CALPINE
BLUE HERON
ENERGY CENTER

Site Certification Application

Volume 1
Chapters 1-2

Submitted by

CALPINE
CONSTRUCTION FINANCE
COMPANY, L.P.

Prepared by

ECT
Environmental Consulting & Technology, Inc.

October 2000

ECT
Environmental Consulting & Technology, Inc.

PA 00-42

October 27, 2000
ECT No. 000105-0200

Mr. Hamilton S. Oven, Jr.
Siting Coordination Office
Florida Department of Environmental Protection
2600 Blair Stone Road, Mail Stop 48
Tallahassee, Florida 32399

Re: Calpine Blue Heron Energy Center

Dear Mr. Oven:

Enclosed are three copies of the Site Certification Application (SCA) for the Blue Heron Energy Center, a natural gas-fired electrical power plant that will be certified and built by the applicant, Calpine Construction Finance Company, L.P. (Calpine), in Indian River County, Florida. The key features and benefits of the Blue Heron Energy Center are concisely described in the Executive Summary of the SCA.

Also enclosed is a check for the application fee of $134,250.

By this submission, we request the Department to commence the SCA review process. Upon notification of the Department's determination of "completeness", copies of the SCA will be distributed by Calpine to agencies, groups, and public libraries identified in the attached Distribution List.

We look forward to working with you and the Department during this certification proceeding. Environmental Consulting & Technology, Inc. (ECT), is Calpine's environmental consultant for this project. If you have any questions regarding the SCA, please call me at ECT at 352/332-0444. Also, feel free to contact Calpine's counsel, David Dee, with Landers & Parsons at 850/681-0311 or Calpine's Environmental Manager, Ben Borsch, at 813/637-3515.

Sincerely,

ENVIRONMENTAL CONSULTING & TECHNOLOGY, INC.

Jack D. Doolittle
CEO

RECEIVED
DEC 05 2000
BUREAU OF AIR REGULATION

JDD/tsw

Enclosures

cc: Tim Eves, Calpine
Ben Borsch, Calpine
David Dee, Landers & Parsons

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APPLICANT INFORMATION

Please supply the following information

Applicant's Official Name: Calpine Construction Finance Company, L.P.

Applicant's Address: The Pilot House, 2nd Floor, Lewis Wharf
Boston, MA 02110

Address of Official Headquarters: 50 West San Fernando Street
San Jose, CA 95113

Business Entity (corporation, partnership, co-operative): Corporation

Owner: Calpine Construction Finance Company, L.P.

Name and Title of Chief Executive Officer: Peter Cartwright, Chief Executive Officer

Name, Address, and Phone Number of Official Representative Responsible for Obtaining Certification: Robert Alff, Senior Vice President
Calpine
The Pilot House, 2nd Floor, Lewis Wharf
Boston, MA 02110
617/723-7200; 617/723-7635 (FAX)

Site Location (County): Indian River County

Nearest Incorporated City: Vero Beach

Latitude and Longitude: 27° 33' 49N" 80° 28' 52W"

UTMs: Northerly: 3,048.7 Easterly: 551.2 Zone: 17

Section, Township, Range: Section 36, Township 33S, Range 38E

Location of any directly associated transmission facilities (counties): N/A

Name Plate Generating Capacity: 1,080 MW (nominal, average ambient)

Capacity of Proposed Additions and Ultimate Site Capacity (where applicable): N/A

Remarks (additional information that will help identify the applicant): N/A

SITE CERTIFICATION APPLICATION

FOR THE

BLUE HERON ENERGY CENTER

Environmental Consulting & Technology, Inc.
3701 Northwest 98th Street
Gainesville, Florida 32606

Thomas W. Davis, P.E.
Florida Professional Engineer Registration No. 36777

10/24/00
Date

NOTE

Original signatures were filed with the Site Certification Application filed with Hamilton S. Oven, Jr., P.E., Administrator, Office of Siting Coordination, Florida Department of Environmental Protection. All copies of the Site Certification Application contain copies of the signature pages.

Original signature pages may be requested by contacting:

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ABBREVIATIONS, ACRONYMS, AND UNITS OF MEASURE

AAP	ABB Alstom Power Environmental Segment
AAQS	ambient air quality standards
AET	actual evapotranspiration
ANSI	American National Standards Institute
AQRV	air quality related value
BACT	best available control technology
BDL	below detection limit
BEBR	Bureau of Economic and Business Research
BHEC	Blue Heron Energy Center
BMP	best management practice
B.P.	Before Present
Btu	British thermal unit
Btu/ft^3	British thermal unit per cubic foot
°C	degrees Centigrade
CAA	Clean Air Act
Calpine	Calpine Construction Finance Company, L.P.
CCSI	Catalytica Combustion Systems, Inc.
CDM	Camp Dresser & McKee
CFR	Code of Federal Regulations
cfm	cubic foot per minute
cfm-ft^2	cubic foot per minute-square foot
cfs	cubic feet per second
cm/sec	centimeter per second
CNEL	community noise equivalent level
CO	carbon monoxide
CO_2	carbon dioxide
CR	County Road
CTG	combustion turbine generator
CUP	consumptive use permit
°	degree
DB	duct burner
dBA	A-weighted decibel
DDT	dichlorodiphenyltrichloroethane
DHR	Division of Historic Resources
DHS	Division of Historical Resources
DLN	dry low-NO_x
DOE	Department of Energy
DOT	U.S. Department of Transportation
ECT	Environmental Consulting & Technology, Inc.
EMS	Emergency Medical Service
EPA	U.S. Environmental Protection Agency
ERP	environmental resource permit

ABBREVIATIONS, ACRONYMS, AND UNITS OF MEASURE
(Continued, Page 2 of 5)

ESP	electrostatic precipitator
°F	degrees Fahrenheit
F.A.C.	Florida Administrative Code
FAESS	Florida Association of Environmental Soil Scientists
FBN	fuel bound nitrogen
FCG	Florida Electric Power Coordinating Group
FCMP	Florida Coastal Management Program
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FECR	Florida East Coast Railroad
FEECA	Florida Energy Efficiency and Conservation Act
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFWCC	Florida Fish and Wildlife Conservation Commission
FGD	flue gas desulfurization
FGT	Florida Gas Transmission Company
FIRM	Flood Insurance Rate Map
FLUCFCS	Florida Land Use, Cover and Forms Classification System
FNAI	Florida Natural Areas Inventory
FPL	Florida Power & Light Company
fps	foot per second
FRCC	Florida Reliability Coordinating Council
F.S.	Florida Statutes
ft	foot
ft^2	square foot
ft^3	cubic foot
ft/day	feet per day
ft^2/day	square foot per day
ft bls	feet below land surface
ft-msl	feet above mean sea level
ft-NGVD	feet National Geodetic Vertical Datum
FWENC	Foster Wheeler Environmental Corporation
GAQM	*Guideline for Air Quality Models*
GLET	Goal Line Environmental Technologies
gN/m^2-yr	grams nitrogen per square meter per year
gpd	gallon per day
gpm	gallon per minute
gr S/100 dscf	grains of sulfur per 100 dry standard cubic feet
gr/dscf	grains per dry standard cubic foot
g/s	gram per second
Gulfstream	Gulfstream Natural Gas System, L.L.C.
H_2O	water

ABBREVIATIONS, ACRONYMS, AND
UNITS OF MEASURE
(Continued, Page 3 of 5)

H_2S	hydrogen sulfide
H_2SO_4	sulfuric acid
HAP	hazardous air pollutant
HHV	higher heating value
HNO_3	nitric acid
HRSG	heat recovery steam generator
hr/yr	hour per year
I	Interstate
IRFWCD	Indian River Farms Water Control District
ISCST3	Industrial Source Complex Short-Term
ISO	International Standards Organization
JEA	Jones, Edmunds & Associates, Inc.
K	Kelvin
kg/km^2	kilogram per square kilometer
km	kilometer
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
lb/acre/month	pound per acre per month
lb/acre/yr	pound per acre per year
lb/hr	pound per hour
LHV	lower heating value
LOS	level of service
MACT	maximum achievable control technology
MGD	million gallons per day
mg/L	milligram per liter
MMBtu/hr	million British thermal units per hour
MMscf/day	million standard cubic feet per day
MOA	Memorandum of Agreement
mph	miles per hour
MSCU	middle semi-confining unit
m/sec	meter per second
msl	mean sea level
MW	megawatt
N_2	molecular nitrogen
N/A	not applicable
NCDC	National Climatic Data Center
Neg	negligible
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NH_3	ammonia
NO	nitric oxide

ABBREVIATIONS, ACRONYMS, AND
UNITS OF MEASURE
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NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NSCR	nonselective catalytic reduction
NSPS	new source performance standards
NSR	new source review
NTU	nephelometric turbidity units
NWI	National Wetlands Inventory
NWS	National Weather Service
O_2	oxygen
OAQPS	Office of Air Quality Planning and Standards
OD	outside diameter
PAN	peroxyacetyl nitrate
PBS&J	Post, Buckley, Schuh & Jernigan
pCi/L	picocuries per liter
PEM	palustrine, emergent
PFO	palustrine, forested
PM	particulate matter
PM_{10}	particulate matter less than or equal to 10 micrometers aerodynamic diameter
POTW	publicly owned treatment works
ppmv	part per million by volume
ppmvd	part per million by volume, dry
PPSA	Power Plant Siting Act
ppt	part per thousand
PSC	Public Service Commission
PSD	prevention of significant deterioration
psia	pounds per square inch absolute
PSS	palustrine, scrub/shrub
RARE	roadless area review and evaluation
RO	reverse osmosis
SACTI	Seasonal/Annual Cooling Tower Impact
SCA	site certification application
SCR	selective catalytic reduction
SCRAM	Support Center for Regulatory Air Models
SCS	Soil Conservation Service
SFWMD	South Florida Water Management District
SIA	significant impact area
SJRWMD	St. Johns River Water Management District
SJWCD	St. Johns Water Control District
SNCR	selective noncatalytic reduction
SO_2	sulfur dioxide

ABBREVIATIONS, ACRONYMS, AND UNITS OF MEASURE (Continued, Page 5 of 5)

SO_3	sulfur trioxide
SPL	sound pressure level
SR	State Road
SRPP	strategic regional policy plan
SSC	species of special concern
STP	standard penetration test
S.U.	standard unit
SWIM	Surface Water Improvement and Management
TCRPC	Treasure Coast Regional Planning Council
TDS	total dissolved solids
tpy	ton per year
$\mu g/L$	microgram per liter
$\mu g/m^3$	microgram per cubic meter
UCU	upper confining unit
U.S.	U.S. Highway
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UCU	upper confining unit
VMT	vehicle miles traveled
VOC	volatile organic compound
WWTP	wastewater treatment plant
yd^3	cubic yard

EXECUTIVE SUMMARY

Calpine Construction Finance Company, L.P. (Calpine), plans to certify, permit, construct, own, and operate a new 1,080-megawatt (MW) electrical power generating plant (Project) in Indian River County, Florida. The new power plant, called the Blue Heron Energy Center (BHEC), will use clean natural gas fuel and state-of-the-art, highly efficient combined cycle generating and pollution control technologies and equipment to produce cost-effective electric power in an environmentally friendly manner. The main electric generating facilities will consist of four combustion turbine generators (CTGs), four heat recovery steam generators, and two steam turbine generators. Calpine has designed the BHEC to avoid or minimize all potential impacts on the environment.

This Executive Summary describes the key features of the BHEC, including its potential environmental impacts and positive benefits in the local, regional, and Peninsular Florida areas. More detailed information on the BHEC is provided in the comprehensive site certification application (SCA) filed by Calpine pursuant to the Florida Electrical Power Plant Siting Act (PPSA).

SITE CERTIFICATION APPLICATION AND NEED FOR THE PROJECT

The certification of electrical power plants in Florida requires compliance with applicable federal, state, and local laws, regulations, and ordinances. The most comprehensive state law governing the licensing of the BHEC is the PPSA, which establishes the State's policy to balance the need for new power plant facilities with the potential effects of the facility's construction and operation on human health, welfare, and the environmental resources of the State. The PPSA establishes a centrally coordinated permitting process that is initiated when the applicant files a SCA with the Florida Department of Environmental Protection, which administers and coordinates the process with affected state, regional, and local agencies, governmental entities, and other parties. The process concludes with the approval or certification of the power plant by the Governor and Cabinet, sitting as the Siting Board.

The BHEC is needed to provide reliable, competitively priced electric power in Peninsular Florida and to meet Florida's increasing power demands, without creating economic risks for Florida's retail electric customers. Peninsular Florida is projected to need more than 11,000 MW of new generating capacity to maintain acceptable winter reserve margins in the 2003 to 2010 time frame, without implementing load management and interruptible power measures. The BHEC's electrical power will be sold to Florida's retail-serving utilities to meet these projected electrical needs. As a competitive facility in the wholesale market, the BHEC must produce power at the lowest possible cost relative to other generating plants in Florida in order to sell capacity and energy to retail-serving utilities. The BHEC will be more cost effective than approximately 34,000 MW or more of the generating capacity that is projected to be available in Peninsular Florida in 2003. The BHEC will provide a cost benefit to the utilities purchasing wholesale power from the Project, which then can provide benefits to their retail customers.

SITE AND VICINITY

The BHEC will be constructed on an approximately 50.5-acre property (Site) in southeastern unincorporated Indian River County. The Site is immediately east of Interstate 95 (I-95), immediately north of the St. Lucie County line, and approximately 5 miles southwest of the City of Vero Beach. The Site primarily consists of pine flatwood vegetative communities. Two wetland areas (i.e., one approximately 3.5-acre mixed hardwood forest and a 0.7-acre marsh) are present on the Site, but these two areas will not be impacted by the construction and operation of the Project. Hand ferns, which are listed by the State as an endangered plant species, have been identified at four locations within or adjacent to the hardwood forest wetland system. An upland buffer area (minimum width of 15 feet [ft] and an average width greater than 25 ft) will surround and protect both wetland areas and also protect the ferns. Several inactive gopher tortoise burrows occur on the Site and this species is probably present in small numbers. It is unlikely that other listed species use the Site. The Site does not contain any surface water bodies, significant wildlife habitats, or known historic or archaeological resources.

The Site is located in an area that has been affected by a variety of agricultural, industrial, institutional, and residential activities. The Site is bordered on the east by the 74th Street right-of-way, the Indian River Farms Water Control District (IRFWCD) Lateral C Canal, the Ocean Spray Cranberries' industrial wastewater sprayfield, and citrus groves. The IRFWCD Sublateral C-7 Canal, a single-family residence, abandoned citrus groves, and the Indian River County solid waste landfill and correctional institution are located to the north of the Site. I-95 runs along the western Site boundary. Several borrow pits, an electric transmission line corridor, a natural gas pipeline corridor, and undeveloped brushland are located to the west of I-95. In St. Lucie County, open pasturelands and the Spanish Lakes Fairways residential development are located southwest and southeast, respectively, of the Site. The Site is separated from the Spanish Lakes development by a drainage ditch, berm, and existing buffer of mature trees and vegetation.

AIR EMISSION CONTROLS

The BHEC will use the best available control technology (BACT) to minimize the Project's airborne emissions. Emissions of nitrogen oxides (NO_x) will be reduced to very low levels (3.5 parts per million, dry volume) through the use of dry low-NO_x technology and a selective catalytic reduction (SCR) system. Emissions of other pollutants also will be reduced to very low levels by using clean-burning natural gas and advanced combustion turbines.

The Project's impacts on ambient air quality will be minimal. The Project will not cause or contribute to any violations of any state or national ambient air quality standards (AAQS), or any Class I or II increments for the prevention of significant deterioration of air quality. The Project's impacts on ambient air quality will be significantly less than the impacts allowed under the AAQS, which have been set by the U.S. Environmental Protection Agency to protect human health and the environment, including the health of the young, the elderly, and those with respiratory diseases.

WATER USE AND SUPPLY

The primary water uses for the BHEC operations will be for cooling tower makeup; boiler makeup; CTG inlet air evaporative cooling; and potable, sanitary, and other miscellaneous plant process water purposes. Cooling tower makeup is by far the largest use. The Project's consumptive water use will be approximately 6.5 million gallons per day

(MGD) on an average annual daily basis, and 7.5 MGD on a peak daily basis. The primary source of water for the Project's operations will be excess surface water withdrawn from the IRFWCD drainage canal system. The Project will also use reclaimed water, on an as-available basis, from the Indian River County reclaimed water system. Potable water and sanitary wastewater service will also be provided by Indian River County. No ground water will be used or impacted by the Project.

The use of excess surface water and reclaimed water, especially during wet weather conditions, will provide significant environmental benefits to the area. The Project's water use plans support the current goals of the master storm water planning program of the St. Johns River Water Management District (SJRWMD), Indian River County, City of Vero Beach, and IRFWCD, which call for a reduction in freshwater flows and pollutant loadings to the Indian River Lagoon system. The Project's water use will reduce freshwater flows from the IRFWCD canal system to the Indian River Lagoon by an average of 7 percent. To further support these programs, Calpine will consider the alternative of obtaining the Project's water supply from storm water storage and treatment facilities that will be developed in the future as part of the current master storm water planning program. In addition, Calpine will consider accepting some quantity of the reverse osmosis system discharge from the County's potable water treatment plants as a supplemental water supply.

ZERO WASTEWATER DISCHARGES

The BHEC will be designed and operated as a *zero wastewater discharge* facility. All plant wastewaters will be collected, treated, recycled, and evaporated on the Site. There will be no discharges of wastewaters from the Project to surface waters. The nonhazardous solids resulting from the wastewater treatment system will be disposed in a permitted landfill.

The Project's zero wastewater discharge system will provide significant environmental benefits by removing all pollutants in the water supply from the area's surface water canal system. Thus, the Project operations will reduce pollutant loadings to the Indian River Lagoon.

STORM WATER MANAGEMENT

The drainage facilities for the BHEC will be constructed and operated to control and treat storm water runoff on the Site during construction and operation. The Project's storm water management systems will be designed to comply with all applicable Indian River County, SJRWMD, and IRFWCD criteria and requirements. A 5.2-acre storm water detention pond will be constructed on the Site to control peak runoff from a 25-year, 24-hour storm event and limit the offsite discharge to less than 2 inches over a 24-hour period. Excess flows from the detention pond will be directed to the Lateral C Canal, which is located east of the Site.

TRAFFIC AND PUBLIC SERVICES

During the construction of the BHEC, there will be a temporary increase in traffic on local roads, but the roads will continue to operate at acceptable levels (level of service "C" or greater). Calpine will pave the extension of 74th Street to the Site early in the construction phase. The long-term operation of the BHEC will not cause any significant impacts on traffic or public services.

ZONING AND COMPREHENSIVE LAND USE PLAN

The Site is currently zoned Agriculture (A-1). According to the Indian River County Planning Department, public facilities and utilities, including power plants, are allowed within this zoning district with the approval of a Special Exception Use. Calpine is working with the County to obtain this approval.

The Future Land Use Map in Indian River County's Comprehensive Plan designates the Site as Agriculture (AG-1). This designation allows the construction of public facilities, including public utilities. According to the County's staff, the Project is in compliance with the current land use designation and will not require an amendment or modification of the County's Comprehensive Plan.

NOISE

The Project will use various noise suppression techniques and equipment. In addition, a 200-ft, heavily vegetated buffer area will be left undisturbed along the northern Site boundary to attenuate potential noise impacts at the residence and correctional institution located to the north of the Site. Noise modeling analyses demonstrate that the Project will comply with the Indian River County noise limits for the areas near the Site. The noise modeling analyses also demonstrate that the Project will comply with St. Lucie County's noise limits for residential uses in the Spanish Lakes Fairways development, which is south of the Site. The existing ambient noise levels at the northwesternmost portion of Spanish Lakes Fairways (i.e., the area closest to the Site) are primarily due to traffic on I-95. The Project will cause the sound levels at this location to increase less than 1 A-weighted decibel (dBA), which would not be perceptible or measurable.

LINEAR FACILITIES

The BHEC will require the construction of several linear facilities to interconnect the Project with existing facilities and services in the Site vicinity. For the primary water supply, a new intake/pumping structure will be constructed in the IRFWCD Lateral C Canal, just south of Glendale Road (State Road 612), and an approximately 3.5-mile water supply pipeline will be installed within the IRFWCD right-of-way adjacent to the canal from the new intake structure to the Site. Natural gas for the Project will be supplied to the Site via a new pipeline running approximately 15-miles from the Gulfstream Natural Gas System, LLC, metering station in St. Lucie County. The new pipeline will be located in a 50-ft right-of-way within a 0.25-mile-wide corridor, which generally follows and is centered on the Florida Power & Light Company's (FPL's) two 230-kilovolt (kV) transmission lines on the west side of I-95. Calpine is seeking certification of the water supply pumping station, the water pipeline, and the natural gas pipeline corridor in the PPSA proceeding for the Project.

The BHEC will be interconnected with the Florida power grid by two new 230-kV transmission lines running approximately 1,400 ft from the Site to FPL's two existing 230-kV lines located west of I-95. These new transmission lines will be certified by Calpine in the PPSA proceeding for the Project.

ECONOMIC BENEFITS

The Project's direct economic benefits will include:

- Approximately $2.6 to $3.0 million annually in additional ad valorem tax revenue to Indian River County.
- Approximately $3.1 to $3.6 million annually in additional tax revenues to the Indian River County School District.
- Approximately $6.3 to $7.2 million annually in additional total tax revenues.
- Approximately 36 new permanent jobs with a total payroll of approximately $2.0 million annually.
- An average of approximately 234 construction jobs (full time equivalent) and construction wages of approximately $24.5 million over the 27-month construction period.
- A capital investment of about $500 million to build the Project.

In addition to the direct benefits, numerous indirect benefits will accrue as a result of the construction and operation of the Project.

ENVIRONMENTAL PROTECTION AND BENEFITS

Throughout its development efforts for the BHEC, Calpine has selected and implemented Project designs that avoid or minimize potential environmental impacts. These environmentally protective designs include:

- Use of combined cycle technology with advanced CTGs, which provides higher efficiency electric generation and lower environmental impacts than other technologies.
- Use of natural gas only as fuel for the CTGs, which produces lower air emissions than coal- or oil-fired power plants.
- Use of advanced dry low-NO_x combustor design for the CTGs and SCR systems, which represent BACT for minimizing NO_x air emissions.
- Development of a facility layout that avoids and preserves existing wetlands on the Site.

- Use of excess surface water and reclaimed water for plant water supply, which is consistent with SJRWMD's consumptive water use criteria (i.e., avoid use of ground water) and supportive of the current master storm water planning program for the IRFWCD drainage basin, which seeks to reduce pollutant loadings and freshwater flows to the Indian River Lagoon.
- Use of a zero wastewater discharge treatment system to eliminate cooling tower blowdown and wastewater discharges to surface waters. This system also is consistent with the local and SJRWMD plans to reduce pollutant loadings and freshwater inflows to the Indian River Lagoon.

1.0 NEED FOR POWER AND THE PROPOSED FACILITIES

This chapter of the Site Certification Application (SCA) introduces Calpine Construction Finance Company, L.P. (Calpine) and explains why Calpine's Blue Heron Energy Center (BHEC) is needed.

1.1 INTRODUCTION

1.1.1 THE APPLICANT

Calpine Construction Finance Company, L.P. (Calpine), is a San Jose, California-based company that intends to own and operate a new gas-fired, combined-cycle electrical power plant, which will be known as the Blue Heron Energy Center (BHEC or the Project). Calpine's parent company, Calpine Corporation, is a San Jose, California-based company, which owns, operates, or is developing 77 power plants in the United States. Calpine Corporation's subsidiaries presently operate 28 gas-fired and 19 geothermal power plants. Calpine Corporation's subsidiaries also have 18 power plants under construction and 12 under development. The aggregate capacity of these plants is 23,913.7 megawatts (MW) (net Calpine ownership of 20,957.0 MW). The 28 operating gas-fired plants are located in California (seven plants); New Jersey (three plants); Pennsylvania (two plants); New York (four plants); Texas (five plants); and one plant each in Florida, Illinois, Massachusetts, Oklahoma, Rhode Island, Virginia, and Washington. Calpine Corporation owns, through wholly-owned subsidiaries, the Auburndale Power Plant, a 150-MW natural gas-fired cogeneration plant in Polk County, Florida, southwest of Auburndale.

1.1.2 PURPOSE OF SITE CERTIFICATION APPLICATION

Calpine intends to own and operate the Project, which will be a new 1,080-MW (nominal) natural gas-fired, combined-cycle power plant. The BHEC will be built on a 50.5-acre parcel of land (the Site) that is located southwest of the City of Vero Beach in Indian River County, Florida. The Site was selected as the preferred location for the BHEC because, among other things, the Site is near existing, required infrastructure (e.g., access road and electric transmission lines) and because the Site is predominantly surrounded by agricultural and other non-residential uses (e.g., Interstate 95 [I-95], a landfill, a correctional institution, and an industrial wastewater sprayfield). The Site's features are suitable for a power plant and the Site is of sufficient size to accommodate the Project without significant adverse environmental impacts.

The licensing of power plants in Florida requires compliance with federal, state, regional, and local laws, regulations, and ordinances. The primary state law governing the licensing of the Project is the Florida Electrical Power Plant Siting Act (PPSA), Sections 403.501 through 403.518, Florida Statutes (F.S.). Under the PPSA, the Florida Department of Environmental Protection (FDEP) coordinates the PPSA review process for the certification (i.e., approval) of a new power plant. The PPSA process begins with the submittal of an SCA to FDEP by the applicant and culminates with the certification of the Project by the Governor and Cabinet, sitting as the Siting Board.

Accordingly, Calpine is submitting this SCA to the FDEP for the BHEC. This SCA describes the BHEC, the need for the Project, the environmental conditions on the Site, and impacts associated with the Project. The SCA has been prepared to meet the requirements of the PPSA and the FDEP rules in Chapter 62-17, Florida Administrative Code (F.A.C.).

1.2 NEED FOR THE PROPOSED PROJECT

The Project is needed by Calpine to allow Calpine to increase its participation in the Peninsular Florida competitive wholesale power market. The Project's output will be sold to Florida retail-serving utilities and will contribute meaningfully to Peninsular Florida's need for electrical system reliability and integrity and for adequate electricity at reasonable cost. The BHEC is also needed to provide the energy conservation and environmental benefits described herein. The "need for power" issue often encompasses several aspects of need. The following discussion addresses in detail the manner in which the Project meets these needs.

1.2.1 NEED FOR THE PROJECT

As previously stated, Calpine is a wholly owned subsidiary of Calpine Corporation. Calpine will construct, own, and operate the Project in a manner that will provide reliable, competitively priced, environmentally clean power in the Peninsular Florida wholesale market without risk to Florida's retail electric customers. As expressed in the Federal Energy Regulatory Commission's (FERC) Order No. 888 relating to transmission access, it is the goal of the FERC and the Congress to "remove impediments to competition in the wholesale bulk power marketplace and bring more efficient, lower cost power to the nation's electricity customers." Order 888, 61 Fed. Reg. 21,539 (1996). Calpine is developing the Project in accordance with the policies of the FERC to promote a robust, competitive, wholesale electricity market in Florida. The Florida Public Service Commission (PSC) also has recognized that a competitive wholesale electricity market is enhanced by competitive wholesale power plants like the BHEC, and the PSC has stated that competitive wholesale "plants increase wholesale competition thereby in theory lowering wholesale electric prices from what they otherwise may be." In re: Joint Petition for Determination of Need for an Electrical Power Plant in Volusia County by Utilities Commission, City of New Smyrna Beach, Florida and Duke Energy New Smyrna Beach Power Company, Ltd., L.L.P., 99 PSC 3:401, 438 (1999), rev'd on other grounds sub nom. Tampa Electric Co. v. Garcia, 25 Fla. L. Weekly S 294 (Fla. April 20, 2000), rehearing denied, 2000 WL 422871 (Fla. September 28, 2000). Calpine seeks to continue its role in developing competitive, wholesale power plants, and thus satisfy the public need for cost-effective and environmentally clean power supply resources such as the Project, and to promote the state and federal governments' goal of ensuring competitively priced wholesale generation for the benefit of electric customers.

There are immediate reliability and economic needs in Peninsular Florida for the Project. The reliability need for the nominal 1,080 MW of highly efficient, reliable electric capacity and associated energy production in Peninsular Florida is evidenced by current constrained reserve margins, by projected needs to maintain planned reserve margins, and by the fact that the majority of current and projected reserve margins is made up of load management and interruptible load resources rather than actual generation capacity. Peninsular Florida needs the BHEC because the Project will provide bulk power and energy at the lowest cost available to customers as compared to the continued use of traditional rate-based power plants, most of which are more costly to operate and significantly less efficient than the Project. Moreover, the high-efficiency, gas-fired, combined cycle technology chosen for the Project represents the lowest cost technology available to serve Peninsular Florida's future power supply needs. In addition, the Project represents an environmentally superior alternative to conventional power plants. Accordingly, there is a demonstrable need for the Project in Peninsular Florida.

1.2.2 NEED FOR ELECTRIC SYSTEM RELIABILITY AND INTEGRITY

The Project is consistent with and meets Peninsular Florida's needs for generating capacity to maintain system reliability and integrity. According to the *2000 Regional Load & Resource Plan* prepared by the Florida Reliability Coordinating Council (FRCC) dated July 2000 (FRCC 2000 Regional Plan), Peninsular Florida needs more than 11,000 MW of new installed capacity in order to maintain winter reserve margins generally between 9 and 13 percent without exercising load management and interruptible resources from the winter of 2003-2004 through the winter of 2009-2010. Even with the exercise of load management and interruptible resources, Peninsular Florida needs approximately 11,000 MW of new capacity to maintain reserve margins generally between 19 and 24 percent during the same period. A 20-percent reserve margin was recently adopted by Florida's three large investor-owned utilities, which together account for approximately three-fourths of all generation resources in Peninsular Florida. In Re: Generic Investigation into Aggregate Electric Utility Reserve Margins Planned for Peninsular Florida, 99

PSC 12:426. Most of the capacity planned by Florida utilities over this period is not yet in the permitting process, and a significant portion of this planned capacity does not yet even have an identified site.

The foregoing discussion of reserve requirements clearly demonstrates that there is a significant and substantial reliability need for new generating capacity in Peninsular Florida. The Project will contribute to meeting that need by providing firm capacity to the Florida retail-serving utilities that contract to purchase the Project's output. The Project will improve the Peninsular Florida winter reserve margin by approximately 2.5 percent in the winter of 2004-2005. The winter 2004-2005 reserve margin of generation resources will increase from approximately 24.0 percent (including Calpine's Osprey Energy Center and including load management and interruptible resources) to approximately 26.8 percent with the BHEC's additional 1,155 MW of winter capacity (without duct firing or power augmentation). The Project will provide similar reserve margin improvements in the summer seasons, and these improvements will continue to be realized in subsequent years.

Under any scenario, the Project is expected to provide 1,155 of net capacity to Peninsular Florida utilities during winter peaking conditions and 1,332 MW of additional capacity (with duct firing and power augmentation) during the extreme winter peaks The Project is also expected to provide at least 992 MW of additional capacity during summer peaking conditions, and up to 1,150 MW of additional capacity (with duct firing and power augmentation) during extreme summer peaks. In an extreme weather event (e.g., a prolonged period in the summer with daily temperatures exceeding 100 degrees Fahrenheit [°F] or winter weather similar to that experienced at Christmas of 1989), the Project will provide substantial additional generating capacity to Peninsular Florida that would not otherwise be available. Assuming an average coincident peak demand of 3.5 to 5.0 kilowatts (kW) per residential customer, the Project's capacity would be sufficient to maintain electric service to approximately 200,000 to 330,000 customers during such an event.

1.2.3 NEED FOR ADEQUATE ELECTRICITY AT A REASONABLE COST

The Project meets Peninsular Florida's need for adequate electricity at a reasonable cost. Most new capacity proposed by other Florida utilities is similar gas-fired, combined cycle capacity. The direct construction cost and heat rate of the Project compare favorably to those of other similar power plants, including repowering projects that are outside the scope of the PPSA, proposed in Peninsular Florida. Because no utilities or retail customers can be required to pay for the cost of the Project and because other Peninsular Florida utilities can reasonably be expected to buy power from the Project *only* when it is cost effective (as compared to other supply sources), the Project is also necessarily consistent with and meets Peninsular Florida's need for adequate electricity at a reasonable cost. Moreover, the Project's estimated projected operating costs will place it favorably in the Peninsular Florida "supply stack" of generating plants. The Project will be more cost effective than approximately 34,000 MW or more of the generating capacity projected to be available in Peninsular Florida in 2003.

As indicated above, the Project will be a competitive wholesale power plant, and Calpine plans to commit the Project's output to Florida retail-serving utilities pursuant to long-term contracts. Competitive wholesale power plants differ from traditional "rate-based" plants in that the overhead, finance, construction, and operating costs of a rate-based plant are recovered through rates, which include a reasonable rate of return on investment, charged to the utility's captive customers. If lower cost power becomes available after a rate-based plant is constructed, the utility nevertheless remains entitled to recover the costs of its plant through its rates. Hence, the utility's ratepayers, rather than its shareholders, bear the risks associated with obsolescence. Similarly, absent a finding of imprudence, a utility is permitted to recover the fixed and variable operating costs of its rate-based plants, even if those costs are higher than originally projected or if the plant fails to operate as projected. In essence, the utility has an incentive to maximize the amount of its rate base, thereby permitting its allowed return on equity to be applied to a larger sum that results in greater earnings.

In contrast, a competitive wholesale power plant, like the BHEC, has no rate base and no captive customers. Therefore, it must produce power at the lowest possible cost and with maximum reliability to ensure it remains truly competitive. Competitive wholesale plants simply offer their capacity and energy to potential wholesale customers, who are free to purchase or decline to purchase capacity and energy offered by competitive wholesale suppliers. An economically rational purchasing utility will only enter into an agreement to purchase electric capacity or energy from a competitive wholesale plant if the cost of the capacity or energy is lower than the costs of alternatives otherwise available to the utility (e.g., generation from its own power plants or purchases from others). If the cost of power from the competitive wholesale plant is higher than the cost of other alternatives, a purchasing utility will simply choose not to buy the competitive wholesale plant's output. In such circumstances, the unrecovered costs of the competitive wholesale plant will be borne by the plant's owners, and not by any customer. The same result will occur if the competitive wholesale plant incurs cost overruns or fails to operate as efficiently or reliably as projected; the plant's owners, rather than any ratepayers, bear all of the capital, operating, and market risks associated with the power plant. Consequently, if the competitive wholesale plant's economics are favorable, other utilities and power marketers will purchase its output and enjoy cost savings. If the plant turns out not to be economical, the competitive wholesale plant's owners and operators have substantial incentives to improve its competitiveness. For these reasons, a competitive, wholesale power plant can only benefit other utilities and their customers.

1.2.4 STRATEGIC CONSIDERATIONS

The Project is consistent with strategic factors that may be considered when building a power plant, from Calpine's perspective, from the perspective of Florida retail-serving utilities that will purchase the Project's output, and from the perspective of the State of Florida. The Project will be fueled by domestically produced natural gas rather than by imported fuel that may be subject to interruption due to political or other events. The Project has a low installed cost and a highly efficient heat rate, assuring its long-term economic viability. The Project's gas-fired, combined cycle technology is exceptionally clean and minimizes airborne emissions. Since the BHEC will use very clean natural gas as its fuel, there is substantially less risk that the Project will be adversely affected by future changes in environmental regulations. Moreover, the Project's use of natural gas in a very efficient generation technology will improve the overall environmental profile of electricity generation in Florida. The Project will also conserve fuel consumed for electricity production in Florida (by displacing generation from less efficient resources). Consistent with the goals of the Florida Energy Efficiency and Conservation Act (FEECA), the Project will enhance the overall efficiency of electricity production and of natural gas use, as well as reduce the consumption of petroleum fuels for electricity generation in Florida. Additionally, the Project will enhance competition and reduce market concentration, thereby reducing wholesale power supply costs (and thus retail prices).

1.2.5 COST EFFECTIVENESS

1.2.5.1 Cost Effectiveness to Peninsular Florida

The Project will be a cost-effective power supply resource for Peninsular Florida. Projections of the Project's operations show that the BHEC will operate, economically, at annual capacity factors of approximately 86 to 94 percent from 2004 through 2012. The Project is expected to operate more cost effectively, in terms of incremental generation costs, than well over 34,000 MW of existing generating capacity in Peninsular Florida. Analyses prepared for Calpine using the PROMOD IV® production cost simulation model indicate the average generation heat rate for Peninsular Florida power supply will decline as a result of adding the Project to the fleet. These analyses also predict that the Project, with its high efficiency and relatively low dispatch cost, is expected to suppress wholesale power prices significantly below what they otherwise would be. Moreover, the Project cannot increase power supply costs above the cost of existing or planned power supply alternatives.

Beginning in 2004, the BHEC's output is expected to be sold in the wholesale power market to retail-serving utilities in Peninsular Florida (i.e., within the FRCC region) pursuant to voluntary contractual arrangements entered into on the basis of the relative economics of the Project and other Peninsular Florida generation facilities. Sales outside of Florida are not expected under any realistic scenario due to generation costs, in general, being lower in Georgia than in Florida, and additional transmission wheeling charges which would be incurred to make such sales. Moreover, transmission export capability at the Georgia/Florida interface is limited.

Calpine will *only* be able to sell its wholesale power to other utilities if and when utility purchasers determine that such purchases are cost effective relative to those utilities' alternative power supply options (e.g., self-generation or other wholesale power purchases). In addition, the PSC's ongoing regulatory oversight of utilities' fuel and purchased power costs ensures that Florida's ratepayers are responsible only for reasonable and prudent expenses. In other words, not only will the market ensure that Florida retail-serving utilities' purchases are cost effective, the PSC's ongoing regulation will similarly ensure that purchases from the Project are cost effective to ratepayers. These conclusions apply equally to longer-term power sales contracts, as contemplated by Calpine, and to shorter-term power sales.

The Project is needed to maintain reliable service to Florida electric customers. Moreover, the Project is needed to provide adequate, cost-effective electricity to utilities that provide retail service in Florida. Since the savings resulting from cost-effective purchases from the Project will be passed directly through to retail customers through the purchasing utilities' fuel and purchased power cost recovery charges, the Project will also provide cost-effective power to those utilities' retail customers. The Project will not be subject to inclusion in any utility's rate base; accordingly, there is no risk that captive retail (or wholesale) customers will be *required* to bear the Project's capital or other costs. Retail customers can only be asked to pay for the cost of power from the Project when their retail-serving utility elects to buy power from the Project. These purchases will occur *only* when such transactions are cost effective to the purchasing utility (i.e., when the Project offers power that costs less than what is available elsewhere).

The Project is also demonstrably cost effective based on a comparison of its construction cost and heat rate to the costs and heat rate of other proposed units. This analysis is based on the reasonable assumption that the cost of natural gas to the Project would be similar to the cost of natural gas to other proposed power plants. The direct construction cost of the Project is estimated to be approximately $386 million This construction cost equates to approximately $354 per kW of installed capacity (based on 1,090 MW at International Standards Organization [ISO] temperature and relative humidity conditions). The Project's full load heat rate is projected to be approximately 6,800 British thermal units (Btu) per kilowatt-hour (kWh) based on the higher heating value (HHV) of natural gas at average ambient Site conditions. Both the Project's direct construction cost and its heat rate compare favorably to those of other new gas-fired, combined-cycle power plants proposed for Florida. The proposed Cane Island 3 unit for the Florida Municipal Power Agency and the Kissimmee Utility Authority, the proposed Duke Energy New Smyrna Beach Power Company Project, Calpine's Osprey Energy Center, and the proposed Okeechobee Generating Company Project are the only projects which have similar projected construction costs *and* heat rates.

By virtue of the lack of risk to Florida's electric customers and the low cost production characteristics of this proposed plant, the Project will *necessarily* be a cost-effective power supply option for the utilities that elect to purchase the Project's power. This will translate into lower rates for customers of these utilities. Because no utility or retail customers will be obligated to purchase the Project's output except by choice, and assuming economically rational behavior by purchasing utilities, it is reasonable to conclude that any purchases from the Project will be made at prices less than or equal to the cost of the purchasing utility's next-best alternative. In light of these facts, the Project's actual costs are not essential to a determination of cost effectiveness to Florida ratepayers. Ratepayers *cannot be required* to bear the Project's costs in their rates.

1.2.5.2 Cost Effectiveness to Calpine

Calpine has considered various generating technologies and various configurations of combined-cycle power plants that could be accommodated at the proposed Site and determined that the BHEC represents the most cost-effective and reliable alternative for Calpine to meet its projected wholesale power sales commitments. Calpine considered and evaluated the following technologies in reaching its decision to construct the BHEC with the chosen gas-fired, combined cycle technology: gas- and oil-fired combustion turbines; gas- and oil-fired combined cycle units; gas-fired steam generation units; conventional pulverized coal steam units; nuclear steam units; renewable energy technology; and integrated coal gasification combined cycle units

1.2.6 ENERGY CONSERVATION

As a utility selling electricity only at wholesale, Calpine does not engage directly in the implementation of end-use energy conservation programs. Moreover, Calpine is not required to have conservation goals pursuant to Section 366.82(2), F.S. Nonetheless, the Project meets the overall goals of the FEECA, Sections 366.80-.85 and 403.519, F.S., because the Project contributes directly and significantly to the increased efficiency and cost effectiveness of electricity production and natural gas use (Section 366.81, F.S.). The Project does so by using state-of-the-art generation technology. The Project's primary energy conversion efficiency of approximately 50.2 percent (on an HHV basis) is significantly better than almost all existing utility generating capacity in Florida, better than most cogeneration facilities, and as good as or better than the vast majority of other Florida utilities' proposed new gas-fired, combined cycle capacity. To the extent that the Project, with its average heat rate of approximately 6,800 Btu per kWh at ambient Site conditions, displaces generation from less efficient oil-, coal-, and gas-fired units, the Project will result in substantial increases in the efficiency of natural gas use. Based on projected operations, the BHEC is expected to save approximately 12 to 18 trillion Btu of primary energy per year. If the entire savings were realized through the displacement of natural gas-fired generation, this would represent savings of approximately 12 to 18 billion cubic feet of natural gas per year. If the Project displaced only oil-fired generation, this would reflect savings of approximately 1.9 to 2.9 million barrels of residual fuel oil per year. To the extent that the Project displaces oil-fired generation, it will contribute to the express statutory goal of conserving expensive resources, especially petroleum fuels (Sections 366.81 and 366.82[2], F.S. [1999]). In addition, the Project's capacity and energy will be economically and environmentally preferable to other supply-side alternatives. Thus, future cost-effective conservation measures would likely displace other supply-side alternatives, rather than displace the capacity and energy available from the Project.

1.3 OVERVIEW OF THE BLUE HERON ENERGY CENTER

1.3.1 INTRODUCTION

As noted previously, Calpine is proposing to own and operate a nominal 1,080 MW natural gas-fired, combined cycle electrical power plant, which will be known as the BHEC. Construction of the BHEC is expected to commence no later than January 2002, with the facility being placed into service in the first quarter of 2004.

Calpine will submit its petition for determination of need for the BHEC to the PSC in the near future. The need determination hearing is anticipated to be held in the first quarter of 2001. The PPSA time frames for processing the SCA indicate that the Siting Board will issue the Site Certification in the fourth quarter of 2001. Calpine expects the construction of the Project to begin immediately thereafter.

A more detailed description of the proposed power plant is contained in Chapter 3.0 of this SCA.

1.3.2 SITE LOCATION AND DESCRIPTION

The BHEC will be located in unincorporated Indian River County, Florida. The Site is approximately 5 miles southwest of the City of Vero Beach (see Figures 2.1.0-1 through 2.1.0-3). The Site is approximately 50.5 acres in size and is presently undeveloped. An aerial photograph of the Site is presented in Figure 2.1.0-4. A boundary and topographic survey map of the Site is found in Appendix 10.10. A more detailed description of the Site and surrounding areas is contained in Chapter 2.0 of the SCA.

The Site is presently owned by Ocean Spray Cranberries, Inc.; Calpine has an option agreement to purchase the Site.

1.3.3 PROJECT DESCRIPTION

The Project will include two power blocks, each of which will consist of two Siemens Westinghouse Model 501F Class combustion turbine generators (CTGs) in combined cycle configuration with two matching heat recovery steam generators (HRSGs) and one steam turbine generator. The total generating capacity of the Project (both power blocks) will be a nominal 1,080 MW at average Site conditions without power augmentation and without duct-firing. The CTGs will be fired using natural gas as the only fuel. A Site layout (Site plan) for the Project is presented in Figure 3.2.0-1.

The Project also will include directly associated facilities, such as the operations control center, cooling towers, a water treatment building, pump houses, storage facilities, a general services and warehouse building, a gas regulating-station, and a storm water management system.

The Project will be a highly efficient combined cycle electrical power plant that will utilize the latest pollution control technology and provide optimum efficiency in electric power generation. Nitrogen oxides (NO_x) will be controlled by dry, low-NOx (DLN) combustion technology in conjunction with selective catalytic reduction (SCR) technology. The NO_x emission limit for the Project is proposed to be 3.5 parts per million, volume dry (ppmvd), corrected to 15 percent oxygen (O_2).

The Project will utilize a combination of excess surface water from the Indian River Farms Water Control District (IRFWCD) canal system, and reclaimed water from Indian River County, on an as-available basis to satisfy its water supply needs. The daily average annual water consumption of the Project is expected to be approximately 6.5 million gallons per day (MGD), and the peak daily use is expected to be approximately 7.5 MGD. The Project has been designed as a *zero wastewater discharge* facility; therefore, no wastewater will be discharged from the Project to surface or ground waters. Details of the water supply plan, water supply needs, and wastewater management system are provided in Chapter 3.0 of this SCA.

A Water Supply Alternatives Study has been conducted to identify and evaluate potential water sources for the Project, including water reuse options. The results of the Water Alternatives Study, which will be used in the final design of the BHEC, are included in this SCA in Appendix 10.1.4.

The proposed Project will interconnect to the Peninsular Florida transmission grid via connections to Florida Power & Light Company's (FPL's) Malabar-Midway 230-kilovolt (kV) line and to FPL's Malabar-Emerson 230-kV line, both of which are located in rights-of-way immediately west of I-95. For this interconnection, two 230-kV transmission lines will be constructed within a corridor running from the 230-kV substation on the BHEC Site to FPL's existing transmission lines. The total distance from the onsite substation to the projected interconnection points with FPL's existing 230-kV lines is approximately 1,400 feet (ft). It is anticipated that the 230-kV transmission lines will be overhead, over I-95. There will be no other new linear transmission line corridors required to accommodate the Project's interconnection with the Peninsular Florida grid. The corridor for the new transmission lines will be certified by Calpine in the PPSA proceeding for the Project. The transmission lines and corridor are described in Section 6.1 of this SCA.

Natural gas will be transported to the Site via an approximately 15-mile new underground pipeline to be constructed from the Site to an interconnection with the new Gulfstream Natural Gas System, L.L.C. (Gulfstream) pipeline. The corridor for this lateral pipeline is included in this SCA because it will be developed and certified as part of the Project. The gas pipeline corridor is described in Chapter 6.0 of this SCA.

A conceptual design for the Project has been developed to provide an initial basis for planning and development of this SCA. Specific environmental criteria have been used to ensure that the BHEC will be in compliance with all applicable federal, state, and local regulations.

1.4 BENEFITS OF THE PROJECT

The primary benefit of this Project to Indian River County, the region, and all of Florida is the provision of clean, reliable, cost-effective, and environmentally beneficial electrical capacity and energy. In addition, the Project will enhance the reliability of Florida's electric power supply system. The BHEC also will provide an average of approximately 234 construction jobs and approximately 36 permanent jobs for the local economy, as well as substantial tax revenues to the local governments and agencies within whose jurisdictions the Project will be located. The Project will make beneficial use of the Site with minimal adverse environmental impacts.

Due to the location of the Site, the Project's use of clean-burning natural gas fuel, and the use of both DLN combustion technology and SCR for NO_x control, no significant adverse environmental or social impacts will result from the construction or operation of the BHEC. Indeed, the BHEC will reduce the airborne emissions associated with generating Florida's electrical power supply.

The BHEC will burn natural gas and will tie into the new Gulfstream natural gas pipeline that will bring gas from the Mobile Bay area of the Gulf of Mexico to Peninsular Florida. The Project, as an anchor tenant for the pipeline, will buy gas transportation service from Gulfstream. Calpine's payments will contribute to the cost of the additional natural gas supply infrastructure represented by the Gulfstream pipeline.

2.0 SITE AND VICINITY CHARACTERIZATION

To assess the potential impacts that a project may have, it is necessary to characterize the environment in which the project will be located. This chapter provides the requisite characterization for the BHEC, and describes the Site and vicinity in Indian River County and St. Lucie County to the south. Following the site description, the remainder of this chapter presents the results of the detailed characterization of the socio-political and biophysical environment. This chapter contains the following sections, per the FDEP document, *Instruction Guide for Certification Applications: Electrical Power Plant Site, Associated Facilities, and Associated Transmission Lines* (FDEP, 1983):

- 2.1—Site and Associated Facilities Delineation.
- 2.2—Socio-Political Environment.
- 2.3—Biophysical Environment.

2.1 SITE AND ASSOCIATED FACILITIES DELINEATION

This section provides an overview of the proposed BHEC—its location, the existing land use, and a description of adjacent properties and the general vicinity of the Site.

The BHEC will be located on an approximately 50.5-acre parcel (the Site) located in southeastern Indian River County, approximately 5 miles southwest of the western city limits of Vero Beach. The Site is located in Section 36, Township 33 South, Range 38 East. Figure 2.1.0-1 shows the general location of the Site. The Site is bordered on the west by I-95, several borrow pit lakes, and undeveloped property; to the north by a single-family residence and the Indian River County correctional institution and solid waste landfill; to the east by a wastewater sprayfield operated by Ocean Spray Cranberries, Inc., and by citrus groves; and to the south by undeveloped lands and I-95. The Spanish Lakes Fairways residential development is located southeast of the Site in St. Lucie County. Access to the site is via 74^{th} Avenue (Range Line Road) which terminates at the Site. Figures 2.1.0-2 and 2.1.0-3 show the Site location and vicinity on a U.S. Geological Survey (USGS) 1:24,000-scale topographic quadrangle map (USGS, 1983) and a 1:24,000-scale aerial photograph, respectively. Figure 2.1.0-4 shows the Site and immediate vicinity on a recent (April 2000) color aerial photograph at a scale of 1 inch equals 600 ft.

The natural gas-fired 1,080 MW (nominal) power plant will be constructed on approximately 20 acres (facility footprint) of the Site. Included in the proposed development in addition to the generating facilities will be a storm water detention pond, gas regulating station, administration and warehouse buildings, water treatment facilities, and parking. The temporary construction laydown and parking area will be located on a roughly 30-acre portion of an approximately 65-acre parcel situated to the north of the Site (see Figures 2.1.0-2 and 2.1.0-3). This property is owned by Indian River County and is planned for future landfill expansion use. Since this property's use for the Project is temporary, the construction laydown area is not part of the Site (i.e., Calpine is not seeking certification of any long-term use of this area). Descriptions of environmental characteristics for the construction laydown area are included in Chapter 4.0, Effects of Site Preparation and Plant and Associated Facilities.

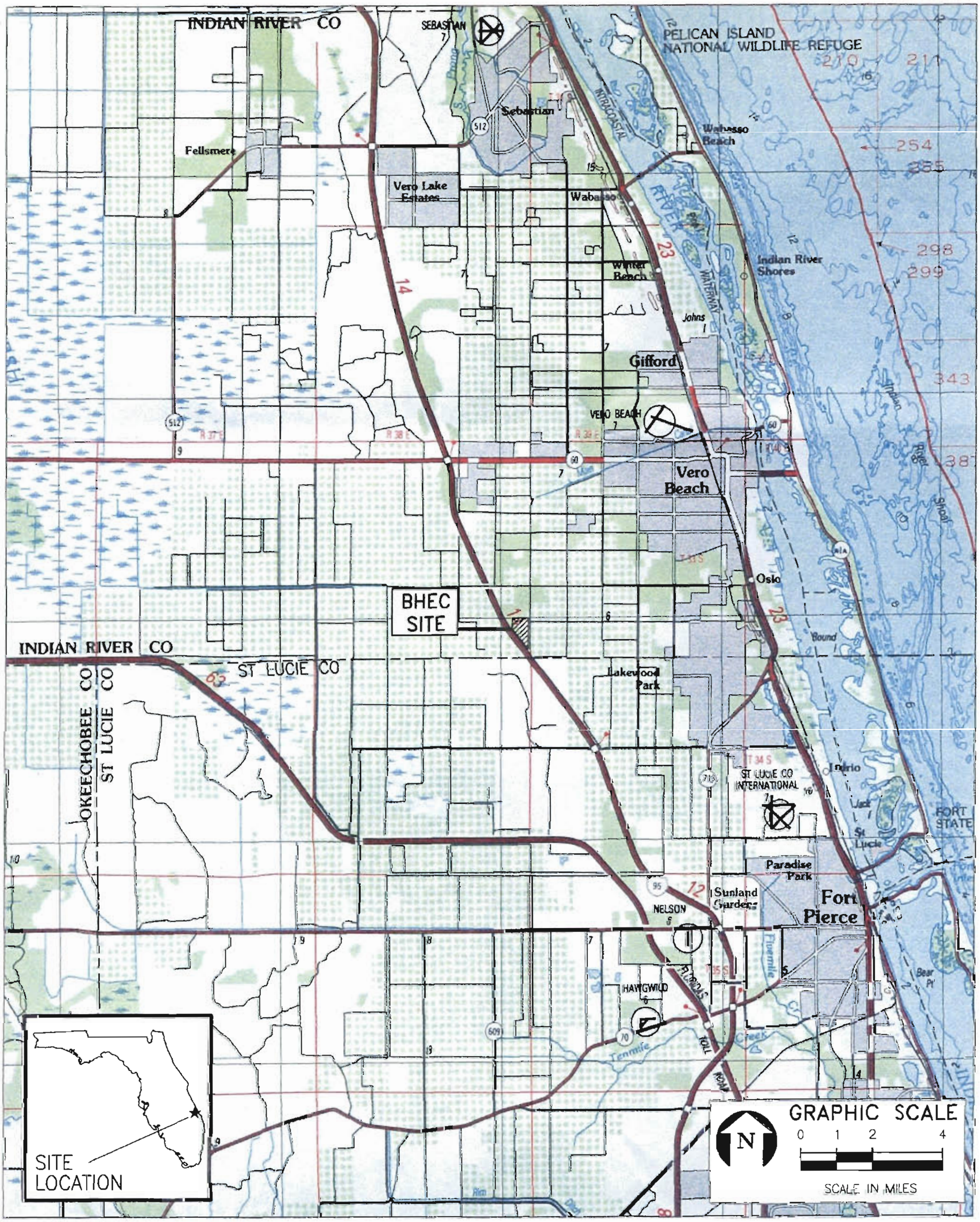

FIGURE 2.1.0-1.

BHEC SITE LOCATION MAP

Sources: USGS Quad: Ft. Pierce, FL, 1988; ECT, 2000.

