.2 Streamflow Data

Monthly average streamflow for the Withlacoochee River at the Inglis Dam (USGS Station #02313230) for the period of record (1969 to 2006) ranges from 178 cubic feet per second (cfs) to 698 cfs. Daily flows for the same period of record range from 70 to 2,000 cfs. Mean annual streamflow for Withlacoochee River can be found in Table 2.3.4-1.

Streamflow data is not available for the Cross-Florida Barge Canal; however, water supply is inherently reliable and resistant to drought. Mean annual streamflow for Withlacoochee River can be found in Table 2.3.4-1.

Monthly average streamflow for Crystal River near Crystal River, Florida (USGS Station # 02310750) for the period of record (1964 to 1977) ranges from 801 cfs to 1,180 cfs. Daily flows for the same period of record range from -1,520 to 4,340 cfs. Mean annual streamflow for Crystal River can be found in Table 2.3.4-1.

2.3.4.3 Water Quality

Surface water quality standards for the state of Florida consist of designated uses for waterbodies, numerical and narrative criteria that correspond with the designated uses, and various policies, including moderating provisions.

Crystal Bay, the only designated water body affected by plant operations, is designated as a Class III Coastal Water. The corresponding uses are shellfish propagation or harvesting. Water Quality data in the vicinity of the site is available from U.S. Environmental Protection Agency's (EPA's) STORET Database (Figure 2.3.4-2). In general, the Crystal Bay has good water quality near the site. Water quality data near the intake canal and near the discharge canal from the site are listed in Table 2.3.4-2.

CREC performs Total Dissolved Solids (TDS) monitoring of the cooling water and reports the data as part of its NPDES permit. Figure 2.3.4-6 shows TDS measured in the discharge canal from October 2005 through February 2007. Values ranged between 24 and 31 parts per thousand. Because of the station's large flow rate, and the much smaller flow rates of added waste streams, the chemical concentrations in the discharge canal are not significantly different than those in the intake canal.

There are no anticipated changes in the chemical concentrations in the intake and discharge canal as a result of the CR3 Uprate Project.

Thermal

Based on EPA data, the average annual temperature in the Crystal Bay near the intake canal is 71.2 °F. The water temperature ranges from a minimum of 43.0 °F to a maximum of 94.6 °F in the summer.

CR 1, 2, and 3 currently withdraw condenser cooling water from the intake canal and discharge it to the discharge canal at the following rates, temperature rises, and heat loads, under design conditions:

Unit	CR1	CR2	CR3	Total
Condenser cooling water flow - gpm	310,000	328,000	680,000	1,318,000
Condenser temperature rise – degrees F.	14.9	16.9	17.5	
Condenser cooling system Heat rejection rate – Billion Btu/hour	2.28	2.74	5.88	10.91

In order to mitigate the thermal impacts to Crystal Bay, the CREC is also equipped with two types of Helper Cooling Towers (HCT), designated Permanent and Modular (Figure 2.3.4-3). These HCT are designed to allow CREC to meet NPDES permit limits on the absolute temperature of the facility

discharge of 96.5° F as a rolling three-hour average. The HCT are operated between May 1 and October 31 in order to achieve those limits.

The design characteristics of the HCT are as follows:

	Permanent HCT	**Modular HCT**
Design Wet Bulb Temperature – Degrees F.	81	81
Flow rate - gpm	684,600	180,000
Design Heat Dissipation Rate – Billion Btu/Hour	4.569	1.317

CREC performs temperature monitoring of the cooling water as part of its NPDES permit, and reports the data as part of its DMRs. Figure 2.3.4-7 shows the recorded intake and discharge temperatures for the period January 2003 through February 2007.

Although the dominant characteristic of the CREC discharge is once-through cooling water, there are other wastewater streams currently permitted by the CR 1, 2, and 3 NPDES Permit Number FL0000159. These waste streams are shown in the plant water use diagram (Figure 2.3.4-4).

2.3.4.4 Existing CREC Effects

Domestic/Sanitary Wastewater

Showers, lavatories, sinks, toilets, urinals and drinking fountains generate plant domestic/sanitary wastewater. These wastewaters are collected and treated in an on-site domestic/sanitary waste treatment facility.

FDEP Permit FLA118753-001-DW3P (Appendix 10.4.2) authorizes PEF to operate a 0.030 MGD Type III extended aeration domestic wastewater treatment plant. The wastewater treatment plant (WWTP) provides secondary treatment with basic level disinfection and consists of equalization, aeration, clarification, and sludge digestion. An associated land application system receives effluent from the WWTP. The land application system is permitted separately under FDEP Permit No. FLA016960 (Appendix 10.4.3).

Potable Water Systems

Potable water uses at the plant include water for drinking, washing, showers, urinals, and toilets. Potable water for the plant is provided by a service water system, supplied by well water. The water treatment plant is located in the Water Treatment Building, located southwest of CR3 and southeast of CR 1 and 2 within the CR 1 and 2 facility. The existing water treatment train is comprised of natural draft aeration, cold lime softening, scale inhibitor addition, chlorination, pressure filtration, storage, and distribution. Potable water is distributed via four 300 gpm service water pumps to CR 1 and 2, CR3 and other facilities within the CREC.

Process Wastewater Systems

The major process wastewater systems for CR3 are authorized by the CR 1, 2, and 3 NPDES (Appendix 10.1.2) and Industrial Wastewater Permits (Appendix 10.4.3) as described below (Figure 3.5.4-1):

Outfalls D-091, D-092, D-093 and D-094 are discharges produced when water from the intake canal (for outfalls D-091, D-092 and D-093) and discharge canal (for outfall D-094) is used to wash debris from the rotating debris screens protecting the intake pumps at Units 1, 2, and 3 and also the HCTs. These outfalls discharge to the intake canal at the plant intake structures (for outfalls D-091, D-092 and D-093) and discharge canal (for outfall D-094).

The nuclear services and decay heat seawater system (Outfall D-0F) associated with CR3 consist of once through cooling water and discharges from internal processes (i.e., laundry shower and sump tanks and secondary drain tanks) and the evaporator condensate storage tanks to the discharge canal.

The plant wastewater pond system (Outfall D-0C2) receives waste streams from the overflow of the plant wastewater evaporation/percolation pond system. This system receives various low volume wastes from CR 1, 2, and 3 including the discharge from the CR 1 and 2 sewage treatment plant. This area is also occasionally used as a dredge spoil dewatering area. This discharge has not been used due to the adequacy of the overall capacity of the pond system; however, the outfall should be maintained for future use as needed. This outfall discharges into the discharge canal.

Chemical and Biocide Waste

CR 1 and 2 currently utilize a mechanical condenser cleaning system, wherein plastic cleaners are added to the once through cooling water stream and recaptured in the discharge canal for reuse. CR3 utilizes a differently designed mechanical condenser cleaning system. With this system, cleaning balls are circulated through the CR3 condensers. The balls are collected and recirculated within the circulating water system.

The nuclear services and decay heat seawater system associated with CR3 consists of once through cooling water and discharges from internal processes. This process is treated with a biocide known as Clamtrol (Spectrus CT1300) which is periodically injected into the system to control bio-fouling.