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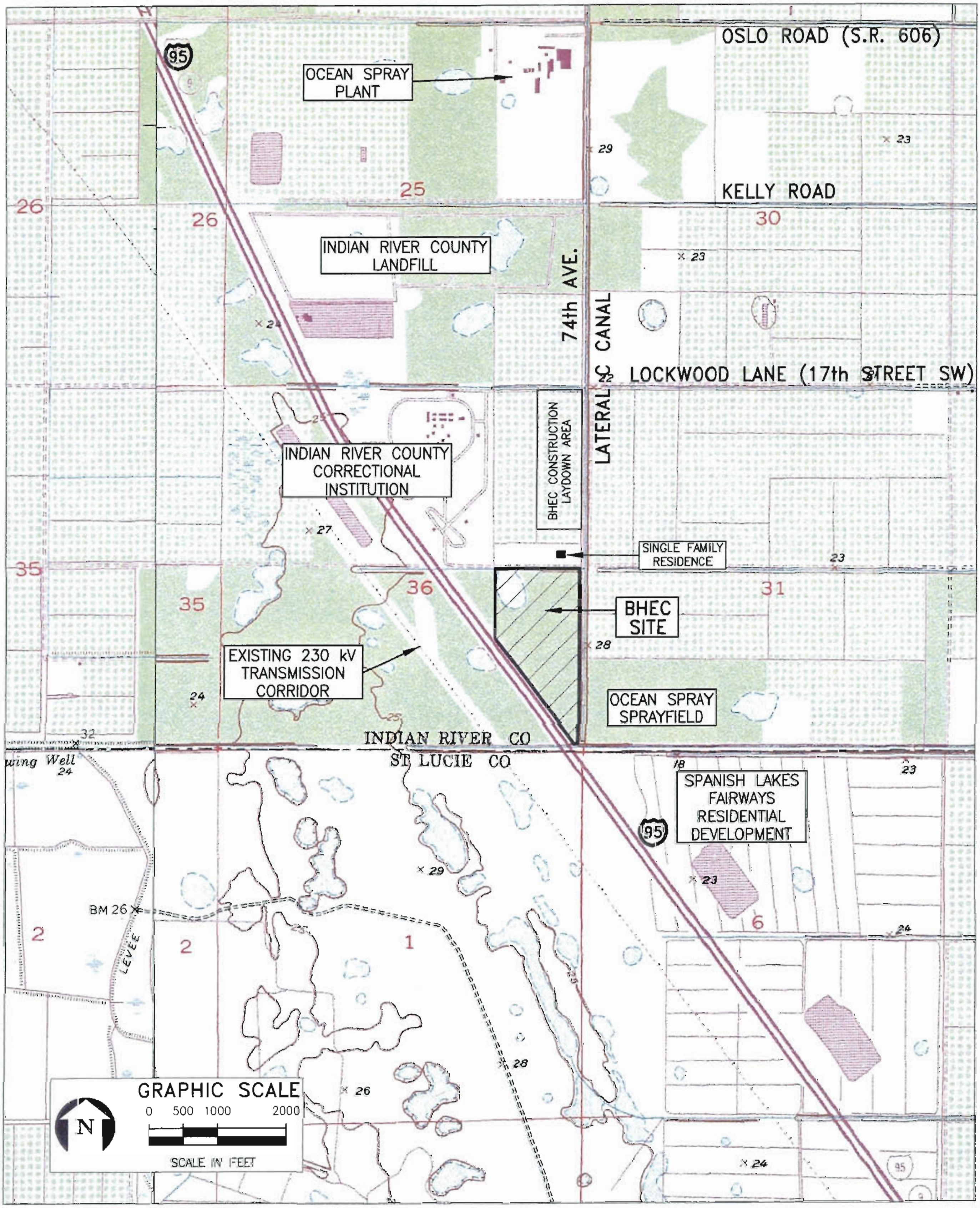

FIGURE 2.1.0-2.

SITE VICINITY MAP

Sources: USGS Quads: Oslo and East of Glum Slough, FL, 1983; ECT, 2000.

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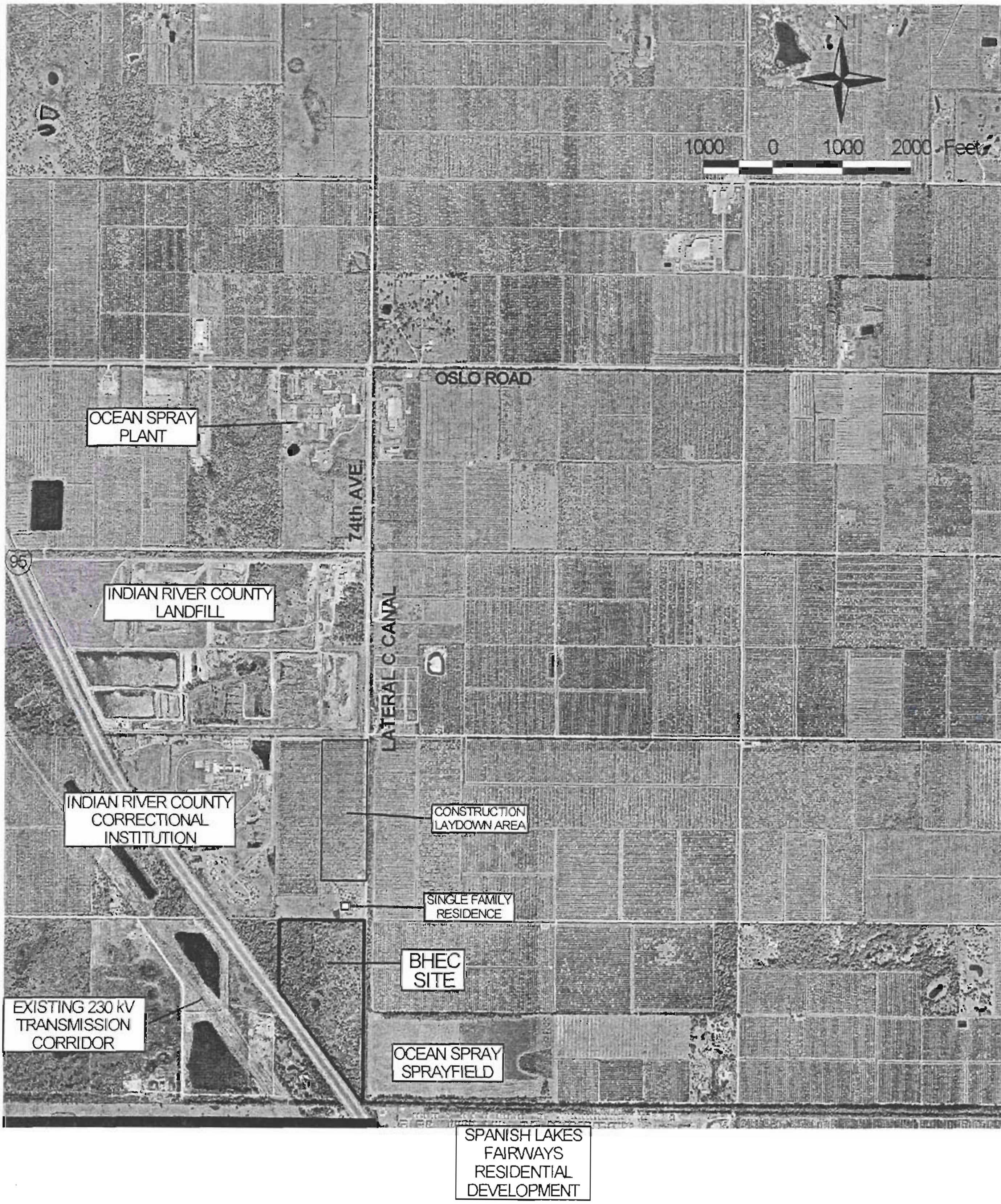

FIGURE 2.1.0-3.

AERIAL AT 1:24000 SHOWING LOCATIONAL FEATURES

Sources: Indian River County, 1998; ECT, 2000.

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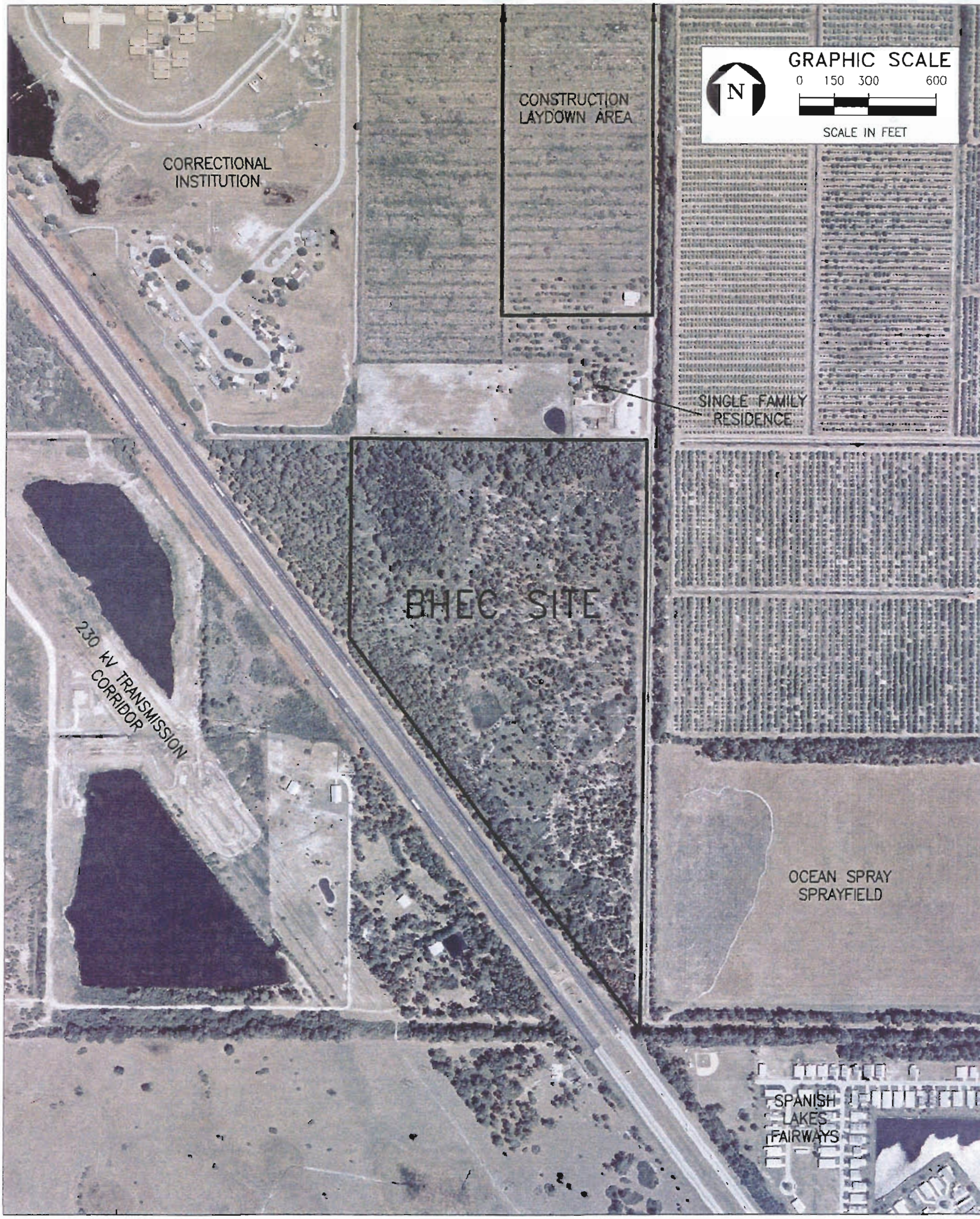

FIGURE 2.1.0-4.

PROJECT SITE AND IMMEDIATE VICINITY

Sources: Aerial Cartographics of America, 2000; ECT, 2000.

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Natural gas for the BHEC will be supplied via a pipeline originating at a Gulfstream metering station located in St. Lucie County approximately 15 miles south of the Site. This new natural gas pipeline is a directly associated facility that is to be certified in this PPSA proceeding. Detailed descriptions of the corridor for this pipeline are provided in Chapter 6.0.

The primary source of cooling and other plant process water for the BHEC will primarily consist of excess surface water withdrawn from the IRFWCD canal system. A new pumping station will be constructed in the Lateral C Canal in the lower pool of the discharge system, and an approximately 3.5-mile water supply pipeline will be constructed from the pumping station in IRFWCD right-of-way to the Site, running parallel to the Lateral C Canal. This pumping structure and pipeline are directly associated facilities that are to be certified in this PPSA proceeding. Detailed descriptions and locations of the structure and pipeline are provided in Chapter 6.0, Transmission Lines and Other Linear Facilities.

As shown in Figure 2.1.0-2, the Site is located in proximity to an existing corridor with two 230- kV electrical transmission lines which are part of the FPL system. Florida Gas Transmission Company (FGT) also has a natural gas pipeline located between the two electric transmission lines. Two new transmission lines, approximately 1,400 ft in length installed across I-95, will provide the power plant's interconnection to the existing 230-kV transmission lines. These new transmission lines will be certified by Calpine in this PPSA proceeding. The new transmission lines and corridor are described in Chapter 6.0.

Additional water for the BHEC operations will be supplied from the Indian River County reclaimed water system on an as-available basis. Potable water and sanitary wastewater services for the BHEC will be provided by Indian River County. Existing pipelines for these county systems are currently located approximately 0.5 mile to the north of the Site. Indian River County will own, operate, and maintain these pipelines. Therefore, these pipeline facilities are not included for certification in this PPSA proceeding. The BHEC will be designed and operated as a *zero-discharge* wastewater facility. These will be no industrial wastewater discharges from the Project to any surface or ground water.

The Site's topography is nearly level, ranging from approximately 20 to 25 feet above mean sea level (ft-msl) (Masteller, Moler & Reed, Inc., 2000). According to Flood Insurance Rate Map (FIRM) Panel No. 1201190165-E, dated May 4, 1989, the Site is located within Zone X, classified as an area determined to be outside the 500-year floodplain (see Figure 2.1.0-5).

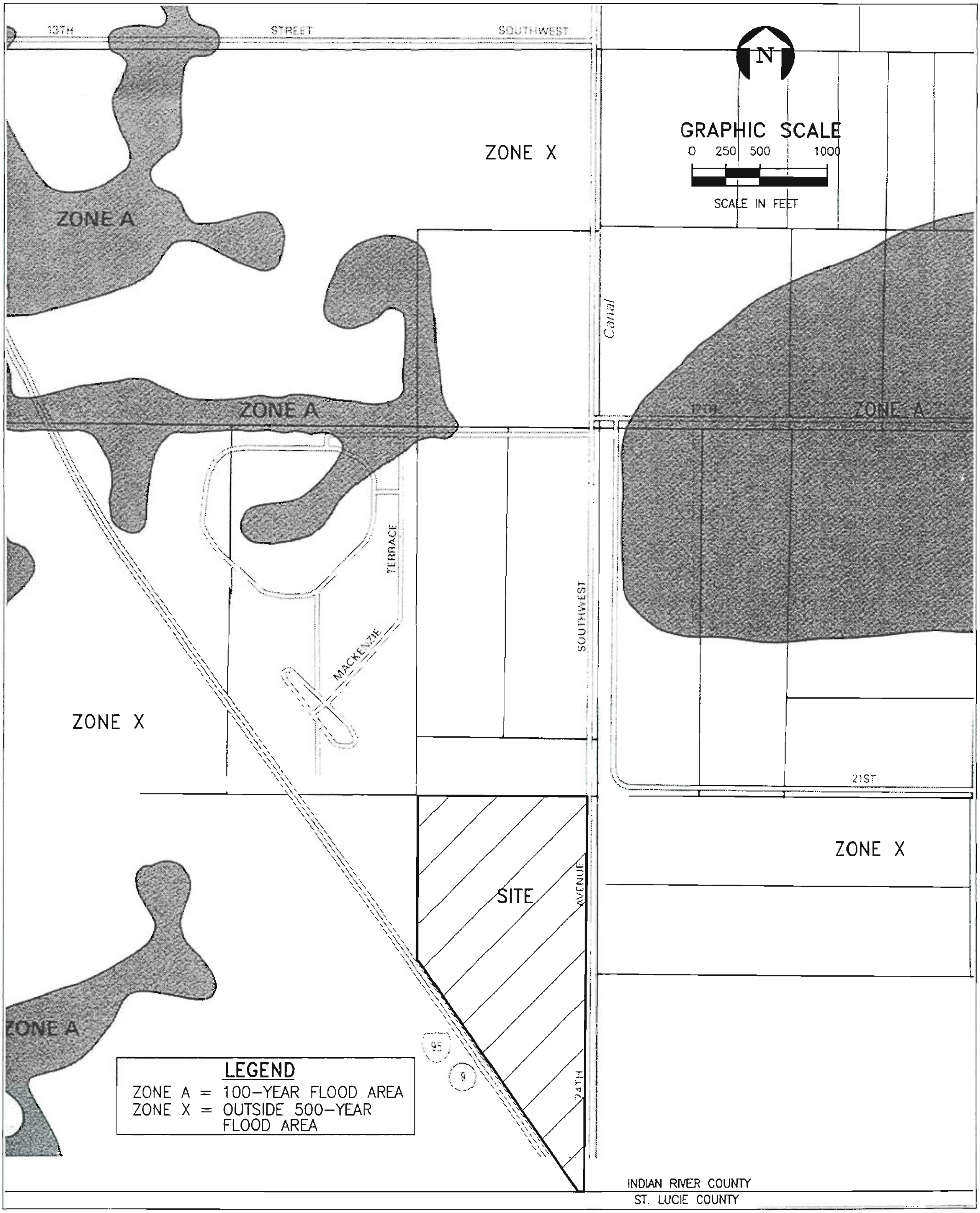

FIGURE 2.1.0-5.

FLOOD-PRONE MAP

Sources: FEMA FIRM Map 12061C0165 E; ECT, 2000.

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2.2 SOCIO-POLITICAL ENVIRONMENT

The FDEP rules for certification of the Site require an analysis of various land use and socioeconomic baseline conditions and projected impacts in accordance with local government comprehensive plans, zoning ordinances, and development regulations. The various planning issues relevant to the Site fall within the following generalized categories: existing land use, comprehensive plans and zoning ordinances, infrastructure and growth management, cultural resources, aesthetics, and socioeconomics. Per the FDEP instructions, this section includes the following subsections:

- 2.2.1—Governmental Jurisdictions.
- 2.2.2—Zoning and Land Use Plans.
- 2.2.3—Demography and Ongoing Land Use.
- 2.2.4—Easements, Title, and Agency Works.
- 2.2.5—Regional Scenic, Cultural, and Natural Landmarks.
- 2.2.6—Archaeological and Historic Sites.
- 2.2.7—Socioeconomics and Public Services.

Based on the following evaluation of existing conditions, land development plans and ordinances, and the capacity of existing and planned public facilities, the BHEC is a compatible development and is expected to have no significant negative impacts to the socio-political environment in the surrounding area.

2.2.1 GOVERNMENTAL JURISDICTIONS

The Site is located within an unincorporated area of Indian River County. Figure 2.2.1-1 depicts the Site location in relation to the incorporated and unincorporated areas in a 5-mile radius at a 1-inch equals 2-mile scale (i.e., 1:126,720 scale). Figure 2.1.0-2 presents a Site vicinity map at a 1-inch equals 2,000-ft scale (i.e., 1:24,000 scale).

The nearest incorporated area within Indian River County is the City of Vero Beach. The western boundary of the city is located approximately 5 miles northeast of the Site. The nearest incorporated area within St. Lucie County is Fort Pierce, located approximately 8.5 miles southeast of the Site. As discussed in Section 2.2.5, there are no local, regional, state, or federal environmentally protected areas within 5 miles of the Site.

FIGURE 2.2.1-1.

FDOT MAP WITH 5-MILE RADIUS (1 MILE INTERVALS)

Sources: FDOT: St. Lucie, FL, 1986; Indian River, FL, 1998; ECT, 2000.

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2.2.2 ZONING AND LAND USE PLANS

The Site is undeveloped. The current zoning and land use plan designations for the Site are described in the following sections. Copies of applicable sections of the Indian River County and St. Lucie County zoning ordinances and comprehensive land use plans are provided in Appendices 10.2 and 10.3, respectively. Descriptions of the zoning and land use plan designations for the natural gas pipeline corridor in Indian River County and St. Lucie County are provided in Chapter 6.0.

2.2.2.1 Comprehensive Plan Future Land Use Map

The Site is located within unincorporated Indian River County. Indian River County has designated the Site as Agriculture (AG-1) on its Comprehensive Plan Future Land Use Map (Indian River County, 1998). The Agriculture land use designation allows public facilities, which include public utilities. Neither public facilities nor public utilities are specifically defined within the Indian River County Comprehensive Plan, according to county planning staff. In the AG-1 land use category, the only zoning district is Agriculture A-1, which allows Private Utilities, Heavy, with the approval of a Special Exception Use. The proposed Project is in compliance with the Agriculture land use designation and will not require modification of the Indian River County Comprehensive Plan. Figure 2.2.2-1 depicts the Indian River County and St. Lucie County comprehensive plan land use descriptions in proximity to the Site.

2.2.2.2 Zoning

The Site is currently zoned Agriculture (A-1) within Indian River County. One of the intentions of this zoning district is to permit activities that require non-urban locations and do not detrimentally impact lands devoted to rural and agricultural activities. Public facilities and utilities are allowed within this zoning district with the approval of a Special Exception Use in accordance with Section 971.05 of the Code of Indian River County. Figure 2.2.2-2 depicts the surrounding Indian River and St. Lucie County zoning designations.

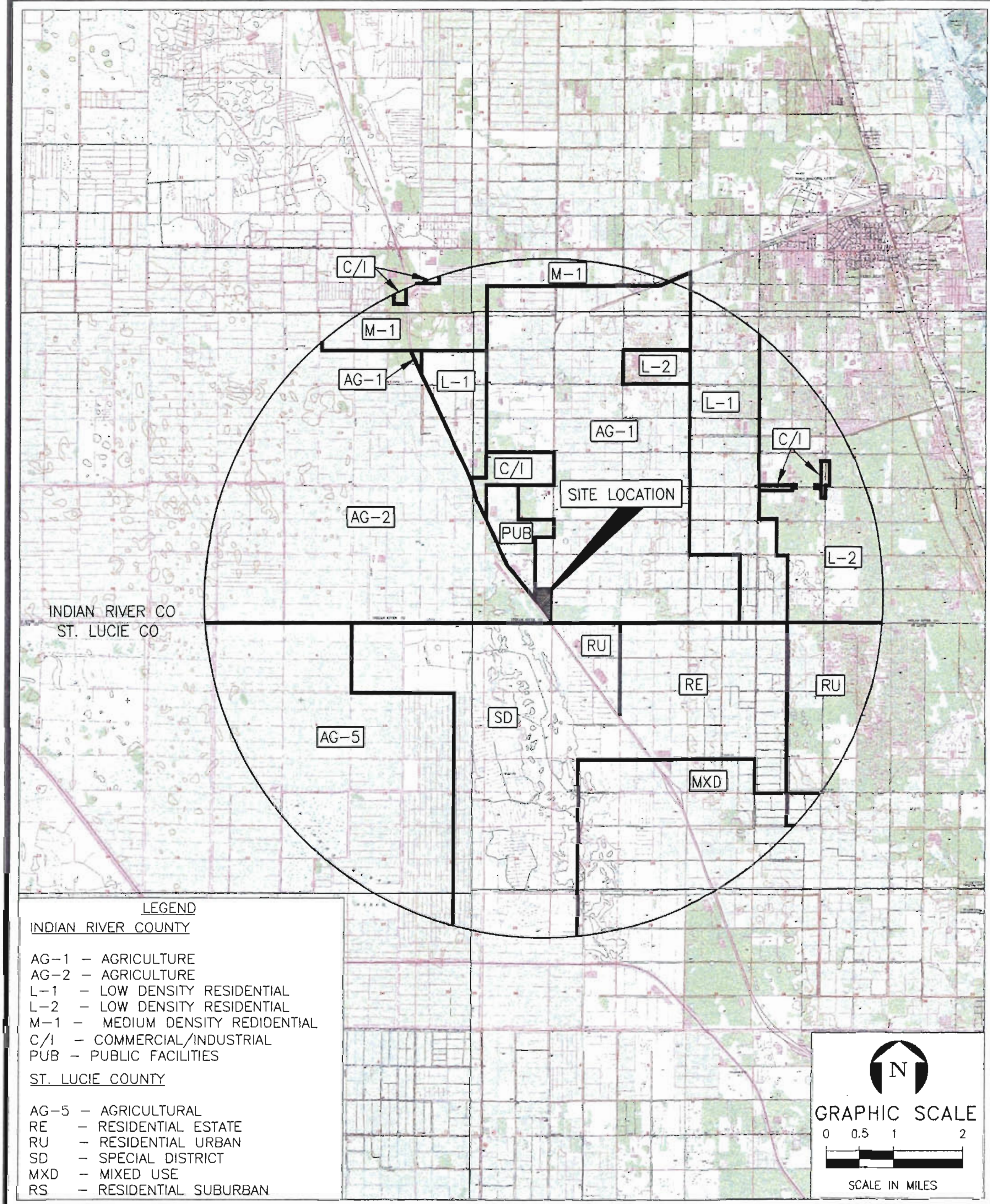

FIGURE 2.2.2-1.

COMPREHENSIVE PLAN DESIGNATIONS WITHIN 5-MILE RADIUS

Sources: USGS Quad Maps of Indian River and St. Lucie Counties, FL; ECT, 2000.

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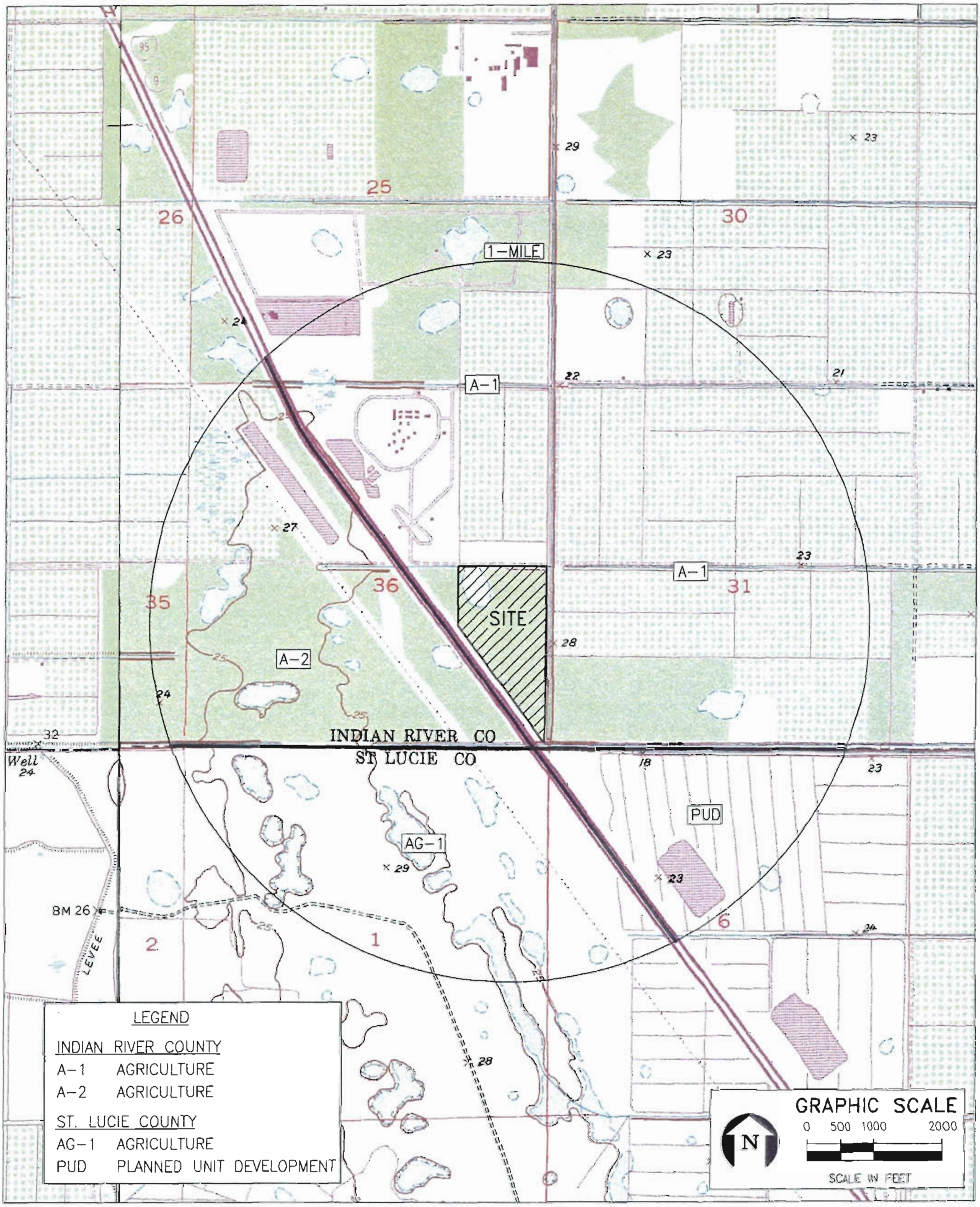

FIGURE 2.2.2-2.

APPROXIMATE ZONING DESIGNATIONS

Sources: USGS Quads: Oslo and East of Gum Slough, FL, 1983; ECT, 2000.

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2.2.3 DEMOGRAPHY AND ONGOING LAND USE

The estimated 1998 population of Indian River County is 106,690. Population trends for Indian River County, City of Vero Beach, and the State of Florida are as follows:

Area	Population 1970	Percent Change 1960-1970	Population 1980	Percent Change 1970-1980	Population 1990	Percent Change 1980-1990
Indian River	35,992	42.2	59,896	66.4	90,208	50.6
Vero Beach	11,908	34.6	16,176	35.8	17,350	7.3
Florida	6,791,418	37.2	9,746,961	43.5	12,938,071	32.7

Source: U.S. Bureau of the Census, 1990.

Indian River County has been growing in population at a rate greater than for the state as a whole. Indian River County is currently the 33rd most populous of the 67 counties in Florida.

The following estimates of population in Indian River County are the medium projection prepared by the Bureau of Economic and Business Research (BEBR) at the University of Florida.

Population 2000	Percent Change 1990-2000	Population 2005	Population 2010	Percent Change 2000-2010	Population 2015	Population 2020	Percent Change 2010-2020
111,000	23	121,500	131,300	18.3	141,600	152,300	16

Source: BEBR, 1999.

Indian River County is expected to experience a higher growth rate than that of the state as a whole through the year 2020 (from 16 percent to 23 percent versus 6.4 percent to 7.9 percent). The Introductory Element of the Indian River County Comprehensive Plan (Indian River County, 1998) projects slightly different population growth, also based on the BEBR medium projections. The numbers presented above are the most recently published.

Existing land uses within a 5-mile radius of the Site are depicted on Figure 2.2.3-1. Land uses to the west and southwest are undeveloped or agriculture. Land uses to the north are residential (one single-family residence), public (correctional institution and landfill), and citrus groves, which are currently abandoned and planned for future use for expansion of the landfill operations. East of the Site are citrus groves and a permitted wastewater sprayfield. Southeast of the Site, within St. Lucie County, is an existing residential subdivision, Spanish Lakes Fairways, which currently has approximately 1,800 residences and an estimated population of 4,122. The predominant land use in this area of both Indian River and St. Lucie Counties is agriculture. Field verification of the surrounding land uses was conducted in February 2000. The western city limits of Vero Beach are located approximately 5 miles northeast of the Site.

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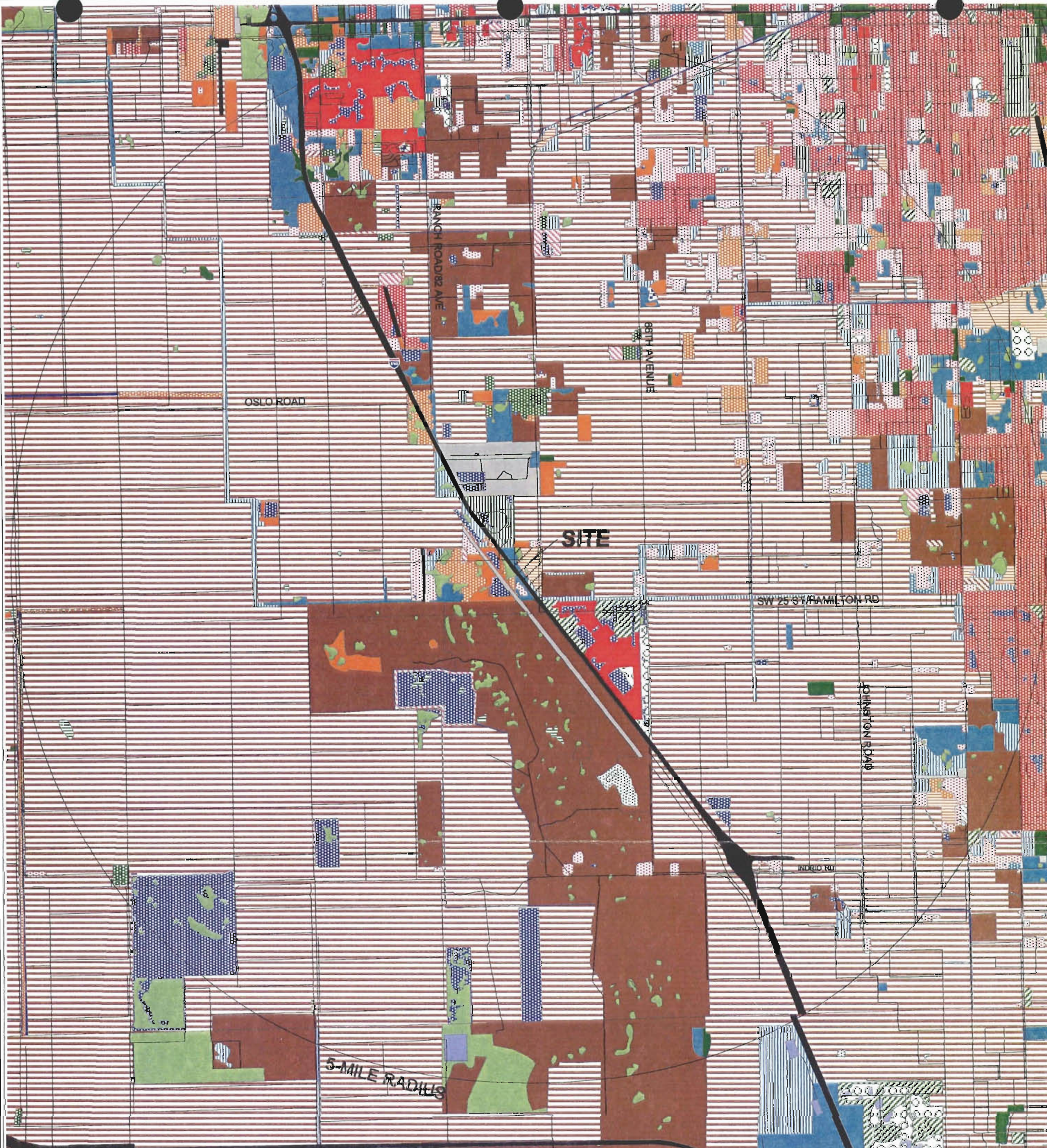

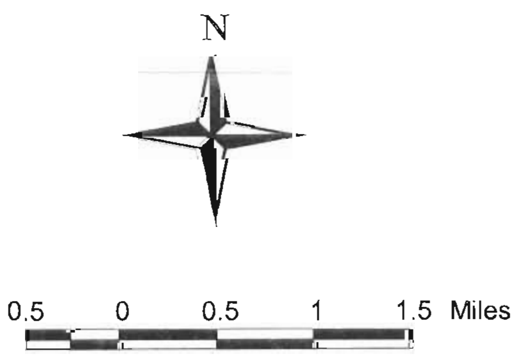

LAND USE CODES

110 -RESIDENTIAL, LOW DENSITY
120 - RESIDENTIAL, MEDIUM DENSITY
130 - RESIDENTIAL, HIGH DENSITY
140 - COMMERCIAL & SERVICES
150 - INDUSTRIAL
160 - EXTRACTIVE
170 - INSTITUTIONAL
180 - RECREATIONAL
190 - OPEN LAND
210 - CROPLAND & PASTURELAND
220 - TREE CROPS
230 - FEEDING OPERATIONS
240 - NURSERIES & VINEYARDS
250 - SPECIALTY FARMS
260 - OTHER OPEN LANDS (RURAL)
310 - HERBACEOUS
320 - SHRUB & BRUSHLAND
330 - MIXED RANGELAND
410 - UPLAND CONIFEROUS FOREST
420 - UPLAND HARDWOOD FOREST
430 - UPLAND HARDWOOD FOREST
440 - TREE PLANTATIONS
500 - WATER
510 - STREAMS & WATERWAYS
520 - LAKES
530 - RESERVOIRS
540 - BAYS & ESTUARIES
600 - WETLANDS
610 - WETLAND HARDWOOD FOREST
620 - WETLAND CONIFEROUS FOREST
630 - WETLAND FOREST MIXED
640 - VEGETATED NON-FORESTED WETLANDS
650 - NON-VEGETATED WETLANDS
720 - SAND OTHER THAN BEACHES
730 - BARREN LAND
740 - DISTURBED LAND
810 - TRANSPORTATION
820 - COMMUNICATIONS
830 - UTILITIES

FIGURE 2.2.3-1.

LAND USE/VEGETATION TYPE WITHIN 5-MILE RADIUS OF PLANT SITE

Source: SJRWMD, 1998; ECT, 2000.

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2.2.4 EASEMENTS, TITLE, AND AGENCY WORKS

It is anticipated that approval for the use of the IRFWCD rights-of-way will be required for the water supply pumping station and pipeline to withdraw water from the Lateral C Canal located approximately 3.5 miles north of the Site. Easements or rights-of-way will be required for the natural gas transmission pipeline connection to the Site from the Gulfstream metering station in St. Lucie County.

The existing 30-ft right-of-way of Indian River County on the Site will be abandoned and a 30-ft easement for the County will be provided along the eastern boundary of the Site.

Storm water discharges from the Site will be routed via a culvert eastward to the Lateral C Canal which will require easements from the county and IRFWCD.

2.2.5 REGIONAL SCENIC, CULTURAL, AND NATURAL LANDMARKS

The Treasure Coast Regional Planning Council (TCRPC) has prepared a strategic regional policy plan (SRPP) that was adopted in December 1995. An SRPP, required by Section 186.507, F.S., is a long-range guide for physical, economic, and social development of a region. The SRPP is required to identify and address significant regional resources and facilities. Using existing information from numerous state and federal agencies, natural resources inventory maps have been compiled for the region. Regionally significant natural resources within 5 miles of the Site have been identified by the TCRPC as surface water resources, ground water resources, upland natural communities and natural systems.

The TCRPC has identified ground water resources, including the surficial aquifer and the Floridan aquifer, as regionally significant resources. Concerns related to the region's ground water resources are saltwater intrusion and loss of ground water recharge potential. The quality and quantity of ground water present in the aquifers affects the water supply available for a variety of important and competing users. Surface water resources include wetlands and water bodies. Small, scattered water bodies and wetlands are depicted in the Site area (Figure 2.2.5-1). The only linear facility depicted in a 5-mile radius of the subject property is Main Canal, a man-made drainage feature. Other canals within the IRFWCD are not depicted on the TCRPC surface water resources map.

The predominant plant community onsite is pine flatwoods. As depicted on Figure 2.2.5-2, the surrounding area is mostly devoid of upland natural communities because of the extensive conversion to agricultural uses. Figure 2.2.5-3 depicts an upland plant community natural system onsite and east and west of the Site. The Site and the surrounding area have not been identified by TCRPC as a planning or resource management area or as coastal or marine resources. The Site has not been identified by TCRPC as an area of priority wetlands, strategic habitat conservation area, or as a biodiversity hot spot. A biodiversity hot spot is a data set representing biological diversity created by the aggregation of predictive habitat maps for wading birds, important natural communities, and 54 focal species/communities. Within a 5-mile radius of the Site, there are two areas indicated as biodiversity hot spots (1 mile to the west and 3 miles to the east-northeast).

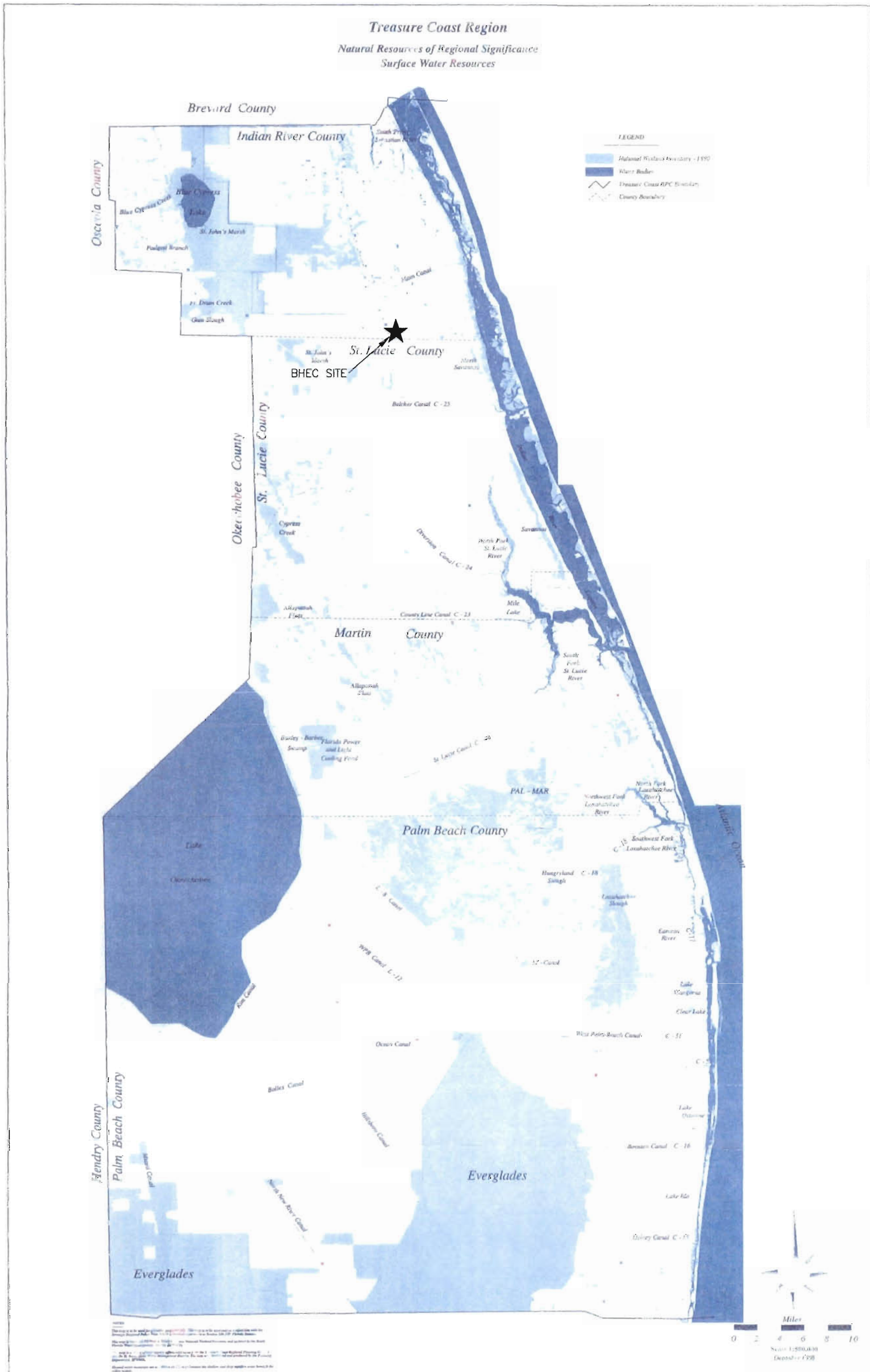

FIGURE 2.2.5-1.
SURFACE WATER RESOURCES

Sources: Treasure Coast Regional Planning Council, Strategic Regional Policy Plan; ECT, 2000.

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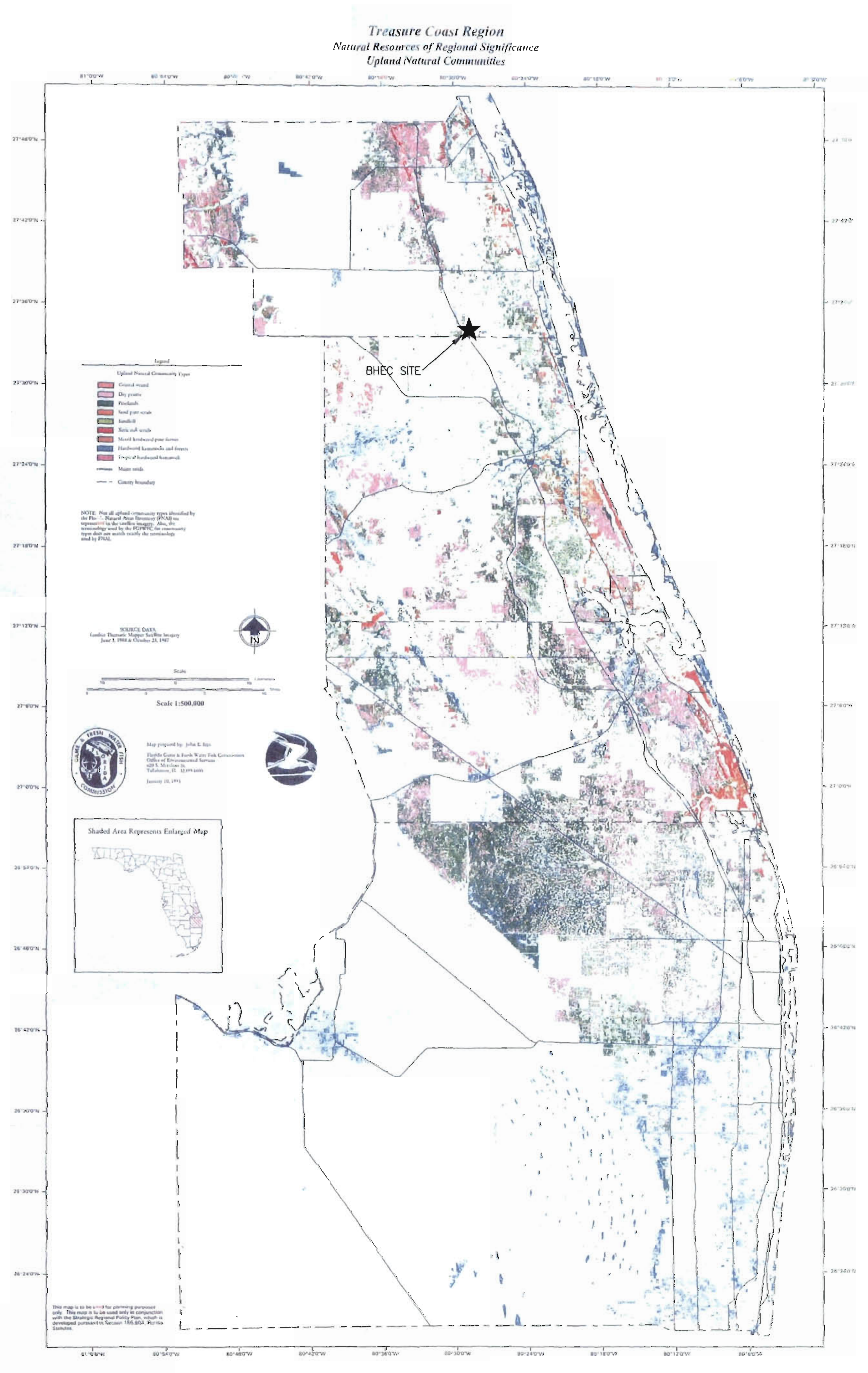

FIGURE 2.2.5-2.

UPLAND NATURAL COMMUNITIES

Sources: Treasure Coast Regional Planning Council, Strategic Regional Policy Plan; ECT, 2000.

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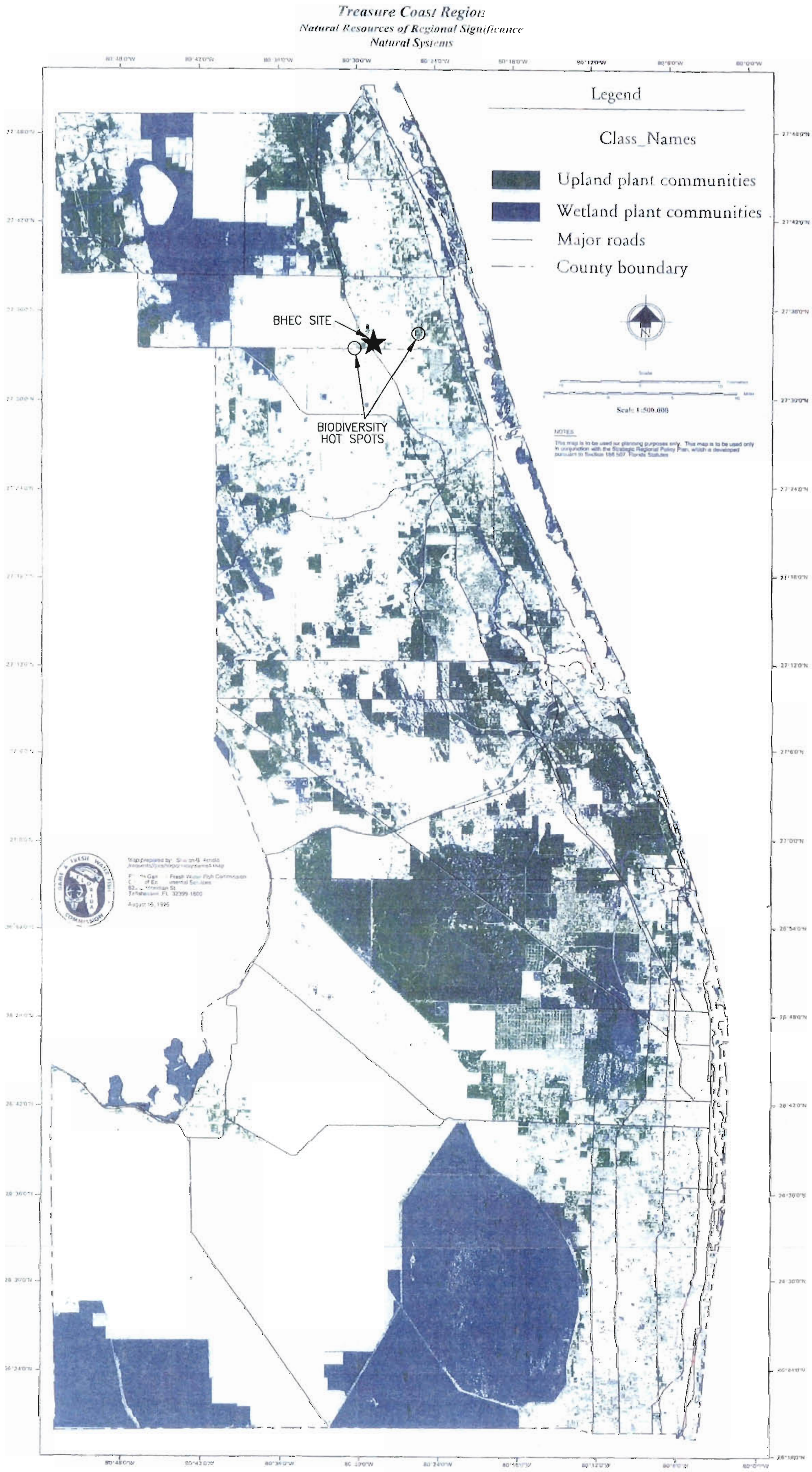

FIGURE 2.2.5-3.
UPLAND PLANT COMMUNITIES

Sources: Treasure Coast Regional Planning Council, Strategic Regional Policy; ECT, 2000.

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The Indian River County 2020 Comprehensive Plan Future Land Use Element (Indian River County, 1998) identifies three conservation land use designations intended to identify areas of the County which contain or possess lands with qualities and features which play a vital or essential role in the normal functioning of the county's ecosystems and have been so identified in the Conservation Element of the Comprehensive Plan or merit preservation as vestiges of once common county ecosystems. There are no such designations within 5 miles of the Site within Indian River County. Within St. Lucie County, there are no Conservation—Public or Residential/Conservation land use designations located within 5 miles of the Site. These are the land use designations used to identify public or private lands that contain unique environmental characteristics.

The following areas are *not* found within a 5-mile radius of the Site:

- National parks
- National forests
- National seashores
- Military lands
- Roadless area review and evaluation (RARE) areas
- National wild and scenic rivers
- Scenic and wild rivers
- State parks
- State forests
- National memorials or monuments
- Areas of critical state concern
- National marine and estuarine sanctuaries
- Indian reservations

2.2.6 ARCHAEOLOGICAL AND HISTORIC SITES

A review of the Florida Site File and the National Register of Historic Places by the Florida Department of State, Division of Historical Resources (DHS) (see Appendix 10.6), identified no listed cultural resources or historic properties on the Site. The DHS review concluded that "…no historic properties will be affected by this undertaking."

2.2.7 SOCIOECONOMIC AND PUBLIC SERVICES

2.2.7.1 Socioeconomic

Employment and Income

The *Florida Statistical Abstract* (BEBR, 1999) provides employment and economic information at the county level. Indian River County had an estimated labor force of 44,993 persons in 1998. Unemployed persons in 1998 totaled 3,572 for an unemployment rate of 7.9 percent. The unemployment rates in 1996 and 1997 were 9.0 percent and 8.1 percent, respectively. This compares to the statewide unemployment rate of 4.3 percent, 4.8 percent, and 5.1 percent for the years 1998, 1997, and 1996, respectively. The total number of jobs within Indian River County in 1997 was 42,560, indicating that the county is nearly self-sufficient in the supply of jobs for its workforce. Major industries, in terms of employment, in Indian River County in 1998 were as follows:

Industry	Number of Persons Employed	Percent of Total Persons Employed
Services	12,822	30.1
Retail Trade	10,183	23.9
Government	4,746	11.2
Agriculture	3,887	9.1
Construction	2,729	6.4
Manufacturing	2,629	6.2

Per capita personal income in Indian River County in 1997 was $34,997 compared to the Florida and national per capita figures of $24,799 and $25,288, respectively. The difference between nonfarm per capita income compared to the Florida and national averages was comparable: $34,580 versus $24,670 and $25,121, respectively. Per capita transfer payments (income maintenance, unemployment insurance, retirement, and dividends) in 1997 were much higher in Indian River County than in Florida or the nation: $20,555 versus $8,715 and $6,773, respectively. The 1997 per capita income in Indian River County increased 3.5 percent from that of 1996.

Housing

The 1970 Census indicated that there were a total of 14,008 housing units in Indian River County. The 1980 Census indicated an increase to 29,417 total units and the 1990 Census reflected a total of 47,128 units. The Indian River County Planning Department, as reported in the Comprehensive Plan (Indian River County, 1998), had estimated 53,321 total housing units in 1995. The following information appears in the Housing Element of the Comprehensive Plan indicating a breakdown of housing types:

Housing Type	1987	%	1990	%	1995	%
Single-Family (SF)	25,724	59.31	27,305	57.94	32,216	60.42
Multi-Family (MF)	11,331	26.13	13,019	27.62	13,436	25.20
Mobile Homes (MH)	6,315	14.56	6,804	14.44	7,669	14.38

Over this short period of time, the mix of housing types has remained relatively unchanged. Similarly, the percentage of housing units within the unincorporated county has remained relatively unchanged at approximately 62.5 percent of all units. In 1995, more than 90 percent of all of the mobile homes were located in the unincorporated county.

In 1970, 73.3 percent of the housing units in Indian River County were owner-occupied. The corresponding percentages for 1980 and 1990 are 75.4 percent and 75 percent, respectively. The estimated percent in 1995 was 75.2 percent. The trend in residential building permits issued in Indian River County between 1990 and 1995 is summarized below:

	Type (Municipalities)			Type (Unincorporated County)		
Year	SF	MF	MH	SF	MF	MH
1990	276	10	24	560	206	15
1991	336	13	27	447	188	19
1992	309	33	31	425	113	9
1993	302	11	42	552	79	32
1994	422	12	45	610	141	28
1995	252	22	42	524	135	16
Totals:	**1,897**	**101**	**211**	**3,118**	**862**	**119**

Within Indian River County, approximately 62 percent of all the single-family units built between 1990 and 1995 and 90 percent of the multi-family units were built in the unincorporated county area.