2.3.5 Vegetation/Land Use

The Florida Land Use, Cover, and Forms Classification System (FLUCFCS) Level III codes were utilized to describe the existing vegetative communities at the project area and the surrounding CREC. Figure 2.3.5-1 illustrates vegetative communities and land use at the project area. Each community is discussed in detail in Section 2.3.6.1

Existing land use and land cover within the project boundary includes electrical power facilities (FLUCFCS 831), open land (FLUCFCS 190), freshwater marsh (FLUCFCS 641), saltwater marsh (FLUCFCS 642), and mixed wetland hardwoods (FLUCFCS 617). Upgrades to the CREC will be conducted within areas currently used for electrical power generation. Open land and areas of freshwater marsh and mixed wetland hardwoods will be utilized for construction laydown.

The land use and vegetative communities surrounding the project area include mixed wetland hardwoods, open land, electrical power facilities, saltwater marsh, canals (FLUCFCS 510), and transmission lines (FLUCFCS 832).

2.3.6 Ecology

2.3.6.1 Species-Environmental Relationships

The following subsections include descriptions of flora and fauna at the project area and areas near CR3. The CR3 area reconnaissance was conducted on April 12, 2007.

Terrestrial Systems – Flora

831 - Electrical Power Facilities

The project area is dominated by the existing electric power facilities and associated infrastructure, including CR3, warehouses, offices, and cooling water intake and discharge structures. Occasional species occurring adjacent to roadways and upon filled areas include red cedar (*Juniperus virginiana*), cabbage palm (*Sabal palmetto*), Brazilian pepper (*Schinus terebinthifolius*), lantana (*Lantana camara*), marsh elder (*Iva frutescens*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron radicans*), peppervine (*Ampelopsis arborea*), wax myrtle (*Myrica cerifera*), groundsel tree (*Baccharis halimifolia*), and ragweed (*Ambrosia artemisiifolia*).

832 - Transmission Line Corridor

Two sets of 230 kV and 500 kV transmission lines enter the CREC. The transmission line corridor crosses areas that will be used for construction laydown.

190 - Open Land

There are large areas of open filled land adjacent to the project site that are covered in grasses. Grasses that dominate this habitat include Bermuda grass (*Cynodon dactylon*) and bahia grass (*Paspalum notatum*).

641 - Freshwater Marsh

Several small freshwater marsh areas exist on the project site within areas designated for parking and construction laydown. Dominant species in the freshwater marsh areas include cattails (*Typha latifolia*), coastal plain willow (*Salix caroliniana*), and buttonbush (*Cephalanthus occidentalis*), while common subdominant species include arrowhead (*Sagittaria lancifolia*), sawgrass (*Cladium jamaicense*), white top sedge (*Dichromena colorata*), St. Johns wort (*Hypericum* spp), persimmon (*Diospyros virginianus*), soft rush (*Juncus effusus*), primrose willow (*Ludwigia* spp.), spadeleaf (*Centella asiatica*), marsh pennywort (*Hydrocotyle umbellata*), smartweed (*Polygonum* spp.), lizard's tail (*Saururus cernuus*), groundsel bush (*Baccharis halimifolia*), dogfennel (*Ambrosia artemisiifolia*), sedges (*Cyperus* sp.), spikerush (*Eleocharis* sp.), blue-eyed grass (*Sisyrinchium atlanticum*), American elm (*Ulmus americana*), ash (*Fraxinus* sp.), swamp bay (*Persea palustris*), mermaidweed (*Proserpinaca pectinata*), water hyssop (*Bacopa monnieri*), red maple seedlings (*Acer rubrum*), and blue flag (*Iris virginica*).

642 - Saltwater Marsh

Areas of saltwater marsh are located to the west of the CREC, as well as between the intake and discharge canals. The saltwater marsh areas are dominated by black needlerush (*Juncus roemerianus*), with additional herbaceous and shrub species including marsh elder, salt grass (*Distichlis spicata*), bushy seaside oxeye (*Borrichia frutescens*), saltmarsh cordgrass (*Spartina alterniflora*), annual glasswort (*Salicornia bigelovii*), and occasional cabbage palm and red cedar trees.

617- Mixed Wetland Hardwoods

An area of mixed wetland hardwoods occurs to the east of CR3; this area is designated for additional construction laydown and parking. Canopy species present in the wetland include ash, red maple, cabbage palm, American elm, swamp bay (*Persea palustris*), red cedar, dahoon holly (*Ilex cassine*), coastal plain willow, and live oak (*Quercus virginiana*). Understory species present include sawgrass, swamp lily (*Crinum americanum*), greenbriar (*Smilax* spp.), cattail, lizard's tail (*Saururus cernuus*), marsh pennywort (*Hydrocotyle umbellata*), poison ivy, and leather fern (*Acrostichum danaeifolium*). Shrub species present include coastal plain willow, buttonbush, wax myrtle, Walter's viburnum (*Viburnum obovatum*), and swamp dogwood (*Cornus foemina*).

Vegetative Communities Adjacent to the Project Area

The vegetative communities adjacent to the project area were classified during field reconnaissance conducted in 2006 and 2007.

831 - Electrical Power Facilities

Portions of the CREC are located outside of the defined project area.

832 - Transmission Lines

Two sets of 230 kV and 500 kV transmission lines enter the CREC.

190 - Open Land

There are large areas of open filled land within the CREC adjacent to the project area that are covered in grasses. Grasses that dominate this habitat include Bermuda grass (*Cynodon dactylon*) and bahia grass (*Paspalum notatum*).

641 - Freshwater Marsh

Freshwater marshes are common in the area. Dominant species in these areas include torpedo grass (*Panicum repens*), maidencane (*Panicum hemitomon*), arrowhead (*Sagittaria lancifolia*), cattails, sawgrass, buttonbush, lizard's tail, bushy broomsedge (*Andropogon virginicus*), and coastal plain willow. Other species present include marsh pennywort, smartweed, blue flag iris (*Iris virginica*), and leather fern. Some freshwater marsh areas are located within the transmission line corridors and are impacted by transmission line maintenance activities.

642 - Saltwater Marsh

Saltwater marsh habitat is abundant to the west of CREC adjacent to Crystal Bay. Dominant species include black needlerush with a sparse canopy of cabbage palm and occasional red cedar, marsh elder, as described previously.

630 - Wetland Forested Mixed

These are communities in which neither hardwoods nor conifers achieve a 66 percent dominance of the crown canopy composition. Canopy species present in these areas include cabbage palm, red cedar, slash pine (*Pinus elliottii*), red maple, laurel oak, water oak (*Quercus nigra*), green ash, American elm, swamp bay, red bay (*Persea borbonia*), dahoon holly, and willow. Common understory species include include wax myrtle, blueberry (*Vaccinium* sp.), Virginia creeper (*Parthenocissus quinquefolia*), greenbrier, and poison ivy.

510 - Canals

The intake and discharge canals for the CREC are located just outside of the project area. The banks of these areas are actively mowed and maintained.

Terrestrial Systems – Fauna

Wildlife habitat in the project area has been significantly altered by the construction and operation of the existing power facility. Only a very small amount of native habitat is present within the project area. The majority of the site contains structures related to power generation, or is cleared, grassed and periodically mowed. As a result of these extensive habitat alterations, most of the project area provides poor wildlife habitat.