The 1990 median value of owner-occupied houses in Indian River County was $78,800. The median gross rent for renter-occupied housing units in 1989 in Indian River County was $505.

2.2.7.2 Public Services

Parks and Recreation

The Indian River County Comprehensive Plan, Recreation and Open Space Element, includes a map of the parks in the County, including the municipalities. Figure 2.2.7-1 depicts the location of the 56 park sites in the county. As the figure shows, there are no recreational parks within at least a 3-mile radius of the Site. The nearest park/recreation space in St. Lucie County is located approximately 5 miles to the southeast according to the Recreation and Open Space Element of the St. Lucie County Comprehensive Plan (St. Lucie County, 1997). Figure 2.2.7-2 depicts the parks and recreation space in St. Lucie County.

As previously discussed in Section 2.2.5, both the Indian River County and St. Lucie County future land use maps have conservation land use designations. Neither county has such a land use designation within 5 miles of the Site. In addition, development of the Site will not remove any publicly accessible land.

Educational Services

According to the Future Land Use Element of the Indian River County Comprehensive Plan, there are 2 high schools, 1 freshman learning center, 3 middle schools, and 13 elementary schools that provide public education in the county. The nearest school is Glendale Elementary, located approximately 4 miles northeast of the Site.

Public Safety

Police protection within the unincorporated areas of the county is provided by the Indian River County Sheriff's Department located at 4055 41st Avenue in the Gifford area of the county, approximately 7 miles northeast of the Site.

Fire protection and Emergency Medical Service (EMS) are provided by the Indian River County Department of Emergency Services. Figure 2.2.7-3 depicts the location of fire stations throughout the county. EMS/fire station #7 is located at 1215 82nd Avenue, approximately 3.5 miles north of the Site. There are a total of ten professional and four volunteer fire stations located throughout the county. There are EMS services located at

PARKS IN INDIAN RIVER COUNTY

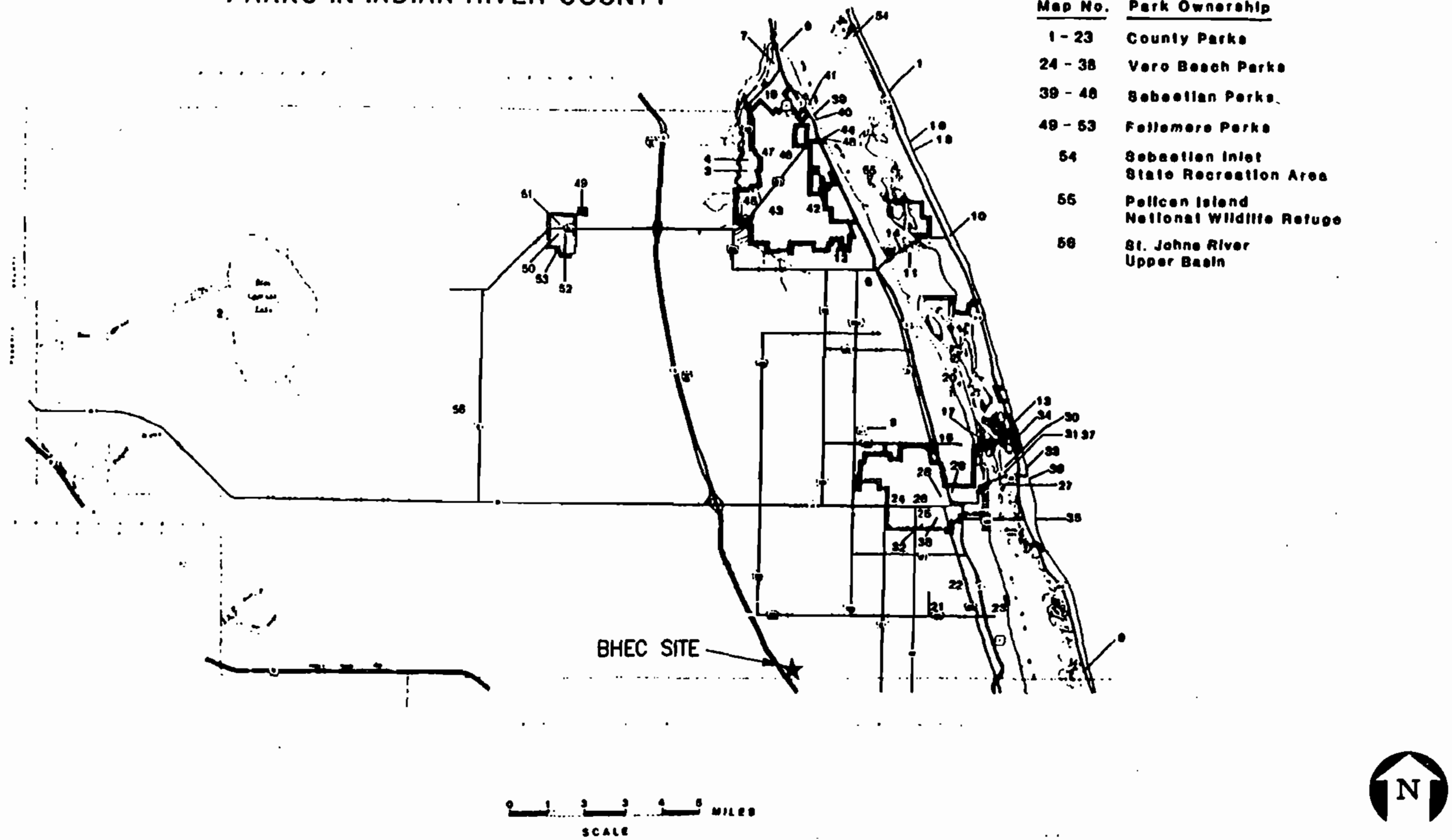

FIGURE 2.2.7-1.
PARKS IN INDIAN RIVER COUNTY

Sources: Indian River County Comprehensive Plan; ECT, 2000.

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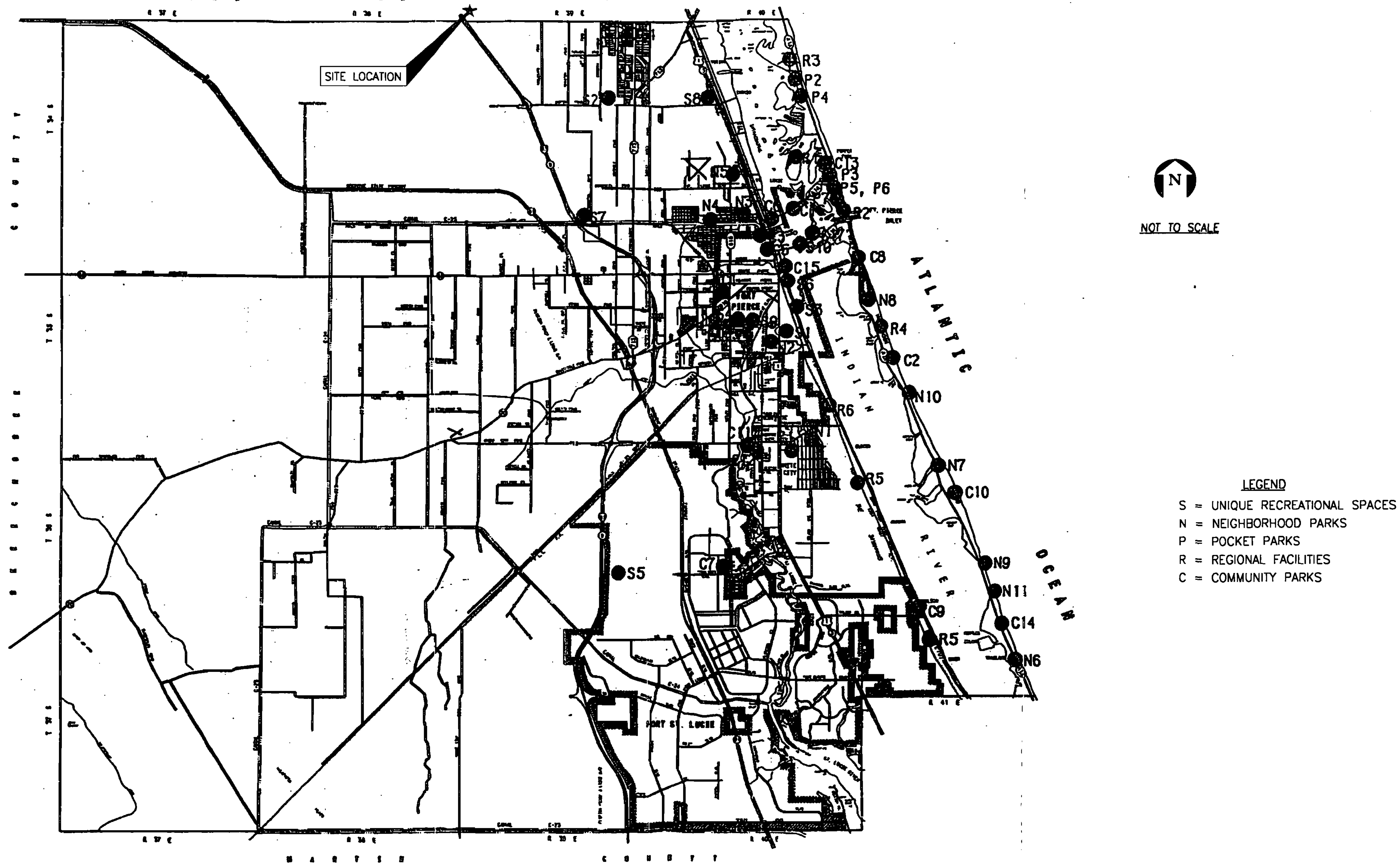

FIGURE 2.2.7-2.

ST. LUCIE COUNTY RECREATIONAL FACILITIES

Sources: St. Lucie County Comprehensive Plan; ECT, 2000.

ECT
Environmental Consulting & Technology, Inc.

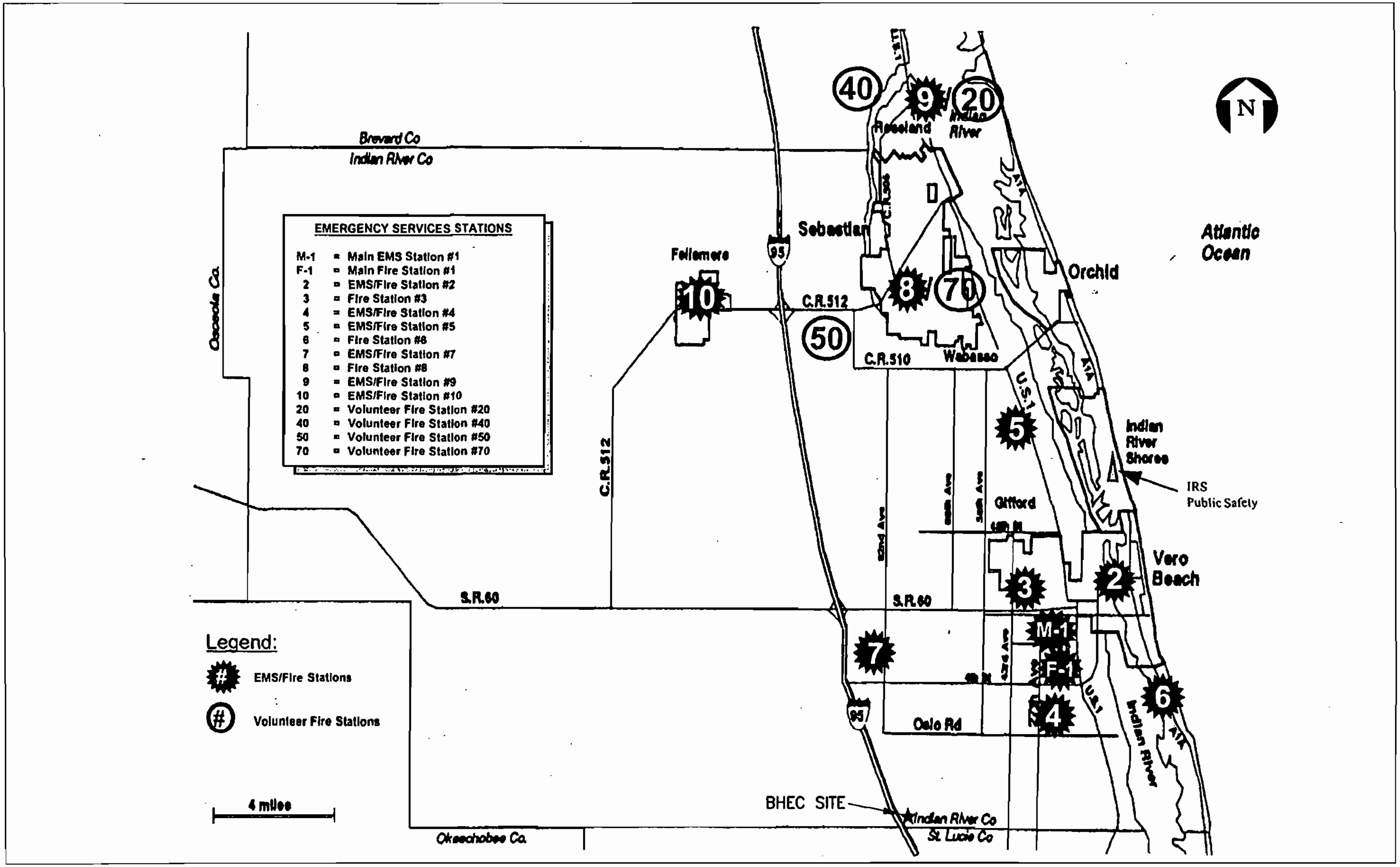

FIGURE 2.2.7-3.

FIRE AND EMS STATION LOCATIONS

Sources: Indian River County Comprehensive Plan; ECT, 2000.

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seven of the professional fire stations. The closest hospital to the Site is Indian River Medical Center located at 777 37th Street, just north of Vero Beach, approximately 7.5 miles to the northeast.

Utility Services

The current termini of the nearest domestic wastewater, potable water, and reclaimed water lines are at 74th Avenue and 17th Street (Lockwood Lane), approximately 0.5 mile north of the Site. Sanitary wastewater, potable water, and reclaimed water pipelines will be extended to the Site (at Calpine's expense) to serve the needs of the BHEC operations. The Site is located within the West Region wastewater service area, which is served by the West Regional wastewater treatment plant with a design capacity of 2 MGD. The 1995 demand at this plant was 800,000 gallons per day (gpd). This plant is programmed for capacity expansion to 3 MGD by the beginning of 2007. The Site is located in the South Region water service area, serviced by the South County reverse osmosis potable water treatment plant with a capacity of 8.5 MGD. The Potable Water Sub-Element of the Indian River County Comprehensive Plan indicates this plant is operating at approximately 4 MGD (Indian River County, 1998). By 2020, the capacity of this plant will be increased to 12 MGD. The County's sanitary wastewater and potable water systems have sufficient capacity to serve the needs of the BHEC.

Solid Waste Services

The Indian River County Solid Waste Management facility is located approximately 0.5 mile north of the Site. Projections of solid waste generation indicate that the landfill (existing segment II and future segments III, IV, and V) can meet estimated County needs through the year 2020. Construction debris from the Project may be disposed at the County's solid waste management facility, which has a designated construction debris landfill area. Certain solid wastes produced during plant operations may also be disposed at the county facility.

Transportation

Figure 2.2.7-4 depicts Indian River County's existing roadway functional classification system. Access to the Site is currently from the north via an unpaved section of 74th Avenue. Calpine will pave the road extension to the south to provide access to the BHEC. Project traffic will enter and exit the roadway system via 9th Street, also known as Oslo Road. Between 82nd Avenue and 58th Avenue, Oslo Road is a 2-lane rural minor arterial with an acceptable level of service (LOS) of C. The LOS C standard equates to an hourly directional peak capacity of 600 trips. The most recent (1999) traffic counts with the addition of vested trips indicate that the available capacity on 9th Street between 82nd Avenue and 58th Avenue is 363 trips eastbound and 424 trips westbound. Interstate access is available at the I-95 and State Road (SR) 60 interchange, approximately 6.5 miles to the northwest.

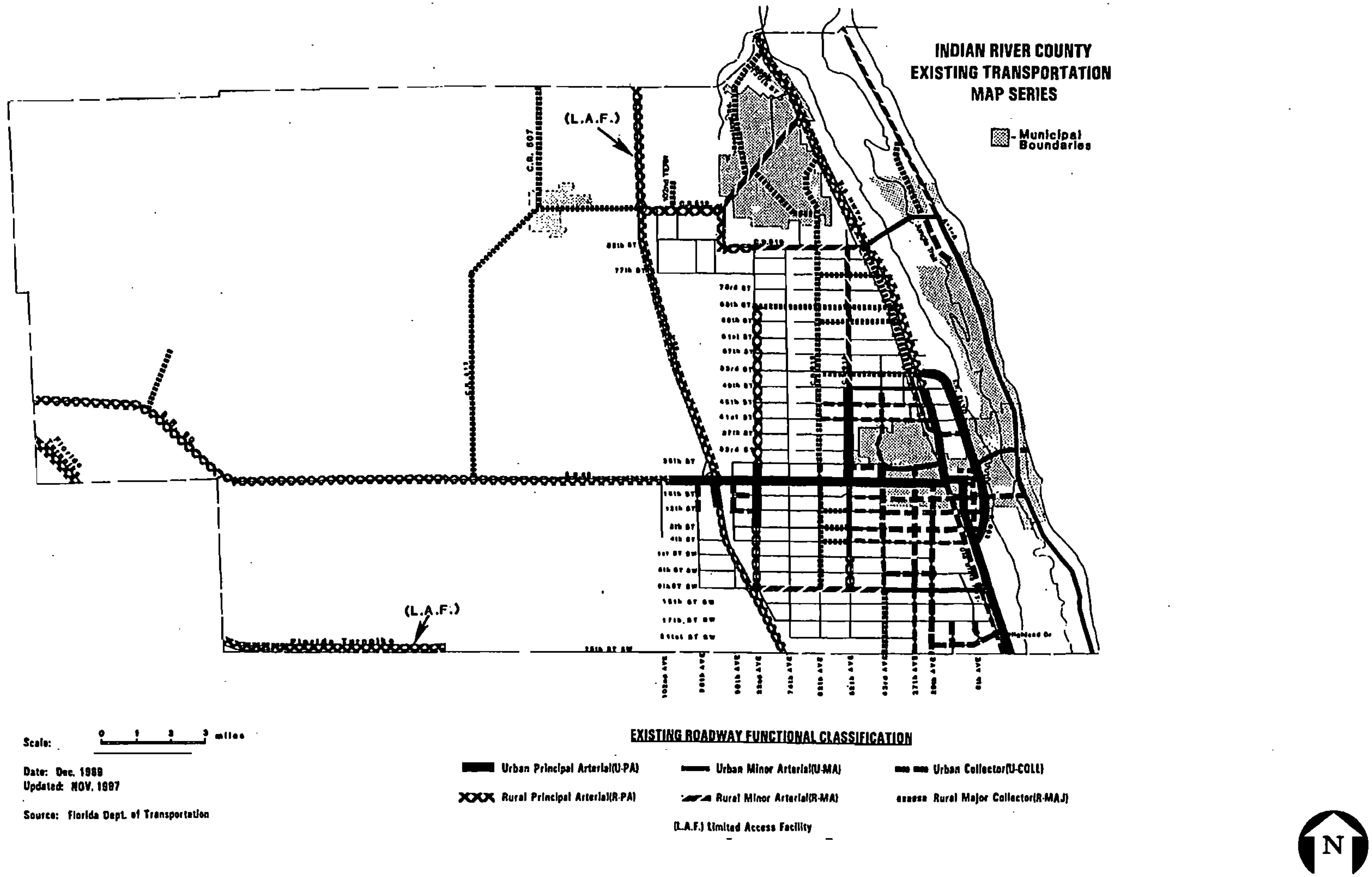

FIGURE 2.2.7-4.
TRANSPORTATION NETWORK

Sources: Indian River County Comprehensive Plan; ECT, 2000.

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2.3 BIOPHYSICAL ENVIRONMENT

This section provides information to characterize the existing biophysical environment of the Site and vicinity. This characterization constitutes a comprehensive description of the baseline conditions against which impacts are assessed. Pursuant to the FDEP instructions (FDEP, 1983), this section includes the following subsections:

- 2.3.1—Geohydrology.
- 2.3.2—Subsurface Hydrology.
- 2.3.3—Site Water Budget and Area Users.
- 2.3.4—Surficial Hydrology.
- 2.3.5—Vegetation/Land Use.
- 2.3.6—Ecology.
- 2.3.7—Meteorology and Ambient Air Quality.
- 2.3.8—Noise.
- 2.3.9—Other Environmental Features.

These subsections include documentation of the relevant, available information, and the results of field data collection and analyses conducted specifically for the Project.

2.3.1 GEOHYDROLOGY

This section describes the geology in the region of the Site. The geology of this area has been characterized in considerable detail in various publications, most notably Crain *et al.* (1975), Tibbals (1990), and Lukasiewicz (1992). These publications provide the basis for much of this section. Additional information is provided in Section 2.3.2.

2.3.1.1 Geological Description of Site Area

Site Area Physiography

The Site is located in the topographic division described by Cooke (1945) as the Coastal Lowlands. These lowlands consist of well defined, essentially level marine terraces and several ridges (Figure 2.3.1-1). The terraces and ridges result from repeated periods of sea level fluctuations due to cycles of glaciation and deglaciation that occurred during the Pleistocene Epoch, some 10,000 to 2,000,000 years B.P. (Before Present) (White, 1970). The series of sandy coastal ridges and marine terraces were formed as coastal dunes and near-shore sea bottoms, respectively, during periods of sea level fluctuation.

The Site is situated on the Pamlico terrace, which typically has land surface elevations of less than 30 ft-msl in this area; the typical land surface elevation at the Site is approximately 24 ft-msl.

The Pamlico terrace is interrupted by three distinct ridges in this region: an offshore bar, the Atlantic Coastal Ridge, and Ten-mile Ridge (Figure 2.3.1-1). The offshore bar is the modern-day barrier island, which reaches a maximum elevation of about 20 ft-msl. The Atlantic Coastal Ridge reaches elevations exceeding 50 ft-msl, and is separated from the offshore bar by the shallow Indian River Lagoon. The Ten-mile Ridge is somewhat less pronounced than the other ridges; it occurs approximately 10 miles inland from the mainland coast, and was thus named by Puri and Vernon (1964). The St Johns Marsh extends west of the Ten-mile Ridge.

The Site is located just east of the Ten-mile Ridge, and approximately 6 miles west of the Atlantic Coastal Ridge. This area, between the ridges, is a flat or trough-shaped area that

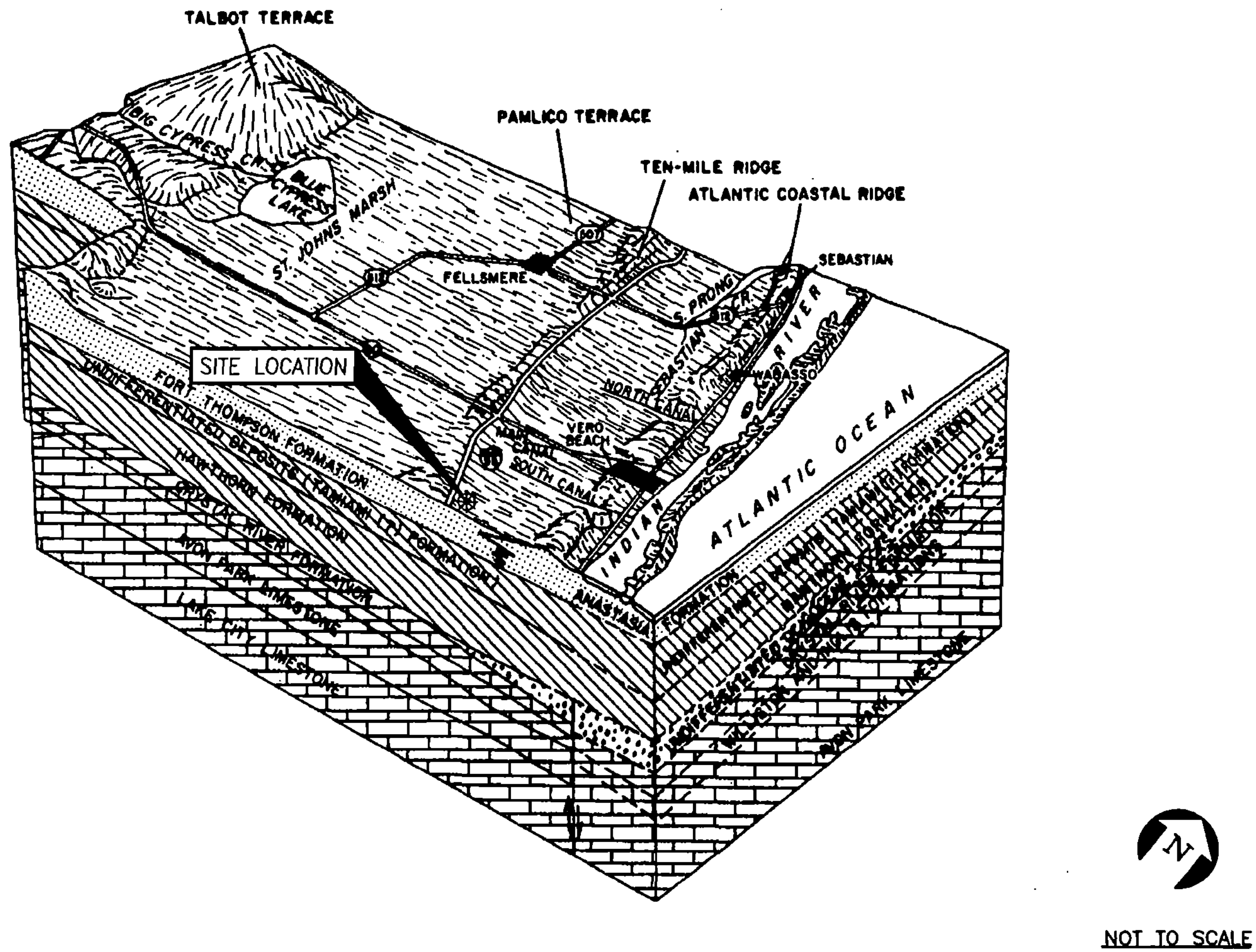

FIGURE 2.3.1-1.

BLOCK DIAGRAM SHOWING GENERALIZED FEATURES AND GEOLOGIC FORMATIONS IN INDIAN RIVER COUNTY

Sources: Crain, et al., 1975; ECT, 2000.

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is geologically analogous to the present-day Indian River Lagoon (Crain *et al.*, 1975). These ridges have a great effect on surface water drainage, although man-made drainage canals constructed in the early 1900s have significantly altered the drainage patterns in recent decades (Crain *et al.*, 1975).

Site Area Stratigraphy

The geologic stratigraphy is outlined here. Section 2.3.2 provides additional detail and relates primarily to the subsurface hydrology and other hydrogeologic features in the region of the Site.

The Site area is underlain by a layered sequence of unconsolidated sedimentary deposits of Pleistocene to early Miocene age, which are underlain by a thick sequence of consolidated limestones and dolomites primarily of Eocene age. Figure 2.3.1-2 illustrates a generalized cross-section showing the primary geologic formations in Indian River County, and their associated lithologies (Crain *et al.*, 1975). The geologic formations underlying Indian River County dip slightly toward the southeast (Figure 2.3.1-1).

The geologic formation names used in this report conform to current usage by the Florida Geological Survey; many of these names have evolved through the years. The geologic stratigraphy described below is present from land surface downward.

The Pleistocene age sediments extend downward from land surface to depths ranging from 100 to 150 feet below land surface (ft bls). These sediments represent the Anastasia and Fort Thompson Formations (Figure 2.3.1-2), which grade horizontally into one another. The Anastasia Formation occurs along the coast and grades inland into the Fort Thompson Formation. According to the Florida Geological Survey (Duncan and Scott, 1993), the surface contact between these two formations occurs approximately 3 or 4 miles west of the Site. Both of these formations consist primarily of sand and shell fragments; however, the main differences are that the Fort Thompson Formation has a finer texture and has fewer cemented layers than the Anastasia Formation.

Age		Formation Name	Thickness (feet)		Physical and Water-bearing Character
Pleistocene		Fort Thompson Formation (western part of county); Anastasia Formation (eastern part of county)	100-150	Shallow aquifer	Sand, shell, clay, coquina, and mixtures. Yields moderate amounts of water, depending on permeability of deposits.
Miocene		Undifferentiated deposits (Tamiami (?) Formation)	50-125	Confining bed	Shell, sandy clay, clay, and cemented zones. Generally low permeability and water yield.
Miocene		Hawthorn Formation	125-200	Confining bed	Sandy clay, green and brown clays, and some limestones. Generally impermeable; poor water yield except from some thin shell and limestone beds.
Oligocene		Undifferentiated Oligocene rocks	0-200	? Floridan aquifer	Gray to cream-colored clayey, granular limestone. Poor water yields.
Eocene	Ocala Group	Crystal River Formation	25-100	Floridan aquifer	Gray to cream-colored porous massive limestone; generally yields good quantity of water.
Eocene	Ocala Group	Williston and Inglis Formations	25-125	Floridan aquifer	Tan to cream-colored granular, porous limestone. Water yields generally less than the Crystal River Formation.
Eocene		Avon Park Limestone	50-250	Floridan aquifer	Cream-colored to tan soft porous limestone. Yields water from porous zones in some areas.
Eocene		Lake City Limestone	300-400	Floridan aquifer	Cream-colored to tan porous, chalky limestone and hard crystalline limestone and dense dolomite. Dense zones poorly permeable; water yields vary.
Eocene		Oldsmar Limestone		Floridan aquifer	Not commonly topped by wells in Indian River County.

FIGURE 2.3.1-2.

GENERALIZED SECTION OF GEOLOGIC FORMATIONS IN INDIAN RIVER COUNTY

Sources: Modified after Crain, et al., 1975; ECT, 2000.

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The Pleistocene sediments are underlain by the Pliocene age Tamiami Formation (Post, Buckley, Schuh & Jernigan [PBS&J], 1993; Gee and Jenson, 1979). The Tamiami Formation is composed of interbedded shell and sandy clay, with some cemented zones; its thickness ranges from 50 to 125 ft (Crain *et al.*, 1975).

The Pliocene deposits are underlain by the Miocene age Hawthorn Group, which ranges in thickness from about 200 ft in the northwest part of the county to more than 300 ft in the southeast part of the county. The Hawthorn Group generally consists of a heterogeneous sequence of silty or sandy clay, clay, phosphatic and quartz sands, and some poorly indurated limestone at its base (PBS&J, 1993). In general, the Miocene sediments are much finer grained than the Pleistocene and Pliocene sediments.

The Miocene deposits are underlain by the Oligocene age Suwannee Limestone only in the eastern part of the county, where they have apparently been preserved through downfaulting (Crain *et al.*, 1975). Where present, these limestones are clayey and granular, and up to 200 ft in thickness.

A thick series of Eocene age limestones underly the Miocene deposits, or the Oligocene limestones where present. The uppermost Eocene limestone is the Ocala Limestone. It ranges in thickness from about 50 to 200 ft and is composed of fossiliferous (shell fragments) limestone that is highly porous. The Ocala Limestone is underlain by the Avon Park Formation, which is 50 to 250 ft thick and composed of soft, porous, chalky limestone with some layers of hard dolomite. The Avon Park Formation is, in turn, underlain by the Lake City Formation, and then the Oldsmar Formation (Figure 2.3.1-2).

2.3.1.2 Detailed Site Lithologic Description

An extensive and detailed lithological study was conducted at the Site by Jones Edmunds & Associates, Inc. (JEA, 1989). The site investigation included detailed lithologic logging at 15 soil boring locations. The maximum depth of investigation was 60 ft bls. The site investigation also included 12 hydraulic conductivity tests of specific lithologic units, and measurements of ground water and surface water elevations. Results of the site investigation were reported by JEA (1989).

The 15 soil borings included: four soil borings by power auger to a depth of 30 ft bls; two standard penetration test (SPT) soil borings to a depth of 60 ft bls; and nine SPT soil borings to a depth of 8 ft bls. The 15 soil boring locations are shown in Figure 2.3.1-3. Detailed lithologic logs for the soil borings are provided in Figures 2.3.1-4 and 2.3.1-5 (JEA, 1989). As shown in those figures, 11 discernible lithologic types, or "strata", were identified at the Site. Based on similar lithologic and hydraulic properties, JEA grouped the 11 strata into four lithologic units. The four lithologic units at the site are illustrated in lithologic cross-sections in Figures 2.3.1-6 (cross-section A-A') and 2.3.1-7 (cross-section B-B'). Locations of the cross-sections are shown in Figure 2.3.1-3.

The uppermost lithologic unit, in most locations, is comprised of fine sand, which is slightly silty to silty at some locations and depths. This fine sand unit is relatively permeable. Based on laboratory tests, the horizontal hydraulic conductivity of this fine-sand lithologic unit ranged from 40 to 80 feet per day (ft/day). A sandy peat was the uppermost lithologic unit at three of the soil boring locations, and the sandy peat was found underlying the fine sand unit at one location. The average combined thickness of the fine sand unit and the sandy peat unit is approximately 3.5 ft.

The third lithologic unit encountered is described as a clayey, fine sand. It also includes some silty, fine sand. This clayey, fine sand lithologic unit underlies the fine sand, or the sandy peat where present. The clayey, fine sand has low permeability. Based on laboratory tests, the vertical hydraulic conductivity of the clayey, fine sand lithologic unit ranged from 0.0002 to 0.03 ft/day. This lithologic unit was encountered in 14 of the 15 boreholes (absent only at TB-4); its thickness ranged from 0.6 to 3.5 ft.

The fourth lithologic unit encountered is described as a slightly silty to silty, fine sand with variable amounts of shell fragments. Virtually all sediments below a depth of 20 ft bls contained some shell, and shell content generally increased as a function of depth. This lithologic unit showed varying degrees of cementation to sandstone. According to JEA, the transmissivity of this lithologic unit was estimated at 980, 490, and 38 square

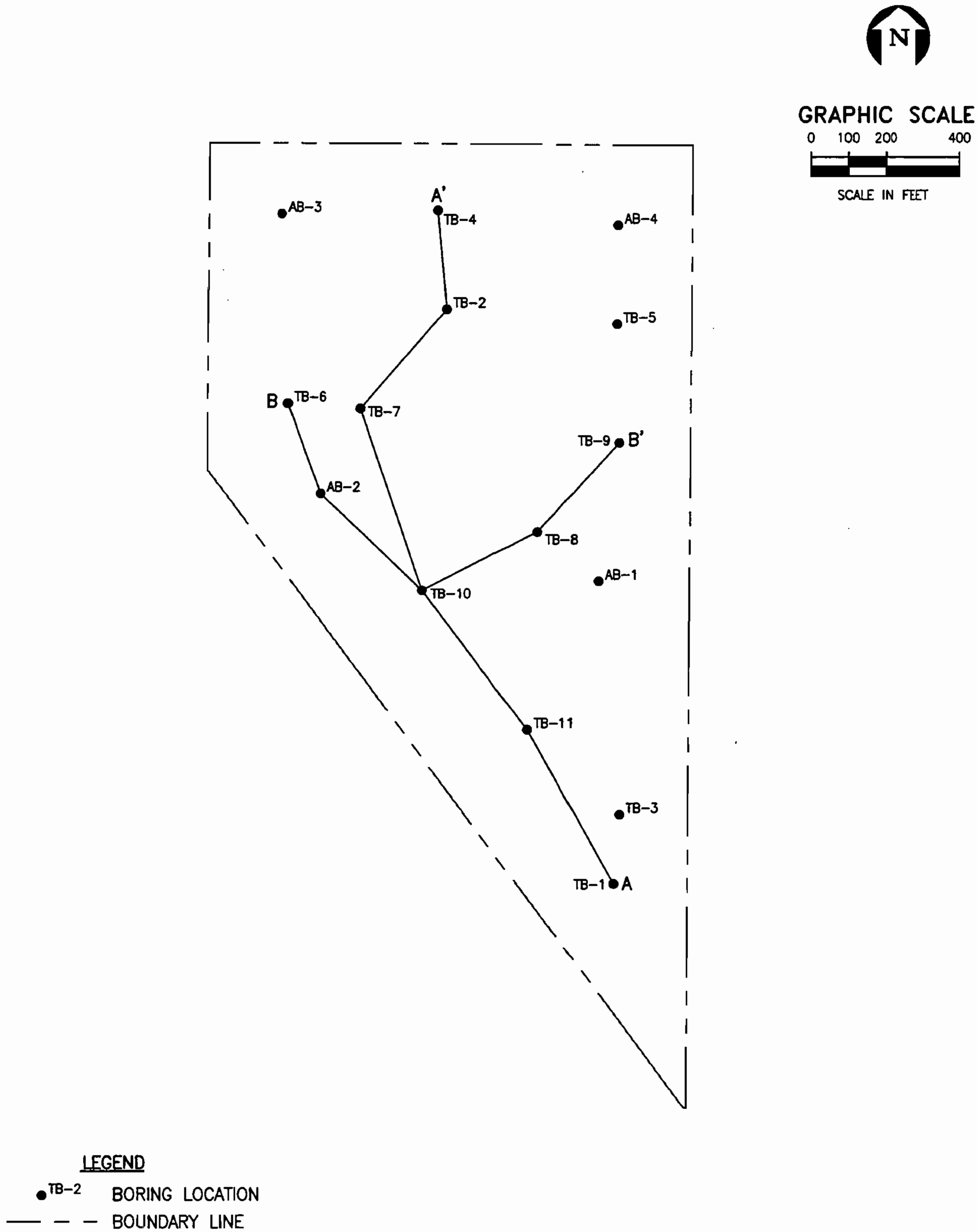

FIGURE 2.3.1-3.

SOIL BORING LOCATIONS

Sources: JEA, 1989; ECT, 2000.

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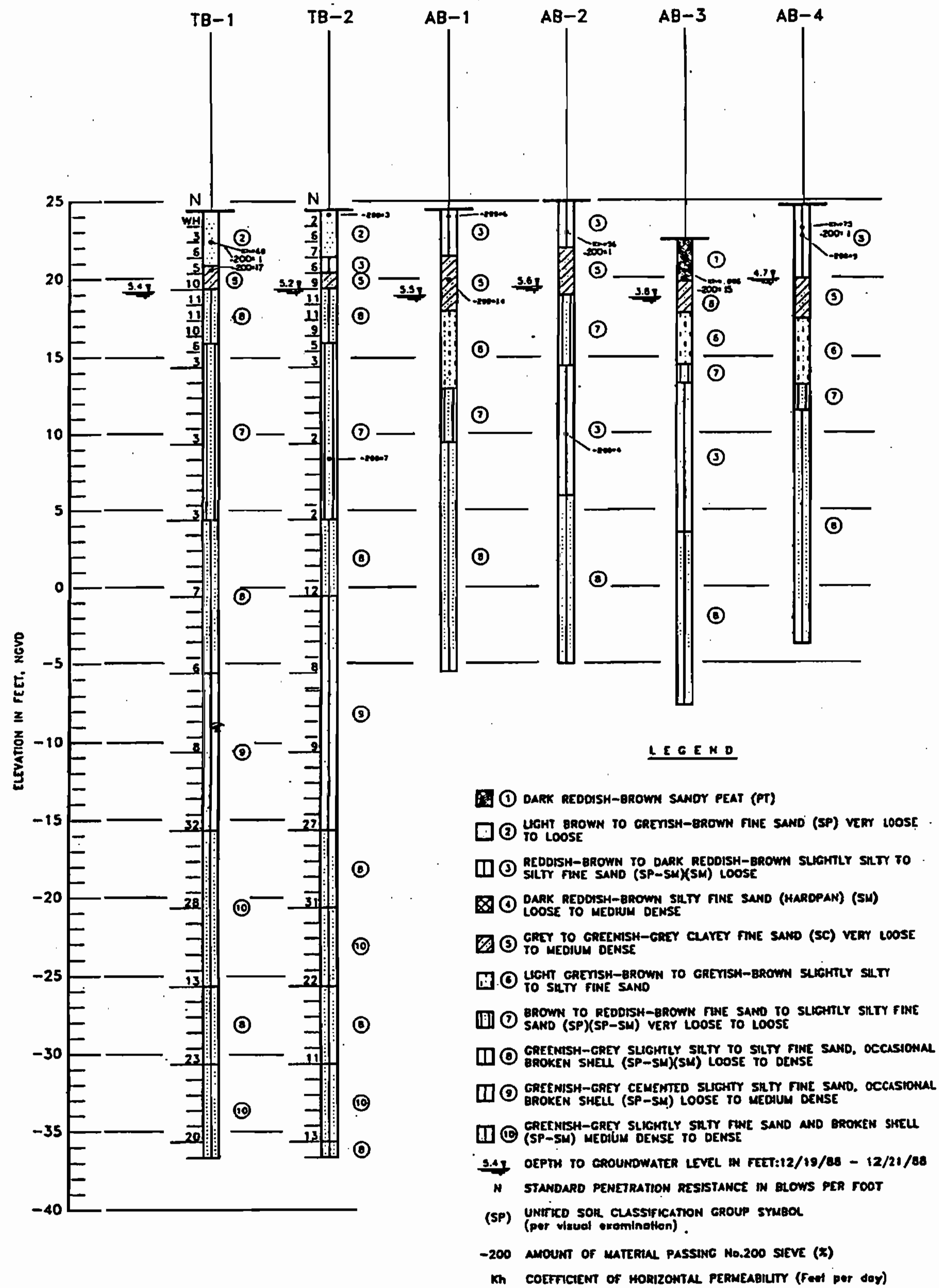

FIGURE 2.3.1-4.

LITHOLOGIC PROFILES AT THE SITE - DEEP

Sources: JEA, 1989; ECT, 2000.

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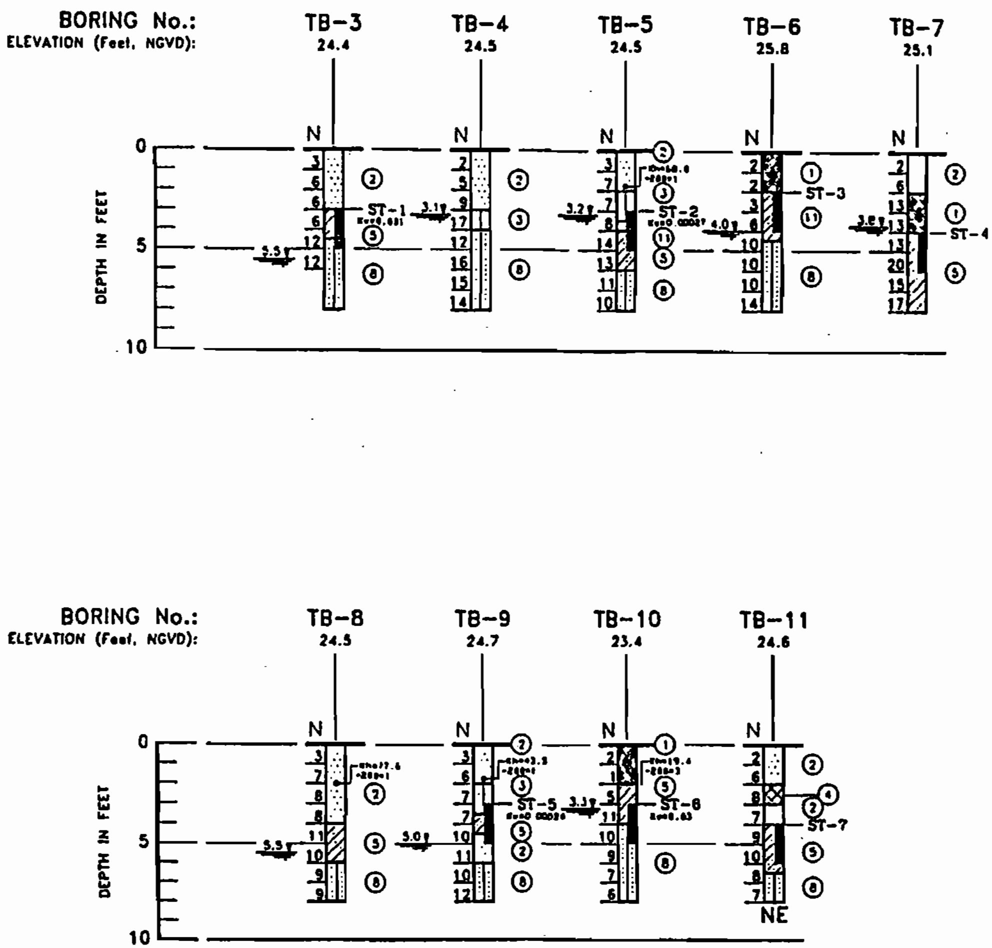

LEGEND

- ① DARK REDDISH-BROWN ORGANIC FINE SAND TO SANDY PEAT (SP)/(PT) MEDIUM DENSE/VERY SOFT
- ② LIGHT BROWN TO GREYISH-BROWN FINE SAND (SP) VERY LOOSE TO LOOSE
- ③ REDDISH-BROWN TO DARK REDDISH-BROWN SLIGHTLY SILTY TO SILTY FINE SAND (SP-SM)(SM) LOOSE
- ④ DARK REDDISH-BROWN SILTY FINE SAND (HARDPAN) (SM) LOOSE TO MEDIUM DENSE
- ⑤ GREY TO GREENISH-GREY CLAYEY FINE SAND (SC) VERY LOOSE TO MEDIUM DENSE
- ⑥ LIGHT GREYISH-BROWN TO GREYISH-BROWN SLIGHTLY SILTY TO SILTY FINE SAND
- ⑦ BROWN TO REDDISH-BROWN FINE SAND TO SLIGHTLY SILTY FINE SAND (SP)(SP-SM) VERY LOOSE TO LOOSE
- ⑧ GREENISH-GREY SLIGHTLY SILTY TO SILTY FINE SAND, OCCASIONAL BROKEN SHELL (SP-SM)(SM) LOOSE TO DENSE
- ⑨ GREENISH-GREY CEMENTED SLIGHTY SILTY FINE SAND, OCCASIONAL BROKEN SHELL (SP-SM) LOOSE TO MEDIUM DENSE
- ⑩ GREENISH-GREY SLIGHTLY SILTY FINE SAND AND BROKEN SHELL (SP-SM) MEDIUM DENSE TO DENSE
- ⑪ DARK BROWN TO DARK GREYISH-BROWN CLAYEY FINE SAND (SC) VERY LOOSE TO LOOSE

(SP)	UNIFIED SOIL CLASSIFICATION GROUP SYMBOL (per visual examination)
3.4	DEPTH TO GROUNDWATER LEVEL IN FEET: 3/2/89
NE	GROUNDWATER LEVEL NOT ENCOUNTERED TO 7 FEET
N	STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
-200	AMOUNT OF MATERIAL PASING No.200 SIEVE (%)
w	NATURAL MOISTURE CONTENT (%)
Kh	COEFFICIENT OF HORIZONTAL PERMEABILITY (feet per day)
Kv	COEFFICIENT OF VERTICAL PERMEABILITY (feet per day)
▌	UNDISTURBED SAMPLE (Shelby Tube)

FIGURE 2.3.1-5.
LITHOLOGIC PROFILES AT THE SITE - SHALLOW

Sources: JEA, 1989; ECT, 2000.

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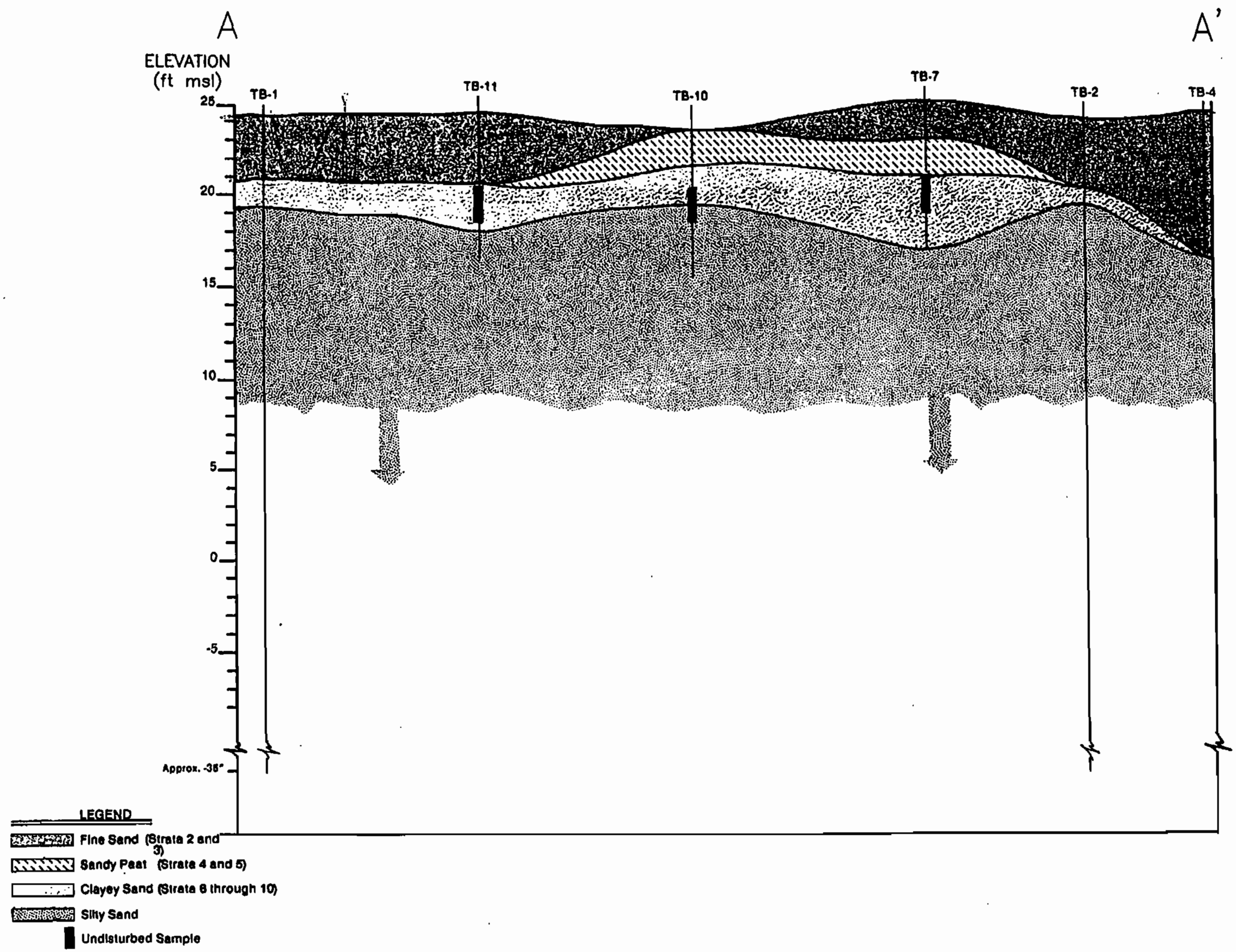

FIGURE 2.3.1-6.

LITHOLOGIC CROSS SECTION A-A' AT THE SITE

Sources: JEA, 1989; ECT, 2000.

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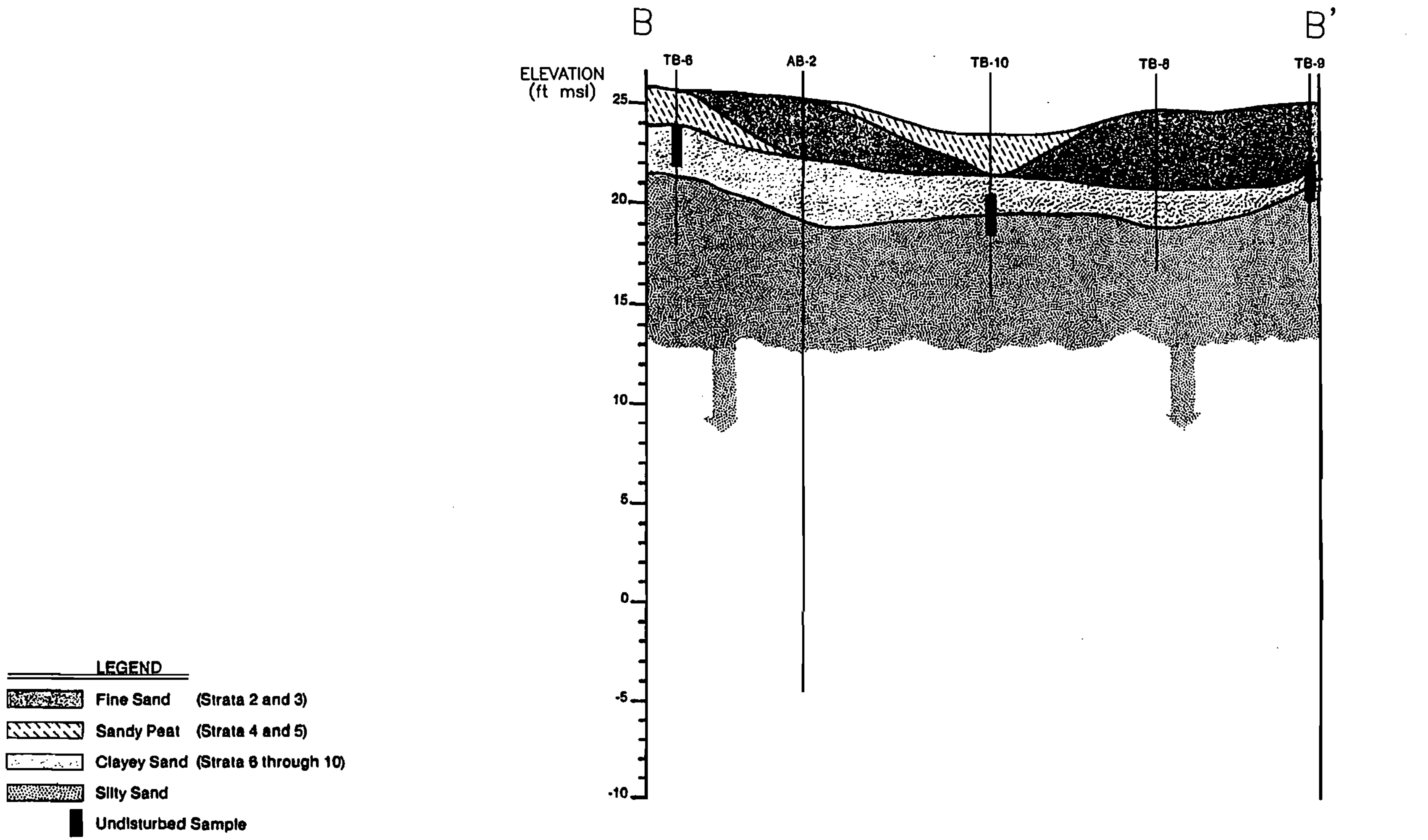

FIGURE 2.3.1-7.

LITHOLOGIC CROSS SECTION B-B' AT THE SITE

Sources: JEA, 1989; ECT, 2000.