Wildlife utilization of the project area is expected to be minimal. Species tolerant of urbanization and human interaction were observed during the site reconnaissance conducted on April 12, 2007, including common ground doves (*Columbina passerina)* and common grackles (*Quiscalus quiscula*). One wading bird, a snowy egret (*Egretta thula*), was observed in a forested wetland area (FLUCFCS 617). Wading birds may occasionally use wetlands within and adjacent to the project area. Common wading birds that may utilize these areas include the great blue heron (*Ardea herodias*), little blue heron (*Ardea caerulescens*), great egret (*Casmerodius albus),* snowy egret (*Egretta thula*), and white ibis (*Eudocimus albus*).

Non-listed wildlife either directly observed, observed through tracks, scat, and/or burrows, or likely to occur in areas adjacent to the project area based upon habitat present include but are not limited to bobwhite quail (*Colinus virginianus*), raccoon (*Procyon lotor*), armadillo (*Dasypus novemcinctus*), white tailed deer (*Odocoileus virginianus*), grey squirrel (*Scuirus carolinensis*), eastern cottontail (*Sylvilagus floridanus*), red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicense*), mourning dove (*Zenadia macroura*), rufous-sided towhee (*Pipilo erythrophthalmus*), cardinal (*Cardinalis cardinalis*), barred owl (*Strix varia*), leopard frog (*Rana sphenocephala*), water moccasin (*Agkistrodon piscivorus*), and black racer (*Coluber constrictor*).

Gopher tortoises (*Gopherus polyphemus*) are known to occur within the CREC property outside of the project area in upland areas adjacent to the existing rail line. Gopher tortoises are currently listed as a species of special concern by the Florida Fish and Wildlife Conservation Commission (FWC), but are proposed for uplisting to threatened upon approval of a management plan. Several species are known to utilize gopher tortoise burrows including the federally threatened Eastern indigo snake (*Drymarchon corais couperi*) and two state species of special concern, the gopher frog (*Rana capito*) and the Florida mouse (*Podomys floridanus*).

Aquatic Systems

The aquatic systems in the vicinity of the CREC consist of the cooling water intake and discharge canals, Crystal Bay, Crystal River, and the Withlacoochee River. The two most comprehensive sources of information on the aquatic resources of the CR3 area are the Final Environmental Statement related to the proposed CR3 (AEC 1973) and the CR 1, 2, and 3 316 (a) and (b) Demonstration (SWEC 1985). These historical documents contain useful information on the oceanography (bathymetry, currents, tides, water quality) and marine/estuarine communities of the

Crystal Bay area. PEF has supplemented this historical information with information from state and federal resource agency websites.

Cooling Water Intake and Discharge Canals

Water for cooling is withdrawn from a canal that leads to Crystal Bay. Heated cooling water is discharge into a separate canal that also leads to Crystal Bay.

Crystal Bay

Crystal Bay is a shallow embayment of the Gulf of Mexico. As far out as Fisherman's Pass, approximately three miles west of the site, the depth of the bay is less than 10 ft (SWEC 1985). Shallow inshore areas are characterized by oyster bars oriented parallel to shore that are visible at low tide and covered by water at high tide. These oyster bars, composed mostly of broken shell, create numerous small basins with north-south orientation in the area of the intake and discharge canals.

The Crystal and Withlacoochee Rivers

CREC is midway between the Withlacoochee and Crystal Rivers, and approximately four miles from each. The Withlacoochee River, with a watershed of 2,100 square miles, has an annual average flow of approximately 447 cfs at the Ingles Dam (USGS Station #02313230, period of record 1969-2006). Crystal River, with a much smaller watershed, has an annual average flow of approximately 975 cfs (USGS Station #02310750, period of record 1964-1977).

Salinity in the area of the plant ranges from 22 to 29 parts per thousand (ppt), depending on freshwater inflows to Crystal Bay from rivers and creeks in the area (AEC 1973). Eight to ten miles offshore, in the Gulf of Mexico, the salinity is more typical of open ocean waters; approximately 35 ppt. Water temperatures in the area are lowest in December-January and highest in late summer (July-September). Temperatures as high as 92°F were measured in the general area of the plant (Cedar Keys) prior to CR3 operation, but more typically average in the mid-to-high 80s in late summer (AEC 1973). Water temperatures in mid-winter can approach 40°F in shallow areas, but are generally in the 50s (AEC 1973).

Shoreline Marshlands

A well-developed 0.5 to 1.0 mile-wide band of marshland extends along the coast in the Crystal River area, separating the uplands to the east from the Gulf of Mexico. The marshlands are drained by

numerous small creeks and are typical of those found near this part of the Gulf Coast, with softrushes (*Juncus* spp.) and cordgrasses (*Spartina* spp.) the dominant marshland plants. The marshlands and associated creeks provide habitat for a variety of invertebrate organisms, including oysters and crabs, and are nursery areas for finfish including mullet, spot, black drum, red drum, and croaker (AEC 1973). They also support alligators, wading birds, waterfowl, and small mammals, including river otters and raccoons.

Seagrasses

Five species of seagrass were found in shallow water adjacent to CREC prior to plant startup (AEC 1973). Three species were most abundant: shoal grass (*Halodule wrightii*), widgeon grass (*Ruppia maritima*), and turtle grass (*Thallassia testudinum*). Manatee grass (*Syringodium filiforme*) and star-grass (*Halophila englemanni*) were also present. Seagrass beds often contained dense assemblages of rooted green algae, primarily *Caulerpa spp*. Limestone outcroppings were colonized by rockweeds, such as Sargassum.

The same five seagrass species were observed by biologists conducting studies in the Crystal Bay area in support of the Crystal River Clean Water Act Section 316 Demonstration in 1983-1984 (SWEC 1985). These operational surveys confirmed what studies in the 1970s had suggested - that the heated effluent from the plant influenced seagrass abundance and distribution in the immediate area of the discharge (SWEC 1985). In 1983-1984, shoalgrass was the only seagrass species observed northwest of the plant's discharge canal, the area most affected by the plant's heated discharge (SWEC 1985). Shoal grass often colonizes areas where other more sensitive seagrasses cannot grow (FOCC 2003) and can withstand the widest range of temperatures and salinities (FKNMS 2001).

Biomass of the three dominant seagrasses (*Thalassia*, *Halodule*, and *Syringodium*) was also lower in the discharge area than the area south of the intake canal outside of the plant's thermal influence (SWEC 1985). Studies conducted in the late 1970s showed the same general trends with respect to biomass, but looked at combined biomass of all seagrass species rather than individual species.

Benthic Invertebrates

Preoperational surveys of marine benthos at the CREC identified 286 species, including Atlantic Coast and West Indian species. Most of these were widely distributed forms capable of withstanding a wide variation of environmental conditions, such as fluctuating temperature and salinity. Thirty

mollusks were characterized as "common" or "abundant," including 22 marine gastropods (snails) and 8 marine pelecypods (bivalves). The following mollusks were described as "abundant" in the vicinity of the CREC: variable bittium (*Bittium varium*), semiplicate doveshell (*Anachis semiplicata*), lunar doveshell (*Mitrella lunata*), common eastern nassa (*Nassarius vibex*), scorched mussel (*Brachidontes exustus*), lateral musculus (*Musculus lateralis*), and Eastern oyster (*Crassostrea virginica*). Other important groups found were six families of Polychaetes, four species of Isopods, and eight species of Decapods, including pink shrimp (*Farfantepenaeus duorarum*).

Fisheries

The Final Environmental Statement (FES) for CR3 lists 64 finfish species and 6 shellfish species commonly found in the Crystal River area that are either commercially/recreationally important or important as "food chain species" (AEC 1973). The four finfish species collected most often in pre-operational (1969-1970) surveys were silver perch (*Bairdiella chrysoura*), spot (*Leiostomus xanthurus*), pigfish (*Orthopristis chrysoptera*), and pinfish (*Lagodon rhomboides*). American oyster (*Crassostrea virginica*), blue crab (*Callinectes sapidus*), stone crab (*Menippe spp.*), and pink shrimp were the most important shellfish. The FES contains useful information on spawning periods and food habits of important species, including species sought by recreational anglers, e.g., spot, Atlantic croaker (*Micropogonias undulatus*), spotted seatrout (*Cynoscion nebulosus)*; forage species, e.g., striped mullet (*Mugil cephalus*); and commercial species, e.g., blue crab and pink shrimp.

Trawls captured 98 species of fish and 108 species of invertebrates in the general vicinity of the plant (SWEC 1985). Catch varied by season, with highest numbers in the spring and summer (April through August) and lowest numbers in January and February. Although there was considerable variability in the data, some trends were apparent. Lowest densities of fish and invertebrates were observed along the central transect, the area most affected by the plant's heated discharge. Transects to the north and south had similar densities of fish, and were both higher than the central transect. Highest numbers of fish were collected at the northern transects in 1983 and the southern transects in 1984.

With regard to important species, spot were present year-round and were captured in highest numbers at northern transects. Pigfish were collected primarily in spring and summer, but were found in greater concentrations at southern transects. Pinfish were collected mostly in spring and summer, but were collected in substantial numbers at both northern and southern transects.

Seine collections in 1983-1984 produced 49 species of fish and 15 invertebrate species (SWEC 1985). Fish captured in significant numbers were usually juveniles of schooling species, such as spot and bay anchovy (*Anchoa mitchilli*). Highest densities were generally observed in June and July and lowest densities were normally observed in fall, winter, and spring. Large numbers of spot, clupeids (Clupeidae), and anchovies were sometimes captured during these "slow" periods as schools of these small fish moved into nearshore shallows where they were more vulnerable to capture by seiners.

Creek trawls collected 43 species of fish and 27 species of invertebrates. The largest numbers of fish were collected from January through May with the peak in March (SWEC 1985). Juveniles dominated all creek samples. Fish biomass was highest in the spring, with a secondary peak in November. Invertebrate numbers were highest from November through March. Fish and invertebrate were found in highest densities at a creek north of the discharge canal. They were found in lowest densities at a creek north of the discharge canal and a creek south of the intake canal.

Commercial and Recreational Fishing in the CR3 Area

The FES observed that the shallow waters and numerous oyster bars in the area of the CR3 site make commercial fishing infeasible (AEC 1973). It noted that the marshy shoreline and lack of marinas or landings in the area limited sport fishing opportunities to some degree, but fishing from small boats appeared to be increasing in popularity (AEC 1973). The FES listed red drum (*Sciaenops ocellatus*), spotted seatrout, sheepshead (*Archosargus probatocephalus*), black drum (*Pogonias cromis*), jack crevalle (*Caranx hippos*), and croaker as species sought by anglers in the plant's intake and discharge canals. The CWA Section 316 Demonstration for CR 1, 2, and 3 was concerned exclusively with assessing potential impacts of the plant's cooling water intake structures and thermal discharge. The authors of the report did not survey recreational anglers or fishing guides in the area, focusing instead on data that was verifiable and amenable to statistical analysis.

Threatened and Endangered Species – Flora and Fauna

Species in this category consist of plants and animals designated by the U.S. Fish and Wildlife Service (USFWS) as endangered, threatened, or under review for listing; animal species designated by the FWC as endangered, threatened, or species of special concern; and plant species designated by the Florida Department of Agriculture and Consumer Services (FDACS) as endangered, threatened, or commercially exploited

Flora

Table 2.3.5-1 details the state and federally listed plant and animal species of Citrus County. No suitable habitat for listed plant species is located within the project area. Native vegetation was cleared during construction of the existing plant facilities. The probability of listed species occurring in the Project area is extremely low.

Fauna

The project area offers very poor habitat for wildlife. However, several state and federally listed wading birds may forage in the freshwater marsh areas located within the project area. Also, the federally listed Florida manatee and several species of sea turtles are known to utilize the intake and discharge canals immediately adjacent to the project area. Those species with a moderate or high probability of occurrence in or near the project area are discussed below.

Birds

Bald eagle

The bald eagle (*Haliaeetus leucocephalus*) is listed as threatened by the USFWS and the FWC. Bald eagles nest throughout the United States and occur in a wide variety of habitats, but proximity of their nests to water (as foraging habitat) is important (Stalmaster 1987). Preferred nesting habitat includes a high amount of water-to-land edge where their aquatic prey is concentrated. Thus, bald eagles are generally restricted to coastal areas, lakes, and rivers. They prey on fish and other aquatic prey near the surface but will eat dead fish or other carrion, as well as birds, mammals, and occasionally reptiles. Some bald eagles in the southern U.S. migrate northward in mid-summer (after the nesting season) and return in early autumn, but some bald eagles in Florida are non-migratory (Stalmaster 1987, CRC 2006).

In 1999, nearly one thousand active eagle nests were recorded in Florida (FNAI 2001). Bald eagles breed throughout most of peninsular Florida and the Keys. One bald eagle nest (nest ID CI013) has been documented on the CREC and another nest (nest ID CI004) has been confirmed slightly north of the CREC (FWC 2006). The on-site nest is in the southeast corner of the CREC, approximately 1.9 miles from CR3. The off-site nest is approximately 1.2 miles northwest of CR3. According to the FWC bald eagle nest location database, both nests were active during all years from 2001-2005 (FWC 2006). Bald eagles are occasionally observed flying and foraging along Crystal Bay and at the CREC (CRC 2006).

Wood stork

The wood stork (*Mycteria americana*) is listed as endangered by the USFWS and the FWC. Wood stork habitats include cypress/gum ponds, river swamps, marshes (freshwater and saltwater), and bays. The wood stork is highly gregarious in its nesting and feeding behavior. They are tactile feeders (vision seldom used to locate or catch prey) and usually forage in shallow water (6 to 20 inches). Small fish are the primary food items, but storks also consume crustaceans, salamanders, tadpoles, and insects. The distance between nesting colonies and feeding areas can range up to 60 miles or more, although the average distance is typically 12 to 15 km (7 to 9 miles) (Ogden 1996, USFWS 1997). FWC considers the "core foraging area" of wood storks to be that area within 30 km (18.6 miles) of the colony (Cox et al. 1994). There are no known stork rookeries on the CREC. It is unlikely that any rookeries exist on the site, since the gregarious behavior of this species would result in numerous sightings. Wood storks are occasionally seen foraging in the percolation ponds at the CREC and they probably forage, at least occasionally, in nearby salt marshes and in suitable wetlands in or near the transmission corridors (CRC 2006).