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feet per day (ft^2/day) near soil borings TB-1, TB-9, and TB-10, respectively (JEA, 1989). Considering that TB-9 and TB-10 each penetrate only 4 ft into this lithologic unit, the reported transmissivities translate to hydraulic conductivities of approximately 120 and 10 ft/day near TB-9 and TB-10, respectively. As such, the average hydraulic conductivity for the upper 4 ft of this unit (about 65 ft/day) appears quite comparable to the hydraulic conductivities reported for the uppermost sand lithologic unit (40 to 80 ft/day).

Additional lithologic data at greater depths are available from a variety of sources for the immediate area of the Site. For example, Figure 2.3.1-8 shows a lithologic log to a depth of 85 ft bls. This lithologic log is from a monitoring well (34D) located only 0.4 mile northwest from the Site, at the Indian River County landfill. As shown, the sand and sandstone lithologies are underlain by shell beds from depths of about 35 to 80 ft bls (Camp Dresser & McKee, Inc.[CDM], 1989). At 80 ft bls, a clayey shell lithology grades into a shelly clay.

Figure 2.3.1-9 shows a lithologic log to a depth of 560 ft bls. This lithologic log is from a deep monitoring well located at Hercules, Inc. (adjacent to Ocean Spray Cranberries' plant), 1.8 miles due north of the Site (CH2M Hill, Inc., 1979). As shown, and similar to Figure 2.3.1-8, the sand lithologies are underlain by shell beds from depths of about 50 to 90 ft bls. The shell beds are underlain by interbedded clay, sand, and shell to a depth of 130 ft bls. Clay is the dominant lithology from 130 ft bls to approximately 450 ft bls, where limestone occurs.

In general, the sand and shell lithologies represent the Anastasia Formation to depths of 80 or 90 ft bls; the interbedded shell and sandy clay represent the Tamiami Formation to a depth of about 130 ft bls; the thick clay stata represents the Hawthorn Group; and the underlying limestone probably represents the Suwannee Limestone.

Lithologic Log

CLIENT: Indian River County

WELL SITE NO: 34D (pilot hole)

PROJECT NAME: Landfill Expansion Segment II

DATE: 9-1-88

PROJECT NO: 6706-04-GS

DRILLING METHOD: Mud Rotary

CONTRACTOR: Sheltra & Son Construction

SAMPLING METHOD: Grab

DRILLER: Persson Drilling Corporation

CDM PERSONNEL: M. R. Owen

Approximate Depth (ft)	Lithology
0-4	Sand - clear, fine to medium grained, subangular to subrounded, moderately sorted; smooth quick drilling, fair to good porosity.
4-12	Clay - light gray and light brown, soft, very sandy; smooth quick drilling, poor porosity.
12-16	Sand - clear and light brown, very fine to medium grained, subangular to subrounded, moderately sorted, quartzose; quick smooth drilling, good porosity.
16-22	Sand - clear, very fine to medium grained, subangular to subrounded, moderately sorted, quartzose; 30% clay - stringers, dark brown, soft, very sandy; smooth quick drilling, poor porosity.
22-35	Sandstone - clear to white to light brown, firm, poor calcareous cement, friable; 20% sand - clear, very fine to medium grained, subangular to subrounded, moderately sorted, quartzose; 10% shell - very pale orange to light brown, small fragments; quick smooth drilling, some mud loss, very good porosity, good effective porosity.
35-40	Shell - very pale orange to light brown, small to medium fragments, whole shells; very quick smooth drilling, mud loss, very good porosity, very good effective porosity.
40-60	Shell - very pale orange to light brown, small to medium fragments, whole shells; quick smooth drilling, little mud loss, very good porosity, good effective porosity.
60-77	Shell - very pale orange to light brown, medium to small fragments, occasional whole shells; 20% sand - clear, fine to medium grained, subangular to subrounded, moderately sorted, quartzose; some mud loss, very good porosity, good effective porosity.
77-80	Shell - very pale orange to light brown, medium to small fragments, occasional whole shells; 25% clay - light gray, soft, silty, sandy; occasional bit chatter, good to fair porosity.
80-85	Clay - light gray, soft, silty, sandy; 20% shell - very pale orange to light brown, medium to small fragments, most likely stringers or cavings; smooth drilling, poor porosity.

FIGURE 2.3.1-8.

LITHOLOGIC LOG FOR WELL 34D AT THE INDIAN RIVER COUNTY LANDFILL

Sources: CDM, 1989; ECT, 2000.

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Stratigraphic Log--Monitor Well
Hercules, Inc., Vero Beach, Florida

Depth (ft) From	To	Description	Interval
00	20	Sand, very fine to coarse, gray, with cemented shell fragements	20
20	50	Sand, calcareous, gray, very fine to fine, cemented with shell fragments	30
50	85	Shells, small, loose, gray	35
85	90	Shells, medium, loose, cream to light gray	5
90	100	Clay, gray, soft	10
100	130	Sand, calcareous, shells, fine trace, gray	30
130	150	Clay, reddish brown, silty	20
150	180	Clay, brown, silty, arrenaceous	30
180	310	Clay, brown, soft	130
310	370	Clay, silty, arrenaceous and gravel, lignitic	60
370	445	Clay, green, soft trace, shells, coarse	75
445	455	Clay, green, soft, and limestone soft, granular, buff to light gray	10
455	505	Limestone, cream to light gray, clay, soft, green, and shells cemented, thinly interbedded	
505	510	Limestone, as above, and shells, small, partially cemented	5
510	520	Limestone, buff to tan, soft granular	10
520	560	As above, interbedded with clay, cream, soft	40

FIGURE 2.3.1-9.

LITHOLOGIC LOG AT HERCULES, INC.

Sources: CH2M Hill, 1979; ECT, 2000.

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2.3.1.3 Geologic Maps

Figure 2.3.1-10 is a map of surface geology based on the geologic maps of Indian River County and St. Lucie County (Duncan and Scott, 1993). It shows that the surface geology at the Site consists of the Anastasia Formation (map symbol Qa). As previously described, the Anastasia Formation is of Pleistocene origin and is at least 80 ft thick in the site area. Approximately 3 to 4 miles west of the Site, the surficial geologic unit exposed is the Pleistocene age Ft. Thompson Formation (map symbol Qsu). The contact between the Anastasia Formation and the Ft. Thompson Formation is generally considered gradational (Crain *et al.,* 1975). No other geologic units occur at the surface within 7 miles of the Site.

Soil types at the Site have been mapped and published by the Soil Conservation Service (SCS) in the soil survey of Indian River County (SCS, 1987). The SCS is now known as the Natural Resource Conservation Service (NRCS). The Site and vicinity soil map is provided in Figure 2.3.1-11. There are four different soil types onsite. Excerpts of the NRCS description for each of the four soil types are reprinted below, in order of abundance onsite.

Pineda fine sand (16)—This soil is nearly level and poorly drained. It is present on low hummocks and in broad, poorly defined sloughs. The mapped areas range from 10 to 200 acres. Slopes are smooth to concave and range from 0 to 2 percent.

Typically, the surface layer is black, fine sand about 4 inches thick. The subsurface layer is light brownish-gray, fine sand to a depth of about 9 inches. The subsoil extends to a depth of about 40 inches. The upper 14 inches of the subsoil is yellow, fine sand with brownish-yellow mottles; the lower 17 inches is gray and greenish-gray, sandy loam that has yellowish-brown, dark brown, and light olive-brown and olive-yellow mottles. The upper 4 inches of the loamy subsoil material has intrusions of yellowish brown, loamy, fine sand. The substratum extends to a depth of 80 inches or more. The upper 12 inches of the substratum is greenish-gray, loamy sand, and the lower 28 inches is greenish-gray, loamy sand mixed with shell fragments.

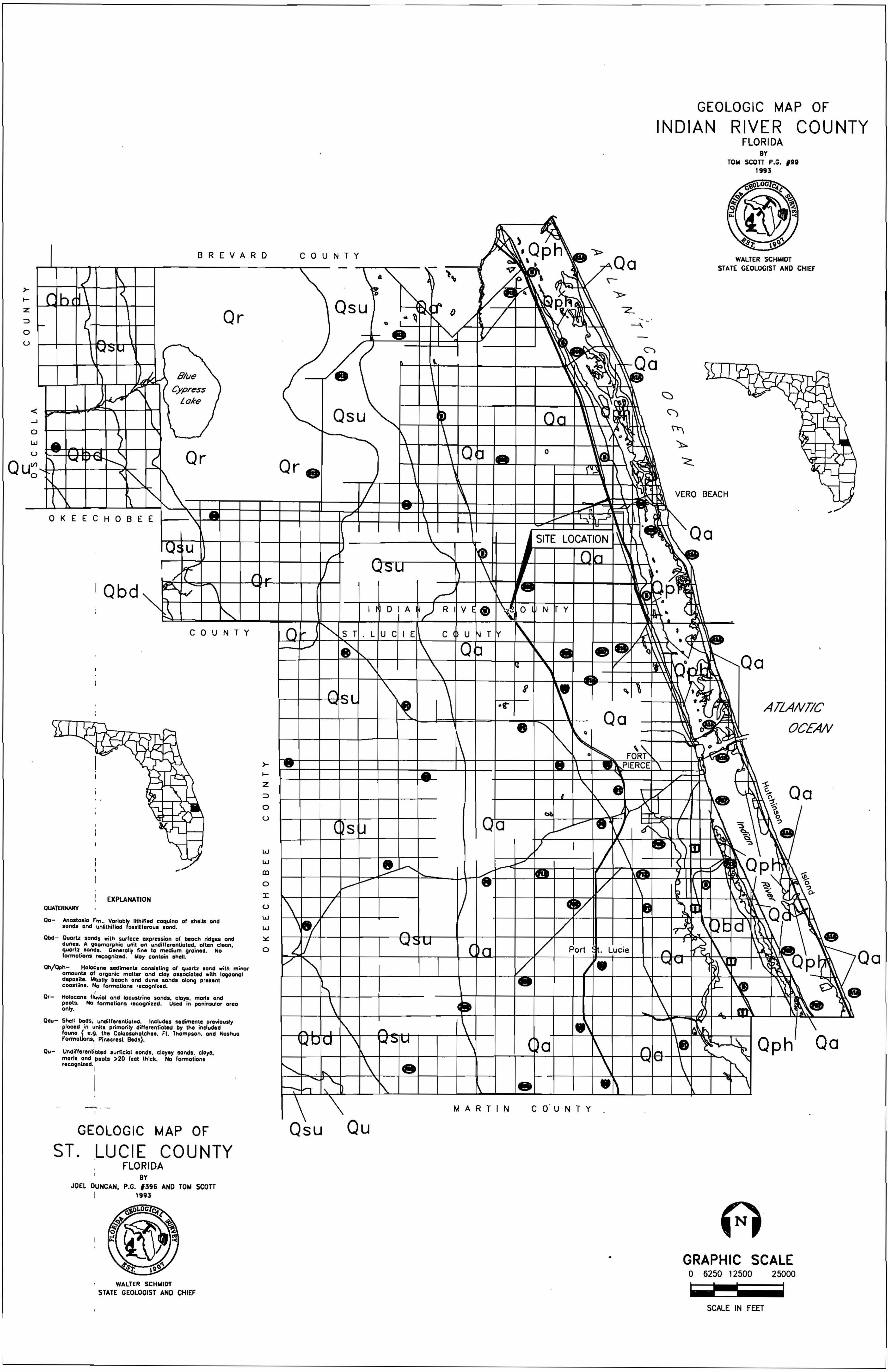

FIGURE 2.3.1-10.
GEOLOGIC MAP OF INDIAN RIVER AND ST. LUCIE COUNTIES

Sources: Duncan, J. and Scott, T., 1993; ECT, 2000.

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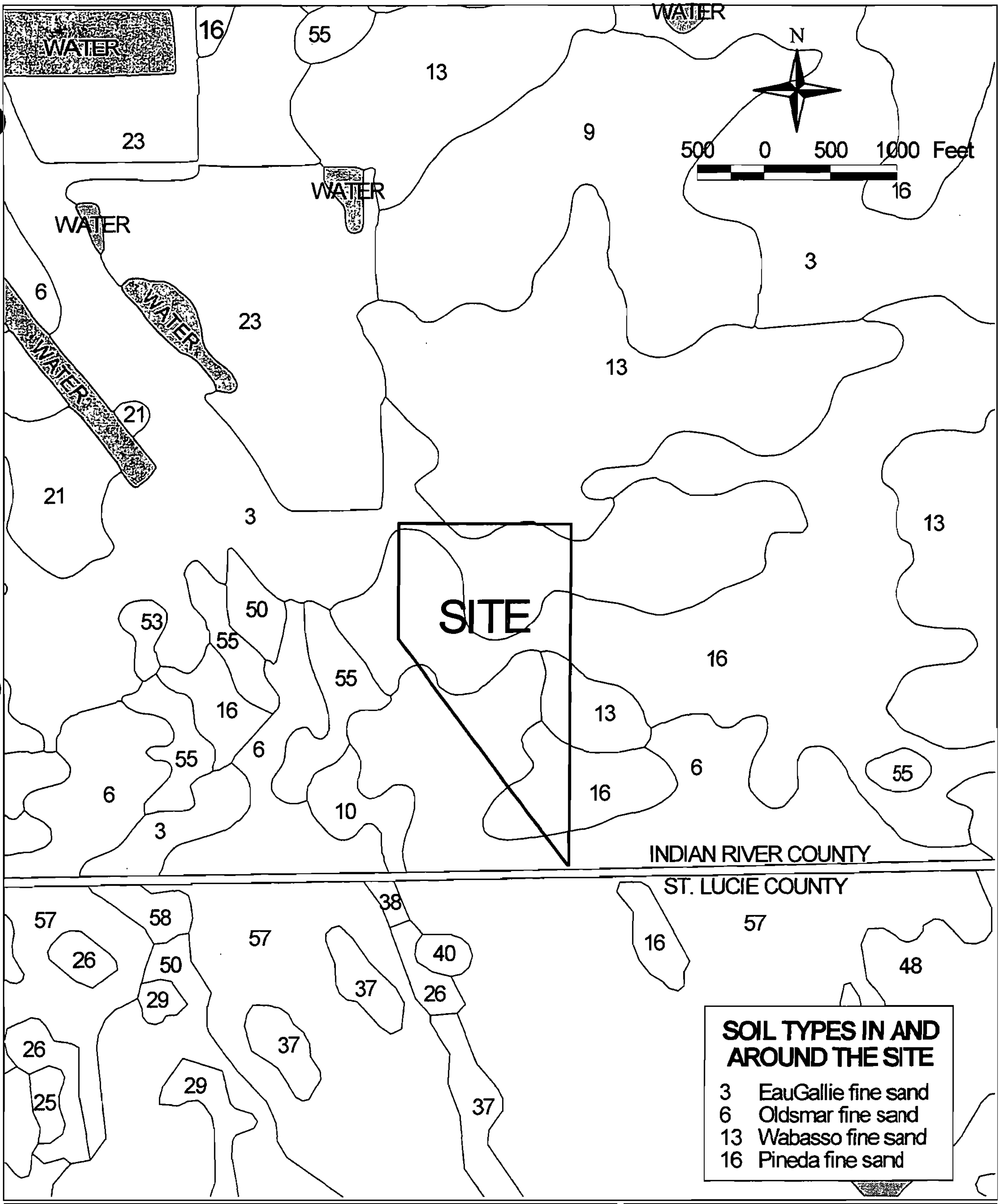

FIGURE 2.3.1-11.
SOILS MAP

Source: FGDL CORE Data, 1999; ECT, 2000.

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This soil mapping unit includes small areas of EauGallie, Riviera, Wabasso, and Winder soils. Also included are a few areas of soils that have a thin layer of very friable, calcareous material at a depth of 10 to 30 inches.

The water table is above the surface for a short period after heavy rainfall. It is within a depth of 10 inches of the surface for 1 to 6 months, and at a depth of 10 to 40 inches for more than 6 months. The available water capacity is very low in the surface and subsurface layers and the substratum. It is very low in the upper part of the subsoil and moderate in the lower part. Permeability is rapid in the surface and subsurface layers, rapid in the upper part of the subsoil and slow or very slow in the lower part, and moderately rapid in the substratum.

The NRCS classifies this soil as hydric (SCS, 1991). Similarly, the Florida Association of Environmental Soil Scientists (FAESS) classifies 95 percent of the Pineda fine sand as hydric (FAESS, 1995).

EauGallie fine sand (3)—This soil is deep, nearly level, and poorly drained. It is on broad flatwoods. The mapped areas range from 20 to 700 acres. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is black grading to dark gray, fine sand about 15 inches thick. The subsurface layer is gray, fine sand to a depth of about 26 inches. The subsoil extends to a depth of about 62 inches. The upper 21 inches of the subsoil is black, very dark gray, dark reddish brown, dark brown, brown, fine sand. The lower 15 inches is grayish-brown or gray, sandy loam. The substratum is light brownish-gray, loamy, fine sand to a depth of about 80 inches.

This soil mapping unit includes small areas of Myakka, Pepper, Wabasso, and Oldsmar soils. Also included are soils in scattered small wet depressions.

In most years, the water table is at a depth of less than 10 inches of the surface for 2 to 4 months during wet season and within a depth of 40 inches for more than 6 months.

Permeability is rapid in the surface and subsurface layers, and moderate to moderately rapid in the subsoil and substratum. The available water capacity is very low in the surface and subsurface layers, low to medium in the subsoil, and low in the substratum.

The NRCS does not classify this soil as hydric (SCS, 1991). Similarly, the FAESS classifies 80 percent of the Eau Gallie fine sand as not hydric (FAESS, 1995).

Oldsmar fine sand (6)—This soil is deep, nearly level, and poorly drained. It is on broad flatwoods. The mapped areas range from 20 to 300 acres. Slopes are smooth and range from 0 to 2 percent.

Typically, the surface layer is black, fine sand about 5 inches thick. The subsurface layer is light brownish-gray, fine sand to a depth of about 32 inches. The subsoil extends to a depth of about 62 inches. The upper 18 inches of the subsoil is black, dark reddish-brown, and dark brown, fine sand; the lower 12 inches is grayish-brown, sandy loam. The substratum is light brownish-gray, loamy, fine sand to a depth of 80 inches or more.

This soil mapping unit includes small areas of EauGallie, Holopaw, Malabar, and Wabasso soils. Also included are soils in scattered small wet depressions.

In most years, the water table is at a depth of less than 10 inches of the surface for 2 to 4 months during the wet season and within a depth of 40 inches for more than 6 months. Permeability is rapid in the surface and subsurface layers, moderate to moderately rapid in the upper part of the subsoil, and slow in the lower part. The available water capacity is very low in the surface and subsurface layers and low to medium in the subsoil.

The NRCS does not classify this soil as hydric (SCS, 1991). Similarly, the FAESS classifies 80 percent of the Oldsmar fine sand as not hydric (FAESS, 1995).

Wabasso fine sand (13)—This soil is nearly level and poorly drained. It is on broad flatwoods. Individual mapped areas are 20 to 300 acres. Slopes are 0 to 2 percent.

Typically, the surface layer is very dark gray, fine sand about 7 inches thick. The subsurface layer is gray, fine sand to a depth of about 24 inches. The subsoil extends to a depth of about 48 inches. The upper 8 inches of the subsoil is black, fine sand that is coated with colloidal organic matter. The next 3 inches is very dark gray, fine sand. The next 6 inches is dark brown, sandy loam. The lower 7 inches is brown, fine, sandy loam. The substratum to a depth of about 80 inches or more is brown, loamy, fine sand.

This soil mapping unit includes small areas of Boca, EauGallie, Oldsmar, Riviera, and Winder soils. Also included are areas of soils that are similar to Wabasso soil but have a thicker, dark colored surface layer and also some areas of soils in scattered small wet depressions. The included soils make up less than 15 percent of the map unit.

The water table is at a depth of 10 to 40 inches for more than 6 months in most years and at a depth of less than 10 inches for 1 to 2 months. The available water capacity is very low in the surface and subsurface layers, medium in the subsoil, and low in the substratum. Permeability is rapid in the surface and subsurface layers, moderate in the sandy part of the subsoil, and slow or very slow in the loamy part.

The NRCS does not classify this soil as hydric (SCS, 1991). Similarly, the FAESS classifies 75 percent of the Wabasso fine sand as not hydric (FAESS, 1995).

2.3.1.4 <u>Bearing Strength</u>

The onsite subsurface investigation is described in Section 2.3.1.2. That section provides a description of physical soils parameters that relate to bearing strength. This preliminary information indicates that the subsurface characteristics are suitable for the Project construction. Additional geotechnical subsurface investigations will be conducted in the future to provide detailed bearing strength characteristic information to facilitate the final engineering/design efforts for the BHEC.

2.3.2 SUBSURFACE HYDROLOGY

The hydrogeologic system in the Site area is comprised of two aquifer systems—the surficial and the Floridan. The surficial aquifer system is separated from the Floridan aquifer system by a thick confining unit known as the "upper confining unit" (UCU). Figure 2.3.2-1 illustrates a hydrogeologic cross-section that transects southern Indian River County from west to east (Schiner *et al.,* 1988). This cross section is positioned only a few miles north of the Site.

The Floridan aquifer system is generally divided into two hydrologic units, known as the Upper and Lower Floridan aquifers. The Upper and Lower Floridan aquifers are separated by a thick confining unit known as the "middle semi-confining unit." These hydrostratigraphic relations are illustrated in Figure 2.3.2-2, which is a generalized hydrogeologic cross-section that transects St. Lucie County (from the north end of Lake Okeechobee to Fort Pierce) about 15 miles south of the Site.

These aquifer systems and confining units are discussed in the following paragraphs.

2.3.2.1 Subsurface Hydrological Data for Site

Surficial Aquifer System

In the Site area, two geologic formations occur within the surficial aquifer system: the Pleistocene age Anastasia Formation, and the underlying Pliocene age Tamiami Formation. Locally, the Anastasia Formation is composed primarily of sand and shell, with some interbedded clay, whereas the Tamiami Formation primarily includes shell, sandy clay, and some limestone. The Anastasia Formation has a thickness of approximately 80 ft and exists under unconfined conditions. The Tamiami Formation has a thickness of approximately 50 ft and exists under unconfined to semi-confined conditions (Toth, 1994). These two formations are hydrologically connected (Gee and Jenson, 1979) and are typically treated as a single unit referred to as the surficial aquifer system (Toth, 1994). The total thickness of the surficial aquifer system is approximately 130 ft in the Site area.

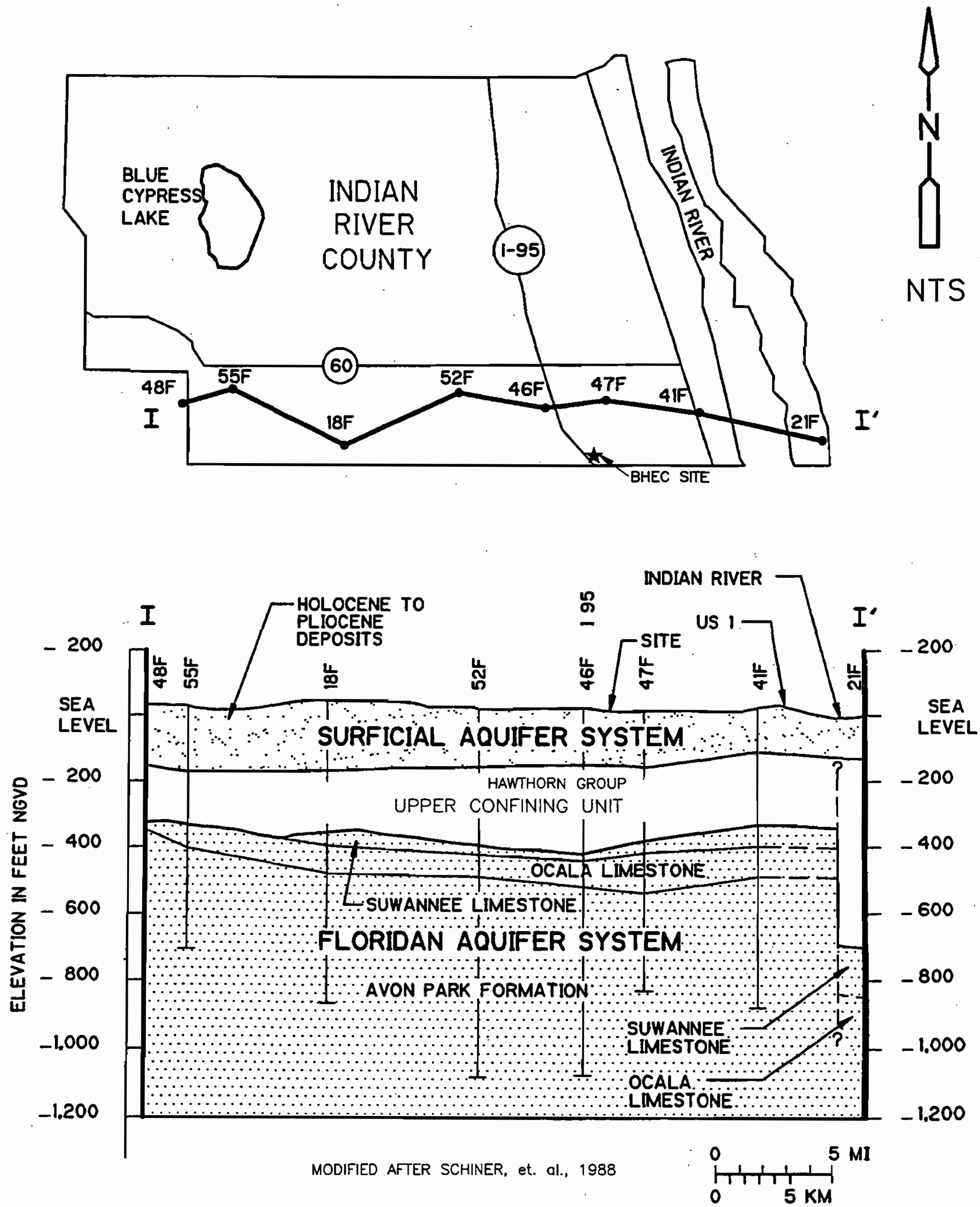

FIGURE 2.3.2-1.

HYDROGEOLOGIC CROSS SECTION THROUGH SOUTHERN INDIAN RIVER COUNTY

Sources: CDM, 1999; ECT, 2000.

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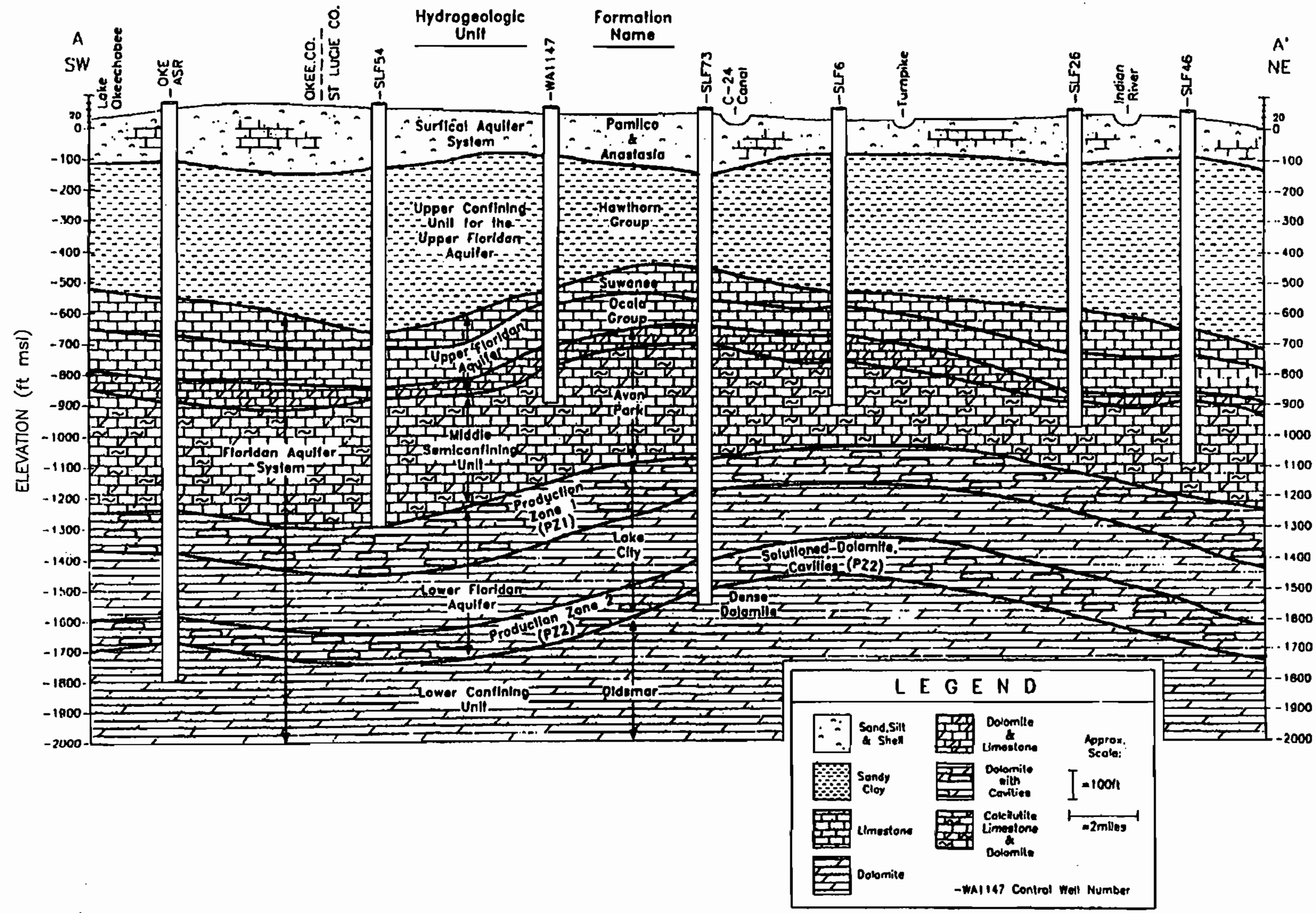

FIGURE 2.3.2-2.

DEEP REGIONAL HYDROGEOLOGIC CROSS SECTION

Sources: Lucasiewicz, 1992; ECT, 2000.

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The hydraulic characteristics of the surficial aquifer system vary with the lithology. The lithology is heterogeneous because the aquifer materials were deposited during periods of repeated transgression and regression of the sea.

The transmissivity of the surficial aquifer system has been evaluated by various researchers, and some of the results are reported in the Technical Publication (SJ93-1) titled *Aquifer Characteristics in the St. Johns Water Management District, Florida* (SJRWMD, 1993). Two extensive aquifer tests in eastern Indian River County resulted in average transmissivity values of 10,700 and 10,600 ft^2/day (Geraghty & Miller, Inc., 1981).

Toth (1994) applied a transmissivity of 4,000 ft^2/day for the surficial aquifer system in his analytical model that was used to simulate impacts from ground water withdrawals at the City of Vero Beach wellfield, which is located approximately 6 miles to the northeast of the Site. Toth cited aquifer testing by Gee and Jenson (1980) as the source of his transmissivity value.

Aquifer testing was conducted at a supply well completed in the surficial aquifer at Hercules, Inc., which is located 1.8 miles due north of the Site (Figure 2.1.0-2). The aquifer testing was conducted at a pumping rate of 600 gallons per minute (gpm), and the well has only 20 ft of well screen to a depth of 65 ft bls. The testing rendered a transmissivity value of 9,600 ft^2/day (CH2M Hill, Inc., 1979). The report also stated that the well is capable of producing up to 1,000 gpm with "minimal drawdown."

Aquifer testing was also conducted at a supply well completed in the surficial aquifer at the Indian River Correctional Institution, which is located 0.2 mile northwest of the Site (Figure 2.1.0-2). Based on the analyses by CDM (1987), the reported transmissivity was 7,000 ft^2/day at that location.

Based on assimilation of all information reviewed, the transmissivity of the surficial aquifer system in the Site area is estimated at approximately 7,000 ft^2/day.

Considering that the surficial aquifer system is approximately 130 ft thick, the average horizontal hydraulic conductivity is estimated at approximately 50 to 55 ft/day. The vertical hydraulic conductivity is probably 10 to 100 times lower than its horizontal component due to the interbedded layering of sand, shell, sandy clay, and some limestone. The average porosity is estimated at approximately 25 percent (Crain *et al.*, 1975).

Figure 2.3.2-3 presents a water table elevation contour map for January 1994 that includes the Site. The figure indicates water table elevations ranging from 19 to 20 ft-msl and an easterly or southeasterly ground water flow direction at the Site (CDM, 1999). Similarly, in their study of the Site, JEA (1989) reported relatively flat water table conditions and average water table elevations of approximately 19.2 and 20.4 ft-msl in December 1988 and February 1989, respectively.

Onsite ground water levels were measured on April 26, 2000, from five onsite monitoring wells. The monitoring well locations are shown in Figure 2.3.2-4, which also summarizes monitoring well depths and ground water levels. As shown, the ground water surface elevations ranged from 19.68 to 18.71 ft-msl, and the depths to ground water ranged from 2.5 to 4.8 ft bls. The hydraulic gradient slopes gently toward the southeast. These data are very consistent with the aforementioned data from CDM (1999) and JEA (1989).

In general, the depth to the water table at the site may vary between 0 to 6 ft bls (approximately 18 to 24 ft-msl) due to seasonal fluctuation and spatial variation, although the water table probably most often occurs from 3 to 4 ft bls. The water table elevations and hydraulic gradients are generally a muted replica of the topographic surface (McGurk, 1998). The horizontal hydraulic gradient at the Site is very small and generally toward the southeast or east because the Site is relatively flat with a slight slope in those directions.

However, the water table elevations and the directions of ground water flow are strongly influenced by canals. The Site is situated within the IRFWCD and the property abuts several canals. The canal water levels are controlled by the IRFWCD. Construction of the canals began nearly a century ago to prevent flooding (see Section 2.3.4). "The drainage

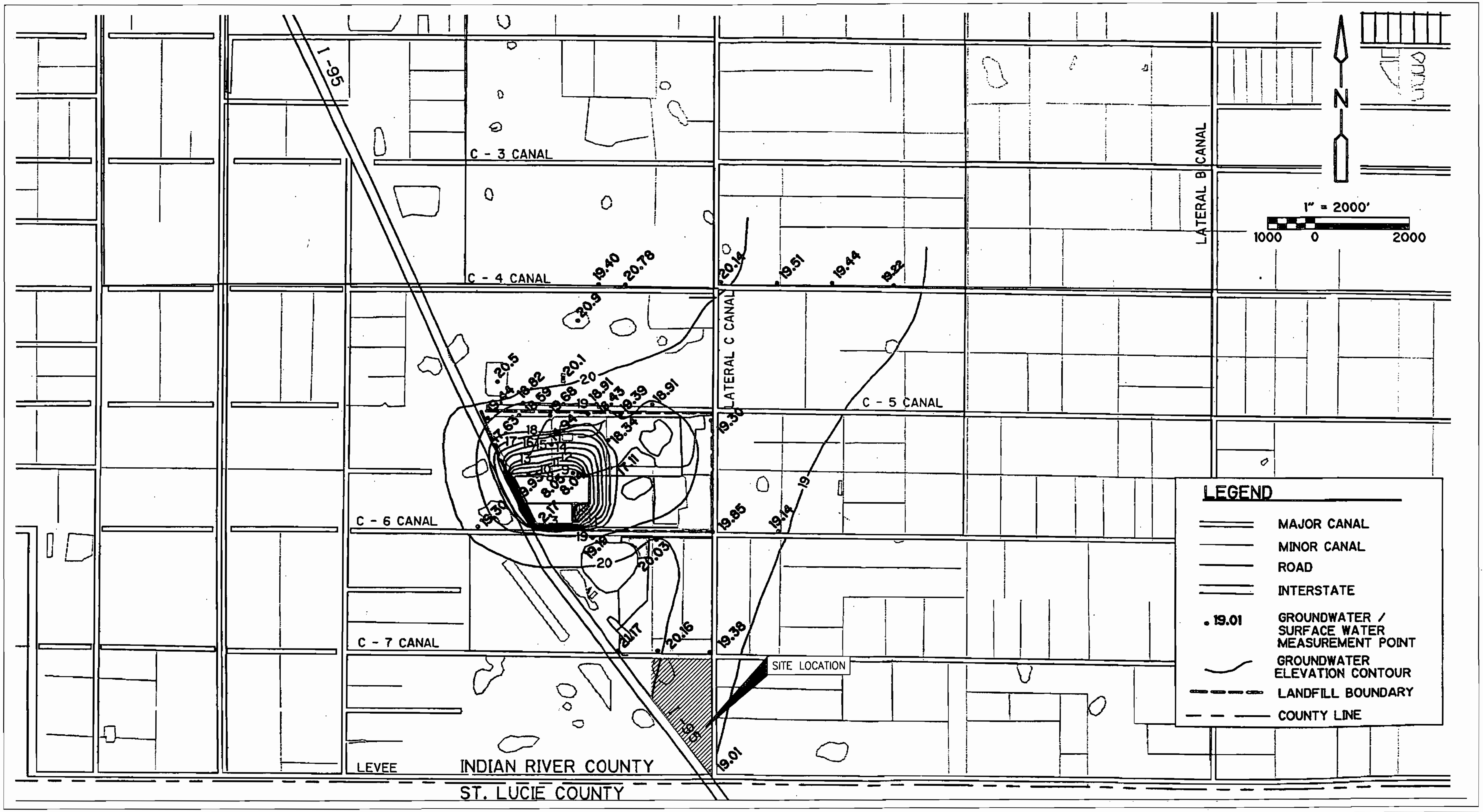

FIGURE 2.3.2-3.

WATER TABLE ELEVATION CONTOUR MAP (JANUARY 1994)

Sources: CDM, 1999; ECT, 2000.

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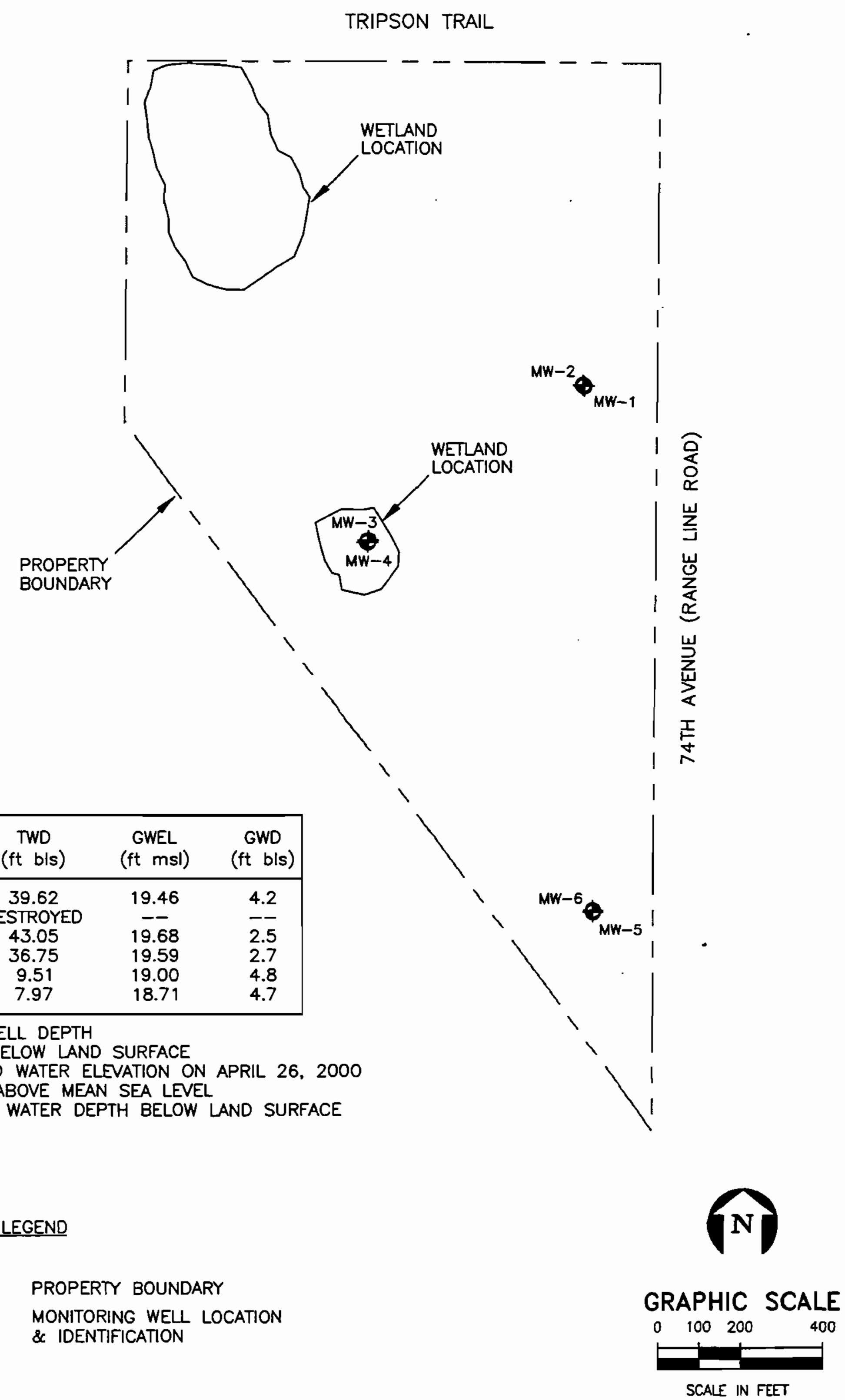

MONITORING WELL	TWD (ft bls)	GWEL (ft msl)	GWD (ft bls)
MW-1	39.62	19.46	4.2
MW-2	DESTROYED	--	--
MW-3	43.05	19.68	2.5
MW-4	36.75	19.59	2.7
MW-5	9.51	19.00	4.8
MW-6	7.97	18.71	4.7

TWD = TOTAL WELL DEPTH
ft bls = FEET BELOW LAND SURFACE
GWEL = GROUND WATER ELEVATION ON APRIL 26, 2000
ft msl = FEET ABOVE MEAN SEA LEVEL
GWD = GROUND WATER DEPTH BELOW LAND SURFACE

LEGEND

— — — PROPERTY BOUNDARY
MW-5 ⊕ MONITORING WELL LOCATION & IDENTIFICATION

FIGURE 2.3.2-4.

ONSITE MONITORING WELL LOCATIONS AND WATER LEVEL DATA

Source: ECT, 2000.

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system insures that excessive rainfalls drain rapidly from the district and that the water table remains generally below the roots of the crops" (Crain *et al*., 1975, p. 35). As such, the direction of localized shallow ground water flow is often toward the nearest canal.

The surficial aquifer system is a major source of potable water supply in Indian River County, particularly for the City of Vero Beach.

Ground water production wells completed in the surficial aquifer system typically yield from 200 to 600 gpm in southeastern Indian River County, although some wells may produce 1,000 gpm or more (Crain *et al*., 1975; Toth, 1994). Well yields tend to decrease significantly in areas west of the Ten-mile Ridge. In the area of the Site, a production rate of approximately 400 to 500 gpm would be expected to be achievable from a well completed in the surficial aquifer system. In part, this estimate is based on the surficial aquifer well yield reported at Hercules, Inc. (600 to 1,000 gpm; CH2M Hill, 1979), located 1.8 miles due north of the Site, and the transmissivity reported at the Indian River Correctional Institution (7,000 ft^2/day; CDM, 1987), located 0.2 mile northwest of the Site.

Water quality in the surficial aquifer system is quite variable and can be strongly influenced by land use. As previously indicated, the Site is situated within the IRFWCD. According to Crain *et al.* (1975), the surficial aquifer water quality within the "drainage districts" depends largely on the extent to which water from the Upper Floridan aquifer is used to irrigate. The concentrations of chemical constituents are generally much higher in Upper Floridan aquifer water than in surficial aquifer water. Therefore, the application of Upper Floridan water to crops can result in increased concentrations of chemical constituents in the surficial aquifer water due to direct infiltration and/or leaching of residual salts (Crain *et al*., 1975). Carter Associates *et al*. (1990) reported that approximately 1,000 to 1,500 Upper Floridan aquifer wells are used for irrigation within the IRFWCD. As a result, the surficial aquifer water quality is not considered potable throughout much of the IRFWCD. In contrast, the surficial aquifer produces potable water quality in most areas outside of the water control districts in Indian River County (Crain *et al.,* 1975).

In the Site area, the potentiometric surface elevation of the Upper Floridan aquifer is higher than the elevation of the water table in the surficial aquifer system (i.e., there is an upward hydraulic gradient between the two aquifer systems). Therefore, a discharge pattern exists between the Floridan and surficial aquifer systems in this area (Phelps, 1984). Consequently, poor quality Floridan water can slowly leak upward through the UCU into the surficial aquifer system, whereas surficial aquifer water can not leak downward into the Floridan.

Surficial aquifer water quality data are available for a nearby well that is 25 ft deep and is located about 2,000 ft north-by-northwest of the Site boundary. This well, known as MW-5, is a background monitoring well associated with the Ocean Spray Cranberries, Inc., south wastewater sprayfield treatment system that is located east of, and adjacent to, the Site. The most recent data available for this well (3/24/00) indicate a total dissolved solids (TDS) concentration of 1,700 milligrams per liter (mg/L) and a chloride concentration of 500 mg/L (see Section 10.7.2). The secondary drinking water standards for TDS and chlorides are 500 mg/L and 250 mg/L, respectively.

In contrast, onsite ground water constituent concentrations are much lower. Ground water samples were collected from onsite monitor wells MW-1 and MW-4 on April 27, 2000. Well locations are shown in Figure 2.3.2-4. All constituents detected in the samples are summarized in Table 2.3.2-1. As shown, the upper portion of the surficial aquifer at the Site indicates TDS concentrations of approximately 320 mg/L and chloride concentrations of only 10 mg/L. The onsite ground water quality results are consistent with the fact that the Site has not been used for agriculture; thus, lower quality Floridan aquifer water has not been used for irrigation onsite.

Floridan Aquifer System

The Floridan aquifer system is the most prolific aquifer system in the southeastern United States. In the Site area, the Floridan aquifer system is almost 3,000 ft thick and its base occurs at an elevation of about 3,400 ft below mean sea level (msl) (Tibbals, 1990).

Table 2.3.2-1. Ground Water Quality Results, Onsite Surficial Aquifer Samples Collected April 27, 2000 (mg/L unless otherwise indicated)

Parameter	Sample Location MW-1	Sample Location MW-4	Method
Metals			
Aluminum	0.44	1.0	200.7
Calcium	83	88	200.7
Iron	3.4	6.4	200.7
Magnesium	2.2	3.4	200.7
Manganese	BDL	0.016	200.7
Silicon	16.08	14.35	6010B
Sodium	10	9	273.1
Titanium	0.008	0.007	200.7
Miscellaneous			
Alkalinity (as $CaCO_3$)	230	240	310.1
Ammonia-N	0.35	0.54	350.1
Bromide	0.066	0.076	9056
Chemical oxygen demand	43	69	410.4
Chloride, total	9	11	325.3
Hardness (as $CaCO_3$)	240	260	130.2
Kjeldahl-N, total	0.76	1.40	351.2
Organic nitrogen, total	0.41	0.86	351.2
Phosphorus, total	0.58	0.29	365.4
TDS	310	320	160.1
Total organic carbon	20	24	415.1
Total suspended solids	17	BDL	160.2
Turbidity (NTU)	16	29	180.1
Radiological			
Gross alpha (pCi/L)	3.9 +/- 1.2	2.4 +/- 1.0	900.0
Radium 226 (pCi/L)	0.7 +/- 0.2	0.5 +/- 0.2	903.1
Radium 228 (pCi/L)	<0.8 +/- 0.5	<0.8 +/- 0.5	Brks/Blach

Note: BDL = below detection limit.
NTU = nephelometric turbidity units.
pCi/L = picocuries per liter.

In addition to the listed parameters, all samples were analyzed for volatile organics (Method 624); semi-volatile organics (Method 625); chlorinated herbicides (Method 615); organophosphorus pesticides (Method 614); organochlorine pesticides (Method 608); antimony (Method 204.2); arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, silver, tin, and zinc (Method 200.7); mercury (Method 245.1); thallium (Method 279.2); total cyanide (Method 335.2); fluoride (Method 340.2); nitrate-N (Method 353.1); nitrite-N (Method 354.1); phenols (Method 420.1); oil and grease (Method 413.1); total sulfate (Method 375.4); and total sulfide (Method 376.1). These constituents were not detected.

Source: ECT, 2000.

The Floridan aquifer system is generally divided into two hydrologic units, known as the Upper and Lower Floridan aquifers. The Upper and Lower Floridan aquifers are separated by a thick, confining unit, known as the middle semi-confining unit (MSCU), which serves to separate these two aquifers hydraulically (Figure 2.3.2-2). As shown in Figure 2.3.2-5, the MSCU is approximately 600 ft thick in the Site area, and its top occurs at an elevation of about 950 ft below msl (Tibbals, 1990). The MSCU and the Lower Floridan aquifer have limited relevance to this Project and are not discussed here in detail. The Upper Floridan aquifer is discussed below.

The Upper Floridan aquifer is composed of beds of limestone and some dolomite ranging in age from the Eocene to the Oligocene. In the area of the Site, the geologic formations include (in descending order): the Oligocene age Suwannee Limestone; the Eocene age Ocala Limestone; and most of the Eocene age Avon Park Formation.

Tibbals (1990) defined the top of the Floridan aquifer system as the first occurrence of vertically persistent, permeable, consolidated carbonate rocks. He characterized the lower limit of the Upper Floridan aquifer as the first occurrence of a low permeability micritic limestone of the underlying MSCU. Figure 2.3.2-6 shows the elevations of the top of the Upper Floridan aquifer in Indian River County; it suggests that the top of the aquifer occurs at an elevation of about 370 ft below msl in the Site area. This elevation is generally corroborated by other data sources for this area, such as Lucasiewicz (1992, fig. 6); and PBS&J (1993, Appendix A). The base of the Upper Floridan aquifer coincides with the top of the MSCU, which occurs at approximately 950 ft below msl in the Site area (Figure 2.3.2-5). Therefore, the Upper Floridan aquifer is approximately 580 ft thick in the Site area.

The hydraulic characteristics of the Upper Floridan aquifer have been evaluated by various researchers, and results of some aquifer tests are reported in the technical publication titled *Aquifer Characteristics in the St. Johns Water Management District, Florida* (SJRWMD, 1993).

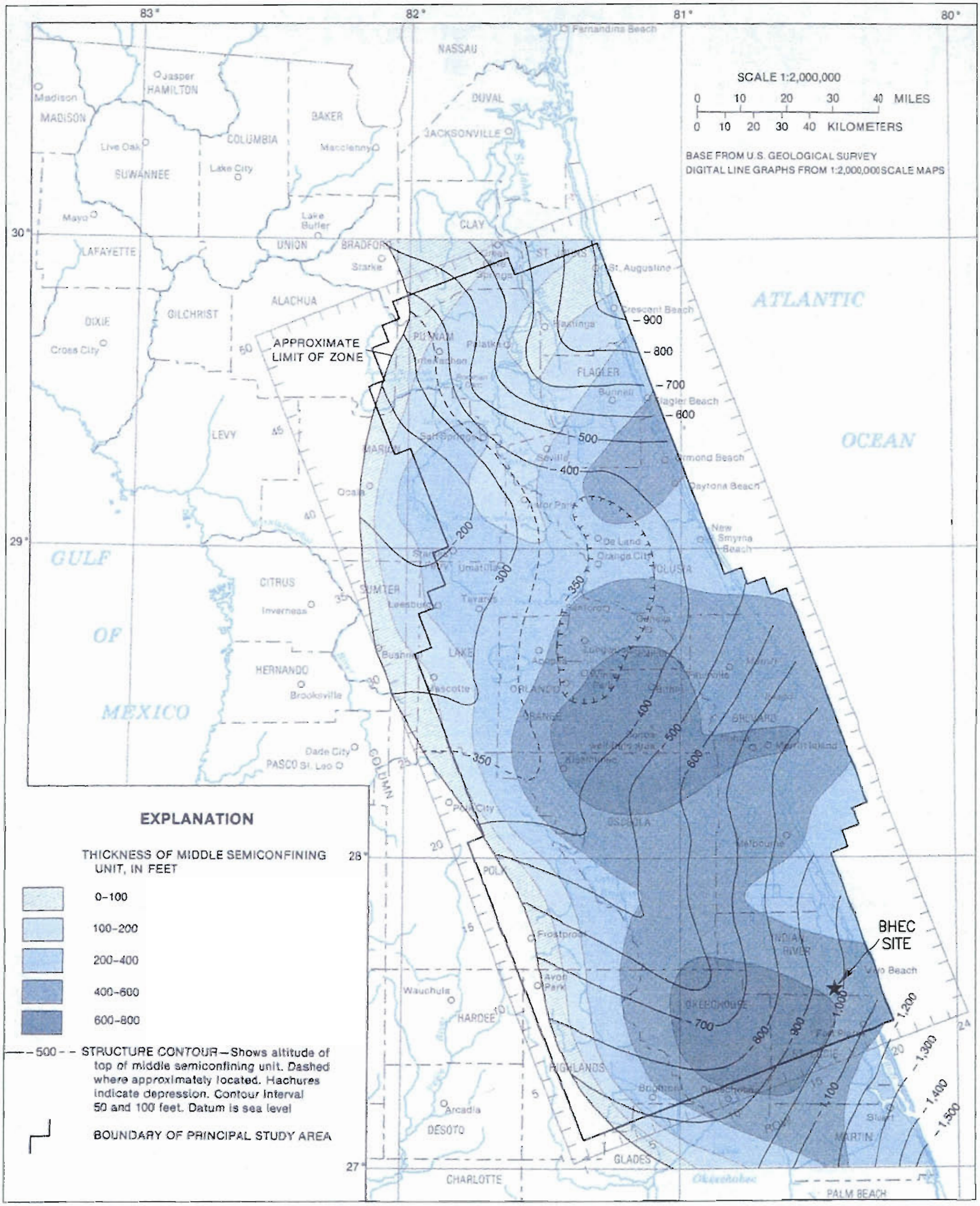

FIGURE 2.3.2-5.

MIDDLE SEMI-CONFINING UNIT: THICKNESS AND TOP ELEVATION

Sources: Tibbals, 1990; ECT, 2000.