Snowy egret

The snowy egret (*Egretta thula*) is listed as a species of special concern by the FWC. The snowy egret feeds in many types of permanently and seasonally flooded wetlands, streams, lakes, and swamps, and in manmade impoundments and ditches. This species is associated with wetlands and may forage in freshwater marsh areas within the project area. One snowy egret was observed in a forested wetland area (FLUCFCS 617) during the site reconnaissance conducted on April 12, 2007.

Tricolored heron

The tricolored heron (*Egretta tricolor*) is listed as a species of special concern by the FWC. Tricolored herons feed in a variety of permanently and seasonally flooded wetlands, mangrove swamps, tidal creeks, ditches, and edges of ponds and lakes. This species is associated with wetlands and may forage in freshwater marsh areas within the project area.

Little blue heron

The little blue heron (*Egretta caerulea*) is listed as a species of special concern by the FWC. Little blue herons feed in shallow freshwater, brackish, and saltwater habitats. This species is associated with wetlands and may forage in freshwater marsh areas within the project area.

White ibis

The white ibis (*Eudocimis albus)* is listed as a species of special concern by the FWC. The white ibis is found in a wide variety of habitats, including freshwater and brackish marshes, salt flats and salt marsh meadows, many types of forested wetlands, wet prairies, swales, seasonally inundated fields, and man-made ditches. This species is associated with wetlands and may forage in freshwater marsh areas within the project area.

Reptiles

Sea Turtles

Sea turtles are sometimes seen in the CREC's intake canal and are occasionally found on the CR3 intake bar racks. From 1994 to 1997, eight sea turtles were stranded on the CR3 intake bar racks. However, monitoring for sea turtles prior to 1997 was non-systematic, and data on species, size, and age was not always obtained.

In the spring of 1998, an unusually high number, approximately 50, of Kemp's ridley sea turtles (*Lepiochelys kempii*) were stranded on the bar racks. As a result, a Biological Opinion was issued by the National Marine Fisheries Service in 1999 which determined that the cooling water intake system was not likely to jeopardize the existence of the five sea turtle species that might be found in the area. A second Biological Opinion, issued by the National Marine Fisheries Service in 2002, stated that continued operation of CR3 would not jeopardize any of the listed sea turtle species populations (Appendix 10.4.4). This Opinion included an Incidental Take Statement allowing the live take of 75 sea turtles annually and three annual lethal takes that are causally related to plant operations (NMFS 2002). There is no limit on non-causally related dead turtles, although there is a reporting requirement if the non-causal take reaches eight individuals (NMFS 2002).

In 1998, a continuous monitoring and rescue program was initiated by Progress Energy: (then dba Florida Power Corporation) to reduce potential sea turtle strandings and mortalities at CR3. PEF implemented Sea Turtle Rescue and Handling Guidance, which provides instructions for sea turtle observation, rescue, handling, notifications, and reporting requirements (Progress Energy undated).

Five species of sea turtles have been recorded in nearshore waters of Citrus County and are discussed below. Four of these sea turtle species have been observed at or near CR3: Kemp's ridley, green (*Chelonia mydas*), loggerhead (*Caretta caretta*), and hawksbill (*Eretmochelys imbricata*).

The Kemp's ridley sea turtle is federally and state listed as endangered. It is the most seriously endangered of the sea turtles, with nesting primarily limited to two provinces in Mexico. It does not nest in Florida. This species is associated with a wide range of coastal benthic habitats, typically with sand or mud bottoms supporting crustaceans and/or other invertebrates. They primarily feed on portunid crabs (*Callinectes spp.*), but other crabs, mollusks and invertebrates are consumed as well. Nearshore waters of the northern Gulf of Mexico provide important developmental habitat for juvenile and sub-adult Kemp's ridley sea turtles (USFWS 2006). The most frequently occurring captured,-killed, and rescued sea turtles in the CR3 cooling water intake areas are sub-adult Kemp's ridleys, which reflects their abundance within the nearshore waters of the northern Gulf coast.

The green sea turtle is federally and state listed as endangered. Most green turtle nesting in Florida occurs during June through September. They require open gradually sloping beaches and minimum disturbance for nesting. Critical habitats have been defined for this species, but do not include areas in Florida. Green sea turtles are herbivores, preferring to feed on marine grasses and algae in shallow bays and lagoons (USFWS 2006).

The loggerhead sea turtle is federally and state listed as threatened. In the U.S. loggerheads nest from Texas to Virginia with approximately 80 percent of the nesting occurring in southern Florida coastal counties. They nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. No Critical Habitat has been defined for this species. The nearshore waters of the Gulf of Mexico are thought to provide important developmental areas for juvenile loggerheads (USFWS 2006).

The hawksbill sea turtle is federally and state listed as endangered. In contrast to other sea turtles, hawksbills tend to nest in low densities on scattered small beaches. Nesting may occur on almost any undisturbed deep-sand beach, typically from April through November. Critical Habitats have been defined for this species, but do not include areas in Florida. Hawksbills prefer coral reefs and thus are uncommon in western Gulf waters (USFWS 2006).

The leatherback sea turtle is federally and state listed as endangered. The largest and most pelagic of the sea turtles, its decline was a result of a crash of the breeding population in western Mexico due to harvest for meat and eggs. Small numbers nest in along the east coast of Florida, but none on the western Florida coast. Critical Habitats have been defined for this species, but do not include areas in Florida. They feed primarily on jellyfish and thus may come into shallow waters if there is an

abundance of jellyfish nearshore (USFWS 2006). Although leatherbacks have been observed in Citrus County waters, none have been observed at the CREC.

American Alligator

The American alligator (*Alligator mississippiensis*) is common throughout Florida. The alligator is federally listed as "threatened due to similarity in appearance" to the endangered American crocodile (*Crocodylus acutus*), and is state-listed as a species of special concern. Alligator habitat consists of swamps, marshes, ponds, lakes, and slow-moving streams and rivers. Alligators are opportunistic feeders and eat fish, turtles, birds, snakes, frogs, insects, and small mammals (Mount 1975). Alligators are occasionally seen in swampy areas at CREC and undoubtedly occur in wetlands, ponds, and streams along the transmission corridors.

Mammals

West Indies (Florida) Manatee

An adult Florida manatee (*Trichechus manatus latirostris*) averages about 10 ft in length and 2,200 pounds in weight. The manatee is an aquatic mammal that feeds primarily on seagrass and other aquatic vegetation. In the winter, the Florida manatee spends most of its time in and around areas of warm water, such as natural springs or the cooling water discharge of power plants. It has been reported that the warm-water refuge of power plants is becoming more important for the Florida manatee; for example, the percentage of animals using these areas on the Atlantic coast has increased by 4-6 percent per year since 1994 (Craig and Reynolds 2004). Crystal River is the northernmost natural, warm-water refuge used by manatees on the west coast of Florida (USFWS 2001).