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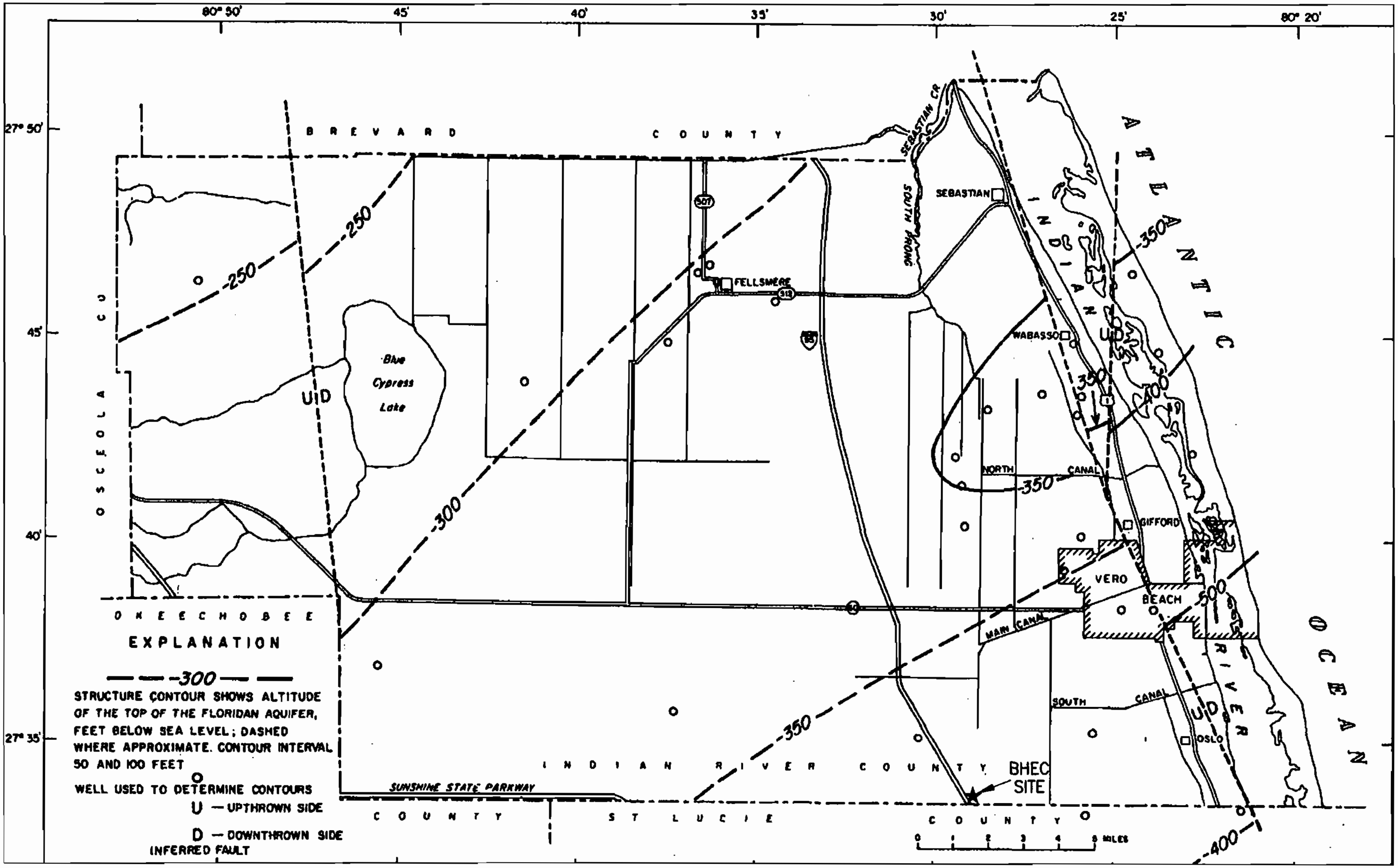

FIGURE 2.3.2-6.

ELEVATION OF TOP OF UPPER FLORIDAN AQUIFER IN INDIAN RIVER COUNTY

Sources: Crain, et al., 1975; ECT, 2000.

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Based on results of aquifer tests, Toth (1994) applied a transmissivity value of 55,000 ft^2/day for the Upper Floridan aquifer in the analytical model that was used to similate impacts from ground water withdrawals at the City of Vero Beach and Indian River County wellfields. Toth cited aquifer testing by Geraghty & Miller (1981) as the source of this transmissivity value. Similarly, Lukasiewicz (1992) indicates a transmissivity of approximately 50,000 ft^2/day in the Site area based on results of various aquifer tests.

According to Tibbals (1990), the transmissivity of the Upper Floridan aquifer in the Site area (Figure 2.3.2-7) is estimated to range from 100,000 to 200,000 ft^2/day; these results were derived from a calibrated ground water flow model. Tibbals explains that model-derived transmissivity values are generally higher and more reliable than values derived from aquifer tests for the Upper Floridan aquifer. Problems associated with partial penetration of the aquifer, duration of aquifer tests, and the highly heterogeneous and anisotropic nature of the limestone aquifer render "...the application of standard methods of aquifer test analysis uncertain and the results questionable" (Tibbals, 1990; p. E33).

Considering all available information, the transmissivity of the Upper Floridan aquifer is estimated at 100,000 ft^2/day in the area of the Site.

The Upper Floridan aquifer exists under confined conditions. Published storage coefficient estimates used for the general area of the Site include 0.0004 (Lukasiewicz, 1992), 0.001 (Toth, 1994), and 0.001 (Tibbals, 1990). Considering these data, a storage coefficient of 0.0008 is considered representative of the Upper Floridan aquifer in the area of the Site.

Upper Floridan aquifer potentiometric surface elevation maps are provided in Figures 2.3.2-8 and 2.3.2-9 for May and September, 1997, respectively. The potentiometric surface elevations shown for the Project site area are approximately 36 and 38 ft-msl, respectively. The Upper Floridan aquifer potentiometric surface elevation data indicate the that horizontal component of ground water flow is generally toward the east in the Project area.

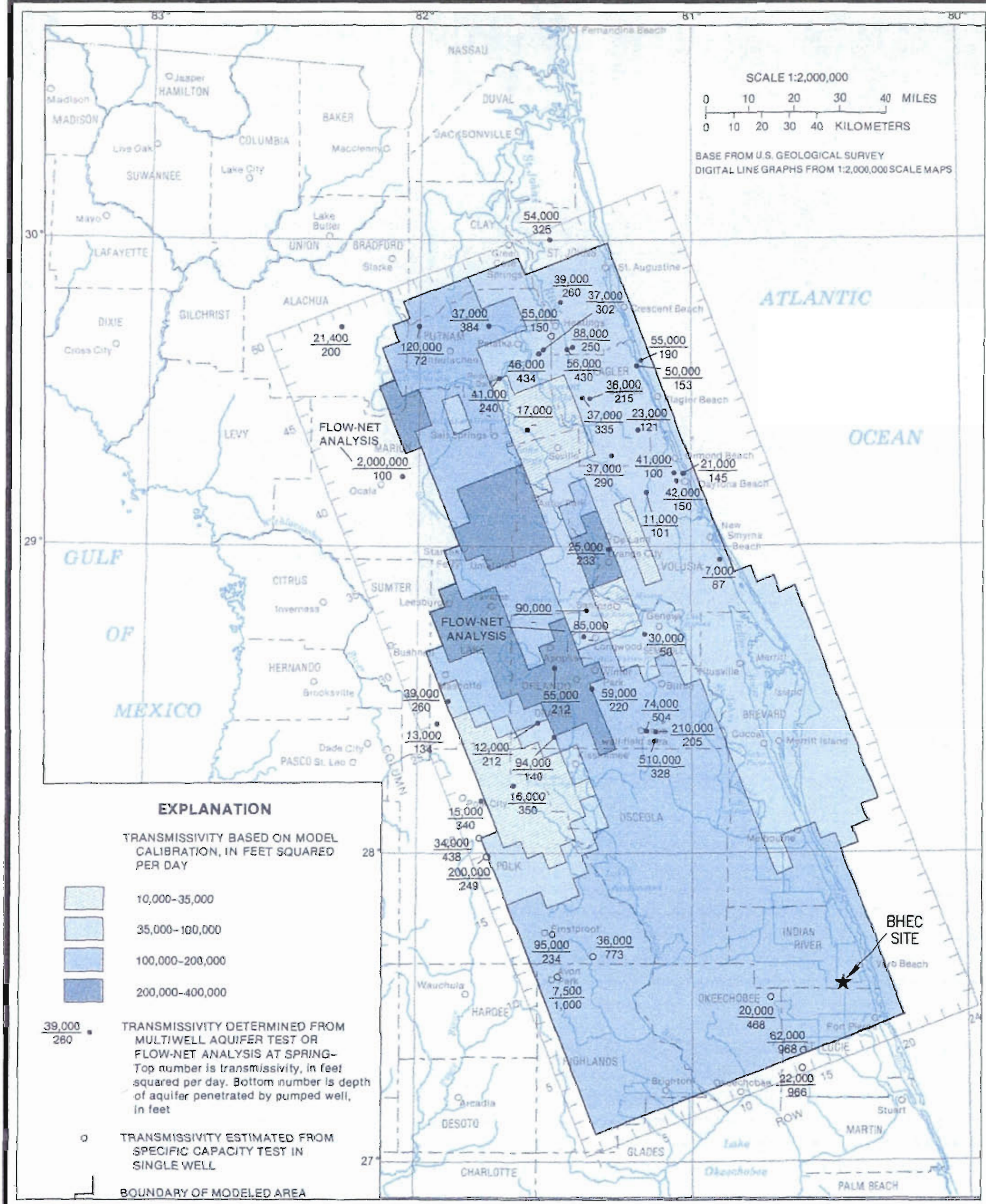

FIGURE 2.3.2-7.
MODEL DERIVED TRANSMISSIVITY OF THE UPPER FLORIDAN AQUIFER AND LOCATIONS OF SELECTED AQUIFER TEST SITES

Sources: Tibbals, 1990; ECT, 2000.

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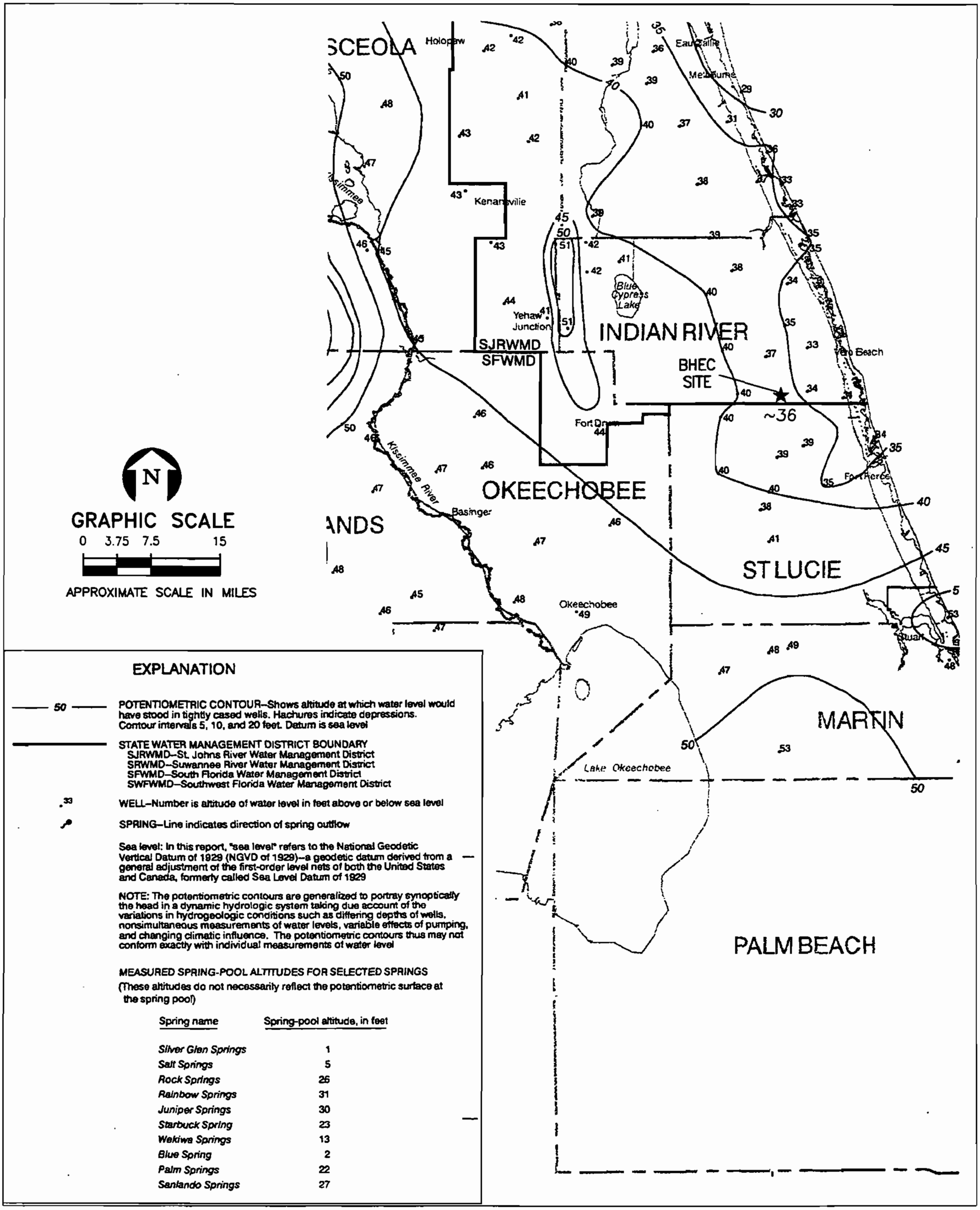

FIGURE 2.3.2-8.

POTENTIOMETRIC SURFACE ELEVATION OF THE UPPER FLORIDAN AQUIFER (MAY 1997)

Sources: St. Johns River Water Management District, 1997; ECT, 2000.

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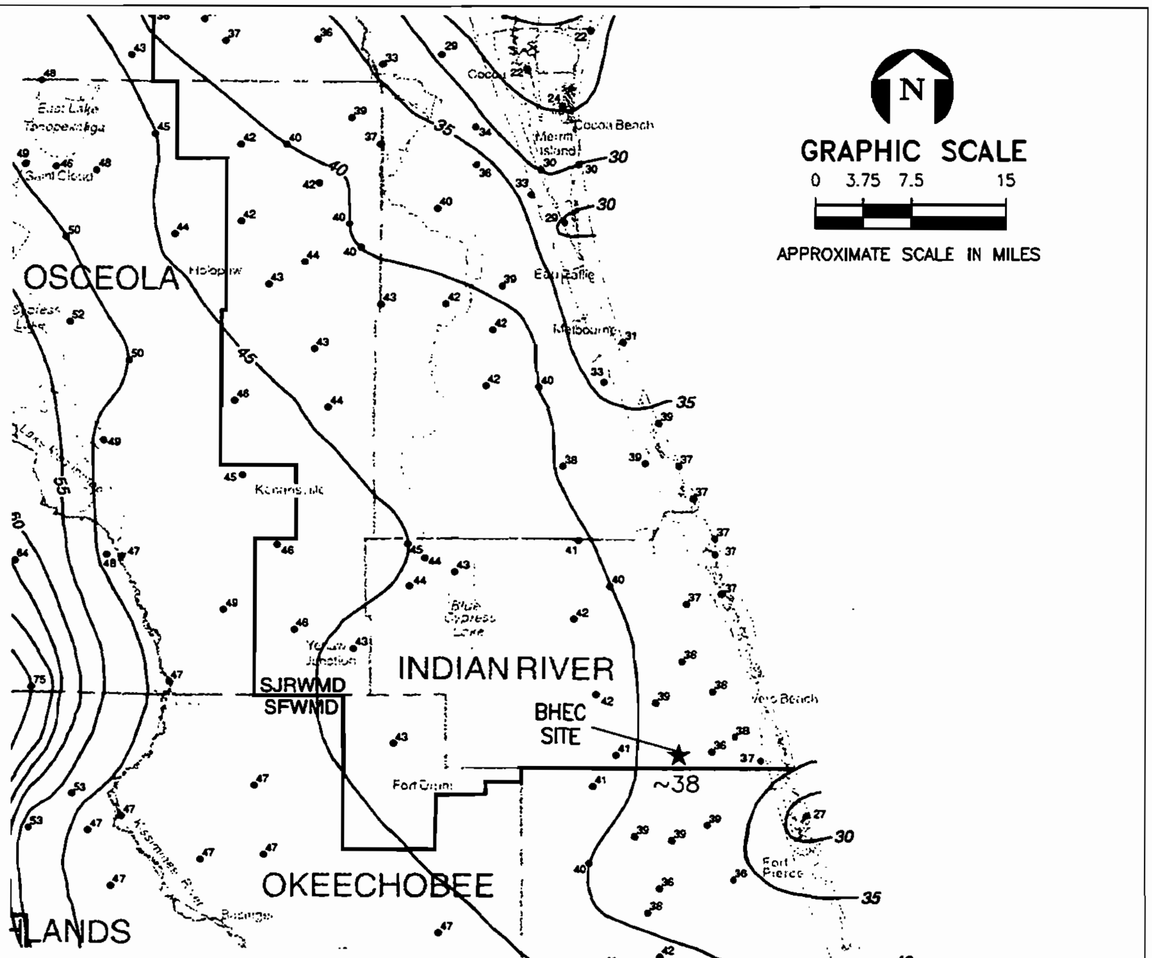

EXPLANATION

—— 50 —— POTENTIOMETRIC CONTOUR – Shows altitude at which water level would have stood in tightly cased wells. Hachures indicate depressions. Contour intervals 5 and 10 feet. Datum is sea level

STATE WATER MANAGEMENT DISTRICT BOUNDARY
- SJRWMD -- St. Johns River Water Management District
- SRWMD -- Suwannee River Water Management District
- SFWMD -- South Florida Water Management District
- SWFWMD -- Southwest Florida Water Management District

•33 WELL – Number is altitude of water level in feet above or below sea level

SPRING – Line indicates direction of spring outflow

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929

NOTE: The potentiometric contours are generalized to portray synoptically the head in a dynamic hydrologic system taking due account of the variations in hydrogeologic conditions such as differing depths of wells, nonsimultaneous measurements of water levels, variable effects of pumping, and changing climatic influence. The potentiometric contours thus may not conform exactly with individual measurements of water level.

MEASURED SPRING-POOL ALTITUDES FOR SELECTED SPRINGS

(These altitudes do not necessarily reflect the potentiometric surface at the spring pool)

Spring name	Spring-pool altitude, in feet
Salt Springs	2
Rock Springs	26
Rainbow Springs	31
Juniper Springs	30
Starbuck Spring	23
Wekiwa Springs	13
Blue Spring	3
Palm Springs	22
Sanlando Springs	27

FIGURE 2.3.2-9.

POTENTOMETRIC SURFACE ELEVATION OF THE UPPER FLORIDAN AQUIFER (SEPTEMBER 1997)

Source: St. Johns River Water Management District, 1997; ECT, 2000.

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The average potentiometric surface elevation of 37 ft-msl is about 13 ft higher than the average land surface elevation at the Site (approximately 24 ft-msl); consequently, Floridan aquifer wells are artesian and can flow freely at the surface is this area. In addition, poor quality Floridan water can slowly leak upward through the UCU into the surficial aquifer system, whereas surficial aquifer water can not leak downward into the Floridan. In the Site area, Tibbals (1990) estimated an upward leakage (discharge) rate of 0.5 inch per year from the Upper Floridan aquifer, through the UCU, into the surficial aquifer system.

Ground water production wells completed in the Upper Floridan aquifer can typically yield from 500 to 1,400 gpm in southeastern Indian River County. In the area of the Site, a production rate of approximately 800 to 1,000 gpm would be expected to be achievable from a well completed in the Upper Floridan aquifer.

Water quality in the Upper Floridan aquifer near the Site is generally poor due to its highly mineralized nature. The water is somewhat brackish. In the discharge areas of the Floridan aquifer system along the coast and in the St. Johns River valley, the TDS concentration is typically greater than 1,000 mg/L and can be greater than 25,000 mg/L (Tibbals, 1990). Generally, the water quality in the aquifer decreases as a function of depth. Chloride concentration is the single most reliable indicator of the presence of brackish water.

Table 2.3.2-2 provides Upper Floridan aquifer water quality data for various wells in the general area of the Site (CH2M Hill, 1979); Figure 2.3.2-10 shows the locations of the wells associated with Table 2.3.2-2. The wells closest to the Site are identified with the numbers 38 and 39; they are shown at locations only 0.2 mile north of the Site. Well No. 32 is shown to be located approximately 0.4 mile northeast of the project site. As shown in Table 2.3.2-2 for these three wells, the TDS concentration ranged from 1,370 to 1,700 mg/L; the average was 1,550 mg/L. The secondary drinking water standard for TDS is 500 mg/L. Similarly, the chloride concentrations for these three wells ranged from 628 to 821 mg/L, and averaged 727 mg/L. The secondary drinking water standard

Table 2.3.2-2. Artesian Wells Sampled Near Hercules Injection Test Well

Well No.	Previous Desig-nation	Location of Wells	Owner	Casing Diameter (inches)	Total Depth (ft)	Water Quality: Temper-ature (°F)	Alkalinity (mg/L as $CaCO_3$)	Chlorides (mg/L)	Conductivity (µmhos/cm)	Total Hardness (mg/L as $CaCO_3$)	Dissolved Solids (mg/L)	Sulfate (mg/L)	Sample Date
1	OR-71	SE, SE, NW, Sec 13, T33S, R38E, Citrus Blvd.	W.P. Cubanks	5	775	—	55	343	1,320	210	870	43	9-78
				—	—	78.8	—	340	—	—	—	—	4-59
8	IR-263	SE, SW, NE, Sec. 18, T33S R39E	Victor Robertson	—	—	74.0	55	532	1,960	335	1,170	59	9-78
				—	—	—	—	460	—	—	—	—	1-52
13	IR-95	NW, SW, NW Sec. 20, T33S, R39E	Kirby	5	—	—	46	489	1,650	110	1,000	9.8	9-78
				—	—	80.0	—	450	—	—	—	—	4-59
17	IR-93	SW, NW, SW, Sec. 19, T33S, R39E near Oslo Road in grove	Art Karst	4	—	80.0	143	647	2,570	540	1,590	145	9-78
				—	—	80.5	—	492	—	—	—	—	4-59
21	—	NW, SW, NW Sec. 29, T33S R39E, Monroe 1/4 mile south of Oslo Road	Thomas Darnes	6	—	—	93	610	2,260	420	1,400	98	9-78
32	—	NW, NE, NW Sec. 31, T33S, R39E	Hogan Assoc.	12	—	80.0	33	821	2,710	380	1,580	44	9-78
38	—	SW, NE, NE, Sec. 36, T33S, R38E at edge of grove by ditch	C and G Groves	7	—	—	80	628	2,280	385	1,370	82	9-78

Table 2.3.2-2. Artesian Wells Sampled Near Hercules Injection Test Well

Well No.	Previous Desig-nation	Location of Wells	Owner	Casing Diameter (inches)	Total Depth (ft)	Water Quality: Temper-ature (°F)	Alkalinity (mg/L as $CaCO_3$)	Chlorides (mg/L)	Conductivity (µmhos/cm)	Total Hardness (mg/L as $CaCO_3$)	Dissolved Solids (mg/L)	Sulfate (mg/L)	Sample Date
39	—	SE, NE, NE Sec. 36, T33S, R38E	C and G Groves	—	—	82.0	140	731	2,800	565	1,700	154	9-78
41	—	NE, SE, NW, Sec. 25 T33S R38E	Buena Vista Groves	8	—	80.0	142	684	2,660	545	1,670	146	9-78
44	IR-49	SW, SW, NW, Sec. 26, T33S, R38E	Robert W. Newman	5 —	— —	— 80.0	163 —	255 —	1,260 —	310 —	740 —	100 —	9-78 10-58
46	IR-48	SW, SW, SW, Sec. 23, T33S, R38E	William Groves, III	4 —	— —	75.0 75.5	86 —	316 210	1,220 —	215 —	730 —	38 —	9-78 10-58
48	—	NE, SE, SE, Sec. 19, T33S, R39E	Art Karst	—	—	81.0	135	587	2,310	490	1,530	132	9-78
49	—	SE, SE, SW, Sec. 23, T33S, R38E	William Groves, III	—	—	—	143	608	2,490	505	1,670	158	9-78
50	—	SW, NW Sec. 35, T33S, R38E	J.T. Tesley Grove	8	—	80.0	130	663	2,570	500	1,690	130	9-78
51		SW, SE, SE, Sec. 30, T33S, R39E, Lockwood Lane	C and G Groves	—	—	—	59	742	2,610	410	1,600	91	9-78

Source: CH2M Hill, 1979.

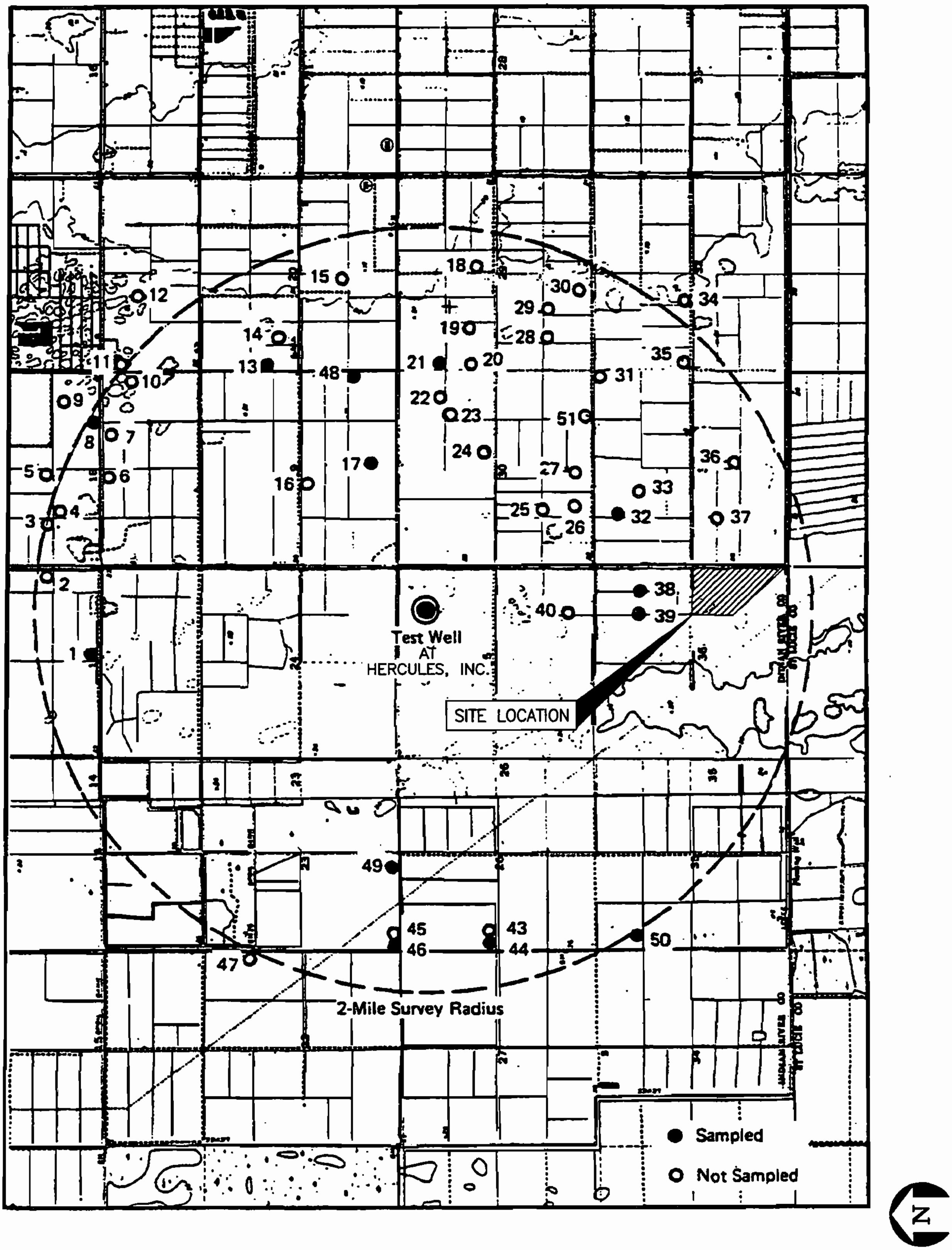

FIGURE 2.3.2-10.

LOCATIONS OF ARTESIAN WELLS INVENTORIED NEAR THE HERCULES, INC. DEEP INJECTION WELL SITE

Sources: CH2M Hill, 1979; ECT, 2000.

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for chloride is 250 mg/L. Clearly, the water in the Upper Floridan aquifer is relatively brackish in the area of the Site.

Characteristic Confining Units

Upper Confining Unit (UCU)

The UCU lies in between the surficial aquifer system and the underlying Upper Floridan aquifer (see Figures 2.3.2-1 and 2.3.2-2). It is primarily composed of the Hawthorn Group of Miocene age, although it can include some low permeability zones of late Pliocene to early Pleistocene origin (Tibbals, 1990). The UCU tends to dip toward the southeast and it also thickens in that direction (Lukasiewicz, 1992). Figure 2.3.2-11 represents the thickness of the UCU. The UCU is estimated to be approximately 260 to 270 ft thick in the Site area.

Various researchers have published UCU leakance coefficient values for the area of the Site. The leakance coefficient represents the hydraulic connection between the surficial aquifer system and the Upper Floridan aquifer. Tibbals (1990) estimated a range of leakance coefficient values of 1×10^{-6} to 1×10^{-5} day^{-1} (inverse days) for the UCU in the area of the Site (Figure 2.3.2-12). Toth (1994) used a value of 5×10^{-4} day^{-1} in his analytical model. Lukasiewicz (1992) used a value of 1×10^{-5} day^{-1} in his model for the Site area. Considering these data, a leakance coefficient value of 1×10^{-5} day^{-1} is considered representative for the UCU in the Site area.

In the Site area, Tibbals (1990) estimated an upward leakage (discharge) rate of 0.5 inch per year from the Upper Floridan aquifer, through the UCU, into the surficial aquifer system.

Middle Semi-Confining Unit (MSCU)

The MSCU separates the Upper Floridan aquifer from the Lower Floridan aquifer (Figure 2.3.2-2). It is comprised of a soft, chalky limestone and dolomitic limestone sequence of low permeability and of Eocene age. As shown in Figure 2.3.2-5, the MSCU is approximately 600 ft thick in the Site area, and its top occurs at an elevation of about 950 ft below msl (Tibbals, 1990).

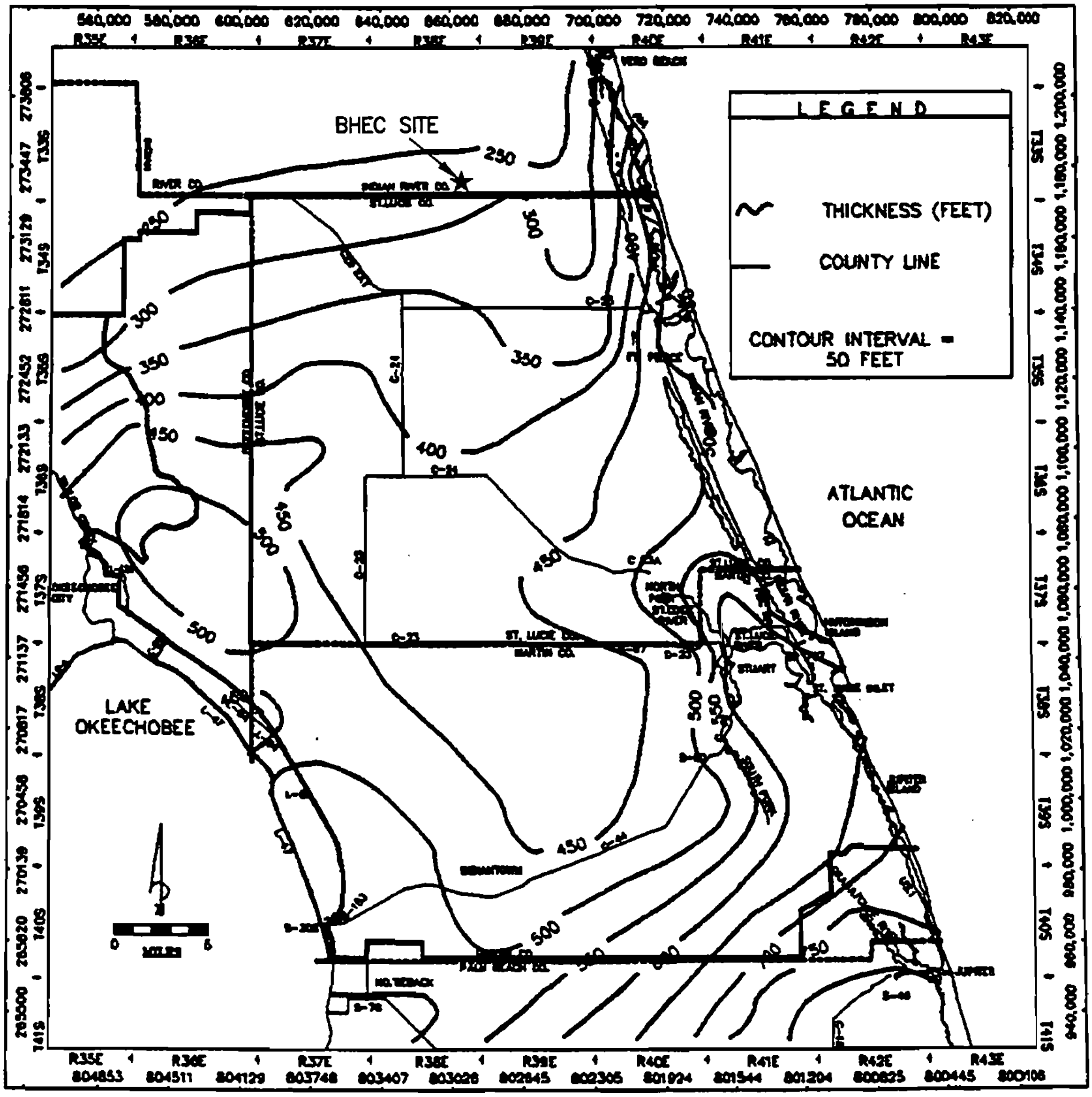

FIGURE 2.3.2-11.

THICKNESS OF THE UPPER CONFINING UNIT

Sources: Lucasiewicz, 1992; ECT, 2000.

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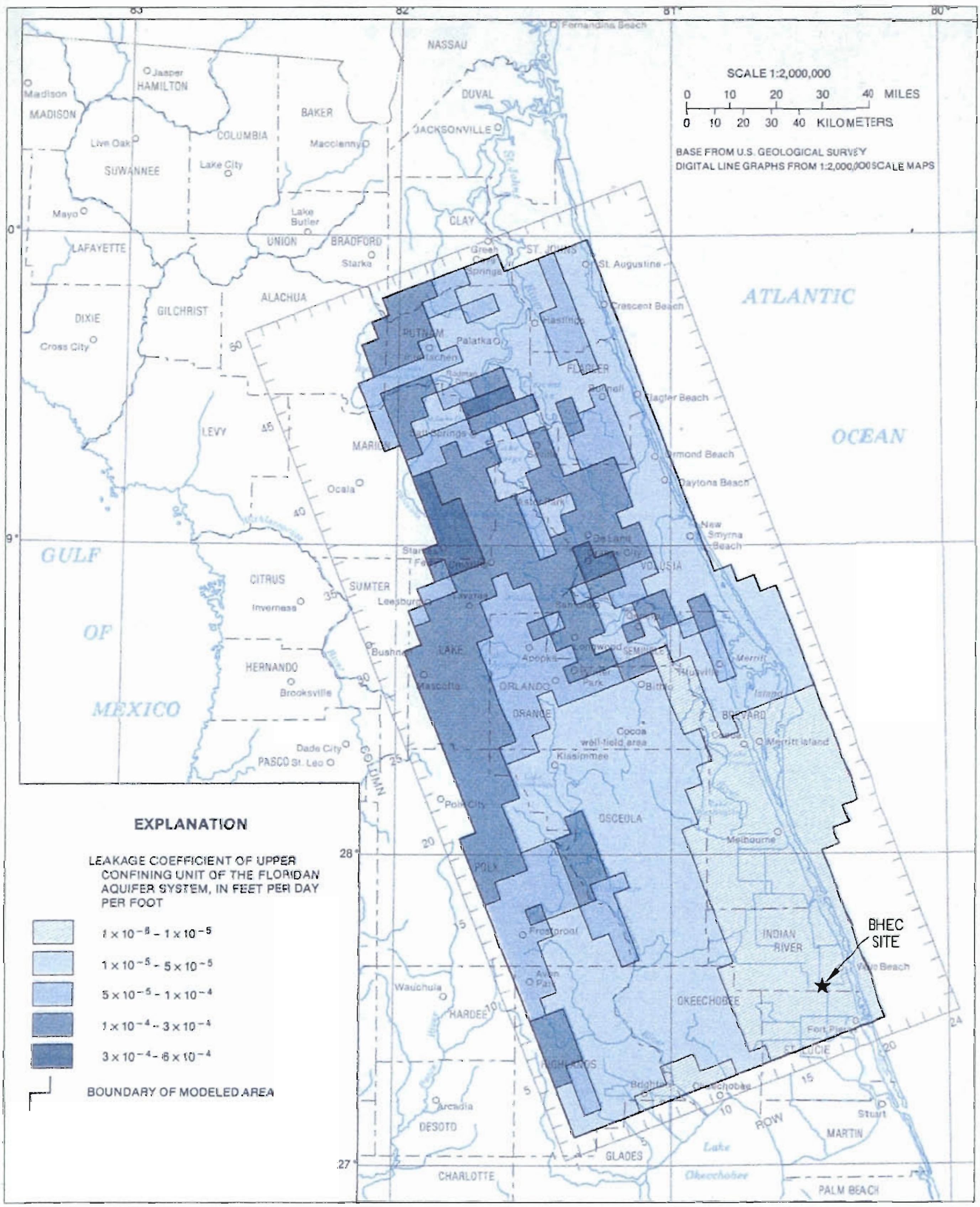

FIGURE 2.3.2-12.

MODEL DERIVED LEAKAGE COEFFICIENT OF THE UPPER CONFINING UNIT

Sources: Tibbals, 1990; ECT, 2000.

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Tibbals (1990) applied a leakance coefficient value of 5 x 10^{-5} day^{-1} in his model for the MSCU, although he indicated that no actual data were used to derive that number. In contrast, Lukasiewicz (1992) used a leakance coefficient value of 0.04 day^{-1} in his model for the MSCU, and he indicated reasonable confidence in this value. As such, the leakance coefficient value of 0.04 day^{-1} is considered a reasonable estimated leakance coefficient value for the MSCU in the Site area.

Based on the altitude and thickness of the MSCU described above, the top of the Lower Floridan aquifer is estimated to occur at an elevation of approximately 1,550 ft below msl. The base of the Lower Floridan aquifer occurs at approximately 3,400 ft below msl in the Site area (Tibbals, 1990). Information provided in Tibbals (1990) suggests that the Lower Floridan aquifer is approximately 1,850 ft thick, has a transmissivity of about 60,000 ft^2/day, and a storage coefficient of roughly 8 x 10^{-4}. The water quality is very brackish. This aquifer has little bearing on the Project and is not described here in detail. Figure 2.3.2-13 summarizes a variety of geologic, hydrologic, and water quality observations from a 3,000 ft deep borehole for a deep injection well at the Hercules, Inc. facility, located 1.8 miles north of the Site (CH2M Hill, 1979).

2.3.2.2 Karst Hydrogeology

The entire state of Florida is underlain by an extensive thickness of carbonate strata. These sedimentary units are subject to dissolution by the percolation of naturally occurring and slightly acidic recharge from rainfall. Over time, this process will develop solution cavities and features (secondary porosity) within the rock sequence as recharge infiltrates through the carbonate strata. The irregular land surface that eventually results from this process is called *karst topography*. Karst topography is usually recognizable on topographic maps by a high number of circular features, often containing water.

One of the more notable features of such terrain is sinkholes. The circular depressions caused by sinkhole formation are found throughout Florida, including Indian River County. Sinkholes may provide an avenue for surface water and ground water from the

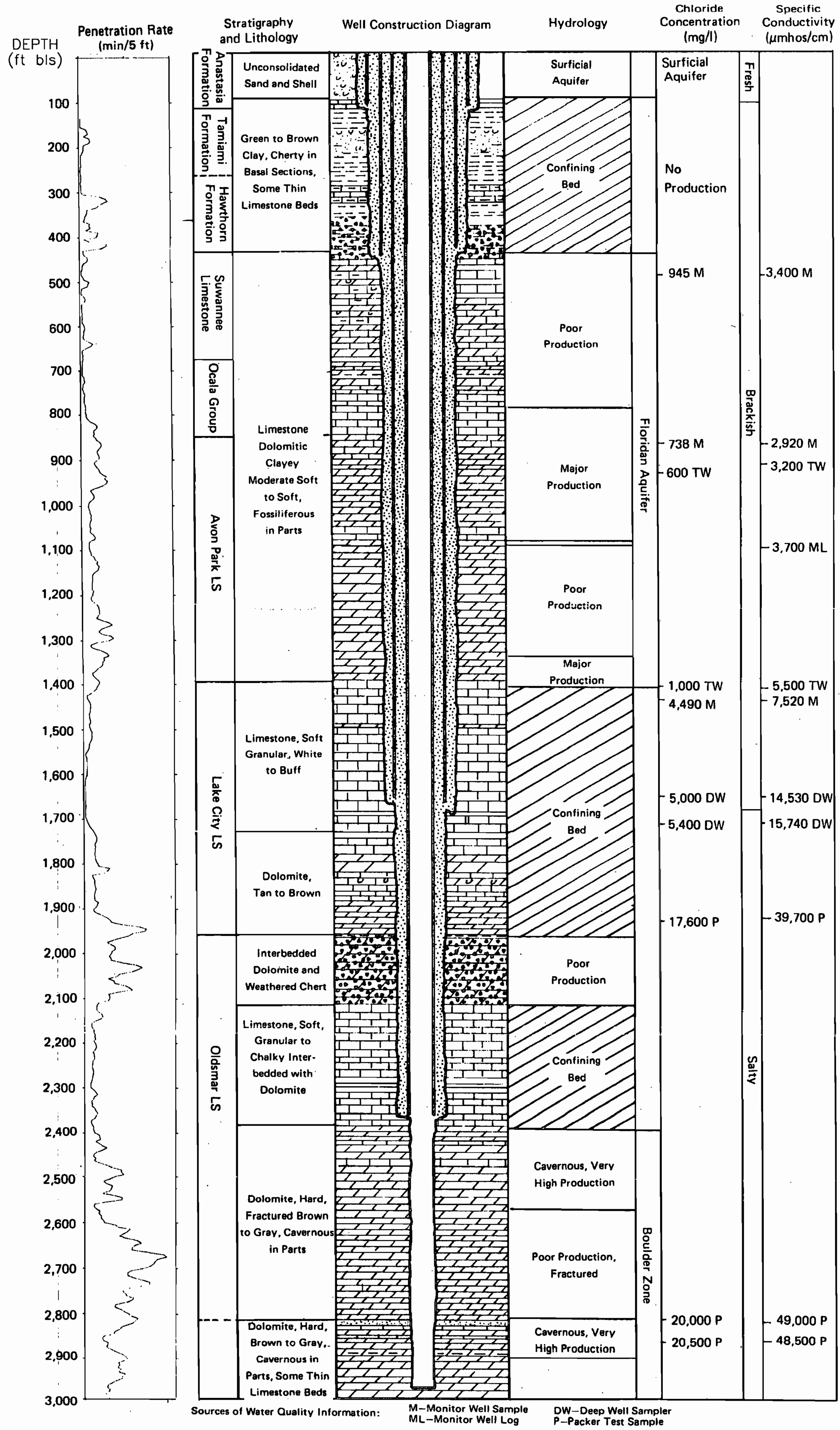

FIGURE 2.3.2-13.

GEOLOGIC, HYDROLOGIC, AND WATER QUALITY SUMMARY FROM THE DEEP INJECTION WELL AT THE HERCULES, INC. SITE

Sources: CH2M Hill, 1979; ECT, 2000.

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overlying aquifer to rapidly infiltrate into the lower stratigraphic units and aquifers. Generally, karst activity occurs at a slow rate resulting with the gradual subsidence of the land surface over a large area. This slow, dissolutioning process of the carbonate strata has been estimated to result in subsidence of as much as 1 ft every 5,000 to 6,000 years (Sinclair and Stewart, 1985). The types of sinkholes that develop in Florida are controlled by the geology and hydrogeology of the regions in which they occur. The three main types of sinkholes common in Florida include solution sinkholes, cover-collapse sinkholes, and cover-subsidence sinkholes. These sinkholes are readily distinguishable by their mode of formation.

Figure 2.3.2-14 shows a map of Florida indicating the areas prone to the development of the different types of sinkholes. The thickness and type of cover that overlies the limestone (carbonate) strata has a significant influence on the susceptibility to and the type of karst topography that develops. If present, a thick clay sequence (>200 ft) or other less permeable material with high artesian pressure would reduce the recharge potential. Hence, this type of cover results in less susceptibility to the development of karst features and sinkholes. In the Site area, "Sinkholes are few, shallow, of small diameter, and develop gradually. Cover subsidence sinkholes dominate" (Sinclair and Stewart, 1985).

Almost all sinkhole occurrences are in areas where the recharge rates to the Floridan aquifer are high, and the depth to the top of the Floridan aquifer is less than 200 ft bls (Tibbals, 1990). The Site area fits neither of these criteria. The Site is in a discharge area for the Floridan aquifer, not a recharge area, and the depth to the Floridan aquifer is approximately 400 ft bls; these facts significantly reduce the potential for sinkhole development at the Site. For these reasons, sinkholes are not expected to develop at the Site.

According to Bermes (1958), at least two geologic faults are inferred to exist in Indian River County. Both are essentially shore-parallel (oriented north by northwest); one parallels the Indian River Lagoon through the City of Vero Beach (approximately 7 miles east of the Site), the other is slightly west of Blue Cypress Lake (approximately 35 miles west of the Site). However, according to Lane (1983), no earthquakes or seismic activity

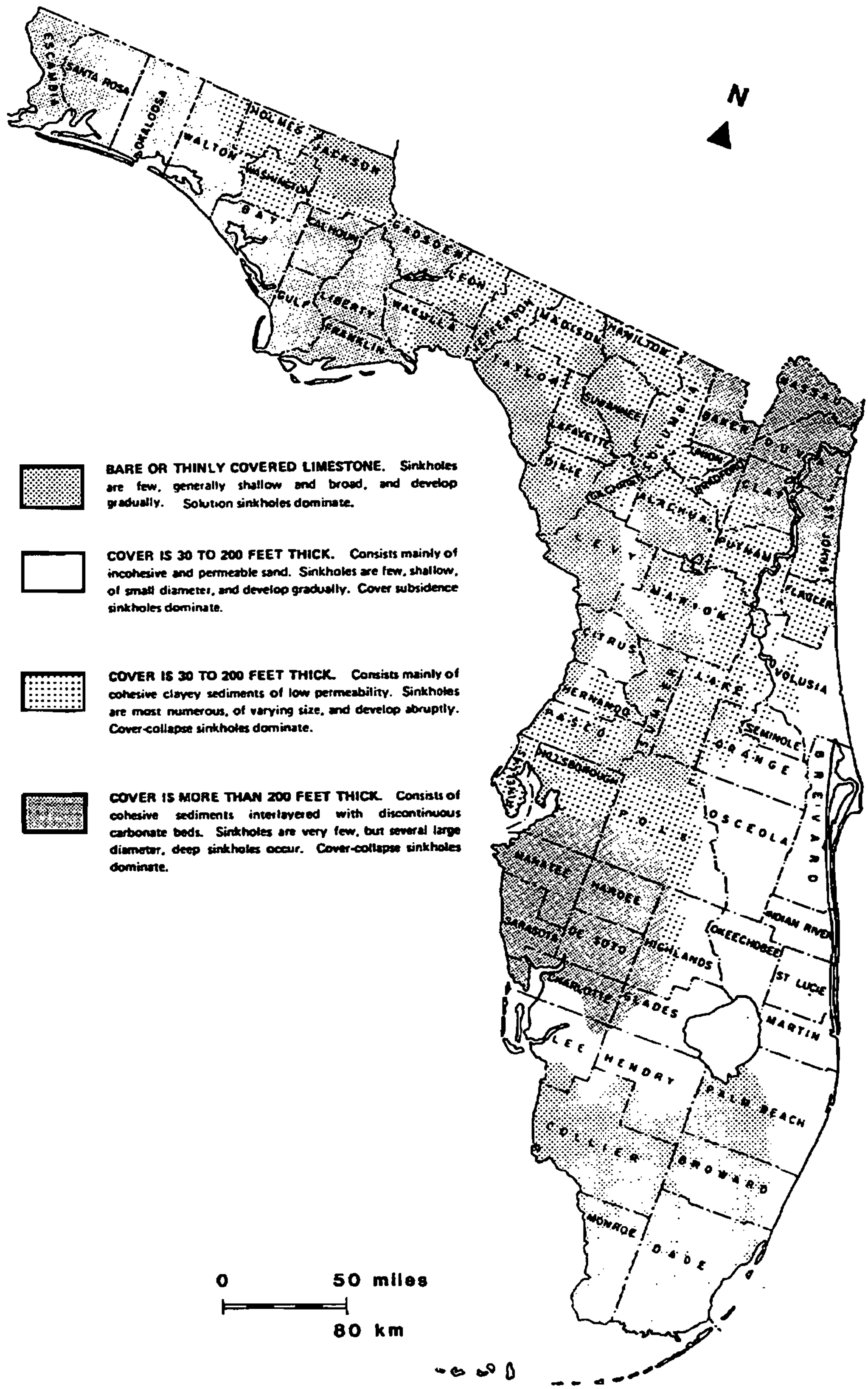

FIGURE 2.3.2-14.

MAP OF FLORIDA SHOWING AREAS PRONE TO SINKHOLE DEVELOPMENT (MODIFIED AFTER SINCLAIR & STEWART, 1985)

Sources: Williams, 1997; ECT, 2000.

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are known to have ever occurred in Indian River County. The *Seismic Risk Map of Florida* (Lane, 1983) shows this County as Zone 0, defined as "areas with no reasonable expectancy of earthquake damage." Accordingly, neither geologic faults nor seismic activity should pose a material threat to the Project.

2.3.3 SITE WATER BUDGET AND AREA USERS

The climate in this area is subtropical, characterized by warm annual temperatures, high humidity, and relatively high annual rainfall. Summers are long, with frequent thunderstorms and showers. Winters are mild with little rainfall. The wettest months are June through September. The driest months are typically December through February.

Average monthly temperatures and rainfall amounts for the period of October 1950 to September 1999 were determined based on meteorological data for West Palm Beach, Florida, and are shown in Table 2.3.3-1. Based on these data, the average annual temperature is 75.0°F (23.9 degrees Centigrade [°C]) and the average annual precipitation is 61.7 inches.

Table 2.3.3-1. Average Monthly Temperatures and Rainfall at West Palm Beach, Florida, for October 1950 through September 1999

Month	Temperature (°F)	Temperature (°C)	Rainfall (inches)
January	65.8	18.8	3.1
February	66.8	19.3	2.7
March	70.2	21.2	3.6
April	73.9	23.3	3.5
May	78.0	25.6	5.5
June	80.9	27.2	8.0
July	82.5	28.1	6.1
August	82.8	28.2	6.5
September	81.7	27.6	8.7
October	77.9	25.5	6.9
November	72.3	22.4	4.4
December	67.5	19.7	2.7
Average	**75.0**	**23.9**	**5.1**
Annual Total			**61.7**

Source: Foster Wheeler Environmental Corporation (FWENC), 2000.

The Site lies within the approximately 50,600-acre IRFWCD and is under the jurisdiction of the SJRWMD. The IRFWCD has an average elevation of 22 ft-msl and is characterized by very flat topography and sandy soils. A complex network of main canals, lateral canals, and sublaterals provide flood control. The district is shielded from outside inflow by a system of levees.

The watershed is actually a composite of three individual watersheds that are connected by equalizing canals and drainageways. Outflow occurs through three major outfall canals, viz., the Main Canal, the North Relief Canal, and the South Relief Canal, which empty into the Indian River between Sebastian and Fort Pierce Inlets. Outflow from these canals is controlled by control gate structures.

The IRFWCD area is a major citrus producer. The groves are irrigated with water obtained from the canal system as well as thousands of artesian wells installed in the Floridan aquifer. Flood irrigation is used, wherein water is pumped from the canals back into the fields. When water levels in the canals drop, ground water is released into the canals so as to be available for pumping.

Overall, the effective recharge capability of Indian River County is described by the SJRWMD as poor to very poor (SJRWMD, 1977). Recharge to the Floridan aquifer in this area is 0 inch per year. Estimated yearly runoff for water year 1996 is 44 inches (approximately 87 percent of annual precipitation).

Actual evapotranspiration (AET) is defined as the combined loss of water from soils by evaporation and plant transpiration. Estimated AET near the site area for water year 1996 ranges between 26 and 45 inches (approximately 51 to 89 percent of annual precipitation). The excess of runoff plus AET relative to rainfall (19 to 38 inches in water year 1996) is attributed to irrigation water.

Water use in Indian River County in 1996 is shown in Table 2.3.3-2.

Table 2.3.3-2. Water Use in 1996 By Category in Indian River County (MGD)

	Ground Water	Surface Water		Total
		Fresh Water	Saline Water	
Agricultural use (99 percent for irrigation)	49.80	128.56	0	178.36
Abandoned flowing artesian wells (Floridan aquifer; 5 with known flow and 33 estimated)	16.75	0	0	16.75
Public supply*	11.36	0	0	11.36
Domestic self-supply	7.37	0	0	7.37
Recreational and landscape irrigation (primarily golf courses)	2.42	1.30	0	3.72
Commercial and industrial	0.14	0	0	0.14
Thermo electric power generation (Vero Beach Municipal Power Plant)	0	0	49.77	49.77
Subtotal Surface Water		129.86	49.77	
Total Use	**87.84**	**179.63**		**267.47**

*Includes slightly saline water (250 to 1,000 mg/L chlorides) treated via reverse osmosis and diluted with fresh water.

Source: SJRWMD, 1999.

In 1996, Indian River County was by far the greatest single user of fresh surface water in the SJRWMD, accounting for 68 percent of SJRWMD's total. Agricultural irrigation was the primary use for this water. In 1996, total irrigated acreage in the county was 94,978 acres, of which 65,446 acres (or 69 percent) was citrus crops. According to the SJRWMD, a majority of the citrus groves in Indian River County are irrigated with artesian water originating from the Floridan aquifer. This lower quality water contains TDS concentrations in excess of 500 mg/L and is not suitable for human consumption. A small but undetermined amount of moderately saline water (i.e., 1,000<TDS<3,000 mg/L) was reportedly used for agricultural irrigation in Indian River County during 1996.

The SJRWMD projects Indian River County fresh water use to increase by only 5 percent by the year 2020, to 281.40 MGD (105.10 MGD ground water and 176.30 MGD surface water). The majority of the increase is for public supply and agricultural use (irrigated acreage is expected to increase to 96,127 acres by 2020). A breakdown of expected water use in 2020 by category is shown in Table 2.3.3-3.

Table 2.3.3-3. Projected Water Use in 2020 By Category in Indian River County (MGD)

	Ground Water	Surface Water		Total
		Fresh Water	Saline Water	
Agricultural use	67.91	172.6	0	240.51
Public supply	28.51	0	0	28.51
Domestic self-supply	0.87	0	0	0.87
Recreational and landscape irrigation	7.52	3.7	0	11.22
Commercial and industrial	0.29	0	0	0.29
Thermo electric power generation	0	0	54.9	54.9
Total Use	**105.1**	**176.3**	**54.9**	**336.30**

Source: SJRWMD, 1998.

Monthly breakdowns of water use in 1996 are shown in Table 2.3.3-4.

Table 2.3.3-4. Monthly Agricultural, Recreational, and Landscape Irrigation Water Use in Indian River County in 1996 (MGD)

January	1.58
February	240.6
March	0.1
April	527.55
May	172.33
June	2.84
July	110.95
August	452.14
September	345.57
October	1.44
November	346.83
December	108.71
Average	**192.55**

Source: SJRWMD, 1999.

As indicated in Table 2.3.3-4, the highest average usage for agricultural, recreational, and landscape irrigation was during April; the lowest usage was during March.

No ground water was used by the Vero Beach Municipal Power Plant during 1996 (Table 2.3.3-5).

Table 2.3.3-5. 1996 Monthly Thermoelectric Power Generation Water Use in Indian River County (Vero Beach Municipal Power Plant)

	Surface Water from Indian River (Saline Only)	
	(Million Gallons)	(MGD)
January	2,453.70	79.15
February	2,189.27	75.49
March	963.80	31.09
April	1,571.82	52.39
May	2,087.67	67.34
June	1,490.44	49.68
July	1,586.35	51.17
August	1,201.76	38.77
September	1,219.98	40.67
October	1,324.51	42.73
November	1,541.20	51.37
December	587.07	18.94
Annual Total	**18,217.57**	
Average	**1,518.13**	**49.90**

Source: SJRWMD, 1999.

No surface water was used by the commercial/industrial/institutional enterprises listed in Table 2.3.3-6 during 1996.

Table 2.3.3-6. 1996 Monthly Commercial/Industrial/Institutional Water Use in Indian River County

	Ocean Spray Processing Plant*	Sun-Ag/ Fellsmere Packing House†	Indian River Correctional Facility†	Total (million gallons)	Average (MGD)
January	3.63	0.53	0.85	5.01	0.16
February	3.75	0.49	0.84	5.08	0.18
March	4.29	0.49	0.85	5.63	0.18
April	4.05	0.50	1.03	5.58	0.19
May	2.12	0.43	1.06	3.61	0.12
June	1.82	0.22	0.93	2.97	0.10
July	2.30	0.21	1.10	3.61	0.12
August	3.41	0.18	1.15	4.74	0.15
September	1.73	0.20	0.81	2.74	0.09
October	2.27	0.24	1.11	3.62	0.12

Table 2.3.3-6. 1996 Monthly Commercial/Industrial/Institutional Water Use in Indian River County

	Ocean Spray Processing Plant*	Sun-Ag/ Fellsmere Packing House†	Indian River Correctional Facility†	Total (million gallons)	Average (MGD)
November	2.92	0.39	1.19	4.50	0.15
December	2.98	1.08	1.07	5.13	0.17
Annual total (million gallons)	**35.27**	**4.96**	**11.99**	**52.22**	
	Monthly average (MGD)				**0.14**

*Source of water is the Floridan and surficial aquifers.
†Source of water is the surficial aquifer.

Source: SJRWMD, 1999.

Table 2.3.3-7 provides a breakdown of the public water supply use in Indian River County in 1996.

A 5-mile radius around the BHEC Project Site encompasses parts of Indian River and St. Lucie Counties. The Indian River County portion of this circle is within the SJRWMD. The Indian River County consumptive use permit holders within the 5-mile radius are shown on Figure 2.3.3-1, and are tabulated in Tables 2.3.3-8 for ground water and 2.3.3-9 for surface water. The consumptive use permit holders within the 5-mile radius are provided in Table 2.3.3-10.

The portion of the circle in St. Lucie County lies within the South Florida Water Management District (SFWMD). SFWMD does not provide permit holder locations in a mappable format; however, they do provide locations within Range, Township, and Section. The St. Lucie County consumptive use permit holders within the 5-mile radius are included in Table 2.3.3-11.

Potable wells located within 1 mile of the Site are not readily identifiable from the Indian River County tables. There are some 21 wells permitted within the Indian River County area within 1 mile of the Site. Only two of the wells within 5 miles of the Site (see Table 2.3.3-8) are designated as potable (Status EO). They are owned by Lykes Brothers,

Table 2.3.3-7. 1996 Monthly Public Supply Water Use in Indian River County

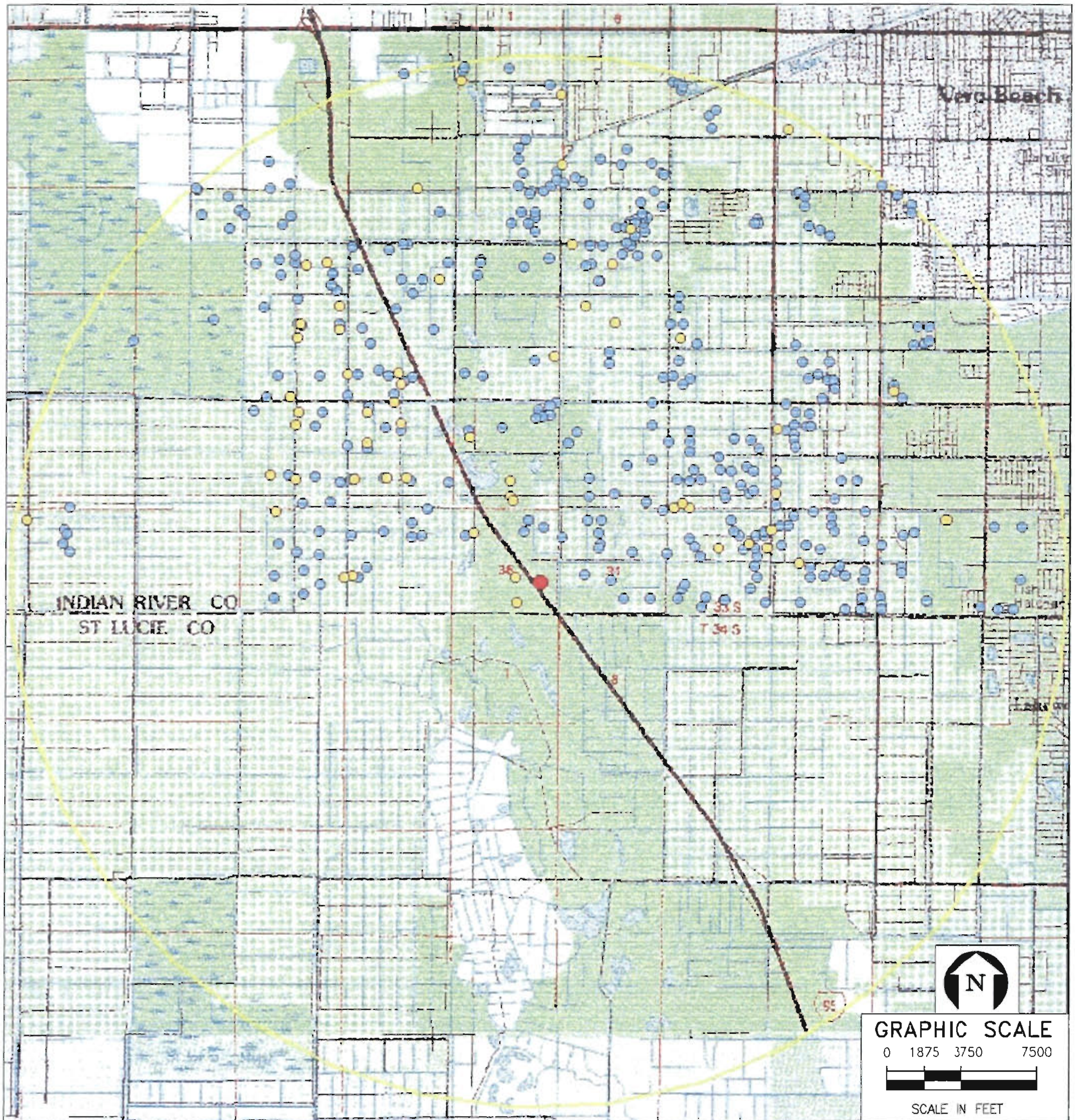
	Aspen Whispering Palms Plant #1*	Aspen Whispering Palms Plant #2*	Countryside North Mobile Home Park†	Fellsmere, City of‡	Indian River County Utilities (North Beach RO)‡	Indian River County Utilities (South RO)‡	Lakewood Village*	Oyster Pointe‡	City of Vero Beach †	City of Vero Beach)**	Total (Million Gallons)	Average (MGD)
January	0.71	0.67	2.32	8.49	10.94	117.18	0.66	0.85	131.56	64.24	337.62	10.89
February	0.74	0.69	2.11	8.23	11.32	120.78	0.54	0.92	169.51	47.55	362.39	12.50
March	0.59	0.68	2.42	8.43	11.93	126.81	0.69	0.97	127.42	65.56	345.50	11.15
April	0.25	0.56	1.77	8.58	11.67	119.28	0.58	0.93	175.06	72.15	390.83	13.03
May	0.25	0.35	1.09	8.29	10.83	119.94	0.85	0.86	123.33	68.09	333.88	10.77
June	0.13	0.18	0.69	7.60	10.90	113.25	0.53	0.91	170.10	50.68	354.97	11.83
July	0.13	0.20	0.43	7.36	11.92	110.92	0.21	0.99	118.99	65.32	316.47	10.21
August	0.11	0.18	0.31	8.30	12.36	124.00	0.44	0.94	124.12	61.01	331.77	10.70
September	0.08	0.21	0.33	8.42	11.33	108.75	1.22	0.76	144.10	69.66	344.86	11.50
October	0.17	0.36	3.14	8.87	10.90	93.00	1.21	0.77	139.99	64.80	323.21	10.43
November	0.44	0.60	3.41	9.07	11.43	120.78	1.14	0.71	183.86	39.33	370.77	12.36
December	0.65	0.57	3.27	8.75	11.42	122.57	1.18	0.76	132.49	62.68	344.34	11.11
Annual Total (Million Gallons)	4.25	5.25	21.29	100.39	136.95	1,397.26	9.25	10.37	1,740.53	731.07	4,156.61	
Average (MGD)	0.01	0.01	0.06	0.27	0.37	3.82	0.03	0.03	4.76	2.00		11.36

Note: RO = reverse osmosis.

*Source of water is Floridan aquifer and RO.
†Source of water is the surficial aquifer.

‡ Source of water is the Floridan aquifer.
** Source of water is the Floridan aquifer (treated saline)

Source: SJRWMD Technical Publication SJ99-3, diskette and page 82.



Surface Water Withdrawal Locations

Ground Water Withdrawal Locations

5-Mile Radius

Center of 5-Mile Radius

NOTE: LOCATIONS OF WATER USE PERMIT HOLDERS IN ST. LUCIE COUNTY NOT AVAILABLE IN MAPPABLE FORMAT FROM SFWMD.

FIGURE 2.3.3-1.

WATER USERS WITHIN A 5-MILE RADIUS OF THE SITE

Sources: SFWMD, 2000; ECT, 2000.

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Table 2.3.3-8. Indian River County Consumptive Use Permits—Ground Water (5-mile radius)

Permit #	Station ID	Well No.	Diameter (inches)	Depth (ft)	Capacity (gpm)	Status	GPS
77	18680	A	8.0	Unknown	Unknown	EC	
242	7036	A	3.0	Unknown	139.5	EC	
242	7036	A	4.0	Unknown	126	EC	
242	7037	B	5.0	Unknown	110.5	EC	
242	7037	B	6.0	Unknown	129	EC	
242	7038	C	3.0	Unknown	79.5	EC	
242	7038	C	4.0	Unknown	36	EC	
242	7039	D	6.0	Unknown	356.5	EC	
242	7039	D	6.0	Unknown	297	EC	
246	18799	A	5.0	Unknown	Unknown	EC	
246	18800	B	6.0	Unknown	Unknown	EC	
251	18789	A	5.0	Unknown	318	EC	
251	18790	B	4.0	Unknown	15	EC	
251	18791	C	4.0	Unknown	Unknown	EC	
263	18740	A	8.0	Unknown	872	EC	
1644	18578	A	12.0	830	2023	EC	
1654	18658	A	6.0	Unknown	Unknown	EC	
1654	18659	B	4.0	Unknown	Unknown	EC	
1654	18660	C	4.0	Unknown	Unknown	EC	
1654	18661	D	4.0	Unknown	Unknown	EC	
1655	18663	A	6.0	1000	550	EC	
1655	18664	B	6.0	500	580	EC	
1661	18681	A	2.0	1000	150	EC	
1661	18682	B	2.0	75	25	EO	
1661	18683	C	4.0	735	75	EC	
1661	18684	D	6.0	760	120	EC	
1661	18685	E	6.0	800	120	EC	
1661	18686	F	6.0	860	175	EC	
1661	18687	G	6.0	735	200	EC	
1661	18688	H	6.0	840	100	EC	
1661	18689	I	4.0	700	50	EC	
1661	18690	J	4.0	700	50	EC	
1662	18695	A	2.0	860	50	EC	
1662	18696	B	3.0	600	50	EC	
1662	18697	C	4.0	750	50	EC	
1662	18698	D	6.0	750	150	EC	
1662	18699	E	6.0	750	250	EC	
1662	18700	F	6.0	800	150	EC	
1662	18701	G	5.0	760	120	EC	
1662	18702	H	8.0	1000	150	EC	
1662	18703	I	6.0	650	150	EC	

Table 2.3.3-8. Indian River County Consumptive Use Permits—Ground Water (5-mile radius)

Permit #	Station ID	Well No.	Diameter (inches)	Depth (ft)	Capacity (gpm)	Status	GPS
1662	18704	J	6.0	760	100	EC	
1662	18705	K	6.0	750	150	EC	
1662	18706	L	2.0	80	Unknown	EC	
1662	18707	M	5.0	840	120	EC	
1662	18708	N	5.0	760	110	EC	
2030	18757	A	0.0	Unknown	Unknown	EC	
2068	7423	A	10.0	1000	900	EC	
2068	7424	B	5.0	650	100	EC	
2080	18579	A	8.0	300	950	EI	
2080	18580	B	4.0	300	700	EI	
2080	18581	C	3.0	300	600	EI	
2098	7590	A	6.0	Unknown	412	EC	
2098	7591	B	6.0	Unknown	441	EC	
2111	0	C	8.0	Unknown	200	EC	
2111	7652	A	8.0	Unknown	674	EC	
2111	7653	B	8.0	Unknown	479	EC	
2122	7701	A	8.0	Unknown	681	EC	
2122	7702	B	6.0	Unknown	471	EC	
2122	7703	C	6.0	Unknown	383	EC	
2122	7704	D	12.0	Unknown	1201	EC	
2122	7705	E	5.0	Unknown	225	EC	
2123	7709	A	6.0	Unknown	330	EC	
2139	7798	A	3.0	Unknown	Unknown	EC	
2139	7799	B	6.0	Unknown	Unknown	EC	
2145	18668	A	6.0	Unknown	351	EC	
2145	18669	B	6.0	Unknown	356	EC	
2154	7852	A	4.0	Unknown	Unknown	EC	
2173	7939	A	6.0	850	Unknown	EC	
2173	7940	B	6.0	850	Unknown	EC	
2173	7941	C	10.0	1200	Unknown	EC	
2175	7949	A	6.0	900	Unknown	EC	
2193	8090	A	8.0	Unknown	Unknown	EC	
2194	8091	A	6.0	Unknown	Unknown	EC	
2195	8092	A	0.0	Unknown	Unknown	EC	
2198	8101	A	6.0	900	125	EC	
2198	8102	B	5.0	Unknown	255	EC	
2200	8106	A	8.0	Unknown	400	EC	
2204	8126	A	8.0	900	500	EC	
2205	8127	A	6.0	900	403	EC	
2212	8146	A	6.0	Unknown	240	EC	
2212	8147	B	6.0	Unknown	80	EC	
2214	8151	A	8.0	Unknown	Unknown	EI	

Table 2.3.3-8. Indian River County Consumptive Use Permits—Ground Water (5-mile radius)

Permit #	Station ID	Well No.	Diameter (inches)	Depth (ft)	Capacity (gpm)	Status	GPS
2214	8152	B	4.0	Unknown	225	EC	
2220	8173	A	8.0	750	370	EC	
2220	8175	D	2.0	Unknown	Unknown	EC	
2224	8183	A	6.0	Unknown	Unknown	EC	
2224	8184	B	6.0	Unknown	Unknown	EC	
2228	8191	A	6.0	Unknown	Unknown	EC	
2234	8211	A	6.0	Unknown	460	EC	
2240	8227	A	5.0	Unknown	Unknown	EC	
2240	8228	B	5.0	Unknown	Unknown	EC	
2248	8276	A	6.0	Unknown	500	EC	
2249	8277	A	8.0	900	850	EC	
2249	8278	B	4.0	600	160	EC	
2250	8279	A	8.0	80	310	EC	
2252	8281	A	6.0	Unknown	250	EC	
2252	8282	B	4.0	Unknown	Unknown	EC	
2252	8283	C	4.0	Unknown	Unknown	EC	
2252	8284	D	4.0	Unknown	Unknown	EC	
2257	8307	A	6.0	Unknown	Unknown	EC	
2258	8308	A	6.0	Unknown	Unknown	EC	
2258	8309	B	12.0	Unknown	Unknown	PP	
2259	8310	A	8.0	Unknown	704	EC	
2260	8311	A	4.0	Unknown	Unknown	EC	
2260	8312	B	6.0	Unknown	Unknown	EC	
2260	8313	C	2.0	Unknown	Unknown	EC	
2261	8314	A	6.0	Unknown	343	EC	
2263	8334	B	5.0	Unknown	Unknown	EC	
2263	8335	C	4.0	Unknown	Unknown	EC	
2263	8336	D	6.0	Unknown	Unknown	EC	
2265	8345	A	10.0	950	750	EC	
2265	8346	B	4.0	750	160	EC	
2269	8357	A	4.0	Unknown	196	EC	
2269	8358	B	5.0	Unknown	244	EC	
2269	8359	C	6.0	Unknown	423	EC	
2275	8368	A	4.0	Unknown	Unknown	EC	
2275	8369	B	4.0	Unknown	Unknown	EC	
2275	8370	C	6.0	Unknown	Unknown	EC	
2289	8434	A	4.0	Unknown	137	EC	
2289	8435	B	4.0	Unknown	442	EC	
2289	8436	C	4.0	Unknown	589	EC	
2293	8479	A	6.0	Unknown	200	EC	
2293	8480	B	6.0	Unknown	200	EC	
2293	8481	C	5.0	Unknown	185	EC	

Table 2.3.3-8. Indian River County Consumptive Use Permits—Ground Water (5-mile radius)

Permit #	Station ID	Well No.	Diameter (inches)	Depth (ft)	Capacity (gpm)	Status	GPS
2293	8482	D	4.0	Unknown	135	EC	
2296	8492	A	6.0	Unknown	239	EC	
2296	8493	B	6.0	Unknown	501	EC	
2304	8511	A	8.0	Unknown	400	EC	
2307	8514	A	8.0	Unknown	Unknown	EC	
2307	8515	B	8.0	Unknown	Unknown	EC	
2309	8519	A	6.0	Unknown	Unknown	EC	
2309	8520	B	5.0	Unknown	Unknown	EC	
2309	8521	C	5.0	Unknown	Unknown	EC	
2313	8529	A	8.0	Unknown	670	EC	
2313	8530	B	8.0	Unknown	534	EC	
2314	8531	A	6.0	Unknown	Unknown	EC	
2317	8541	A	10.0	Unknown	Unknown	EC	
2317	8542	B	8.0	Unknown	Unknown	EC	
2318	8543	A	6.0	750	450	EC	
2325	8632	A	4.0	Unknown	Unknown	PP	
2325	8633	B	4.0	Unknown	Unknown	EC	
2338	18577	A	6.0	Unknown	300	EC	
2343	8685	A	8.0	900	1025	EC	
2345	8687	A	6.0	60	50	EC	
2345	8688	B	6.0	90	60	EC	
2346	8689	A	8.0	900	950	PP	
2348	8693	A	4.0	750	Unknown	PP	
2348	8694	B	10.0	950	1100	EC	
2350	8697	A	8.0	Unknown	800	EC	
2350	8698	B	5.0	Unknown	352	EC	
2350	8699	C	8.0	900	800	PP	
2364	18691	A	5.0	250	175	EC	
2364	18692	B	8.0	250	175	EC	
2364	18693	C	8.0	250	350	EC	
2364	18694	D	5.0	250	150	EC	
2379	18722	A	5.0	760	300	EC	
2379	18723	B	5.0	760	300	EC	
2383	8843	A	4.0	Unknown	Unknown	EC	
2383	8844	B	6.0	Unknown	Unknown	EI	
2383	8845	C	4.0	Unknown	Unknown	EI	
2383	8846	D	6.0	Unknown	Unknown	EI	
4475	18662	A	6.0	800	200	EC	
4481	18709	A	6.0	Unknown	Unknown	EC	
4481	18710	B	6.0	Unknown	Unknown	EC	
5196	7100	A	4.0	400	50	EC	
5196	7101	B	4.0	400	50	EC	

Table 2.3.3-8. Indian River County Consumptive Use Permits—Ground Water (5-mile radius)

Permit #	Station ID	Well No.	Diameter (inches)	Depth (ft)	Capacity (gpm)	Status	GPS
5196	7102	C	4.0	400	50	EC	
5196	7103	D	3.0	400	30	EC	
5216	7260	A	5.0	Unknown	Unknown	EC	
5216	7261	B	8.0	Unknown	Unknown	EC	
5348	7655	A	5.0	Unknown	Unknown	EC	
5348	7656	B	5.0	630	Unknown	EC	
5348	7657	C	4.0	630	Unknown	EC	
5400	18675	A	8.0	Unknown	Unknown	EC	
5400	18676	B	6.0	Unknown	Unknown	EC	
5400	18677	C	6.0	Unknown	Unknown	EC	
5548	8264	A	6.0	Unknown	Unknown	EC	
5548	8265	B	6.0	Unknown	Unknown	EC	
5606	8473	A	2.0	Unknown	Unknown	EC	
5606	8475	C	3.0	Unknown	Unknown	EC	
5606	8477	E	2.0	Unknown	Unknown	EC	
5701	8824	A	12.0	Unknown	Unknown	PP	
9655	0	C	10.0	800	1000	EC	
9655	7295	B	14.0	800	1100	EC	
9985	8381	A	6.0	Unknown	412	EC	
9985	8382	B	4.0	Unknown	210	EC	
9985	8383	C	4.0	Unknown	102	EC	
9987	8384	A	6.0	Unknown	367	EC	
9989	7599	A	5.0	Unknown	469	EC	
9989	7600	B	5.0	Unknown	294	EC	
9991	7534	A	10.0	900	Unknown	EC	
9991	7535	B	4.0	Unknown	Unknown	EC	
9991	7536	C	4.0	Unknown	Unknown	EC	
9992	8288	A	8.0	900	450	EC	
9993	8286	A	6.0	Unknown	Unknown	EC	
9993	8287	B	5.0	Unknown	Unknown	EC	
9996	8285	A	6.0	Unknown	Unknown	EC	
9998	7895	A	10.0	Unknown	Unknown	EC	
9998	7896	B	5.0	Unknown	Unknown	EC	
9998	7897	C	4.0	Unknown	Unknown	EC	
9998	7898	D	6.0	Unknown	Unknown	EC	
10071	7758	A	4.0	Unknown	156	EC	
10071	7759	B	8.0	Unknown	Unknown	EI	
10071	7760	C	5.0	Unknown	121	EI	
10071	7761	D	4.0	Unknown	191	EC	
10071	7762	E	12.0	Unknown	Unknown	EI	
10071	7763	F	4.0	Unknown	Unknown	EI	
10071	7764	G	2.0	Unknown	Unknown	EI	

Table 2.3.3-8. Indian River County Consumptive Use Permits—Ground Water (5-mile radius)

Permit #	Station ID	Well No.	Diameter (inches)	Depth (ft)	Capacity (gpm)	Status	GPS
10071	7765	H	2.0	Unknown	Unknown	EI	
10071	7766	I	6.0	Unknown	Unknown	EI	
10073	7767	A	3.0	Unknown	Unknown	EC	
10073	7768	B	5.0	Unknown	Unknown	EC	
10073	7769	C	3.0	Unknown	Unknown	EC	
10076	7770	A	6.0	600	400	EC	
10076	7771	B	5.0	600	250	EC	
10076	7772	C	3.0	600	Unknown	EC	
10076	7773	D	5.0	600	250	EC	
10076	7774	E	4.0	600	160	EC	
10076	7775	F	6.0	600	250	EC	
10076	7776	G	4.0	600	160	PC	
10076	7777	H	12.0	900	1500	EC	
10083	8272	A	6.0	Unknown	Unknown	EC	
10084	8270	A	6.0	Unknown	450	EC	
10084	8271	B	4.0	Unknown	5	EC	
10131	7913	A	6.0	900	350	EC	
10131	7914	B	4.0	600	100	EC	
10131	7915	C	4.0	600	100	EC	
10131	7916	D	5.0	600	350	EC	
10131	7917	E	4.0	600	150	EC	
10178	8478	A	6.0	1070	600	EC	
10184	8420	A	6.0	250	500	EC	
10184	8421	B	6.0	250	500	EC	
10184	8422	C	4.0	Unknown	Unknown	EO	
10214	7930	A	5.0	Unknown	324	EC	
10214	7931	B	5.0	Unknown	324	EC	
10214	7932	C	4.0	Unknown	159	EC	
10214	7933	D	4.0	Unknown	159	EC	
10214	7934	E	4.0	Unknown	159	EC	
10214	7935	F	6.0	Unknown	422	EC	
10215	7936	A	8.0	880	Unknown	EC	
10215	7937	B	8.0	880	8500	EC	
10215	7938	C	8.0	880	6400	EC	
10224	1689	B	10.0	Unknown	Unknown	EC	
10224	7835	A	6.0	Unknown	Unknown	EC	
10226	7835	A	8.0	Unknown	Unknown	EC	
10268	8423	A	5.0	750	700	EC	
10268	8424	B	10.0	750	450	EC	
10273	7153	A	4.0	Unknown	73	EC	
10273	7154	B	6.0	Unknown	321	EC	
10273	7155	C	6.0	Unknown	381	EC	

Table 2.3.3-8. Indian River County Consumptive Use Permits—Ground Water (5-mile radius)

Permit #	Station ID	Well No.	Diameter (inches)	Depth (ft)	Capacity (gpm)	Status	GPS
10273	7156	D	4.0	Unknown	144	PC	
10273	7157	E	6.0	Unknown	160	PC	
10273	7158	F	12.0	Unknown	2300	EC	
10273	7159	G	8.0	Unknown	746	EC	
10279	7682	A	5.0	Unknown	Unknown	EC	
10279	7683	B	6.0	Unknown	Unknown	EC	
10279	7684	C	4.0	Unknown	Unknown	EC	
10279	7685	D	4.0	Unknown	Unknown	EC	
10287	7448	A	4.0	Unknown	Unknown	EC	
10287	7449	B	4.0	Unknown	Unknown	EC	
10287	7450	C	4.0	Unknown	Unknown	EC	
10490	7059	A	8.0	Unknown	300	EC	
10490	7060	B	4.0	Unknown	Unknown	EC	
10701	7133	A	4.0	750	550	EC	
10701	7134	B	6.0	675	650	EC	
10701	7135	C	8.0	850	1056	EC	
10705	7250	S	12.0	Unknown	Unknown	EC	
10710	7283	A	10.0				Y
10710	7284	B	10.0				Y
10710	7285	C	10.0				Y
10710	7286	D	16.0				Y
10710	7376	E	12.0	65	380	EC	
10710	7377	F	6.0				Y
10710	7378	G	6.0				Y
10718	18566	A	8.0	1000	Unknown	EC	
10720	7335	A	8.0	900	500	EC	
10720	7336	B	6.0	250	400	EC	
10720	7337	C	4.0	250	900	EC	
10720	7338	D	4.0	250	120	EC	
10721	7339	A	6.0	750	450	EC	
10721	7340	B	6.0	750	450	EC	
10721	7341	C	6.0	750	450	EC	
10722	7342	A	8.0	Unknown	850	EC	
10731	7389	A	8.0	Unknown	Unknown	EC	
10731	7390	B	8.0	Unknown	Unknown	EC	
10731	7391	C	6.0	Unknown	300	EC	
10736	7420	A	4.0	Unknown	75	EC	
10736	7421	B	4.0	Unknown	75	EC	
10736	7422	C	4.0	Unknown	75	EC	
10745	7474	A	6.0	Unknown	Unknown	EC	
10745	7475	B	8.0	Unknown	Unknown	EC	
10745	7476	C	6.0	Unknown	Unknown	EC	

Table 2.3.3-8. Indian River County Consumptive Use Permits—Ground Water (5-mile radius)

Permit #	Station ID	Well No.	Diameter (inches)	Depth (ft)	Capacity (gpm)	Status	GPS
10745	7477	D	3.0	Unknown	Unknown	EC	
10746	7478	A	6.0	800	411	EC	
10746	7479	B	5.0	800	411	EC	
10746	7480	C	6.0	700	200	EC	
10746	7481	D	8.0	900	366	EC	
10746	7482	E	8.0	900	366	EC	
10748	7486	A	5.0	Unknown	Unknown	EC	
10748	7487	B	8.0	900	500	EC	
10753	7502	A	8.0	Unknown	Unknown	EC	
10754	7503	A	6.0	800	300	EC	
10754	7504	B	6.0	800	300	EC	
10754	7505	C	6.0	900	600	EC	
10754	7506	D	8.0	900	550	EC	
10757	7512	A	6.0	900	250	EC	
10757	7513	B	8.0	900	250	EC	
10769	7592	A	6.0	Unknown	275	EC	
10769	7593	B	4.0	Unknown	275	EC	
10769	7594	C	4.0	Unknown	95	EC	
10769	7595	D	4.0	Unknown	131	EC	
10769	7596	E	4.0	Unknown	265	EC	
10769	7597	F	4.0	Unknown	196	EC	
10769	7598	G	4.0	Unknown	265	EC	
10779	7662	A	5.0	Unknown	245	EC	
10779	7663	B	8.0	Unknown	647	EC	
10779	7664	C	8.0	Unknown	675	EC	
10779	7665	D	8.0	Unknown	675	EC	
10804	7782	A	4.0	Unknown	Unknown	EC	
10804	7783	B	5.0	Unknown	Unknown	EC	
10804	7784	C	12.0	Unknown	Unknown	EC	
10804	7785	D	5.0	Unknown	Unknown	EC	
10804	7786	E	4.0	Unknown	Unknown	EC	
10804	7787	F	5.0	Unknown	Unknown	EC	
10807	7791	A	8.0	Unknown	Unknown	EC	
10807	7792	B	8.0	Unknown	Unknown	EC	
10811	7814	A	6.0	Unknown	Unknown	EC	
10811	7815	B	6.0	Unknown	325	EC	
10826	7899	A	8.0	Unknown	675	EC	
10828	7904	A	4.0	Unknown	Unknown	EI	
10828	7905	B	5.0	Unknown	Unknown	EI	
10828	7906	C	5.0	Unknown	Unknown	EI	
10828	7907	D	4.0	Unknown	Unknown	EC	
10828	7908	E	5.0	Unknown	Unknown	EI	

Table 2.3.3-8. Indian River County Consumptive Use Permits—Ground Water (5-mile radius)

Permit #	Station ID	Well No.	Diameter (inches)	Depth (ft)	Capacity (gpm)	Status	GPS
10828	7909	F	5.0	Unknown	Unknown	EC	
10828	7910	G	4.0	Unknown	Unknown	EI	
10835	7950	A	10.0	Unknown	750	EC	
10835	7951	B	6.0	Unknown	300	EC	
10838	7959	A	10.0	1020	Unknown	EC	
11032	6987	A	10.0	1000	480	EC	
11231	6988	A	3.0	900	250	EC	
11231	6989	B	4.0	900	200	EC	
11231	6990	C	6.0	900	250	EC	
11231	6991	D	3.0	Unknown	125	EC	
11231	6992	E	3.0	Unknown	125	EC	
50060	18719	A	4.0	Unknown	Unknown	EC	
50060	18719	A	16.0	Unknown	100	EC	
50060	18720	B	4.0	Unknown	Unknown	EC	
50060	18720	B	4.0	Unknown	200	EC	
50203	0	A	8.0	700	150	EC	
50807	0	A	12.0			PP	

Note: EC = existing in use.
EI = existing inactive.
EO = existing domestic.
GPS = Coordinates provided with application.
PC = proposed in use.
PP = proposed for use.

Source: SJRWMD, 2000.

Table 2.3.3-9. Indian River County Consumptive Use Permits—Surface Water (5-mile radius)

Permit No.	Old Permit No.	Pump No.	Surface Water Body
2017	2-061-0044	A	Drainage Canal
2080	20-061-001	D	IRFWCD
2098	2-061-0180	C	Unknown
2122	2-061-0214	F	Ditch
2122	2-061-0214	G	Ditch
2122	2-061-0214	H	Ditch
2123	2-061-0215	B	Borrow pit
2154	2-061-0255	B	Private borrow pit
2185	2-061-0290	A	Borrow pit
2185	2-061-0290	B	Borrow pit #2
2185	2-061-0290	C	Borrow pit #3
2193	2-061-0299	B	Ditch
2193	2-061-0299	C	Ditch
2212	2-061-0328	C	Unnamed
2220	2-061-0340	C	IRFWCD
2220	2-061-0340	E	Unknown
2258	2-061-0392	C	IRFWCD
2300	2-061-0453	A	Borrow pit #1
2300	2-061-0453	B	Borrow pit #2
2302	2-061-0457	B	Canal
2304	2-061-0460	B	Unknown
2307	2-061-0463	C	Onsite ditches
2307	2-061-0463	D	Onsite ditches
2334	2-061-0498	A	Unknown
2334	2-061-0498	B	Unknown
2336	2-061-0502	A	Sand mine
5216	2-061-0091	C	Ditch
5640		B	SJWCD canal
10071	2-061-0230	J	SJWCD canal
10071	2-061-0230	K	SJWCD canal
10076	2-061-0232	I	East-west ditch
10076	2-061-0232	J	East-west ditch
10076	2-061-0232	K	Drainage ditch
10083	2-061-0378	B	Unknown
10084	2-061-0377	C	Ditch
10131	2-061-0271	F	Indian River canal
10184	2-061-0426	D	Unknown
10214	2-061-0275	G	Lateral B canal
10215	2-061-0276	D	IRFWCD
10226	2-061-0249	B	Canal
10273	2-061-0083	H	IRFWCD
10273	2-061-0083	I	IRFWCD

Table 2.3.3-9. Indian River County Consumptive Use Permits—Surface Water (5-mile radius)

Permit No.	Old Permit No.	Pump No.	Surface Water Body
10273	2-061-0083	J	IRFWCD
10490	2-061-0054	C	Drainage ditch
10490	2-061-0054	D	Drainage ditch
10718	20-061-000	B	Canal
10745	2-061-0154	E	Unknown
10745	2-061-0154	F	Unknown
10745	2-061-0154	G	Unknown
10745	2-061-0154	H	Unknown
10746	2-061-0155	F	Unknown
10746	2-061-0155	G	Unknown
10746	2-061-0155	H	North-south ditch
10746	2-061-0155	I	North-south ditch
10804	2-061-0233	G	IRFWCD
10826	2-061-0267	B	Canal
50203	2-061-0099	E	Swan Lake

Note: SJWCD = St. Johns Water Control District.

Sources: SJRWMD, 2000.
ECT, 2000.

Table 2.3.3-10. Indian River County Consumptive Use Permittees (5-mile radius)

Permit No.	Owner/Applicant
77	Lykes Brothers, Inc.
242	Deon D. Gaidry
246	Twin Pair Grove
251	Mr. Donald Beaty
263	Double O Jay Citrus
1644	Thomas R. Jones
1655	Mr. Othmar Zigrang
1661	Lykes Brothers, Inc.
1662	Lykes Brothers, Inc.
2068	Mr. Edwin Pprange
2080	A-1 Citrus Partnership
2098	Mr. Reed C. Knight
2111	R.W. Graves, Inc.
2122	Ed Pierce
2139	Mr. Sidney M. Banack, Jr.
2145	Smith Family Grove
2154	Mr.Alex MacWilliam, Jr.
2173	Packers of Indian River, Inc.
2185	Indian River Co Solid Waste Disposal Dis
2193	Ditch Five Sand Mine, Inc.
2194	Barnette Greene
2198	Mr.Phillip Helseth, Jr.
2198	Mr.Phillip Helseth, Jr.
2200	R.W. Graves, Inc.
2204	Marine and Vendega
2205	Mr. Philip W. Partee
2212	Mr. Frank Baratta
2214	Mr. Raymond A. Jackson
2220	Mr. Robert Linz
2224	Ms. karen r amos
2228	Paul C. Redstone
2234	J.E. Washburn
2240	Ms. Priscilla Amerikanos
2248	Mr. Hurley Rountree
2250	Mr. Mike Fletcher
2252	Harris Groves
2257	Frances Graves
2258	Mr. & Mrs. William Graves, III
2259	Frances Graves
2260	Ms. Frances Graves
2261	Mr. William Graves, IV
2263	Brantley J. Schirard

Table 2.3.3-10. Indian River County Consumptive Use Permittees (5-mile radius)

Permit No.	Owner/Applicant
2265	Parker Properties, Inc.
2269	Triple M Groves
2275	Carol Gollnick
2293	Mr. Frank Baratta
2300	IRFWCD
2302	Sexton Properties of Vero Beach, Inc.
2304	Clausson Lexow
2307	Graves Brothers Co
2309	Mr. Doyle T. Hogan
2313	Douglas A. Henderson
2317	Mr. John Morrison
2318	Mr. Randy Sexton, Jr.
2334	Mr. Charlie Price
2338	Mr. Thomas Jones
2343	Mr. Richard Yachon
2345	Florida Department of Corrections
2346	Mr. Frank G. Baratta
2348	Miraflores, Inc.
2350	Mr. Peter Lier
2364	Mr. Pat Hamilton
2383	Mr. William Graves, III
4475	Mr. Johnny Johnson
4481	Mr. Steven Cartwright
5216	Ms. Betty Joanne Mitchell
5348	Mr. J.M. Wells, Jr.
5400	Steven Mayo
5606	The Laurel Community Association, Inc.
5640	Mr. & Mrs. Charles Hall
5701	Mr. John Geany
9655	Mr. John M. Luther
9985	Mr. Henry Schacht
9987	Mr. Henry Schacht
9989	Mr. Henry Schacht
9991	Mr. Edward W. Elliott
9992	Michael F. and Ellen P. Shulock
9993	Mr. & Mrs. Ed Elliott
9996	Mr. Ed Elliott
9998	Mr. James J. McCann
10071	Mr. W.C. Graves, III
10073	Michael S. Linet
10076	Mr. Donald H. McAllister
10083	Mr. Hurley Rountree
10084	Mr. Hurley Rountree

Table 2.3.3-10. Indian River County Consumptive Use Permittees (5-mile radius)

Permit No.	Owner/Applicant
10131	Mr. Paul Freeman
10184	Mr. John Justin Schumann, Jr.
10214	Mr. Scott Lambeth
10215	Mr. George Lambeth
10224	Terry Ball
10226	Mr. Terry W. Ball
10268	Mr. David Prange
10273	Mr. William Graves, IV
10279	Frances Graves
10287	Mr. Byron H. Beatty
10490	Ms. Eloine S. Langdale
10701	Buena Vista Groves
10705	City of Vero Beach
10710	Ocean Spray Cranberries, Inc.
10718	Mr. James E. McDonnell, II
10720	Mr. Randy Sexton, Sr.
10721	CR Sexton Groves, Ltd.
10722	Carmela Grove Partnership
10731	Mr. Jesse J. Parrish, III, President
10736	Virlyn Groves, Inc.
10745	Mr. Robert Newman
10746	Mr. Robert Newman
10748	Mr. William Nicholas
10753	William E. Harris
10754	Mr. Nick Morris
10757	John T. Lesley, Inc.
10769	Mr. Henry Schacht
10779	C & G Groves
10804	Mr. Edward W. Elliott
10807	William M. Cobb
10811	Mr. T M & Mary Sue Barnes
10826	Steven Cassens
10828	Thomas G. Gallup
10835	Mr. David A. Knight
10838	Duneystein Corp
11231	Ms. Ruby Thornton
50060	Hammond Groves
50203	Manufactured Home Communities, Inc.
50807	Diamond Players Club

Source: SJRWMD, 2000.

Table 2.3.3-11. St. Lucie County Consumptive Use Permit Holders within SFWMD (5-mile radius)

Permit No.	Company	Use	Basin	Town-ship	Range	Section	Issue Date	Expiration Date	Annual Maximum (MG)	Monthly Maximum (MG)	Daily Maximum (MG)
56-00084-W	Strazzulla Brothers Company, Inc.	AGR	UE	34	38	1	12-May-94	15-Dec-01	1,357.49	413.98	
56-00075-W	Belair Groves Joint Venture	AGR	UE	34	38	2	22-Dec-95	15-Dec-01	333.93	122.9	
56-00111-W	Consolidated Citrus Limited Pa	AGR	UE	34	38	3	8-Mar-99	15-Dec-01	2,921.00	1,075.09	
56-00119-W	Belair Groves Joint Venture	AGR	UE	34	38	14	12-May-94	15-Dec-01	455.35	167.6	
56-00980-W	Evans Properties, Inc.	AGR	UE	34	38	15	12-May-94	15-Dec-01	310.47	114.27	
56-00103-W	Strazzulla Brothers Company, Inc.	AGR	UE	34	38	20	12-May-94	15-Dec-01	665.37	244.9	
56-00087-W	Chaplin, Franklin N.	AGR	UE	34	38	21	12-May-94	15-Dec-01	70.05	61.01	
56-00096-W	0 L C Inc	AGR	UE	34	38	25	6-Aug-96	15-Dec-01	0	0	
56-00017-W	Becker Holding Corporation	AGR	UE	34	38	26	12-May-94	15-Dec-01	430.06	158.28	
56-00006-W	Equitable Variable Life Insura	AGR	UE	34	38	27	17-Oct-96	15-Dec-01	846.82	311.68	
56-00176-W	Sexton, Charles R., Sr.	AGR	UE	34	39	2	12-May-94	15-Dec-01	91.99	33.86	
56-00200-W	Lelly, Kenneth H.	AGR	UE	34	39	2	12-May-94	15-Dec-01	36.8	13.54	
56-00114-W	Russos Christ M.	AGR	UE	34	39	3	12-May-94	15-Dec-01	4.6	1.69	
56-00123-W	Lambeth Citrus Products, Inc.	AGR	UE	34	39	3	12-May-94	15-Dec-01	38.45		
56-00169-W	Edsall Groves, Inc.	AGR	UE	34	39	3	12-May-94	15-Dec-01	49.67	18.28	
56-00175-W	Edsall Groves, Inc.	AGR	UE	34	39	3	12-May-94	15-Dec-01	13.8	5.08	
56-00179-W	Stone, Charles Jr.	AGR	UE	34	39	3	12-May-94	15-Dec-01	29.71	10.94	
56-00190-W	Geany, John J.	AGR	UE	34	39	3	12-May-94	15-Dec-01	23.46	8.63	
56-00193-W	Zern, Allen and Judy	AGR	UE	34	39	3	12-May-94	15-Dec-01	44.22	16.27	
56-00196-W	Forest Acres, Inc.	AGR	UE	34	39	3	12-May-94	15-Dec-01	5.47		
56-00090-W	Graves Brothers Company	AGR	UE	34	39	4	2-Nov-94	15-Dec-01	815.54	300.16	
56-00174-W	A-One Citrus	AGR	UE	34	39	4	12-May-94	15-Dec-01	18.4	6.77	
56-00183-W	McAllister, Donald H.	AGR	UE	34	39	4	12-May-94	15-Dec-01	68.99	25.39	
56-00572-W	McAllister, Donald H.	AGR	UE	34	39	4	12-May-94	15-Dec-01	16.56	6.09	
56-01175-W	Triple M Groves	AGR	UE	34	39	4	12-May-94	15-Dec-01	211.55	47.07	0
56-00627-W	Wynne Building Corporation Har	PWS		34	39	6	13-Feb-92	13-Feb-02	129.94	0	0.57
56-00765-W	Dickerson Florida, Inc	DEW		34	39	7	12-Apr-99	13-Mar-00	3,324.42	0	9.5
56-00177-W	McMillan Grove Land Trust	AGR	UE	34	39	8	15-Dec-94	15-Dec-01	44.69	8.64	0
56-00180-W	A-One Citrus	AGR	UE	34	39	8	12-May-94	15-Dec-01	26.22	9.65	
56-00215-W	Cassins Grove Service, Inc.	AGR	UE	34	39	8	12-May-94	15-Dec-01	71.04	26.16	
56-00231-W	Hamilton, David A.	AGR	UE	34	39	8	12-May-94	15-Dec-01	43.66		
56-00172-W	Fawsett, Charles F. Jr.	AGR	UE	34	39	9	12-May-94	15-Dec-01	48.23		

Table 2.3.3-11. St. Lucie County Consumptive Use Permit Holders within SFWMD (5-mile radius)

Permit No.	Company	Use	Basin	Town-ship	Range	Section	Issue Date	Expiration Date	Annual Maximum (MG)	Monthly Maximum (MG)	Daily Maximum (MG)
56-00181-W	Cassens Grove Service, Inc.	AGR	UE	34	39	9	12-May-94	15-Dec-01	25.3	9.3	
56-00203-W	A-One Citrus	AGR	UE	34	39	9	12-May-94	15-Dec-01	14.86	5.47	
56-00210-W	Equitable Life Assurance Socie	AGR	UE	34	39	9	24-Feb-95	15-Dec-01	301.04	110.8	
56-00230-W	Vinson, Augusta	AGR	UE	34	39	9	12-May-94	15-Dec-01	10.92		
56-00747-W	A-One Citrus	AGR	UE	34	39	9	12-May-94	15-Dec-01	9.2	3.39	
56-00771-W	Lykes Brothers, Inc.	AGR	UE	34	39	9	12-May-94	15-Dec-01	99.35	31.75	
56-01174-W	J D Crabb, J L & E T Minton &	AGR	UE	34	39	9	12-May-94	15-Dec-01	62.09	14.39	0
56-00125-W	Russakis, Jim G.	AGR	UE	34	39	10	12-May-94	15-Dec-01	31.28	11.51	0
56-00226-W	Ricci, Elsie	AGR	UE	34	39	10	12-May-94	15-Dec-01	21.86		
56-00124-W	Dungan, Lillian	AGR	UE	34	39	14	12-May-94	15-Dec-01	50.18		
56-00128-W	Yount, Benson O.	AGR	UE	34	39	14	12-May-94	15-Dec-01	17.7	3.39	
56-00216-W	Russakis Jim G.	AGR	UE	34	39	14	12-May-94	15-Dec-01	20.24	7.45	
56-00936-W	Mallonee, John	AGR	UE	34	39	14	12-May-94	15-Dec-01	31.28	11.51	
56-00112-W	Nelson, Cleora and Linn	AGR	UE	34	39	15	12-May-94	15-Dec-01	23.46		
56-00221-W	Triple M Groves, Inc and India	AGR	UE	34	39	15	12-May-94	15-Dec-01	729.58	268.53	
56-00093-W	Bernard A Egan Groves, Inc.	AGR	UE	34	39	16	12-May-94	15-Dec-01	310.92	63.61	0
56-00202-W	Wealden Company The	AGR	UE	34	39	16	9-Nov-94	15-Dec-01	20.7	10.37	
56-00666-W	G Y P 87 Ltd	AGR	UE	34	39	16	12-May-94	15-Dec-01	25.02	9.21	
56-01292-W	Brown Ranch	DEW		34	39	17	16-Jan-97	16-Jan-00	1,051.20	0	5.76
56-00092-W	Marnez Groves, Inc.	AGR	UE	34	39	20	12-May-94	15-Dec-01	185.04	68.1	
56-00192-W	Russakis Jim	AGR	UE	34	39	21	12-May-94	15-Dec-01	18.4	6.77	
56-00104-W	Larry McIver Groves	AGR	UE	34	39	22	12-May-94	15-Dec-01	8.5		
56-00105-W	Marnez Groves, Inc.	AGR	UE	34	39	22	12-May-94	15-Dec-01	26.59	9.78	
56-00113-W	Marnez Groves, Inc.	AGR	UE	34	39	22	12-May-94	15-Dec-01	32.84	12.09	
56-00182-W	Russakis, Jim	AGR	UE	34	39	22	12-May-94	15-Dec-01	28.93	6.9	
56-00186-W	Platts Norman Parker	AGR	UE	34	39	22	12-May-94	15-Dec-01	9.2	3.39	
56-00191-W	D L Scotto & Company, Inc.	AGR	UE	34	39	22	12-May-94	15-Dec-01	36.8	13.54	
56-00211-W	Cassins Grove Service Inc (roy	AGR	UE	34	39	22	12-May-94	15-Dec-01	30.21		
56-00233-W	Kuta, Stephanie a	AGR	UE	34	39	22	12-May-94	15-Dec-01	41.4	15.2	
GENERAL PERMITS											
56-00934-W	Clemens, Jean	PWS		34	39	2	16-Jul-90	20-Jun-10			0.0013
56-01036-W	Edsall Groves, Inc.	PWS		34	39	3	31-Jul-91	10-Jul-11			0.0015

Table 2.3.3-11. St. Lucie County Consumptive Use Permit Holders within SFWMD (5-mile radius)

Permit No.	Company	Use	Basin	Town-ship	Range	Section	Issue Date	Expiration Date	Annual Maximum (MG)	Monthly Maximum (MG)	Daily Maximum (MG)
56-00920-W	Florida Power and Light Company	PWS		34	39	14	07-Jun- 90	7-May-10			0.0021
56-00961	School Board of St Lucie County	LAN		34	39	14	26-Sep-90	6-Aug-10			0.0194
56-01087-W	Lakewood Park Baptist Church	PWS		34	39	14	29-Jul- 92	22-May-12			0.0026
56-01143-W	Zippy Mart Fl-507	IND		34	39	14	1-Jun-93	20-Apr-13			0.0144
56-01344-W	Riverview Oil Company, Inc.	LAN		34	39	14	25-Mar-98	25-Mar-18			0.0059
56-01377-W	National Oil and Gas Distribution	PWS		34	39	14	17-Dec-98	17-Dec-18			0.001
56-00723-W	Kuta, George S.	AGR		34	39	23	14-Feb-89	14-Feb-09			0.0395

Note: AGR = agriculture.
DEW = dewatering
IND = industrial.
LAN = landscape.
MG = million gallons.
PWS = public water supply.
UE = Upper East Coast.

Source: FWENC, 2000.

Inc. (Permit 1661), and Mr. John Justin Schumann (Permit 10184). The well owned by Wynne Building Corporation appears to be the only potable well within 1 mile on the St. Lucie County side. Its location at Township 34, Range 39, Section 6, could be within 1 mile of the Site.

2.3.4 SURFICIAL HYDROLOGY

2.3.4.1 Hydrologic Characterization

Physical Characteristics

The Site is located within the IRFWCD, a F.S. Chapter 298 Drainage District formed in 1919 in Indian River County. It operates under the jurisdiction of the SJRWMD. The IRFWCD watershed area lies between the 1-mile Atlantic coastal ridge and I-95 (Ten-mile Ridge). This approximate 50,600-acre watershed includes almost all of Township 33 South, Range 39 East; Sections 4–9, 15-22, 27-35 in Township 32 South, Range 39 East; and Sections 1-5, 9-15, 22-27, 34-36, in Township 33 South, Range 38 East. The IRFWCD's boundaries extend from County Road (CR) 510 in Wabasso at its northern extent, to 112th Avenue in Vero Beach at the western extent, and 25th Street SW, the boundary of St. Lucie County, at its southern extent. The 1-mile coastal ridge provides the eastern extent of the District's boundary (see Figure 2.3.4-1). The IRFWCD's primary functions are providing drainage, flood protection, and a source of irrigation water. The IRFWCD has more than 200 miles of interconnected drainage canals. Three primary outfalls, the Main Canal, the North Relief Canal, and the South Relief Canal, discharge approximately 100 million gallons of runoff over the watershed area into the Indian River Lagoon during an average day. Figure 2.3.4-2 shows the locations of the IRFWCD canals and radial gate control structures.

Surface Waters—Canals

The canals within the IRFWCD are classified as Class III surface waters. The water in the canal system is comprised of surface water runoff, water from the Floridan aquifer pumped from artesian wells, and surficial aquifer water drawn into the system in areas where the canals have ground water inflows. Four radial gate structures, one at each primary outfall canal and one on Lateral C Canal, control the discharge and water levels in the system year round. There are two elevations maintained by the gate structures in the system. The lower pool is maintained at an elevation of approximately 15.5 feet National Geodetic Vertical Datum (ft-NGVD) and the upper pool is maintained at an elevation of approximately 18.5 ft-NGVD. The coastal pool area of the IRFWCD system is located downstream of the three primary canal gate structures.

FIGURE 2.3.4-1.

IRFWCD WITHIN EAST INDIAN RIVER COUNTY

Sources: Carter Associates, 2000; ECT, 2000.

CALPINE
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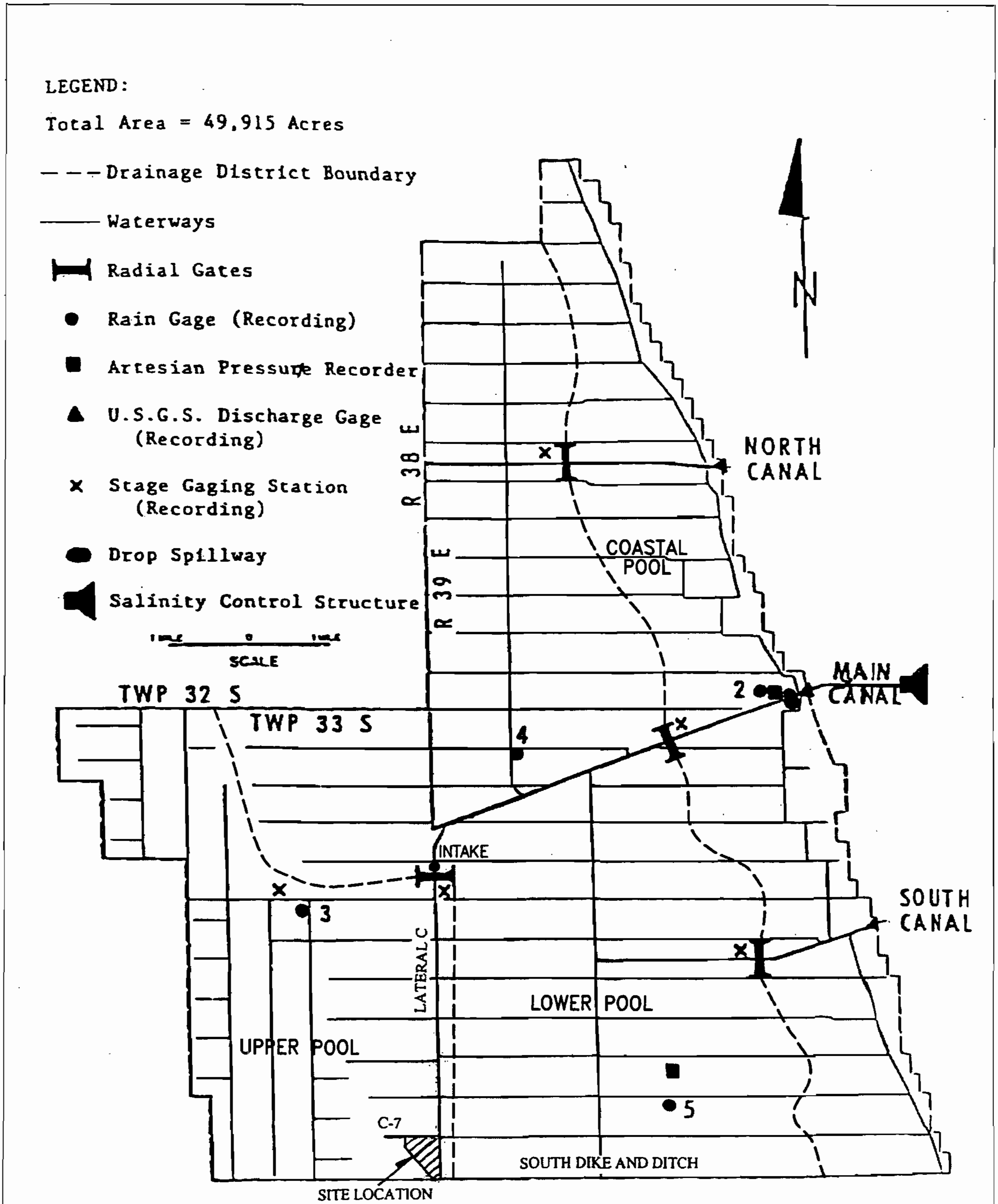

FIGURE 2.3.4-2.