A major threat to manatees is collisions with watercraft (USFWS 2001). Restricted recreational boat access to the Crystal River intake and discharge canal enhances this area for manatee survival by reducing the chance of boat/manatee collisions (CCCD 2006). PEF has also established a Manatee Protection Plan that has been approved by the Florida Department of Environmental Protection (FDEP 2002). The plan establishes various precautions to minimize hazards to manatees at intake and outfall areas, such as having observers on board vessels associated with in-water work, operating vessels at "no wake/idle" speeds while in the warm water refuge area, and avoiding major inwater work in the discharge canal from November 15 through March 31 unless approved by FWC's Bureau of Protected Species Management. PEF cooperates with USFWS, FWC, Florida Fish & Wildlife Research Institute, and the U.S. Geological Service in providing access to CR3 for manatee research and monitoring by these agencies.

The Florida manatee population is divided into four sub-populations (Figure 2.3.6-1). The sub-population of northwest Florida (including Crystal River) accounts for approximately 11 percent of the total population (FWC 2006). The northwest subpopulation has grown at an annual rate of 3.7 percent over the 10 years prior to 2001 (Runge et al. 2004), possibly due to high adult survival rate of manatees in this region (FWC 2006). Synoptic aerial manatee surveys conducted in January 2001 reported preliminary data of 3300 manatees living in Florida waters, with a total of 377 manatees in the northwest region (FWC 2006).

The Florida manatee is currently listed as Endangered by the State of Florida and the U.S. Fish and Wildlife Service (USFWS 2001). They are protected not only by the Federal Endangered Species Act, but also by the Federal Marine Mammal Protection Act and the Florida Manatee Sanctuary Act. In addition, Citrus County has a federal and state approved manatee protection plan as guidance for coastal development (CCCD 2006).

In August of 2001, the Florida Fish and Wildlife Conservation Commission (FWC) was petitioned to re-evaluate the status of the Florida manatee (FMRI 2002). The 2005-2006 FWC Florida Manatee Biological Review Panel has recommended that the Florida manatee should be listed as Threatened for the State of Florida (FWC 2006). Currently, the FWC is proceeding with the final phase of re-classification and is drafting a new management plan for the species.

2.3.6.2 Pre-Existing Stresses

Terrestrial Systems

The greatest pre-existing stress to the terrestrial systems located within and around the site is the result of the existing electric utility facilities. The natural topography, soils, and hydrology of the Site have been altered to accommodate the existing units.

Aquatic Systems

The greatest pre-existing stress to the aquatic systems located within and around the Site is the result of the existing electric utility facilities. Water is withdrawn for cooling from Crystal Bay through an intake canal, causing the impingement or entrainment of aquatic organisms. Heated cooling water is discharged to Crystal Bay through a discharge channel.

2.3.6.3 Measurement Programs

Terrestrial Ecology

Terrestrial ecological resources were evaluated through a combination of literature review, site reconnaissance, and previous studies. Vegetative communities, wildlife utilization, and potential for threatened and endangered wildlife occurrence were addressed during the site reconnaissance conducted in April 2007.

Aquatic Ecology

Aquatic ecological resources were evaluated through a combination of literature review, site reconnaissance, and previous studies. The two most comprehensive sources of information on the aquatic resources of the CR3 area are the FES related to the proposed CR3 (AEC 1973) and the CR 1, 2, and 3 Clean Water Act Section 316 Demonstration (SWEC 1985). Although two and three decades old, respectively, these documents contain useful information on the oceanography (bathymetry, currents, tides, water quality) and marine/estuarine communities of the Crystal Bay area.

2.3.7 Meteorological and Ambient Air Quality

2.3.7.1 Meteorology

Meteorological data collected at existing monitoring stations were used to describe the local and regional climatology in the vicinity of the CREC. The closest existing meteorological station to the plant with complete data is the National Weather Service (NWS) station located at the Tampa International Airport, situated approximately 110 km south of CR3. The NWS has recorded weather observations for more than 50 years at this site. These data are the most complete for, and representative of, the region surrounding the CR3. FDEP has approved the use of these meteorological data in previous air permit applications for this area and recommended that these data be used for the CR3 Uprate Project.

The climate in the plant area is subtropical with a marine influence from the Gulf of Mexico. The NWS station is located approximately 17 miles from the Gulf. The monthly and annual average temperatures for this area are presented in Table 2.3.7-1. The annual average temperature is approximately 73 °F with the average monthly daily extreme temperatures varying from a maximum of 90 °F to a minimum of 52.4 °F. Record extreme temperatures range from a low of 18 °F to a record high of 99 °F. During the summertime, temperatures rarely exceed 99 °F due to the high

relative humidities with subsequent cloud cover formation and the abundant convective-type (e.g., thunderstorms) precipitation.

The monthly and annual average precipitation data are presented in Table 2.3.7-2. Approximately 70 percent of the annual precipitation falls during the six warmest months, May through October. The average annual precipitation is approximately 45 inches, but this has varied from as little as 30 inches to 68 inches in the past 30 years. The majority of rain is in the form of short-lived convection showers (e.g., thunderstorms). Large amounts of rain are also produced during the late summer or fall when tropical storms or hurricanes may pass near the Tampa region. These events may result in heavy downpours that reach torrential proportions; 24-hour amounts of about 12 inches have been associated with hurricanes.

Monthly and annual average relative humidities, which indicate the amount of moisture in the air at a given temperature, are also presented in Table 2.3.7-2 for the morning hours of 1:00 a.m. and 7:00 a.m. and early afternoon and evening hours of 1:00 p.m. and 7:00 p.m. The highest humidities are coincident with the coolest ambient temperatures, which generally occur at 7:00 a.m., or near dawn. The lowest humidities coincide with the highest ambient temperatures.

The project area lies entirely within the trade wind belt (i.e., below 30 °N latitude), resulting in predominant winds from the east. Because of the location of the Gulf of Mexico, moderate to strong late afternoon sea breezes occur on days with strong land heating and produce localized onshore winds to offset the prevailing easterly winds. A wind rose for the five-year period from 2001 through 2005 is given in Figure 2.3.7-1. Seasonal wind roses are presented in Figures 2.3.7-2 through 2.3.7-5. A summary of the seasonal and annual average wind direction and wind speed, including calm conditions, is presented in Table 2.3.7-3. Except during the passage of tropical storms or hurricanes, wind speeds greater than 25 mph in the area are not common.

Atmospheric stability is a measure of the atmosphere's capability to disperse pollutants and potentially reduce ground-level concentrations. During the daytime with strong solar heating, the atmosphere can disperse pollutants very quickly for a relatively short period. This condition is considered unstable and generally occurs more frequently during the summer. During the nighttime, under clear skies and light wind speeds, the atmosphere is considered stable with minimal potential to disperse pollutants. During the day or night, when wind speeds are moderate to high, pollutants are dispersed at moderate rates (i.e., dispersion rates that are lesser than those during unstable conditions

but greater than those during stable conditions). This condition is considered neutral and occurs frequently throughout the year. The seasonal and annual average occurrences of atmospheric stability classes for this area for 1991 to 1995 are shown in Table 2.3.7-4.