IRFWCD CANAL NETWORK AND GATE LOCATIONS

Sources: Carter Associates, 1990; ECT, 2000.

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In 1988, Carter Associates, Inc., in conjunction with Williams, Hatfield & Stoner, Inc., conducted a study of the IRFWCD (Carter Associates, Inc., 1990) that included hydrologic and hydraulic modeling of the canal system. The primary purpose of the modeling effort was to determine flow characteristics and flood elevations associated with the 10-, 25-, and 100-year storm events. The modeling results were utilized to make recommendations to upgrade IRFWCD facilities. The hydrologic and hydraulic model used for this study is currently being updated and upgraded for use in the master storm water management plan development efforts for the watershed being conducted by Indian River County, SJRWMD, and IRFWCD.

The IRFWCD area is a large producer of citrus, the groves being irrigated by water withdrawn from the canal system and more than 1,000 wells completed in the Floridan aquifer. The IRFWCD maintains a water use permit issued by the SJRWMD allowing withdrawal from the canals of up to 14.33 billion gallons annually for irrigation use and an additional 2.4 million gallons for use in freeze protection during the winter season. Citrus groves are, at times, flood irrigated, wherein water is pumped from the canals into the fields to raise the water table temporarily. Following irrigation, the water is released into the nearest drainage canal. When water levels in the canals drop, well water is released into the canals to be available for pumping. Low-volume irrigation systems, either jet spray or drip, are the most common type of irrigation system in the county. Although these systems generally rely on artesian well water from the Floridan aquifer, flood irrigation using canal water is used as a supplement during drought periods.

Surface waters near the Site consist of the IRFWCD Sublateral C-7 Canal abutting the northern property boundary; Lateral C Canal, across the 74^{th} Avenue right-of-way directly east of the Site; and the South Dike and Ditch adjacent to the southern property boundary and parallel to the Indian River and St. Lucie County line. There are also three borrow pits located approximately 1,000 to 2,000 ft to the west and north of the Site on the west side of I-95. These borrow pits were dug for fill during the construction of the adjacent segment of I-95 in the 1970s and are also classified as Class III surface waters. The Site is located within the upper pool of the IRFWCD, which is normally maintained at an elevation of approximately 18.5 ft-NGVD.

Discharge

Discharge from the canal system has been monitored by the USGS since 1949 with stage gauges located at the Main, South, and North Canals. An analysis of the historic flow data recorded by the USGS between 1949 and 2000 shows that the median flow of water out of the system during that period was 49.5 MGD. A Pareto analysis of the data indicates that there were only 85 days in the 50-year period (i.e., approximately 0.5 percent of the time) in which the flow out of the system was less than 10 MGD and only five 7-day periods had average flows less than 10 MGD. The results of the analysis are reflected on Table 2.3.4-1. Monthly average flows and minimum monthly flows for the period of record are reflected in Figures 2.3.4-3 and 2.3.4-4, respectively.

Table 2.3.4-1. Historic Flow Values for Main, North, and South Canals (MGD)

	Main Canal	South Canal	North Canal	Total Daily Flow
Median flow	25.8	11.0	11.0	49.5
Mean flow	48.3	25.7	20.8	94.7
Minimum flow	0.01	0.35	0.39	3.65
Median of weekly averages	32.4	13.4	12.4	57.6
Minimum 7-day flow	1.24	0.69	1.51	5.99

Source: USGS, 2000.

Water Quality

The predominant surface water body in the region is the Indian River Lagoon, which receives the excess storm water runoff from the IRFWCD. The Indian River Lagoon is a long and shallow estuary system that stretches along Florida's east coast for 156 miles, from Volusia County to Palm Beach County. The system encompasses several water bodies, including the Indian River in the south and the Banana River and Mosquito Lagoon in the north.

The state's Surface Water Improvement and Management (SWIM) plan identifies the major concern for the lagoon as the degradation of the quality of the brackish estuarine environment due to the inflow of excessive fresh water, primarily storm water runoff,

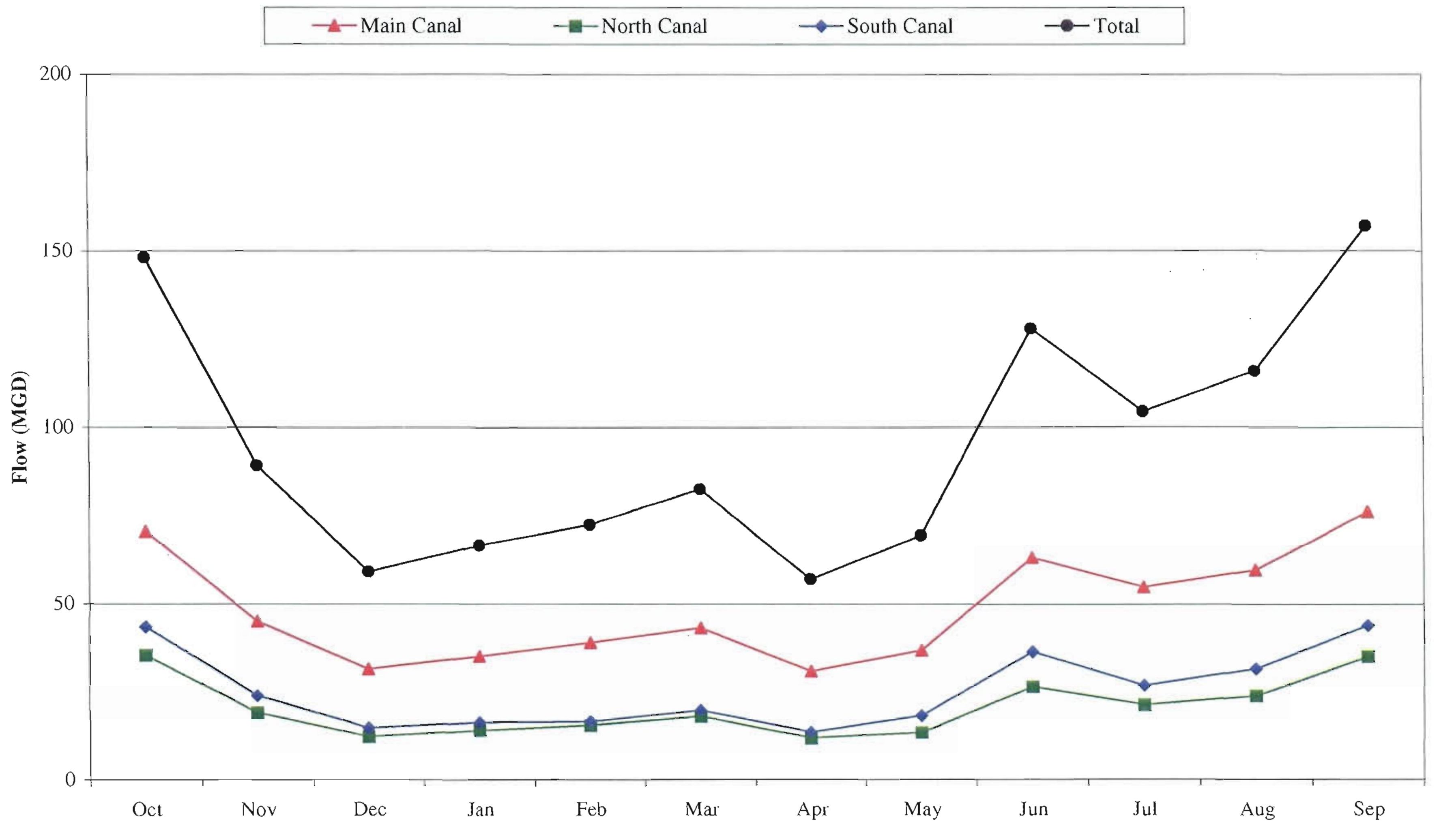

FIGURE 2.3.4-3.

MAIN, NORTH, AND SOUTH CANALS—MONTHLY AVERAGE FLOW (1/1/49—9/30/96)

Sources: USGS, 2000; ECT, 2000.

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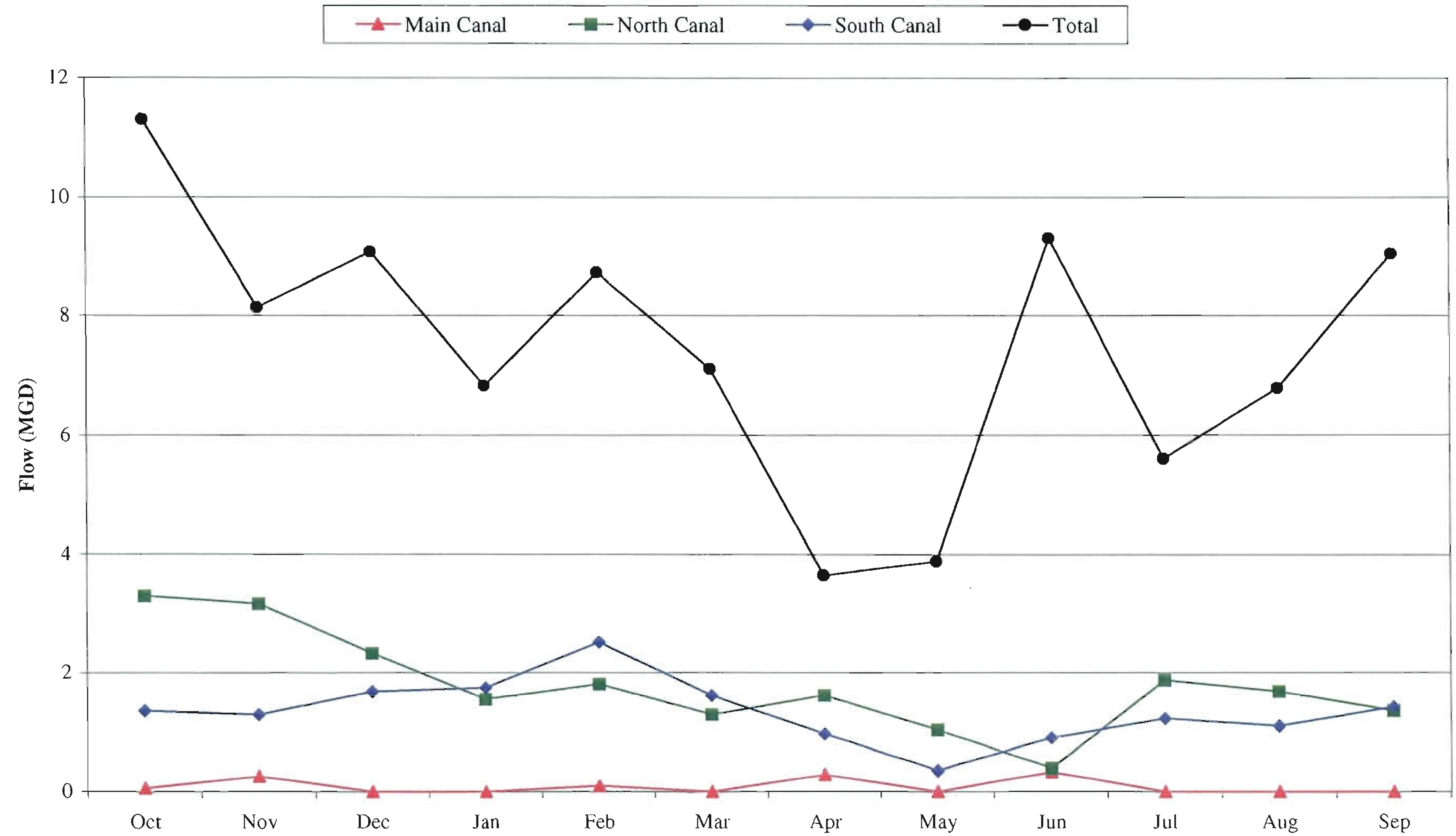

FIGURE 2.3.4-4.

MAIN, NORTH, AND SOUTH CANALS—MINIMUM MONTHLY FLOWS (1/1/49—9/30/96)

Sources: USGS, 2000; ECT, 2000.

CALPINE BLUE HERON ENERGY CENTER

which degrades shellfish habitat and introduces soils and pollutants (mainly nitrogen and phosphorus) that foster algal growth and kill seagrasses.

The portion of the lagoon that crosses Indian River County is known as the South Central Indian River Lagoon segment. The primary sources of pollutant loadings to this segment are urban and agricultural runoff conveyed by extensive drainage systems and the effluent from the City of Vero Beach wastewater treatment plant. Results of SJRWMD sampling performed along this segment from 1988-1994 are shown in Table 2.3.4-2.

Table 2.3.4-2. Indian River Lagoon Water Quality Sampling

Parameter	Units	Minimum	Mean	Maximum
Total suspended solids (TSS)	mg/L	1.0	36.1	102.0
Turbidity	NTU	1.3	6.6	44.0
Salinity	ppt	4.8	26.1	35.9
TKN	mg/L	0.05	0.89	2.3
Total phosphorus	mg/L	0.01	0.14	1.8
pH	S.U.	6.4	7.8	8.2
Dissolved oxygen	mg/L	3.2	6.4	9.2
Chlorophyll *a*	µg/L	0.85	12.1	47.4

Note: ppt = part per thousand.
S.U. = standard unit.
µg/L = microgram per liter.

Source: SJRWMD, 1999b.

The total phosphorus levels in this segment are higher than anywhere else in the Indian River Lagoon system. The low salinity values are attributed to the large volume of fresh water flowing into the lagoon from the Sebastian River and excess fresh water from the IRFWCD canal system.

On March 22, 2000, ECT conducted a surface water sampling effort of the IRFWCD canal system. Water samples were collected from the following locations:

- North Canal (two locations).
- South Canal (two locations).
- Main Canal (two locations).

- WWTP Canal.
- Lateral C Canal.
- Sublateral C-7 Canal.
- Indian River.

Summary results of the sampling effort are shown in Table 2.3.4-3. Sampling locations for the primary canal water samples are shown in Figure 2.3.4-5.

To determine average water quality in the IRFWCD's North Canal, Main Canal, and South Canal over the extensive period of record, water quality data from STORET and WQN were combined with the March 2000 water quality data. The resultant data set provides average water quality for these canals for the period of 1954-2000. The data shows that, for the most part, the average water quality of the canals is within the limits of the Class III Fresh Water Standards. The Main Canal reflects higher concentrations of mercury and silver than the fresh water standards. In addition, dichlorodiphenyltrichloroethane (DDT) was detected in the Main Canal and Lateral C Canal.

For the most part, the water quality data indicated general agreement with the historical water quality data summarized in Table 2.3.4-4. Notable in the March 2000, ECT sampling results was the presence of DDT in samples from the Lateral C Canal sample (0.46 μg/L) and the Main Canal Sample (0.28 μg/L).

To confirm the presence or absence of the DDT and to provide supplemental inorganic data sets, the Lateral C Canal and Main Canal were resampled on July 12, 2000. In addition to surface water sampling, sediment samples were collected at these locations to determine if DDT was present in the sediments on the upstream side of the control structure, coincident with the surface water sampling locations. The sediment samples were collected to determine if a DDT source was present. Also, a water sample from the county's reclaimed system was collected for analyses. The resampling indicated a general correlation of the inorganic constituents with the March 2000 data set, and DDT was not detected in either the surface water or sediment samples. Summary results of this resampling are summarized in Table 2.3.4-5.

Table 2.3.4-3. Indian River County Surface Water Samples, March 2000 Sampling Event (mg/L unless otherwise indicated)

Constituent	North Canal	South Canal	Main Canal	WWTP Canal	Lateral C	Sublateral C-7	Indian River
Aluminum	< 0.050	< 0.050	0.061	< 0.050	0.05	0.093	0.26
Antimony	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Arsenic	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Barium	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Beryllium	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Boron	0.11	0.10	0.11	0.14	0.13	< 0.10	3.5
Cadmium	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Calcium	97	100	97	96	100	80	360
Chromium	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Cobalt	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Copper	0.0025	0.0028	0.0033	0.0039	0.0042	< 0.0010	0.0018
Iron	0.23	0.099	0.13	0.29	0.23	1.9	0.18
Lead	0.006	0.006	< 0.050	< 0.050	< 0.050	0.005	0.005
Magnesium	31	26	36	35	35	3.2	1,100
Manganese	0.017	< 0.010	0.014	0.015	0.016	< 0.010	0.012
Mercury	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020	< 0.00020
Molybdenum	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.024
Nickel	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Selenium	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Silicon	5.8	2.7	4.6	6.6	5.5	3.9	4
Silver	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050	< 0.00050
Sodium	120	120	180	200	170	< 50	9,000
Thallium	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Tin	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Titanium	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Zinc	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Alkalinity (as $CaCO_3$)	180	190	160	140	170	170	140
Ammonia-N	< 0.030	0.04	0.04	< 0.030	0.05	0.09	0.04

Table 2.3.4-3. Indian River County Surface Water Samples, March 2000 Sampling Event (mg/L unless otherwise indicated)

Constituent	North Canal	South Canal	Main Canal	WWTP Canal	Lateral C	Sublateral C-7	Indian River
BOD	< 2.0	< 2.0	< 2.0	3	< 2.0	< 2.0	< 2.0
Chloride (total)	300	270	410	580	380	66	19,000
COD	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	3,100
Specific conductivity, mmhos/cm	1,400	1,400	1,800	1,700	1,600	590	36,000
Cyanide (total)	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluoride	0.4	0.3	0.4	0.5	0.4	< 0.20	0.7
Hardness (as $CaCO_3$)	390	380	430	460	410	240	88
Nitrate-N	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	0.02	< 0.020
Nitrite-N	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Nitrate-Nitrite-N	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	0.02	< 0.020
Total Kjeldahl-N	0.62	0.87	0.65	1	0.68	2.6	1.7
Nitrogen, total organic	0.62	0.83	0.61	1	0.63	2.5	1.7
Phosphorus (total)	0.21	0.19	0.16	0.12	0.12	0.37	0.13
pH, S.U.	8	8.1	8	8.1	8	8	8.1
Sulfate (total)	91	73	86	47	72	12	1,900
Sulfide (total)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TDS	820	750	960	970	890	340	26,000
Total organic carbon	12	13	10	10	11	19	6
TSS	2	4	2	3	4	8	20
Turbidity, NTU	2	2	2	3	2	10	5
Bromide	1.04	0.86	1.32	1.32	1.2	0.215	58.5
Sulfite	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
DDT	<0.05	<0.05	0.28	<0.05	0.46	<0.05	<0.05

Source: ENCO Laboratories, 2000.

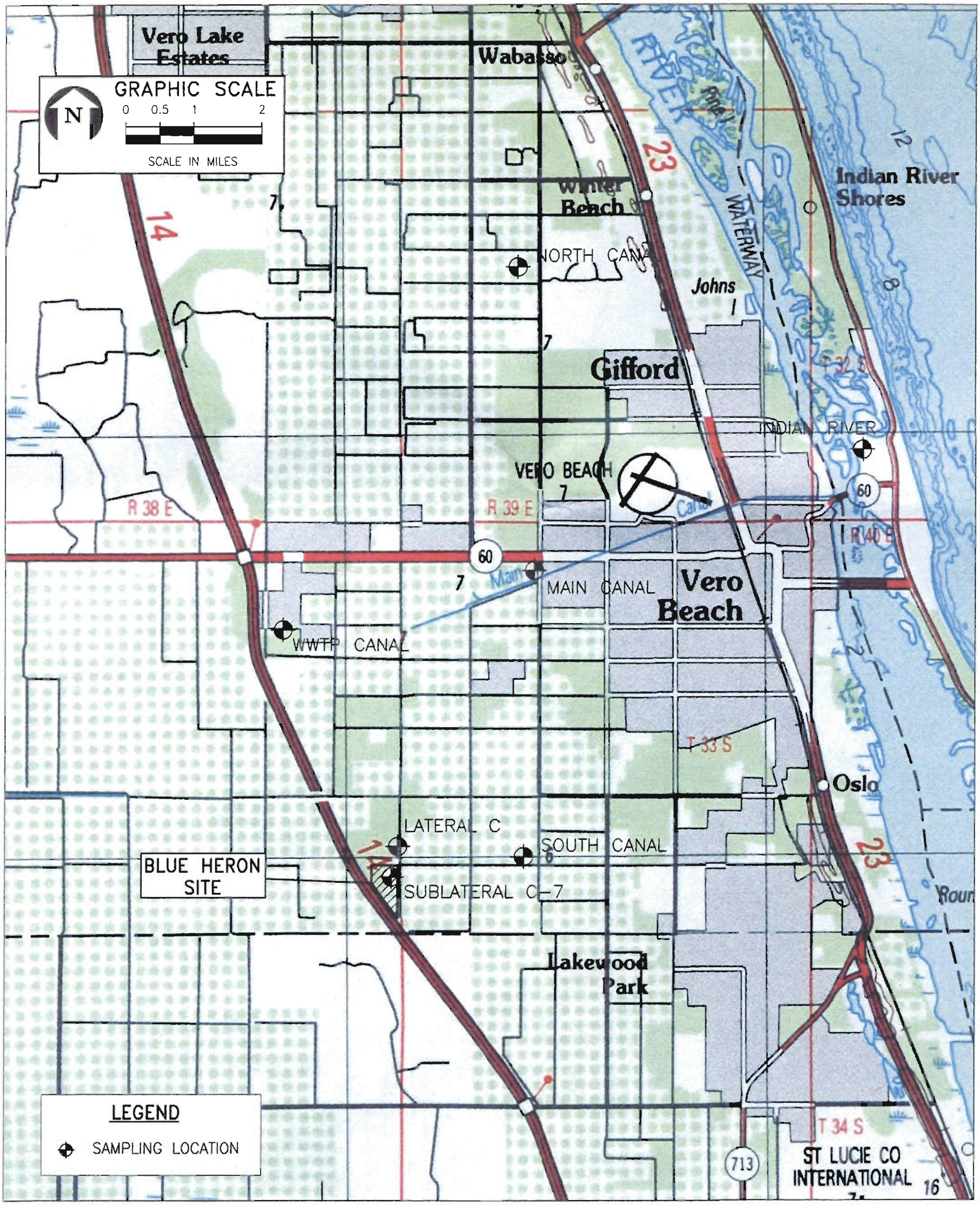

FIGURE 2.3.4-5.

WATER QUALITY SAMPLING LOCATIONS
MARCH 22, 2000

Source: USGS QUAD: FT. PIERCE, FL. 1988; ECT, 2000.

ECT
Environmental Consulting & Technology, Inc.

Table 2.3.4-4. Historical Water Quality of Main, North, and South Canals (mg/L unless otherwise indicated)

Parameter	Main Canal (1954-2000)	North Canal (1954-2000)	South Canal (1954-2000)	Class III Fresh Water Standard*	Class III Marine Water Standard	Note on Standard
Alkalinity as $CaCO_3$	164.8	134.8	145.9	20.0		Minimum
Aluminum	0.024				1.5	
Ammonia + NH_4, dissolved	0.16	0.07	0.21	See Note		0.02 unionized
Antimony	0			4.3	4.3	
Arsenic	0.0012			0.05	0.05	Marine standard for As^{3+} is 0.036
Barium	0.0477					
Beryllium	0.0009			0.00013	0.00013	
Bicarbonate	197.5	163.3	176.4			
BOD	1.28					
Boron	0.11					
Bromide	1.25					
Cadmium	0.0012			0.0030	0.0093	
Calcium	92.4	62.5	67.4			
Chloride	262.1	109.8	119.2		20900	10 percent above background
Chlorine (TRC)	No Data			0.01	0.01	
Chromium	0.0041			.011 hex .566 tri	.05 hex	
Cobalt	0.003					
COD	0					
Conductivity (umho/cm)	1253.0	763.6	802.8	1879.5		Greater of 1,275 or 50 percent above background
Copper	0.0064			0.034	0.0029	
Cyanide	0			0.0052	0.001	
Dissolved Oxygen	5.9			5	5	Minimum
Fluoride	0.47	0.41	0.44	10.0	5.0	

Table 2.3.4-4. Historical Water Quality of Main, North, and South Canals (mg/L unless otherwise indicated)

Parameter	Main Canal (1954-2000)	North Canal (1954-2000)	South Canal (1954-2000)	Class III Fresh Water Standard*	Class III Marine Water Standard	Note on Standard
Hardness (NC) as $CaCO_3$	162.5	73.1	76.2			
Hardness (total) as $CaCO_3$	341.2	210.9	224.7			
Iron	0.12	0.07	0.06	1.0	0.3	
Lead	0.0036			0.0152	0.0056	
Magnesium	26.5	13.1	13.5			
Manganese	0.03					
Mercury	0.0002			0.000012	0.000025	
Molybdenum	0.0049					
Nickel	0.0020			0.445	0.0083	
NO3-N, Diss	0.72					
NO3-N, Total	0.28	0.089	0.13			
NO2-N, Diss	0.03					
NO2-N, Total	0.03	0.02	0.04			
NO_2 and NO_3, N, dissolved	0.33					
NO_2 and NO_3, N, total	0.34	0.09	0.17			
Nitrogen, dissolved	1.45					
Nitrogen, total	1.28	0.67	1.2			
Nitrogen (organic, dissolved)	0.70					
Nitrogen (organic, total)	0.73	0.53	0.71			
Oil and grease	No Data			5.0	5.0	
PH (S.U.)	7.52	7.64	7.62	6-8.5	6-8.5	
Phenols	0			0.0003	0.0003	
Phosphorous, dissolved	0.13				0.0001	Elemental
Phosphorous-total	0.17					
Phosphorous, dissolved, Ortho	0.12					

Table 2.3.4-4. Historical Water Quality of Main, North, and South Canals (mg/L unless otherwise indicated)

Parameter	Main Canal (1954-2000)	North Canal (1954-2000)	South Canal (1954-2000)	Class III Fresh Water Standard*	Class III Marine Water Standard	Note on Standard
Phosphorous-T,Ortho	0.13					
PO_4 Ortho	0.34	0.20	0.54			
Total phosphorous as PO_4	0.52					
Potassium	7.5	3.7	3.7			
Selenium	0.0007			0.005	0.071	
Silica	10.5	8.9	9.4			
Silicon	4.6					
Silver	0.0007			0.00007	0.0032	
Sodium	131.5	61.8	61.4			
Strontium	4.6					
Sulfate	83.3	41.6	43.8			
Sulfide	0.44					
Sulfite	0					
TDS	704.7	384.3	407.7			
Temperature (°C)	24.4	24.8	24.8			See Sec. 62-302.520, F.A.C.
Temperature (°F)	75.9					See Sec. 62-302.521, F.A.C.
Thallium	0			0.0063	0.0063	
Tin	0					
Titanium	0					
TSS	11.9					
Turbidity	7.2			36.2	36.2	<29 above background
Zinc	0.0186			0.3	0.086	
Chloromethane (µg/L)	1.8			470.8	470.8	
4,4'-DDT (µg/L)	0.051			0.00059	0.00059	0.00059 Annual avg; 0.001 max

Table 2.3.4-4. Historical Water Quality of Main, North, and South Canals (mg/L unless otherwise indicated)

Parameter	Main Canal (1954-2000)	North Canal (1954-2000)	South Canal (1954-2000)	Class III Fresh Water Standard*	Class III Marine Water Standard	Note on Standard
1-Methylnaphthalene (µg/L)	28.8					
Radium (pCi/L)	No Data			5	5	Radium 226 + 228

Note: Non detects are assumed at 50 percent of detection limit unless the parameter has never been detected, in which cases its average is 0.
pCi/L = picocuries per liter.
POTW = publicly owned treatment works.
This table includes data from the STORET and WQN databases along with sampling data from ECT's March 22, 2000, sampling effort.

*The hardness-based standards were calculated using the hardness of the Main Canal.

Sources: SJRWMD, 1994.
FWENC, 2000.
ECT, 2000.

Table 2.3.4-5. Indian River County Surface Water, Sediment, and Reclaimed Water Samples, July 12, 2000, Sampling Event

Constituent	Water Sample Reclaimed Water System	Water Sample Main Canal	Water Sample Lateral C Canal	Sediment Sample Main Canal	Sediment Sample Lateral C Canal
Metals (mg/L)					
Aluminum	0.12	NA	NA	NA	NA
Antimony	<0.005	NA	NA	NA	NA
Arsenic	<0.010	NA	NA	NA	NA
Barium	<0.10	NA	NA	NA	NA
Beryllium	<0.0010	NA	NA	NA	NA
Boron	0.41	NA	NA	NA	NA
Cadmium	<0.0010	NA	NA	NA	NA
Calcium	39	NA	NA	NA	NA
Chromium	<0.010	NA	NA	NA	NA
Cobalt	<0.050	NA	NA	NA	NA
Copper	<0.050	NA	NA	NA	NA
Iron	0.063	NA	NA	NA	NA
Lead	<0.0050	NA	NA	NA	NA
Magnesium	12	NA	NA	NA	NA
Manganese	0.014	NA	NA	NA	NA
Mercury	<0.00020	NA	NA	NA	NA
Molybdenum	<0.010	NA	NA	NA	NA
Nickel	<0.010	NA	NA	NA	NA
Selenium	<0.010	NA	NA	NA	NA
Silicon	8.7720	NA	NA	NA	NA
Silver	<0.010	NA	NA	NA	NA
Sodium	130	NA	NA	NA	NA
Thallium	<0.20	NA	NA	NA	NA
Tin	<0.100	NA	NA	NA	NA
Titanium	<0.0050	NA	NA	NA	NA
Zinc	0.11	NA	NA	NA	NA

Table 2.3.4-5. Indian River County Surface Water, Sediment, and Reclaimed Water Samples, July 12, 2000, Sampling Event

Constituent	Water Sample Reclaimed Water System	Water Sample Main Canal	Water Sample Lateral C Canal	Sediment Sample Main Canal	Sediment Sample Lateral C Canal
Miscellaneous (mg/L)					
Alkalinity (as $CaCO_3$)	70	140	120	NA	NA
Ammonia-N	<0.030	<0.030	0.040	2.5	1.5
BOD	4	5.0	6.0	NA	NA
Bromide	<0.010	0.690	0.9100	NA	NA
Chloride (total)	210	250	350	NA	NA
COD	28	51	93	NA	NA
Conductivity, umhos/cm	870	1,100	1,300	NA	NA
Cyanide (total)	<0.010	<0.010	<0.010	NA	NA
Fluoride	1.0	0.70	0.80	NA	NA
Hardness (as $CaCO_3$)	140	300	350	NA	NA
Nitrate-Nitrite-N	0.74	<0.020	0.12	0.4	0.9
Total Kjeldahl-N	0.87	1.2	1.6	17	12
Nitrogen, total organic	0.87	1.2	1.6	14	10
Oil and Grease	<1.0	<1.0	<1.0	10	215
Phenolics, total recoverable	<0.050	<0.050	<0.050	NA	NA
Phosphorus (total)	0.11	0.18	0.23	2.5	2.2
pH (S.U.)	6.6	7.9	7.4	5.8	5.8
Sulfate (total)	72	74	99	<65	80
Sulfide (total)	<1.0	<1.0	<1.0	<13	<12
Sulfite	<0.10	0.20	<0.10	NA	NA
TDS	560	740	890	NA	NA
Total organic carbon	8.8	17	18	3,040	17,500
TSS	<1.0	9.0	9.6		
Turbidity (NTU)	3.0	5.0	8.1	NA	NA

Table 2.3.4-5. Indian River County Surface Water, Sediment, and Reclaimed Water Samples, July 12, 2000, Sampling Event

Constituent	Water Sample Reclaimed Water System	Water Sample Main Canal	Water Sample Lateral C Canal	Sediment Sample Main Canal	Sediment Sample Lateral C Canal
Radionuclides (pCi/L)					
Gross alpha	<1.9+/-1.2	NA	NA	NA	NA
Gross beta	16.1+/-1.5	NA	NA	NA	NA
Radium-226	<0.3+/-0.1	NA	NA	NA	NA
Radium-228	<1.1+/-0.7	NA	NA	NA	NA
Bacteriological (CFU/100/mL)					
Fecal coliform	1.0	NA	NA	NA	NA
VOCs (µg/L)					
Chloromethane	2.8	NA	NA	NA	NA
Chloroform	50	NA	NA	NA	NA
Bromodichloromethane	44	NA	NA	NA	NA
Dibromochloromethane	21	NA	NA	NA	NA
Bromoform	2.5	NA	NA	NA	NA
Organochlorine Pesticides (µg/L)					
4,4'-DDT	<0.073	<0.073	<0.073	<2.0	<2.0
Beta-BHC	0.38	NA	NA	NA	NA
Polyaromatic Hydrocarbons (µg/L)					
Fluorene	0.16	NA	NA	NA	NA

Table 2.3.4-5. Indian River County Surface Water, Sediment, and Reclaimed Water Samples, July 12, 2000, Sampling Event

Constituent	Water Sample Reclaimed Water System	Water Sample Main Canal	Water Sample Lateral C Canal	Sediment Sample Main Canal	Sediment Sample Lateral C Canal
Chlorinated Herbicides (µg/L)					
Dalapon	5.3	NA	NA	NA	NA
MCPA	300	NA	NA	NA	NA
2,4-D	1	NA	NA	NA	NA
2,4-DB	1	NA	NA	NA	NA

Note: PCi/L = picocuries per liter.
CFU/100mL = colony forming units per 100 milliliters.

Sediment sampling results are shown in milligrams per kilogram, except for 4,4'-DDT, which is in micrograms per kilogram.
Water sampling results are shown in milligrams per liter.

In addition to the constituents shown, the reclaimed sample was analyzed for semivolatile organic compounds (EPA Method 625), and organophosphorus pesticides (Method 614). No constituents in these analytical groups were present above their respective method detection limits.

Specific conductivity was measured in the field.

Sample identification numbers include (in parentheses) the depth at which each sample was collected.

Samples were analyzed by ENCO Laboratories for all constituents except for fecal coliform, which was analyzed by Harbor Branch Analytical Laboratory, sulfite and bromide, which were analyzed by TestAmerica, and radiological constituents analyzed by Florida Radiochemistry Laboratories.

Storm Water Management Planning

Currently, SJRWMD, Indian River County, IRFWCD, and the City of Vero Beach are in the process of developing a Master Storm Water Management Plan for the east Indian River County-Indian River Lagoon watershed within IRFWCD. The purpose of this storm water master plan will be to address flood control, water quality, natural and recreational areas, and water reuse in the watershed, as well as to provide information needed for a National Pollutant Discharge Elimination System (NPDES) Phase II compliance program. The specific goals of this program are to develop and implement hydrologic and hydraulic design alternatives for storm water storage, flood attenuation, and water quality treatment to achieve, as feasible, a 50-percent or greater reduction in pollutant loads and a significant reduction in fresh water discharges to the Indian River Lagoon. The Project plans, relying on the use of excess surface water in the IRFWCD canal system, coupled with reclaimed water, as available from the county's system, are consistent with and supportive of SJRWMD, Indian River County, IRFWCD, and Vero Beach goals to reduce freshwater discharge into the Indian River Lagoon System.

Hydrologic Characteristics

The Site consists of 50.5 acres of wooded undeveloped land, inhabited with pine and palmetto scrub. According to FIRM Panel No. 1201190165-E, dated May 4, 1989, the Site is located within Zone X, classified as an area determined to be outside the 500-year flood plain (see Figure 2.1.0-5). Offsite drainage is limited to minor contributions from part of the undeveloped roadway along the eastern perimeter (74th Avenue) and I-95 right-of-way green areas.

There are two isolated wetlands on Site; also classified as Class III surface waters. The forested wetland on the northwest corner of the Site is approximately 3.4 acres and may be hydraulically connected to Sublateral C-7 Canal during storm events in excess of the 25-year storm. The marsh wetland near the center of the property is approximately 0.7 acre and is not connected hydraulically to any surface water body. Typically, the wetlands have standing water during the wet season and may become dry during the dry season. The Site is relatively flat, with changes throughout the project area in general grade of less than 1 ft, ranging in elevation from 23 to 24 ft-NGVD. The northern part of the Site drains towards the wetland in the northwest corner. The southern part of the Site drains towards the east, with some runoff accumulating around the central wetland area. Excess runoff is conveyed to the nearby lateral and sublateral canals via overland flow.

Based on the SCS soil survey of Indian River County (SCS, 1987), the predominant soils on the Site are Oldsmar, Pineda, Eau Gallie, and Wabasso fine sands. These soils are poorly drained and nearly level, with slow to moderate permeability rates. The water table varies approximately 10 to 40 inches below existing grade during the wet and dry seasons, respectively.

2.3.4.2 Measurement Programs

The following surface water quality studies were conducted to obtain the information needed to establish baseline data. Adverse impacts to surface waters are not expected because discharges of process wastewaters or cooling tower blowdown to surface waters are not proposed.

For this Project, water quality samples were collected on March 22, 2000, from various components of the IRFWCD canal network, including the North, South, Main, Sublateral C-7, and Lateral C Canals, and the Indian River County west regional wastewater treatment plant (WWTP) discharge. A sample from the Indian River Lagoon was also collected. The samples were collected by grab method, between 1 and 3 ft bsl, from the center of the water body. The locations of the water sampling stations are shown in Figure 2.3.4-5. The samples were analyzed for organic and inorganic parameters and the results are reflected in Table 2.3.4-3 and discussed in Section 2.3.4.1.

Additional water quality and sediment sampling was conducted of the Lateral C Canal and Main Canal on July 12, 2000. A water sample from the county's reclaim system was collected for analyses during this sampling event. Results of the July 2000 sampling are summarized in Table 2.3.4-5 and discussed in Section 2.3.4.1.

2.3.5 VEGETATION/LAND USE

The land use/vegetation types present at the Site area were characterized utilizing the Florida Land Use, Cover and Forms Classification System (FLUCFCS) Level III code (Florida Department of Transportation [FDOT], 1985). Three Site visits were conducted on February 15, April 10, and April 26, 2000. Based on these surveys, the predominant vegetative community was determined to be overgrown pine flatwoods (FLUCFCS Code 411). There are no natural water bodies on the Site. Nearby aquatic communities are restricted to drainage canals on the east and north and drainage ditch on the south boundaries of the Site. Since no construction or operation aspects of the power plant will occur within these areas, no aquatic baseline studies were performed. A small, 0.7-acre herbaceous marsh (FLUCFCS Code 641) exists in the central portion and a 3.5-acre forested wetland (FLUCFCS Code 617) exists in the northwestern portion of the Site. No impacts to these wetlands are proposed; therefore, the analyses focused on the terrestrial ecological resources on the Site. Existing land use and vegetation types occurring on the Site are shown on Figure 2.3.5-1 (USGS quadrangle map) and Figure 2.3.5-2 (aerial photograph). Figure 2.3.5-3 is a map showing the land uses and vegetation types in an area within a radius of 5 miles from the Site. During these ecological surveys, vegetation and land uses on the Site were inspected and described qualitatively.

Descriptions of land use/vegetation for the temporary construction laydown area are provided in Chapter 4.0, and for the natural gas and water supply pipeline corridors are provided in Chapter 6.0.

Currently, no portion of the Site has been developed or cleared. The Site is comprised of overgrown pine flatwoods. This community type occupies approximately 45.4 acres (89.9 percent) of the 50.5-acre Site. Historic fire suppression has increased the density and height of saw palmetto and numerous other common shrubs. The canopy consists of slash pine with scattered laurel and live oak saplings, comprising an open subcanopy. A small cabbage palm hammock, 0.9 acre (1.8 percent), exists in the southern portion of the Site. Of the approximately 50.5-acre Site, 4.2 acres (8.3 percent) support natural wetland communities: 0.7 acre of freshwater swamp and 3.5 acres of mixed wetland hardwoods.

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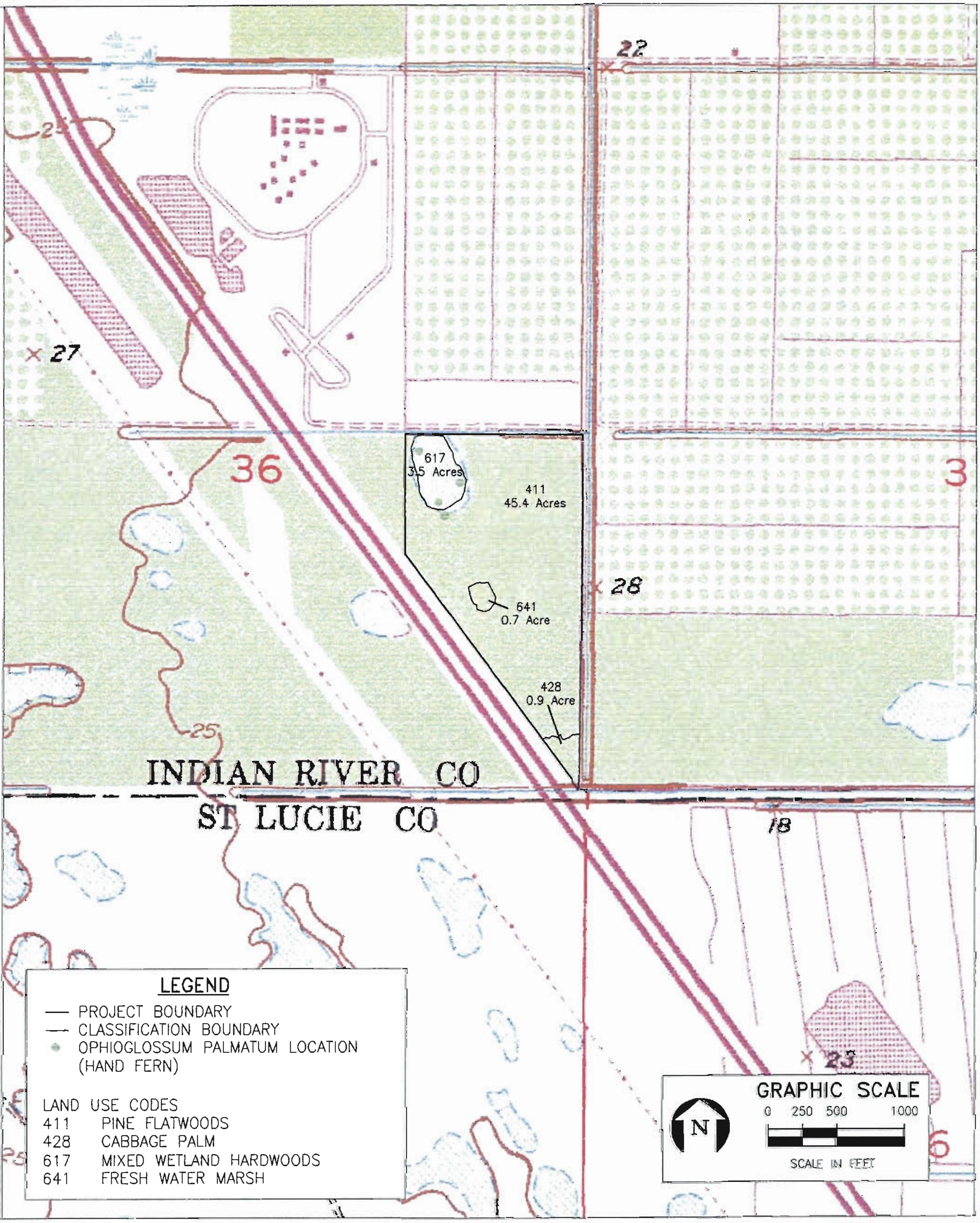

FIGURE 2.3.5-1.

VEGETATION AND LAND USE MAP

Sources: USGS Quad: Oslo, FL, 1983; ECT, 2000.

CALPINE
BLUE HERON
ENERGY CENTER

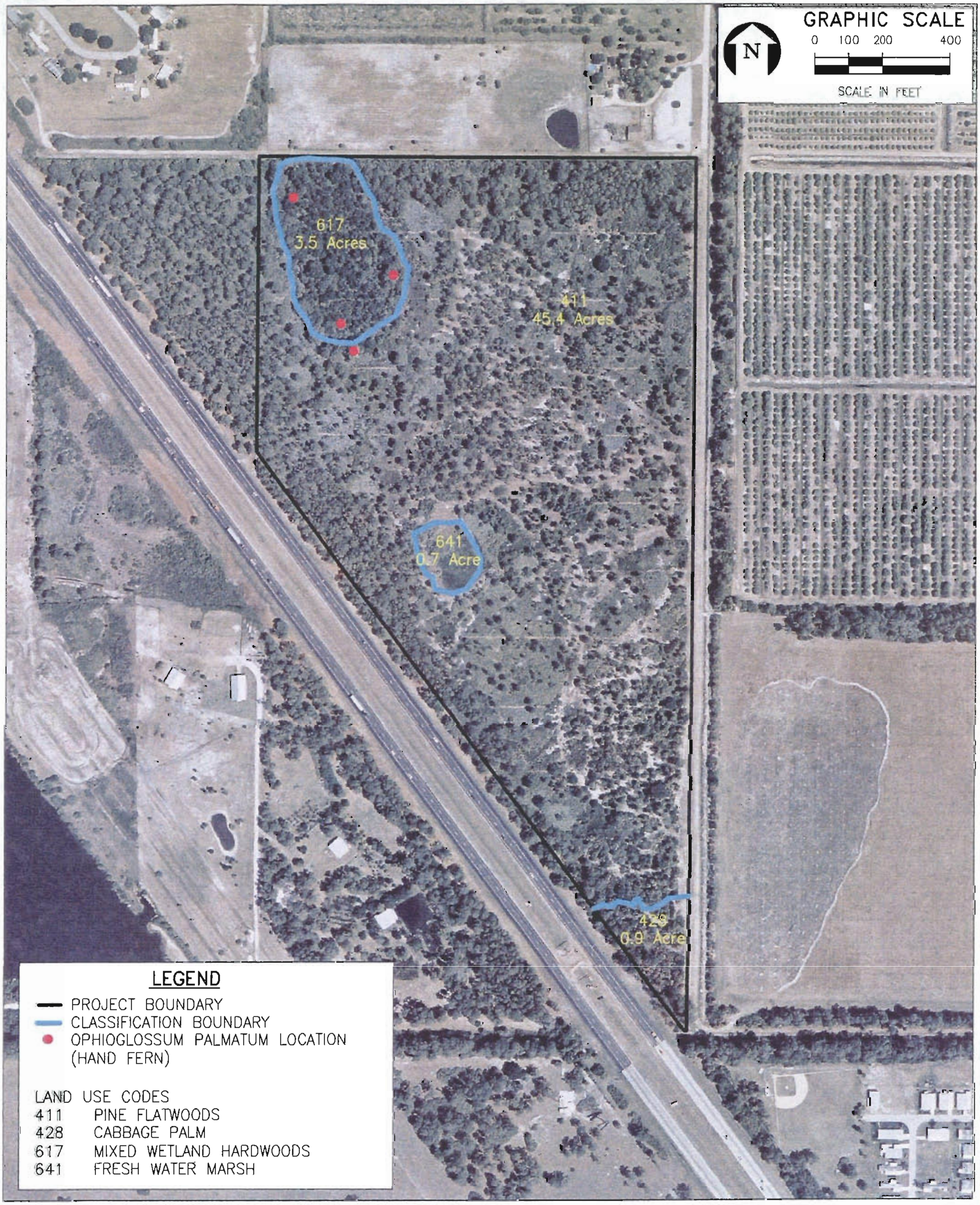

FIGURE 2.3.5-2.

VEGETATION AND LAND USE MAP

Sources: Aerial Cartographics of America, 2000; ECT, 2000.

CALPINE
BLUE HERON
ENERGY CENTER

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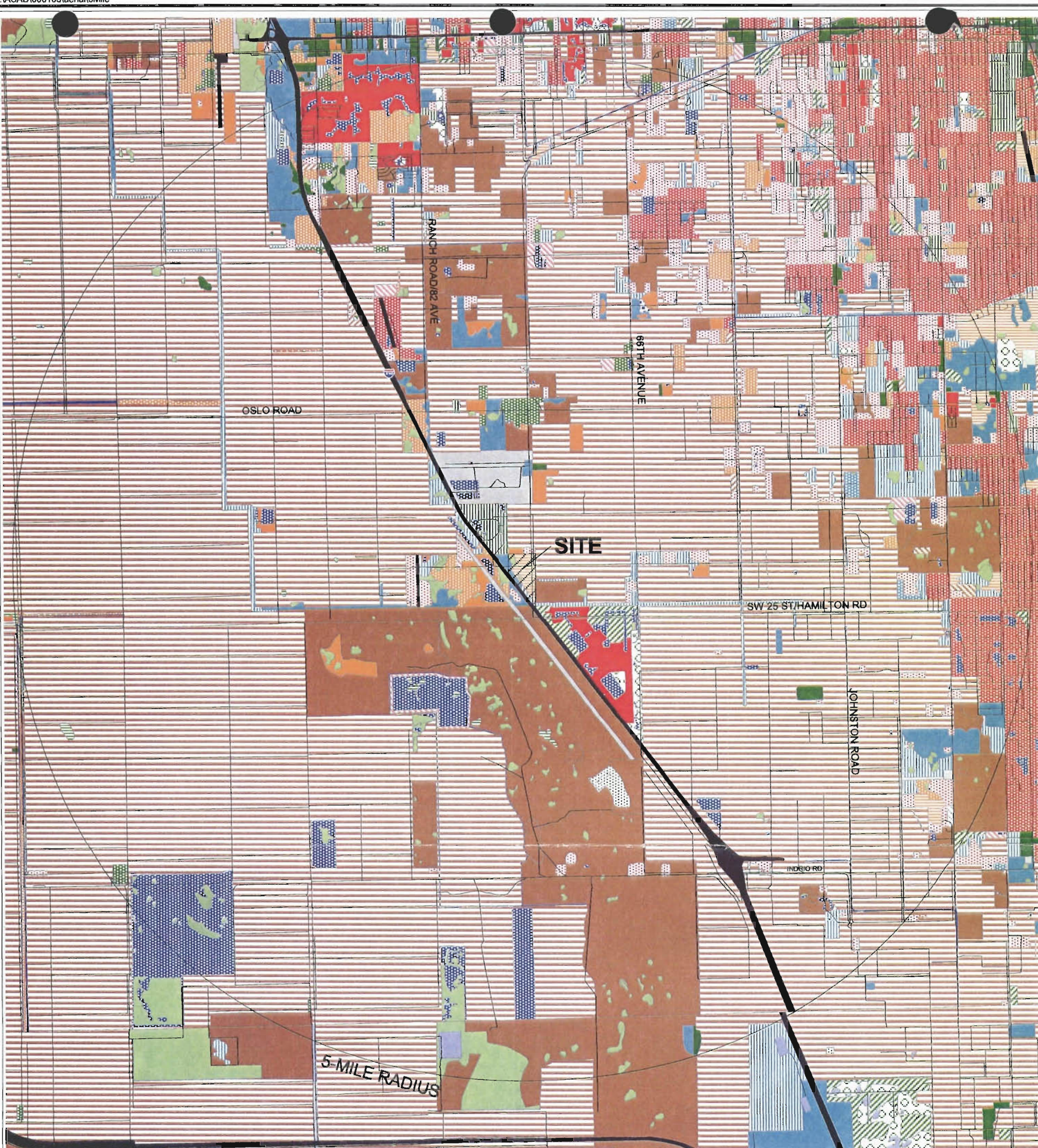

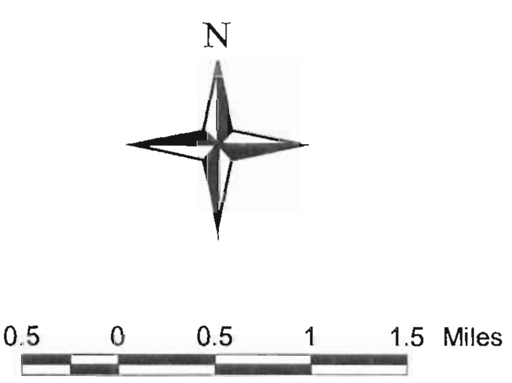

LAND USE CODES

110 -RESIDENTIAL, LOW DENSITY
120 - RESIDENTIAL, MEDIUM DENSITY
130 - RESIDENTIAL, HIGH DENSITY
140 - COMMERCIAL & SERVICES
150 - INDUSTRIAL
160 - EXTRACTIVE
170 - INSTITUTIONAL
180 - RECREATIONAL
190 - OPEN LAND
210 - CROPLAND & PASTURELAND
220 - TREE CROPS
230 - FEEDING OPERATIONS
240 - NURSERIES & VINEYARDS
250 - SPECIALTY FARMS
260 - OTHER OPEN LANDS (RURAL)
310 - HERBACEOUS
320 - SHRUB & BRUSHLAND
330 - MIXED RANGELAND
410 - UPLAND CONIFEROUS FOREST
420 - UPLAND HARDWOOD FOREST
430 - UPLAND HARDWOOD FOREST
440 - TREE PLANTATIONS
500 - WATER
510 - STREAMS & WATERWAYS
520 - LAKES
530 - RESERVOIRS
540 - BAYS & ESTUARIES
600 - WETLANDS
610 - WETLAND HARDWOOD FOREST
620 - WETLAND CONIFEROUS FOREST
630 - WETLAND FOREST MIXED
640 - VEGETATED NON-FORESTED WETLANDS
650 - NON-VEGETATED WETLANDS
720 - SAND OTHER THAN BEACHES
730 - BARREN LAND
740 - DISTURBED LAND
810 - TRANSPORTATION
820 - COMMUNICATIONS
830 - UTILITIES

FIGURE 2.3.5-3.
LAND USE/VEGETATION TYPE WITHIN 5-MILE RADIUS OF PLANT SITE

Sources: SJRWMD, 1998; ECT, 2000.

CALPINE
BLUE HERON
ENERGY CENTER

Table 2.3.5-1 is a list of the land use/vegetation types present on the Site classified according to Level III as per the FLUCFCS.

Table 2.3.5-1. Land Use Cover Types Present at the BHEC Site

FLUCFCS Land Use Code	Land Use Type	Aerial Coverage (acres)
411	Pine Flatwoods	45.4
428	Cabbage Palm	0.9
617	Wetland Hardwood Forest	3.5
641	Fresh Water Marsh	0.7
	TOTAL	**50.5**

Source: ECT, 2000.

2.3.6 ECOLOGY

An ecological assessment of the approximately 50.5-acre Site was conducted to ascertain the identity and abundance of important natural communities, flora, and fauna. In addition to field surveys, a literature search was completed to determine state and federal listed species that could potentially be present in the habitats found on the Site and within a 5-mile radius.

Based on the onsite survey, the predominant vegetative community onsite is pine flatwoods, as discussed in Section 2.3.5. Four state-listed plant species were noted on the Site, all within a wetland hardwood forest which will be preserved. Two are listed as commercially exploited and two are listed as endangered.

2.3.6.1 Species—Environmental Relationships

Aquatic Systems

No natural lake, river, or similar surface water bodies exist on the Site; therefore, none will be affected by construction of the Project. The only aquatic resources potentially affected by this Project will be offsite systems. The nearest aquatic communities are associated with the Lateral C Canal located to the eastern side of the Site, Sublateral C-7 Canal on the north boundary, and the drainage ditch along the south property boundary. The Lateral C Canal will also be used for the primary water supply for the Project. The intake for the water supply pipeline will be located approximately 3.5 miles north of the Site. Potential impacts to offsite aquatic systems are addressed in Chapter 6.0.

Terrestrial Systems—Flora

The following descriptions of plant community/association types and land uses are based upon qualitative vegetation field surveys conducted during February and April 2000. A discussion of potential impacts to these habitats resulting from power plant development is provided in Section 4.4.