During the summer months, unstable conditions occur about 35 percent of the time due to strong solar heating, whereas unstable conditions occurs only 16 percent of the time in the winter months. Neutral stability occurs most frequently during the winter months due to the higher wind speeds that occur in this season. The occurrence of stable conditions is nearly uniform throughout the year.

The mixing height is a parameter used to define the vertical height to which pollutants can disperse and, therefore, is used in estimating the volume of air in which pollutants are emitted and can be dispersed. In general, the higher the mixing height, the greater the potential for pollutants to be dispersed and for ground-level concentrations to be reduced.

The seasonal and annual average morning and afternoon mixing heights for the plant area for 1991 to 1995 were determined using the Holzworth method and are listed in Table 2.3.7-5. These data are obtained from the nearest upper air station closest to the site and located in Ruskin. The highest afternoon mixing heights occur in the spring and the lowest morning mixing heights occur in winter.

Thunderstorms are the most frequent of severe storms, occurring an average of 85 days per year as reported by the NWS at Tampa International Airport. These storms occur throughout the year, but about 73 percent occur from May through October.

Hurricanes and tornadoes are other types of severe weather that can occur in the project area, but the probability of a hurricane or tornado passing over the plant site is low.

Statistics compiled by the severe local storms branch of the national severe storms forecast center (Pautz 1969) show that 42 tornadoes were spotted within the 1 degree latitude by 1 degree longitude square centered just south of the Tampa area from 1955 to 1967. This averages about two tornadoes per year. The tornado recurrence interval for any specific point location within the 1 degree square was estimated by the Methodology of Thom (1963). The recurrence interval, r, is equal to 1/p where p is the probability of a tornado striking within the 1 degree square area and is estimated as follows:

$$p = (2.8209 \times t)/A$$

where: t = mean annual frequency of tornadoes occurring, and

A = area in square mile (mi^2)

In this analysis, t was assumed to be 1.4 based on data collected from 1953 to 1962 and A was estimated to be 4,200 square miles. Therefore, the mean recurrence interval for a tornado striking a point within this square is more than 1,000 years.

2.3.7.2 Ambient Air Quality

Ambient Standards

The National and Florida Ambient Air Quality Standards (AAQS) are presented in Table 2.3.7-6. Primary National AAQS were promulgated to protect the public health, and secondary National AAQS were promulgated to protect the public welfare from any known or anticipated adverse effects associated with the presence of pollutants in the ambient air. Areas of the country in violation of AAQS are designated as nonattainment areas, and new sources to be located in or near these areas may be subject to more stringent air permitting requirements. Pollutants for which AAQS have been established are referred to as criteria pollutants. These pollutants include particulate matter (PM) with an aerodynamic particle size of 10 micrometers (μm) or less (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), and lead (Pb).

Citrus County is classified as an attainment area for all criteria pollutants (Rule 62-204.340, F.A.C.).

On July 18, 1997 the EPA promulgated revisions to the National AAQS for O_3 and PM) [62 Federal Register (FR) No. 138]. The O_3 standard was modified to be 0.08 parts per million (ppm) for an eight-hour average concentration. This standard is achieved when the 3-year average concentration of the forth highest value is 0.08 ppm or less. The 1-hour average AAQS will no longer apply to an area 1 year after the effective date of the designation of that area for the 8-hour O_3 AAQS. The effective date for most areas is June 15, 2004 [Federal Register, April 30, 2004 (69 FR 23996)].

The FDEP has not yet adopted the revised O_3 or $PM_{2.5}$ AAQS. Based on evaluations performed by FDEP and EPA, Citrus County has been designated an attainment area for the revised O_3 AAQS [Federal Register, April 30, 2004 (69 FR 23996)] as well as an attainment area for the new particulate matter less than 2.5 microns ($PM_{2.5}$) AAQS [Federal Register, January 5, 2005 (70 FR 944)]. These standards must be implemented in the 2007 to 2008 timeframe with a revision to the State Implementation Plan.

On October 17, 2006, EPA finalized the AAQS for PM (71 FR 61236). The PM AAQS include two new $PM_{2.5}$ standards: a short-term 24-hour average standard and an annual average standard. The $PM_{2.5}$ standards are based on a 3-year average of the 98th percentile of 24-hour average concentrations that must not exceed 35 micrograms per cubic meter ($\mu g/m^3$) (from population-orientated monitors) and a 3-year average of annual average concentrations that must not exceed 15 $\mu g/m^3$ (from a single- or community-orientated monitor). The form of compliance for the annual standard remains in the form of an expected exceedance that must not be exceeded more than once per year averaged over three years.

In promulgating the 1977 Clean Air Act (CAA) Amendments, Congress specified that certain increases above an air quality *baseline concentration* level of SO_2 and PM concentrations would constitute *significant deterioration* for sources located in attainment areas. The magnitudes of the allowable increases, or prevention of significant deterioration (PSD) increments, depend on the classification of the area in which a new source (or modification) will be located or have an impact. Three PSD increment classifications were designated based on criteria established in the 1977 CAA amendments. Initially, Congress promulgated areas as either Class I (national parks, national wilderness areas, and memorial parks larger than 5,000 acres, and national parks larger than 6,000 acres) or as Class II (all areas not designated as Class I). No Class III areas, which would be allowed greater deterioration than Class II areas, were designated. EPA then promulgated as regulations the requirements for classifications and area designations.

On October 17, 1988, EPA promulgated regulations to prevent significant deterioration due to nitrogen oxide (NO_x) emissions and established PSD increments for NO_2 concentrations. The EPA class designations and allowable PSD increments are presented in Table 2.3.7-6. Florida has adopted the EPA allowable increments for PM_{10}, SO_2, and NO_2.

Citrus County is classified as a Class II area (Rule 62-204.340, F.A.C.) since it is an attainment area for all pollutants. The nearest Class I area to the plant is the Chassahowitzka National Wilderness Area (NWA) located about 22 km (13 miles) to the south. In addition, the St. Marks NWA is located about 175 km to the northwest of the site.

Ambient Air Quality Data

The CREC is located in a rural area of Citrus County, which has a minimal number of air pollution sources. Air monitoring data are not collected in the county. However, monitoring data are collected

in nearby counties for SO_2, PM_{10}, O_3, and NO_2. Summaries of the maximum pollutant concentrations measured in Pinellas and Marion Counties from 2003 through 2005 are presented in Table 2.3.7-7. These data indicate that the maximum air quality concentrations measured in the region are well below applicable standards.

Given the lack of industrial development in the vicinity of the plant, existing concentrations of other criteria pollutants, i.e., CO and Pb, which are usually associated with an urban environment, are expected to be well below the AAQS.

2.3.7.3 Measurement Programs

All information (i.e., meteorology and air quality data) was compiled from offsite monitoring stations maintained and operated by the FDEP, Pinellas County, Marion County, or cooperating governmental agencies (i.e., NWS). No significant changes in these programs are anticipated after the construction and operation of the Project.

Meteorological data were obtained from the NWS surface and upper-air station at the Tampa International Airport. These data were obtained for the five-year periods from 2001 through 2005 from which the joint frequency of wind direction and wind speed were developed, and from 1991 through 1995 from which the atmospheric stability and a five-year average of mixing heights were developed. The wind sensors at the Tampa International Airport have been located 22 ft above grade. Regular surface observations are taken just before each hour, seven days per week. Upper-air soundings are conducted twice per day at 0700 and 1900 Eastern Standard Time at Ruskin.

2.3.8 Noise

2.3.8.1 Background

In 2005, the county commissioners enacted ordinance No. 2005-05 which can be found in Chapter 21, Article II of the Code of Ordinances for the County of Citrus Florida. The intent of this ordinance is to protect the health, safety, and welfare, and to protect the aesthetic and property values of properties within unincorporated Citrus County by providing for abatement of excessive and unnecessary noise.

Receiving Land Use Category	Time	Sound Level Limit (dBA)
Residential	7 a.m. — 10 p.m.	60
	10 p.m. — 7 a.m.	55
Governmental-owned building or property, institutional or recreational	7 a.m. — 10 p.m.	55
	10 p.m. — 7 a.m.	50
Commercial or business	7 a.m. — 10 p.m.	65
	10 p.m. — 7 a.m.	60
Industrial or manufacturing	At all times	75
Agricultural	At all times	75

As defined in the ordinance, the noise from any activity or from any permissible use of property within the applicable land use district classifications of Citrus County shall be deemed a violation if the total noise level as measured on the A-scale due to both ambient noise, and the alleged source of the offensive noise, exceeds the noise levels which are prescribed in the above table, the measurement of which is based upon decibels. All such measurements as well as the method employed shall be consistent with section 21-17 of Chapter 21, Article II of the Code of Ordinances, and shall represent the A-weighted sound pressure level which is exceeded ten percent of the time (L_{10}) during the observation period.

2.3.8.2 Noise Measurement Procedures

A comprehensive ambient noise monitoring program was performed at seven locations at or near the CR3 Uprate Project (Figure 2.3.8-1). The equipment used to monitor the baseline noise levels operated in the slow response mode to obtain accurate, integrated, A-weighted sound pressure levels. A windscreen was used because all measurements were taken outdoors. The microphone was positioned so that a random incidence response, as specified by the American National Standard Institute (ANSI), was achieved. The sound level meter and octave band analyzer were calibrated immediately prior to and just after the sampling period to provide a quality control check of the sound level meter's operation during monitoring.

Integrated sound pressure level (SPL) data consisting of the following noise parameters were collected at each location:

L_{eq} The sound pressure level averaged over the measurement period; this parameter is the continuous steady sound pressure level that would have the same total acoustic energy as the real fluctuating noise over the same time period;

Max The maximum sound pressure level for the sampling period, and;
Min The minimum sound pressure level for the sampling period.
L_n The sound pressure levels which were exceeded n% of the time during sampling period.

The SPL data were analyzed and reported in both decibels (dB) and A-weighted decibels (dBA). The higher the decibel value, the louder the sound. The SPL averages were calculated using the following formula:

$$\text{Average SPL} = 10 \text{ Log} \frac{\sum_{i-1}^{N} 10^{(SPLi/10)}}{N}$$

where: N = number of observations.
SPL_i = individual sound pressure level in data set.

Monitoring was conducted using the sound level meter mounted on a tripod at a height of 1.5 m (5 ft) abovegrade. Local meteorological conditions were measured during the monitoring periods. Detailed field notes were recorded by the operator during monitoring and including major noise sources in the area.

The SPLs and octave band data were collected at the monitoring locations, for a minimum of 10 continuous minutes, using measurement techniques set forth by ANSI S12.9-1993/Part 3 (ANSI, 1993).

The noise monitoring equipment used during the study included:

1. Continuous Noise Monitoring Equipment
   a. Larson Davis Model 824 Precision Integrating Sound Level Meter with Real Time Frequency Analyzer
   b. Larson Davis Model PRM902 Microphone Preamplifier
   c. Larson Davis Model 2560 Prepolarized 1/2" Condenser Microphone
   d. Windscreen, tripod, and various cables
2. Sound Level Meter Calibration Unit
   a. Larson Davis Model CAL200 Sound Level Calibrator, 94/114 dB at 1,000 Hz.

The Larson Davis sound level meter complies with Type I--Precision requirements set forth for sound level meters and for one-third octave filters. The calibration certificates are provided in Appendix 10.5-1.

Of the seven monitoring locations, four (Sites 1 through 4) were chosen to delineate the laydown and construction areas of the future CR3 Uprate Project. The other three monitoring sites (Sites 5 through 7) were selected to determine the baseline noise levels at property lines.

2.3.8.3 Existing Ambient Sound Pressure Level Conditions

The daytime and nighttime ambient noise levels for each of the monitoring sites are indicated in Table 2.3.8-1. Since there are no residential communities adjacent to the plant, the commercial sound level limits from the Code of Ordinances for Citrus County were used for comparison. The sound level limits are 65 dBA during the daytime and 60 dBA at night. In accordance with the ordinance, the L_{10} from each sampling period were used for compliance with the sound level limits.

The highest L_{10} noise levels measured during the study were 70 dBA at Site 3 during the daytime and 74 dBA at Site 6 during the nighttime. The elevated daytime and nighttime noise levels at Site 3 were due to the constant plant operations in that area. Since the location of Site 3 is not near any boundary, it does not have to comply with any sound level limits. All other daytime noise levels were at or below the 65 dBA limit. The high nighttime noise level at Site 6 was due to a train arriving at the plant. The L_{90} at this location was 40 dBA which would be more consistent with the nighttime noise levels in the area of Site 6 without the influence of the noise generated by the train. The nighttime noise levels at Sites 5 and 7 were well below the nighttime limit of 60 dBA.

2.3.9 Other Environmental Features

Several environmental features have been established at the CREC in coordination with state and federal agencies as described below:

The Mariculture Center, a multi-species fish hatchery was established to mitigate fisheries impacts related to the once-through cooling water system at Crystal River Units 1, 2, and 3. The Center has four spawn rooms and eight one-acre ponds. Red drum, spotted seatrout, pink shrimp and striped mullet were the species initially selected for culture. Pigfish, silver fish, blue crab and stone crab were added and cultured at the Center. The Mariculture Center continues to operate to offset the

previously identified fisheries impacts. Approximately 5.18 acres of wetlands were previously established to mitigate wetland impacts associated with the construction of the Mariculture Center and the CR 1, 2, and 3 helper cooling towers.

In 2003, PEF granted permission for the Florida Fish and Wildlife Conservation Commission (FWC) to post signs for the protection of shorebird and sea bird nesting sites in the vicininty of the CREC. The posted areas are on sandbars and spoil islands and was primarily for the protection of nesting least terns, black skimmers and American oystercatchers.

The Crystal River and its headwaters have been designated as Critical Habitat for the Florida Manatee. The Crystal River Critical Habitat is adjacent to the south boundary of the CREC. No other areas designated by the FWC as "Critical Habitat" for endangered species occurs at CR3 or in the vicinity of the CREC.

PEF is currently issuing a conservation easement to FDEP for 90 acres of forested wetlands and tidal marsh associated with Cedar Creek within the CREC site to mitigate for wetland impacts associated with the construction of a new roadway within the CREC.

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