Pine Flatwoods—411

Approximately 45.4 acres (89.9 percent) of the Site are vegetated by pine flatwoods. This community predominates on the central and southern portions of the Site. A dense to open canopy of slash pine ranging from 20 to 40 ft in height is characteristic. A mixture of mature and immature pines is found throughout the Site, and evidence of historic timbering efforts was noted. A subcanopy of pine saplings and scattered laurel oak is characteristic throughout. Saw palmetto comprises a dense and relatively high shrub layer. Other species noted within the shrub layer include gallberry, highbush blueberry, shiny blueberry, and, to a lesser degree, wax myrtle and Brazilian pepper. Suppression of fire within the Site has allowed the shrub and vine vegetation to become dense, limiting the herbaceous cover as compared to pine flatwoods experiencing natural, periodic burns. Groundcover species noted occurring within this land use include broom sedge, bracken fern, and wire grass.

Cabbage Palm—428

This community occurs on 0.9 acre (1.8 percent) of the Site and is found in the southernmost portion of the Site. This forested community is dominated by cabbage palm with little or no understory. Charred vegetation and palm trunks evidenced recent burning in the area, therefore, vegetative cover was greatly reduced. The perimeter of this community is intermixed with slash pine, laurel oak, and Brazilian pepper.

Fresh Water Marsh—641

A 0.7-acre freshwater marsh exists in the west central portion of the Site. This community comprises 1.4 percent of the overall Site. This periodically flooded wetland exhibited evidence of recent and periodic disturbance by feral hogs at the upper limits of the wetland. Surface soils were uneven and disturbed and vegetation indicative of periodic disturbance dominated in these areas. Redroot, carpet grass, dog fennel, and dollar weed were common in this recently disturbed area. The deeper portion of the Site, though dry at the time of investigation, exhibited evidence of past flooding. Pickerelweed, soft rush, smartweed, and scattered cattail were dominant in this zone. Shrub cover existed in the deepest portion of the marsh and was comprised of buttonbush, primrose willow, Brazilian pepper, and wax myrtle.

Mixed Wetland Hardwoods—617

Approximately 3.5 acres (6.9 percent) of the Site are vegetated by a mixed hardwood wetland. The canopy of this wetland is dominated by red maples with dahoon holly, swamp bay, laurel oak, and cabbage palm at the perimeter. The shrub layer is limited to saplings of the aforementioned trees, and wax myrtle, Virginia willow, and saltbush that occur sporadically throughout the wetland. The understory is dominated by swamp fern, Virginia chain fern, and royal fern. Other species noted included scattered pickerelweed, duck potato, and sawgrass. The perimeter of the wetland exhibits evidence of periodic disturbance by feral hogs. Notable species in this area included sand cordgrass, dog fennel, yellow-eyed grass, redroot, and pipewort. Ferns were typically growing on hummocks within the swamp. The stress manifested by numerous red maple trees may be an indication of past extreme high water events. This could be attributed to the spoil material placed between the Sublateral C-7 Canal to the north and the wetland limit and/or to recent (1997-1998) high rainfall years attributed to El Niño.

Terrestrial Systems—Fauna

For the purpose of the SCA, those animals species listed as endangered, threatened, or of special concern were the focus of intense field investigation at the Site. Presence and likelihood of onsite occurrence of terrestrial vertebrates was assessed during field inspections during two sampling periods. The surveys were conducted February 15 and April 10 through 12, 2000, by a qualified wildlife biologist. Table 2.3.6-1 presents a list of all wildlife species observed during the Site surveys. Observations consisted of individual sightings and indirect signs such as tracks, scats, burrows, nests, etc.

The approximately 50.5-acre Site consists of south Florida slash pine flatwoods, a marsh, a forested swamp, and a cabbage palm forest.

Onsite habitats have been impacted through adjacent man-induced activities such as the lateral canal systems, Interstate highway, industrial sprayfield, correctional institution, nearby residential areas, and solid waste disposal area. The flatwoods have been fire-suppressed and exhibit a dense, tall understory of saw palmetto and gallberry.

Wildlife noted utilizing the Site are predominantly opportunistic upland species which thrive in proximity to humans. The following describes the common wildlife species onsite.

Table 2.3.6-1. Wildlife Species Observed On The BHEC Site February 15 and April 10-12, 2000

Species		Habitats			Status*	
Common Name	Scientific Name	Pine Flatwoods	Marsh	Forested Wetland	FFWCC	USFWS
Reptiles						
Gopher tortoise	*Gopherus polyphemus*	✓			SSC	
Eastern black racer	*Coluber constrictor*	✓				
Birds						
Cattle egret	*Bulbicus ibis*	✓				
Killdeer	*Charadrius vociferous*		✓			
Red-tailed hawk	*Buteo jamaicensis*	✓				
Red-shouldered hawk	*Buteo lineatus*	✓				
Black vulture	*Coragyps atratus*	✓				
Barred owl	*Strix varia*	✓		✓		
Mourning dove	*Zenaida macroura*	✓				
Red-bellied woodpecker	*Melanerpes carolinus*	✓				
Common crow	*Corvus brachyrhynchos*	✓				
Blue jay	*Cyanocitta cristata*	✓				
Carolina wren	*Thryothorus ludovicianus*	✓				
Blue-gray gnatcatcher	*Polioptila caerula*			✓		
American robin	*Turdus migratorius*	✓				
Gray catbird	*Dumetella carolinensis*	✓				
Northern mockingbird	*Mimus polyglottos*	✓				
White-eyed vireo	*Vireo grisens*			✓		
Northern parula	*Parula americana*			✓		
Pine warbler	*Dendroica pinus*	✓				
Common yellowthroat	*Geothlypis trichas*		✓	✓		
Northern cardinal	*Cardinalis cardinalis*	✓				
Towhee	*Pipilo erythrophthalmus*	✓				
Mammals						
Raccoon	*Procyon lotor*	✓				
Eastern cottontail	*Sylvilagus floridana*	✓	✓	✓		
Gray squirrel	*Sciurus carolinensis*	✓				
Feral hog	*Sus scrofa*	✓	✓	✓		
Nine-banded armadillo	*Dasypus novemcinctus*	✓				

*Status: FFWCC = Florida Fish and Wildlife Conservation Commission.
USFWS = U.S. Fish and Wildlife Service.
SSC = Species of Special Concern.

Source: ECT, 2000.

Reptiles and Amphibians

Herpetofauna species were uncommon onsite. No amphibians were observed, possibly due to the extremely dry conditions. Both onsite wetlands were dry at the time of Site surveys. Undoubtedly, some toads and frogs make use of these wetlands during wetter conditions. Only two reptiles were documented on the Site: the gopher tortoise and eastern black racer. The gopher tortoise undoubtedly populated the area in greater numbers at one time as evidenced by more abandoned burrows than active/inactive burrows found. The overgrown situation of the flatwoods has diminished the desirability of the habitat for this species.

The eastern black racer is an opportunistic species commonly found in flatwood environments and is expected to occur throughout the Site.

Birds

Bird populations were generally low for spring time surveys and reflect common flatwoods/openland species of south Florida. Common birds observed consisted of cattle egret, mourning dove, vultures, crow, blue jay, catbird, mockingbird, towhee, and cardinal.

No wading birds were noted utilizing the onsite wetlands during the spring surveys, due to the lack of standing water within the communities. Species observed around the wetlands included killdeer, barred owl, gnatcatcher, white-eyed vireo, cardinal, and common yellowthroat. A little blue heron was observed foraging in the adjacent, offsite ditch.

Mammals

Common species onsite include the raccoon, eastern cottontail rabbit, and armadillo. Feral hogs have been onsite as evidenced by rooting, although rooting is sparse and no animals were observed.

Threatened and Endangered Species

Flora

Important flora species for the purpose of the SCA are those species listed as endangered, threatened, or commercially exploited by the U.S. Fish and Wildlife Service (USFWS) or the Florida Department of Agriculture and Consumer Services (FDACS). Several state listed plant species were noted on the Site during field investigations conducted in April 2000. Prior to this survey, literature searches were completed to determine the listed species that occurred in Indian River County. Each species was reviewed for its potential to occur on the Site due to available habitat and known range of the species. Primary sources of information utilized included:

- The Florida Natural Areas Inventory (FNAI) database.
- Rules of the FDACS, Division of Plant Industry, Chapter 5B-40, F.A.C., Preservation of Native Flora of Florida, Regulated Plant Index (5B-40.0055).
- Rare and Endangered Biota of Florida, Volume 5, Plants (Ward, 1978).
- Notes on Florida's Endangered and Threatened Plants, FDACS, Division of Plant Industry, Bureau of Entomology, Nematology and Plant Pathology.
- Atlas of Florida Vascular Plants (Wunderlin *et al.*, 1996).

Table 2.3.6-2 shows the listed plant species with the potential to occur on the Site based on geographic location and habitat records. This table also includes the characteristic habitat of each species as well as the likelihood for a species to occur on the Site.

Four state-listed plant species were observed on the Site. Two species are listed as commercially exploited and two are listed as endangered. All four species occur within the mixed hardwood forested wetland on the northern portion of the Site, which will be preserved. The commercially exploited species were cinnamon fern and royal fern, both of which are common within the state of Florida and listed to discourage commercial exploitation. Royal fern was more common in the wetland than cinnamon fern. Giant wild pine, an epiphytic species commonly found throughout hammocks in the state of Florida, was noted on several trees within the western portion of the forested wetland. The giant wild pine is listed as endangered due to the Chervolat weevil (*Metamasius callizona*)

Table 2.3.6-2. State- or Federally Listed Plant Species Potentially Occurring Onsite

Scientific Name Common Name	USFWS	State	Habitat	Likelihood of Occurrence
Beach star *Cyperus pedunculatus* (syn. *Remirea maritima*)	—	E	Beaches	No suitable habitat
Blue flowered butterwort *Pinguicula caerulea*	—	T	Flatwoods and bogs	Suitable habitat
Cinnamon Fern *Osmunda cinnamomea*	—	C	Swamps	Suitable habitat, species observed onsite
Clark's buckthorn *Sideroxylon tenax* (syn. *Bumelia anomala*)	—	E	Scrub	No suitable habitat
Coastal hoary-pea *Tephrosia angustissima* var. *curtissii*	—	E	Coastal strand	No suitable habitat
Coastal vervain *Glandularia maritima* (syn. *Verbena maritima*)	—	E	Coastal strands	No suitable habitat
Curtiss's milkweed *Asclepias curtissii*	—	E	Dry hammocks and scrub	No suitable habitat
Florida peperomia *Peperomia obtusifolia*	—	E	Tropical hammocks	Limited, marginal suitable habitat
Giant wild pine *Tillandsia utriculata*	—	E	Hammocks and cypress swamps	Limited habitat, species observed onsite
Hand fern *Ophioglossum palmatum*	—	E	Hydric hammocks	Suitable habitat, species observed onsite
Indian River prickly-apple *Harrisia fragrans* (syn. *Cereus eriophorus* var. *fragrans*)	E	E	Coastal hammock Shell middens	No suitable habitat
Inflated wild pine *Tillandsia balbisiana*	—	T	Hammocks and scrub	Limited habitat
Inkberry *Scaevola plumieri*	—	T	Coastal Strands	No suitable habitat
Large-flowered rosemary *Conradina grandiflora*	—	E	Scrub and sand pine scrub	No suitable habitat
Leafless beak orchid *Sacoila lanceolata* (syn. *Stenorrhynchos lanceolata*)	—	T	Flatwoods	Suitable habitat

Table 2.3.6-2. State- or Federally Listed Plant Species Potentially Occurring Onsite

Scientific Name Common Name	USFWS	State	Habitat	Likelihood of Occurrence
Many-flowered grass-pink *Calopogon multiflorus*	—	E	Flatwoods	Low, due to fire suppression
Olga's mint *Dicerandra immaculata*	E	E	Sand pine scrub	No suitable habitat
Peperomia *Peperomia humilis*	—	E	Calcareous hammocks	No suitable habitat
Royal Fern *Osmunda regalis*	—	C	Swamps	Suitable habitat, species observed onsite
Satin leaf *Chrysophyllum oliviforme*	—	T	Hammocks	Limited suitable habitat
Scrub pinweed *Lechea cernua*	—	T	Scrub	No suitable habitat
Shell mound prickly pear cactus *Opuntia stricta*	—	T	Shell mounds	No suitable habitat
Simpson's stopper *Myrchianthes fragrans*	—	T	Coastal hammocks	No suitable habitat
Simpson's zephyr lily *Zephyranthes simpsonii*	—	T	Wet pinelands and pastures	Suitable habitat
Small's milkpea *Galactia regularis* (syn. *Galactia smallii*)	E	E	Sandhills, scrub	No suitable habitat
Small-leaved melanthera *Melanthera nivea* (syn. *Melanthera parvifolia*)	—	T	Moist to dry hammocks	Limited suitable habitat
Tampa vervain *Glandularia tampensis* (syn. *Verbena tampensis*)	—	E	Flatwoods and Hammocks	Suitable Habitat
West Coast Prickly-Apple *Harrisia simpsonii* (syn. *Cereus gracilis* var *simpsonii*)	—	E	Coastal hammock	No suitable habitat
Yellow flowered butterwort *Pinguicula lutea*	—	T	Flatwoods and bogs	Suitable habitat

Note: C =commercially exploited. E = endangered. T = threatened.

Sources: Section 5B-40.0055, F.A.C.; FNAI, 1998; FFWCC, 1997; Wunderlin, 1998.

whose larvae tunnel through the plant bases. Thirty-nine hand fern plants were observed in the boots of four cabbage palm trees. Two of the cabbage palm trees are located on the southern perimeter of the forested wetland and one each was found on the eastern and northwestern perimeters. The approximate locations of the trees are noted on Figures 2.3.5-1 and 2.3.5-2. This endangered species is relatively uncommon in the state. Formerly widespread throughout the southern half of the state, the hand fern is now rare in most places. Collectors have taken many hand ferns from the wild, while loss of habitat and destruction by fire has also contributed to the decline in populations.

No federally listed species were observed on the Site, or are likely to occur within the habitats found onsite. Three federally listed plant species are known to occur in Indian River County. Two species (Olga's mint and Small's milkpea) require scrub habitat, which does not occur on the Site. The third (Indian River prickly-apple) is a coastal species, normally found on shell mounds or in coastal hammocks, which also does not occur on the Site.

Fauna

Table 2.3.6-3 lists potentially occurring state or federally listed wildlife species on the Site. The list was developed from the FNAI matrix, Florida Fish and Wildlife Conservation Commission (FFWCC), and USFWS records, as well as personal observations.

The only listed wildlife species documented onsite was the gopher tortoise. Gopher tortoises are currently listed as a species of special concern (SSC) by FFWCC. The little blue heron is listed as SSC by FFWCC and was observed just offsite in the east perimeter drainage ditch. Data searches of FNAI, FFWCC, or USFWS records indicate that no other listed species occur on the Site.

Gopher tortoises are in low numbers on the Site; one active and two inactive burrows were observed. Several abandoned burrows were found, possibly indicating a greater population historically. Habitat is present but without fire onsite, the flatwoods are getting too dense to make ideal gopher tortoise habitat.

Table 2.3.6-3. State- or Federally Listed Wildlife Species Potentially Occurring Onsite*

Common Name / Scientific Name	Status† USFWS	Status† FFWCC	Likelihood of Occurrence
Amphibians			
Gopher frog *Rana capito*	—	SSC	Suitable habitat is lacking. Not likely to occur onsite.
Reptiles			
American alligator *Alligator mississippiensis*	—	SSC	Marginal habitat exists onsite. Likelihood of occurrence is low.
Eastern indigo snake *Drymarchon corais couperi*	T	T	Suitable habitat is marginal; likelihood of occurrence is low.
Gopher tortoise *Gopherus polyphemus*	—	SSC	Suitable habitat is present. Species observed onsite.
Florida pine snake *Pituophis melanoleucus mugitus*	—	SSC	Suitable habitats present; likelihood of occurrence is moderate.
Birds			
Little blue heron *Egretta caerula*	—	SSC	Suitable habitat is marginal. Species observed just offsite.
Snowy egret *Egretta thula*	—	SSC	Suitable habitat is marginal. Likelihood of occurring onsite is low.
Tricolored heron *Egretta tricolor*	—	SSC	Suitable habitat is marginal. Likelihood of occurring onsite is low.
White ibis *Eudocimus albus*	—	SSC	Suitable habitat is marginal. Likelihood of occurrence is low.
Florida sandhill crane *Grus canadensis pratensis*	—	T	Habitat is lacking. Likelihood of occurrence is low.
Snail kite *Rostrhamus sociabilis*	E	E	Habitat is lacking. Likelihood of occurrence is low.
Arctic peregrine falcon *Falco peregrinus tundruis*	—	E	Migratory species may forage over coastal areas near the Site. Suitable habitat onsite is lacking.
Southeastern kestrel *Falco sparverius paulus*	—	T	Suitable habitat onsite is present. Likelihood of occurrence is moderate.
Bald eagle *Haliaeetus l. lueocephalus*	—	T	Suitable habitat is lacking. No known nests within 5 miles; likelihood of occurrence is low.
Woodstork *Mycteria americana*	E	E	Suitable habitat is marginal. Likelihood of occurrence onsite is low.

Table 2.3.6-3. State- or Federally Listed Wildlife Species Potentially Occurring Onsite*

Common Name Scientific Name	Status† USFWS	FFWCC	Likelihood of Occurrence
Crested caracara *Caracara plancus*	T	T	Suitable habitat is lacking. Likelihood of occurrence is low.
Florida scrub jay *Aphelocoma c. coerulescens*	T	T	Habitat is lacking. Likelihood of occurrence is low.
Red-cockaded woodpecker *Picoides borealis*	E	T	Habitat is lacking. No known colonies within 5 miles.
Least tern *Sterna antillarum*	—	T	No known nesting within 5 miles of Site. Habitat is lacking onsite.

*Sources: List developed from FNAI (1998), FFWCC (2000), and USFWS (2000).
†Status: E = endangered.
T = threatened.
SSC = species of special concern.

The little blue heron was observed in the ditch off the eastern property boundary. The bird uses the ditch for foraging as do other waders, to some degree. The two onsite wetlands, which will not be disturbed, would normally provide some foraging habitat during periods of inundation.

No wading bird colonies are present within 2 miles of the Site according to agency records. FNAI does show a rookery approximately 3 miles southwest and another approximately 5 miles southwest of the Site. The nearer rookery does contain little blue herons among others.

Other listed species found regionally as reported by the agencies and FNAI include the eastern indigo snake, the tri-colored heron, snowy egret, and the snail kite. According to FNAI, documented observations of these species exist within 5 miles of the Site.

The indigo snake is typically found where gopher tortoises are found. While it is possible that this animal occurs onsite, it is unlikely to occur in significant numbers due to the paucity of gopher tortoises.

The tri-colored heron and snowy egret, like the little blue heron, may use the surrounding drainage ditches for foraging. No suitable nesting habitat exists onsite.

The snail kite is an endangered species typically found in sawgrass marshes of south Florida. No suitable habitat exists onsite for this bird.

Other listed species likelihood of occurrence for the Site are summarized in Table 2.3.6-3.

2.3.6.2 Preexisting Stresses

The general isolation of the Site from other larger, natural resources areas constitutes the greatest preexisting stress to the biota on the Site. The Site is bordered on the west by I-95, which creates a barrier to wildlife movement. Lateral canals and dirt access roads border the north and eastern boundaries. Land uses to the north of the Site include a single-family residence, county solid waste landfill, a correctional institution, abandoned citrus grove land, and low-density residential areas. An industrial sprayfield exists on the eastern boundary and a residential area is located to the southeast in St. Lucie County.

Within the Site itself, periodic burning has been suppressed causing the understory to become extremely overgrown within the majority of the Site. This has created an environment that is not suitable for many plant and animal species.

2.3.6.3 Measurement Programs

As preparation for Site reconnaissance, field surveys, and wetland delineation a literature search/agency consultation was conducted. Data reviewed included aerial photographs, county maps, current listings of endangered and threatened species, soils survey, National Wetland Inventory (NWI) maps, and USGS quadrangle maps. Subsequent to this review, an ecologist and senior wildlife biologist conducted two Site evaluations: on February 15 and in April (10-12) of 2000. The entire Site was traversed over a 4-day period in spring 2000. All species or signs of species (tracks, scats, dens, burrows, etc.) were noted by habitat type. Ecologists also evaluated the onsite habitats for suitability of listed species usage. Additionally, presence of listed wildlife species was assessed based on records from USFWS, FFWCC, FNAI, and others as appropriate. The 3.5-acre forested wetland was resurveyed on April 26, 2000, by a senior ecologist and ecologist, to determine the density of endangered hand ferns. The purpose of these Site visits were to locate potentially sensitive or unique areas, classify major vegetation communities on the Site, identify land uses and existing stresses and impacts, identify any observed endangered or threatened species, and delineate all wetlands both natural and artificially created. The boundaries of these wetland areas were verified with the FDEP and the U.S. Army Corps of Engineers (USACE) (see FDEP correspondence in Appendix 10.6).

2.3.7 METEOROLOGY AND AMBIENT AIR QUALITY

2.3.7.1 Climatology/Meteorology

The nearest first-order surface observation station to the Site having a meteorological database suitable for dispersion modeling is the National Weather Service (NWS) station located at the West Palm Beach International Airport (WBAN: 12844, COOP ID: 089525). The closest coastal station collecting upper air meteorological data (i.e., mixing heights) is also located at the West Palm Beach International Airport. The West Palm Beach International Airport is situated approximately 60 miles (100 kilometers [km]) south of the Site. Meteorological data collected at this station are representative of weather conditions occurring at the Site. Consistent with FDEP guidance, surface and upper data from the West Palm Beach NWS station for 1987 through 1991 were used in the air quality impact analysis.

The Site is situated approximately 6 miles inland from the Atlantic Ocean on the south-east coast of Florida. This maritime location has a strong influence on the climate of the region. Discussions of regional temperature, rainfall and relative humidity, winds (direction and speed), atmospheric stability, and severe weather are provided in the following sections.

Temperature

Summers are long and warm, while winters are generally mild because of the southern latitude and the warming influence of the Gulf Stream. Cold, continental air masses are significantly modified as they either pass over water or the Florida Peninsula. On average, only 1 day every 3 years experiences freezing temperatures, usually in January. Summer temperatures are tempered by the ocean breeze and by the frequent formation of cumulus clouds. Temperatures of 89°F or higher have occurred in all months of the year but temperatures of 100°F or higher are rare. Table 2.3.7-1 provides a summary of monthly mean and extreme temperatures based on NWS data collected at the West Palm Beach International Airport (National Climatic Data Center [NCDC] Web Site, 2000); the period of record for these data is through 1999. Based on these data, January exhibits the lowest mean daily minimum temperature (56.9°F) and the lowest normal mean monthly temperature (66.0°F). The highest mean daily maximum temperature (90.2°F)

Table 2.3.7-1. Meteorological Data from West Palm Beach, Florida

NORMALS, MEANS, AND EXTREMES

WEST PALM BEACH, FL (PBI)

LATITUDE: 26° 41' 05" N LONGITUDE: 80° 05' 58" W ELEVATION (FT): GRND: 22 BARO: 22 TIME ZONE: EASTERN (UTC + 5) WBAN: 12844

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	NORMAL DAILY MAXIMUM	30	74.5	75.9	78.8	82.0	85.6	88.1	89.9	90.0	88.6	84.9	80.0	76.0	82.9
	MEAN DAILY MAXIMUM	41	74.6	75.9	78.8	82.3	85.6	88.3	90.1	90.2	88.5	85.0	80.1	76.2	83.0
	HIGHEST DAILY MAXIMUM	62	89	90	94	99	96	98	101	98	97	95	91	90	101
	YEAR OF OCCURRENCE		1942	1949	1977	1971	1971	1998	1942	1963	1937	1989	1992	1941	JUL 1942
	MEAN OF EXTREME MAXS.	51	83.7	85.6	88.1	90.6	91.8	93.7	94.4	94.2	92.9	90.5	86.5	84.3	89.7
	NORMAL DAILY MINIMUM	30	55.7	56.5	61.2	64.7	69.7	73.1	74.5	75.0	74.6	70.7	64.5	58.7	66.6
	MEAN DAILY MINIMUM	41	56.9	57.4	61.3	65.3	70.0	73.4	74.7	75.2	74.4	70.8	65.0	59.0	67.0
	LOWEST DAILY MINIMUM	62	27	32	30	43	51	61	66	65	66	46	36	28	27
	YEAR OF OCCURRENCE		1977	1989	1980	1987	1992	1984	1937	1957	1938	1968	1950	1989	JAN 1977
	MEAN OF EXTREME MINS.	51	39.0	42.5	45.7	53.3	60.9	68.3	70.5	70.7	70.1	59.5	49.4	41.5	56.0
	NORMAL DRY BULB	30	65.1	66.2	70.0	73.4	77.6	80.6	82.2	82.5	81.6	77.8	72.3	67.4	74.7
	MEAN DRY BULB	51	66.0	67.1	70.3	73.8	77.9	81.0	82.5	82.7	81.6	77.8	72.4	67.8	75.1
	MEAN WET BULB	48	60.3	61.0	63.4	66.2	70.6	74.2	75.6	75.8	75.2	71.0	66.1	61.9	68.4
	MEAN DEW POINT	48	56.4	57.0	59.2	62.0	67.3	71.8	73.2	73.4	72.9	68.1	62.6	58.1	65.2
	NORMAL NO. DAYS WITH:														
	MAXIMUM ≥ 90°	30	0.0	0.0	0.5	1.9	3.8	9.8	18.2	20.1	11.2	2.2	0.1	0.0	67.8
	MAXIMUM ≤ 32°	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MINIMUM ≤ 32°	30	0.4	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8
	MINIMUM ≤ 0°	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H/C	NORMAL HEATING DEG. DAYS	30	122	85	27	0	0	0	0	0	0	0	15	74	323
	NORMAL COOLING DEG. DAYS	30	125	119	182	252	391	468	533	543	498	397	234	149	3891
RH	NORMAL (PERCENT)	30	73	71	70	68	72	77	76	76	78	74	73	73	73
	HOUR 01 LST	30	81	80	78	76	79	84	85	84	84	80	80	80	81
	HOUR 07 LST	30	83	83	81	79	80	84	85	85	87	83	83	82	83
	HOUR 13 LST	30	59	56	56	54	59	65	64	64	66	62	61	59	60
	HOUR 19 LST	30	72	70	68	65	71	76	75	75	78	74	73	73	72
S	PERCENT POSSIBLE SUNSHINE														
W/O	MEAN NO. DAYS WITH:														
	HEAVY FOG(VISBY≤1/4 MI)	56	1.7	1.1	0.9	0.9	0.3	0.3	0.0	0.1	0.3	0.4	0.6	1.1	7.7
	THUNDERSTORMS	56	0.9	1.3	2.4	3.5	7.6	13.2	15.8	16.2	11.3	4.4	1.5	0.9	79.0
CLOUDINESS	MEAN:														
	SUNRISE-SUNSET (OKTAS)	1					5.6	4.8						5.6	
	MIDNIGHT-MIDNIGHT (OKTAS)	1						4.8							
	MEAN NO. DAYS WITH:														
	CLEAR	1	1.0	8.5	7.0		5.0	6.0						2.0	
	PARTLY CLOUDY	2	6.5	3.0	6.0		6.0	8.0						3.0	
	CLOUDY	2	5.5	2.5	4.0		8.0	9.0							
PR	MEAN STATION PRESSURE(IN)	26	30.09	30.07	30.04	30.01	29.98	30.00	30.05	30.02	29.97	29.98	30.04	30.08	30.03
	MEAN SEA-LEVEL PRES. (IN)	48	30.12	30.09	30.06	30.04	30.00	30.01	30.06	30.02	29.97	29.98	30.05	30.11	30.04
WINDS	MEAN SPEED (MPH)	37	10.3	10.6	11.1	10.9	9.8	8.4	7.8	7.9	8.8	10.3	10.5	10.1	9.7
	PREVAIL.DIR(TENS OF DEGS)	21	32	32	14	13	13	13	13	12	09	07	08	32	09
	MAXIMUM 2-MINUTE:														
	SPEED (MPH)	6	37	48	36	33	30	45	38	33	44	47	39	38	48
	DIR. (TENS OF DEGS)		19	11	25	33	19	01	33	11	13	06	10	36	11
	YEAR OF OCCURRENCE		1994	1998	1994	1999	1994	1994	1997	1994	1994	1999	1994	1994	FEB 1998
	MAXIMUM 5-SECOND:														
	SPEED (MPH)	6	46	55	43	39	39	53	45	41	54	61	46	48	61
	DIR. (TENS OF DEGS)		19	11	25	29	20	36	33	12	10	05	11	36	05
	YEAR OF OCCURRENCE		1994	1998	1994	1999	1994	1994	1997	1994	1998	1999	1994	1994	OCT 1999
PRECIPITATION	NORMAL (IN)	30	2.80	2.69	3.66	2.91	6.13	8.09	6.14	6.02	8.53	6.60	4.69	2.49	60.75
	MAXIMUM MONTHLY (IN)	60	11.18	8.71	16.78	18.26	15.22	17.91	17.74	13.52	24.86	18.74	14.63	11.69	24.86
	YEAR OF OCCURRENCE		1998	1983	1982	1942	1976	1966	1941	1950	1960	1965	1982	1994	SEP 1960
	MINIMUM MONTHLY (IN)	60	0.22	0.29	0.33	0.04	0.39	1.07	1.22	1.73	1.77	0.56	0.23	0.06	0.04
	YEAR OF OCCURRENCE		1960	1948	1956	1967	1967	1952	1961	1987	1988	1997	1970	1968	APR 1967
	MAXIMUM IN 24 HOURS (IN)	60	9.12	4.70	8.80	15.23	7.04	9.21	5.83	6.72	8.71	9.58	7.67	6.45	15.23
	YEAR OF OCCURRENCE		1998	1966	1982	1942	1958	1945	1972	1988	1960	1965	1984	1994	APR 1942
	NORMAL NO. DAYS WITH:														
	PRECIPITATION ≥ 0.01	30	7.7	7.4	7.6	5.6	11.0	14.4	14.3	15.9	16.7	12.2	9.2	7.7	129.7
	PRECIPITATION ≥ 1.00	30	0.7	0.8	1.0	0.7	1.9	2.9	1.7	1.5	2.7	1.7	1.4	0.7	17.7
SNOWFALL	NORMAL (IN)	30	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	MAXIMUM MONTHLY (IN)	52	T	0.0	T	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	T
	YEAR OF OCCURRENCE		1977		1994					1993					MAR 1994
	MAXIMUM IN 24 HOURS (IN)	52	T	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	T
	YEAR OF OCCURRENCE		1977		1994					1993					AUG 1993
	MAXIMUM SNOW DEPTH (IN)	48	0	0	0	0	0	0	0	T	0	0	0	0	T
	YEAR OF OCCURRENCE									1993					AUG 1993
	NORMAL NO. DAYS WITH:														
	SNOWFALL ≥ 1.0	30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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and the maximum mean monthly temperature (82.7°F) both occur in August. The highest and lowest daily record temperatures of 101°F and 27°F were experienced in July 1942 and January 1977, respectively.

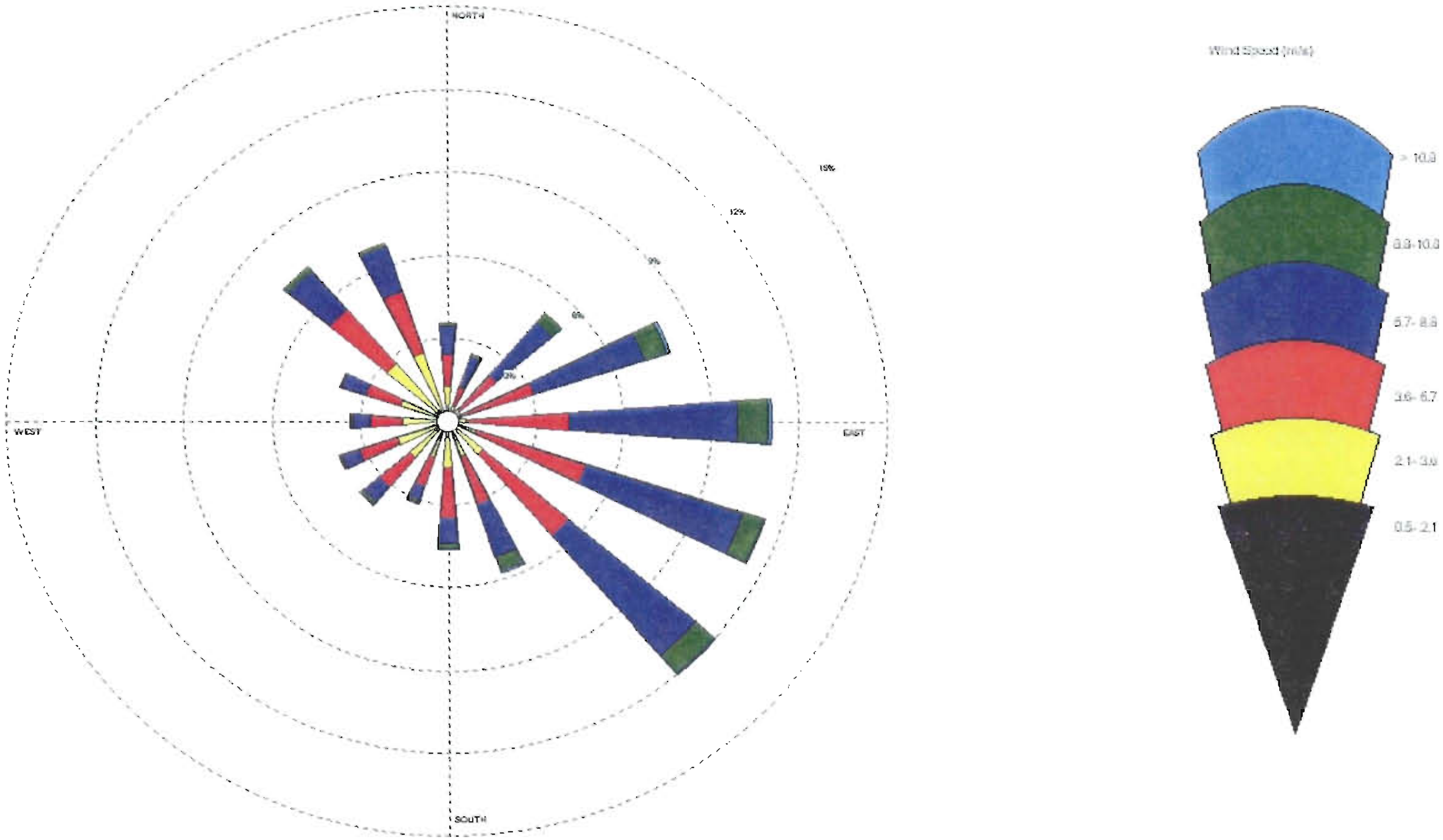
Rainfall and Relative Humidity

The moist, unstable air prevalent in the region results in frequent showers, typically of short duration. Rainfall is heaviest during the summer and fall with thunderstorms occurring frequently throughout the summer months due to convective heating. Fall rainfall is often associated with the occasional heavy rains that accompany tropical disturbances. Heavy fog occurs on average only one morning a month in the winter and spring and rarely in the summer and fall. Normal annual rainfall is 60.75 inches. The monthly statistics (see Table 2.3.7-1) show the rainy season to begin in May and end in October. The highest normal monthly rainfall is 8.53 inches in September. January, February, and December are the driest months, with an average of 2.66 inches of precipitation. Record monthly precipitation occurred in September 1960, when 24.86 inches of rain were recorded. The record daily precipitation of 15.23 inches occurred in April 1942.

The monthly normal relative humidity varies little throughout the year ranging from 68 percent in April to 78 percent in September. On a diurnal basis, recorded relative humidities are lowest in the early afternoon and highest during the early morning hours.

Winds

Figure 2.3.7-1 presents a 5-year annual wind rose (1987 to 1991) based on surface wind direction and windspeed observed at the West Palm Beach International Airport. Figures 2.3.7-2 through 2.3.7-5 present 5-year winter, spring, summer, and fall wind roses for the same station, respectively. The values presented in these figures represent the percent of the time that the wind blows from a particular direction at a given speed. The predominant wind direction during the 5-year period was from the east-southeast, which occurred approximately 12 percent of the time. Wind directions from the east and southeast each occurred approximately 11 percent or more of the time.



Note:
Wind direction is the direction
from which the wind is blowing.

Average Windspeed: 5.15 m/s
Calm Winds Frequency: 2.69%

FIGURE 2.3.7-1.
5-YEAR ANNUAL WIND ROSE FOR WEST PALM BEACH INTERNATIONAL AIRPORT (1987-1991)

Source: NCDC, 2000; ECT, 2000.

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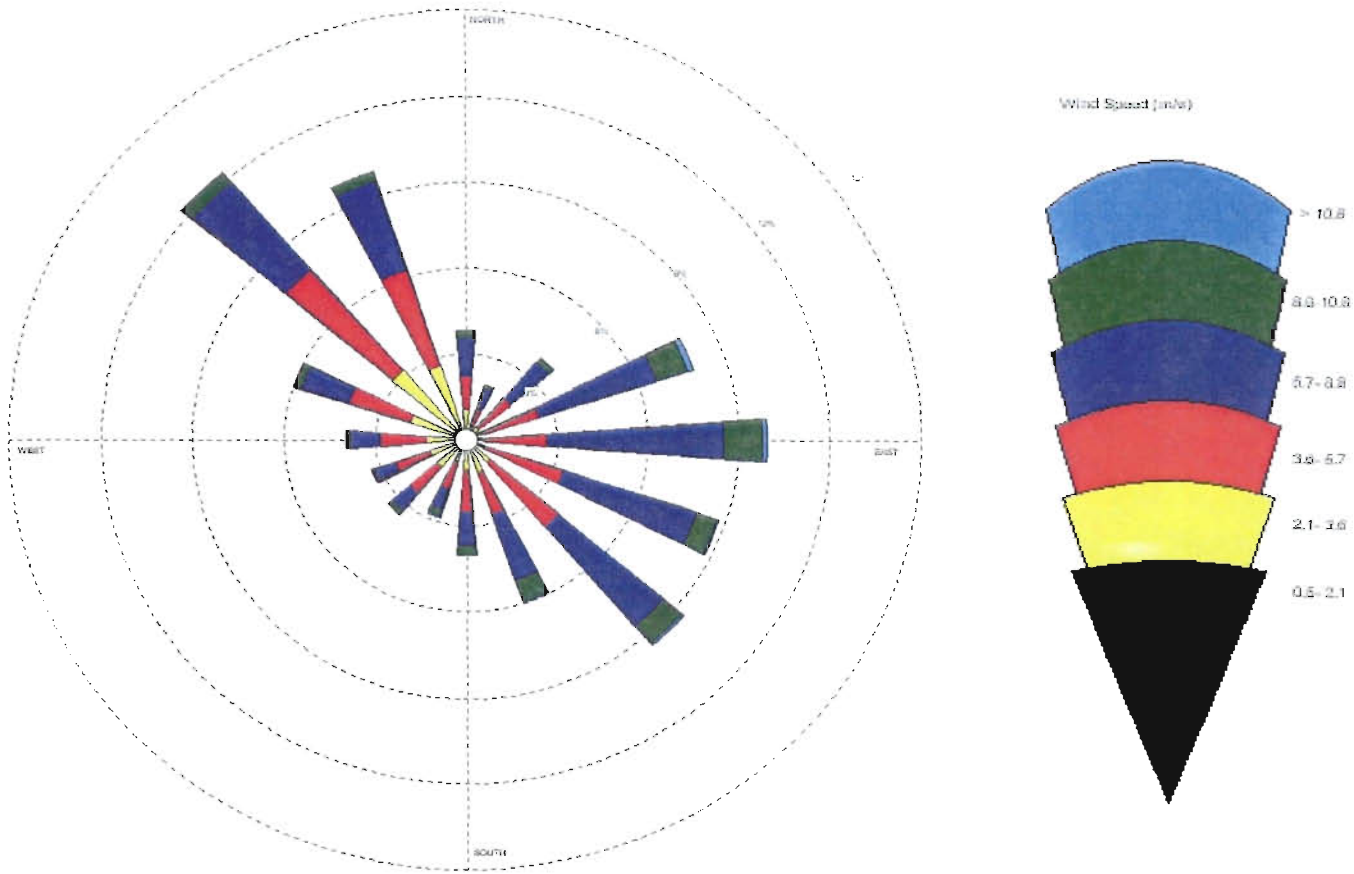

Note:
Wind direction is the direction
from which the wind is blowing.

Average Windspeed: 5.39 m/s
Calm Winds Frequency: 1.89%

FIGURE 2.3.7-2.
5-YEAR WINTER WIND ROSE FOR WEST PALM BEACH
INTERNATIONAL AIRPORT (1987-1991)

Source: NCDC, 2000; ECT, 2000.

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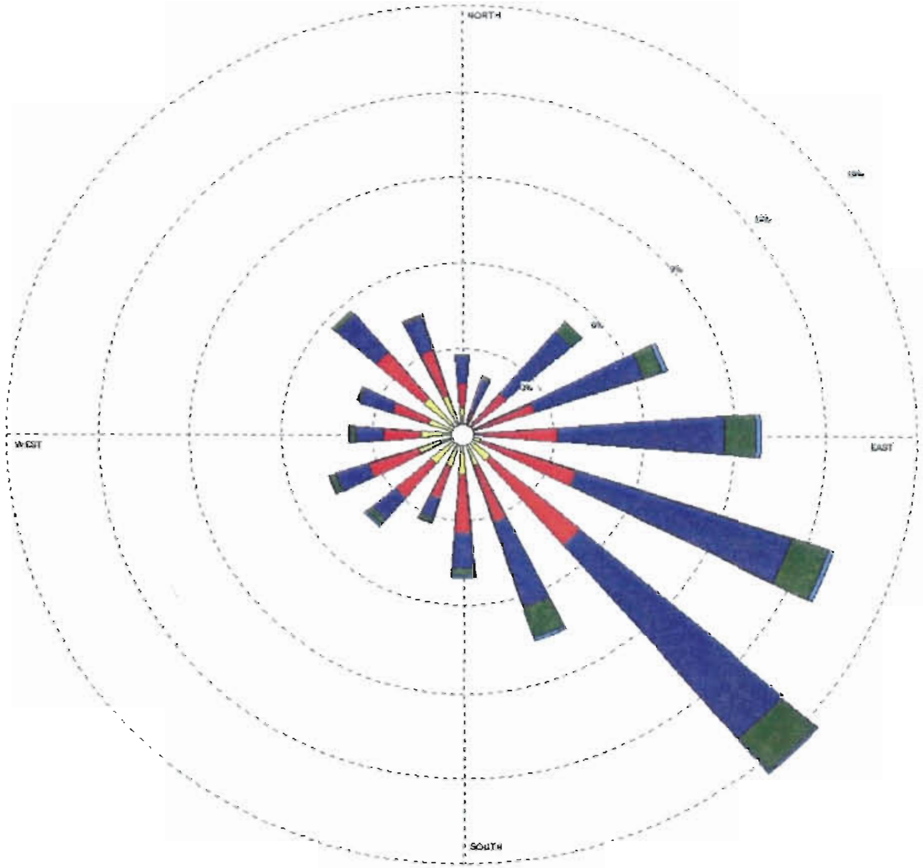

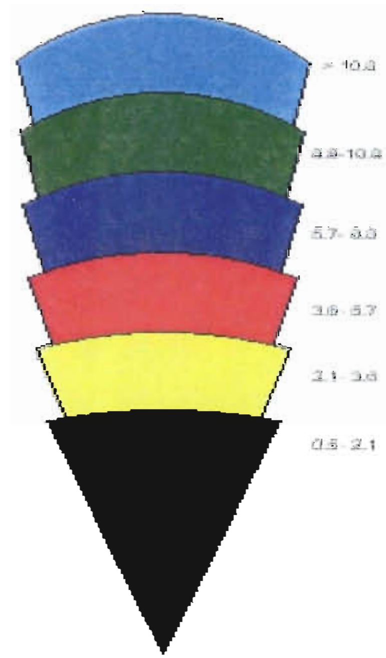

Note:
Wind direction is the direction from which the wind is blowing.

Average Windspeed: 5.62 m/s
Calm Winds Frequency: 1.49%

FIGURE 2.3.7-3.
5-YEAR SPRING WIND ROSE FOR WEST PALM BEACH INTERNATIONAL AIRPORT (1987-1991)

Source: NCDC, 2000; ECT, 2000.

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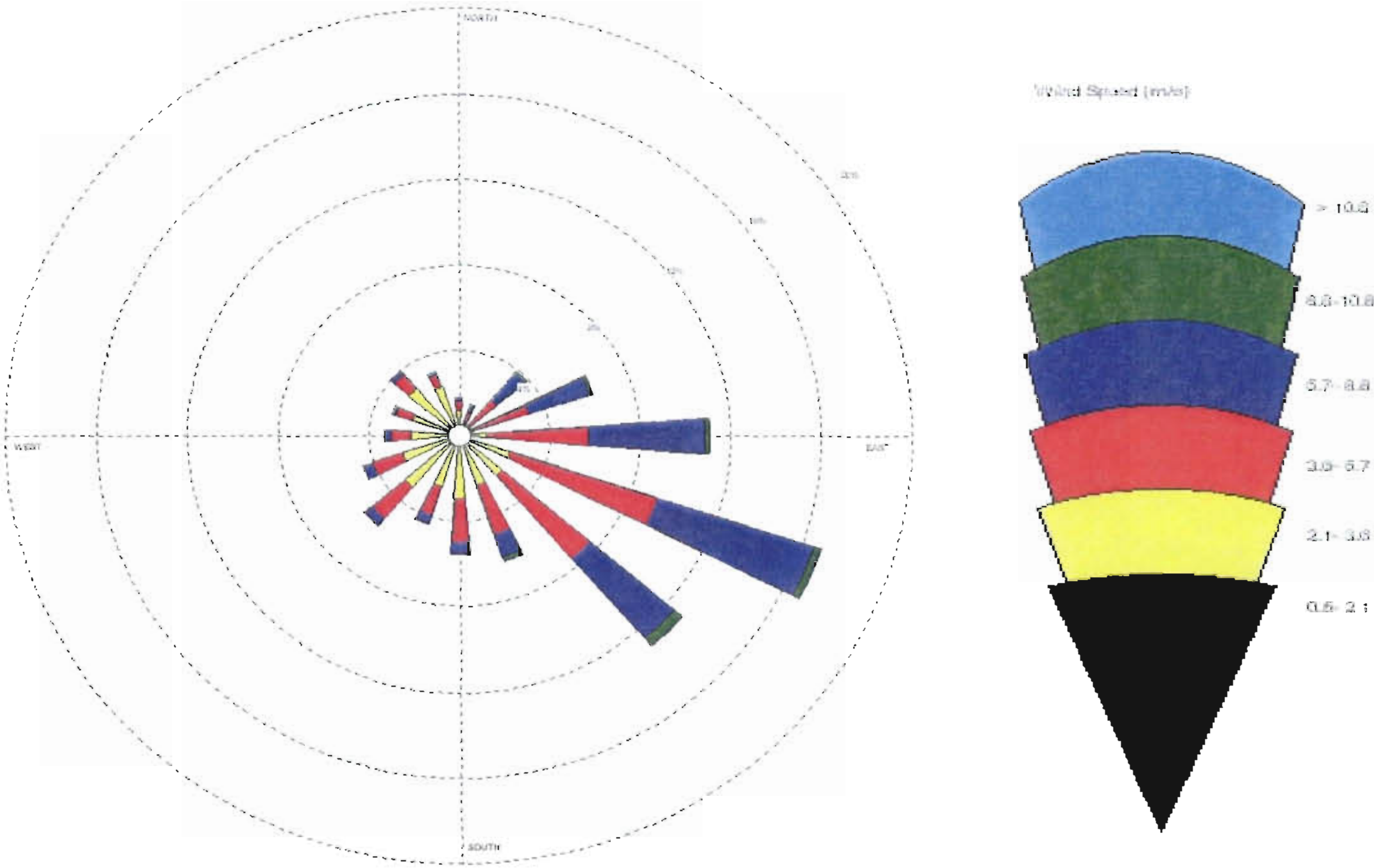

Note:
Wind direction is the direction from which the wind is blowing.

Average Windspeed: 4.39 m/s
Calm Winds Frequency: 4.84%

FIGURE 2.3.7-4.
5-YEAR SUMMER WIND ROSE FOR WEST PALM BEACH INTERNATIONAL AIRPORT (1987-1991)

Source: NCDC, 2000; ECT, 2000.

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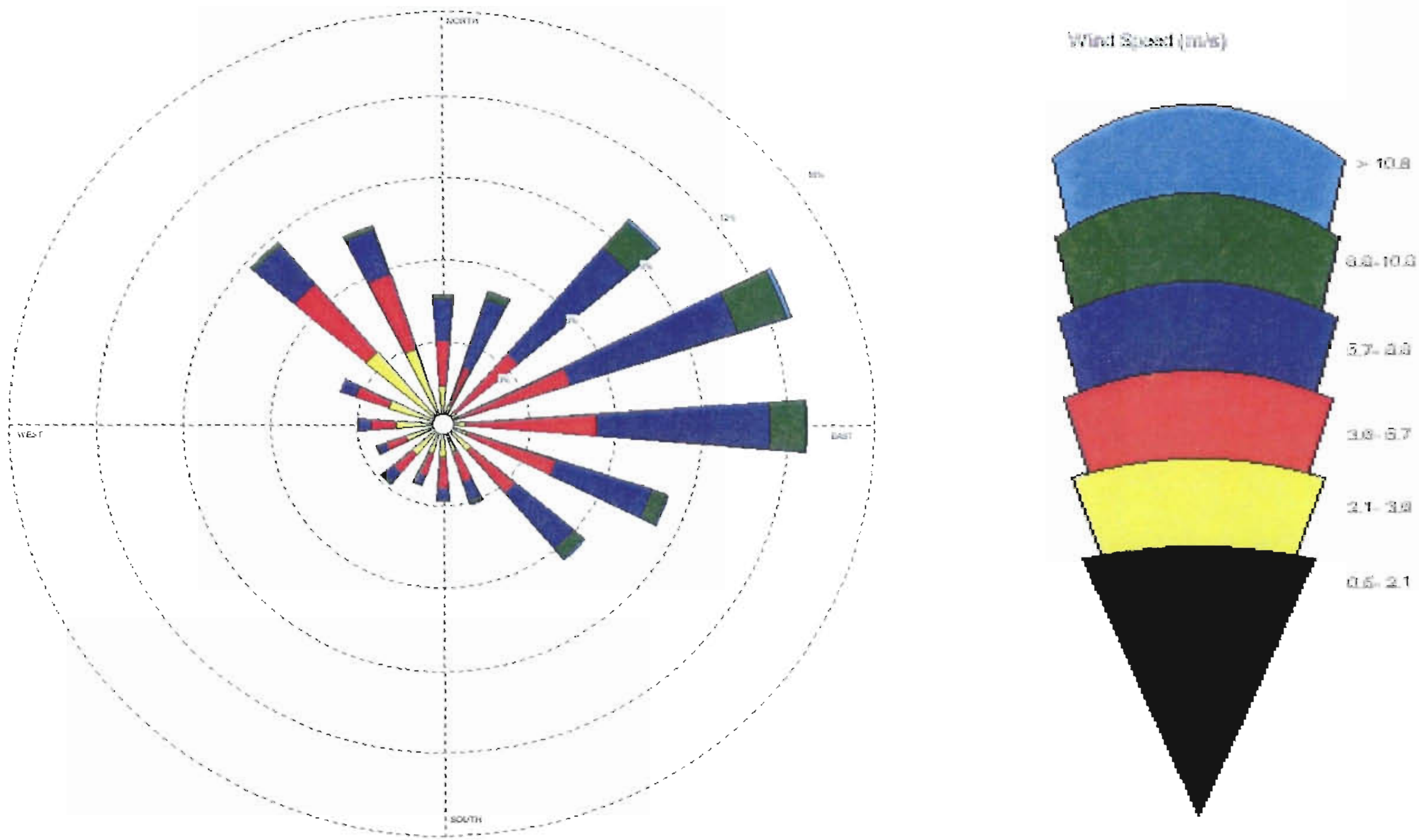

Note:
Wind direction is the direction
from which the wind is blowing.

Average Windspeed: 5.17 m/s
Calm Winds Frequency: 2.55%

FIGURE 2.3.7-5.
5-YEAR FALL WIND ROSE FOR WEST PALM BEACH INTERNATIONAL AIRPORT (1987-1991)

Source: NCDC, 2000; ECT, 2000.

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March has the highest mean monthly windspeed of 11.1 miles per hour (mph). The lowest mean monthly windspeed of 7.8 mph occurs in July. The annual average windspeed is 9.7 mph. The highest recorded 5-second windspeed was 61 mph in October 1999.

Atmospheric Stability

Table 2.3.7-2 presents the annual and seasonal pattern of atmospheric stability in the Site area, as characterized by the 5-year modeling period of record for West Palm Beach upper air data. During the summer, unstable conditions are present approximately 27 percent of the time because of strong insulation. During the winter, the occurrence of unstable conditions is reduced to 7 percent of the time. Neutral stability is more common in the winter, occurring approximately 63 percent of the time. Stable conditions are uniformly distributed throughout the year, occurring 25 to 33 percent of the time.

Table 2.3.7-2. Annual and Seasonal Average Distribution of Atmospheric Stability Classes for West Palm Beach, Florida (1987 through 1991)

	Occurrence (%) of Stability Class					
Season	Very Unstable	Moderately Unstable	Slightly Unstable	Neutral	Slightly Stable	Moderately Stable
Winter	<0.1	1.0	5.7	62.6	17.9	10.9
Spring	0.1	2.2	13.8	57.1	16.8	8.5
Summer	0.4	6.0	20.5	34.7	18.4	15.2
Fall	<0.1	2.3	11.1	53.6	18.2	12.2
Annual	**0.1**	**2.9**	**12.8**	**52.0**	**17.8**	**11.7**

Sources: NCDC, 2000.
ECT, 2000.

The mixing height defines the upper limit of the surface boundary layer, and thus, is an important factor in determining the atmosphere's dispersion characteristics. The annual and seasonal averaging morning and afternoon mixing heights for West Palm Beach, as calculated by NWS, are presented in Table 2.3.7-3. The lowest mixing heights occur in the morning in the winter and the highest mixing heights occur in the afternoon in the spring.

Table 2.3.7-3. Annual and Seasonal Average Mixing Heights for West Palm Beach, Florida (1987 through 1991)

Season	Mixing Height (meters)	
	Morning	Afternoon
Winter	698	1,257
Spring	868	1,429
Summer	840	1,372
Fall	868	1,307
Annual	**818**	**1,341**

Sources: NCDC, 2000.
ECT, 2000.

Severe Weather

Thunderstorms are the most common severe weather in the area, occurring on an average of 79 days each year at the NWS West Palm Beach observation station. Thunderstorms occur most frequently from late spring to early autumn, but may occur at any time during the year.

Hurricanes and tornadoes are types of severe weather that may occur in the area, but the probability of a hurricane or tornado passing over the Site is small. The possibility of any tropical storm crossing the Vero Beach area is less than 10 percent in any given year. The possibility of a hurricane-strength tropical storm (winds greater than 117 km per hour) crossing the area is approximately 6 percent in any given year. The possibility of a hurricane with winds greater than 200 km per hour crossing the area in any given year is approximately 1 percent. Tornadoes also are reported rarely in the area, with June being the month of highest occurrence.

2.3.7.2 Ambient Air Quality

The Site is located in an area that FDEP classifies as attainment for all criteria pollutants (Section 62-204.240, F.A.C.). This means that the area meets all state and federal ambient air quality standards (AAQS), which are given in Table 2.3.7-4.

Table 2.3.7-4. National and Florida Air Quality Standards (micrograms per cubic meter [µg/m3] unless otherwise stated)

Pollutant (units)	Averaging Periods	National Standards Primary	National Standards Secondary	Florida Standards
SO_2 (ppmv)	3-hour[1]		0.5	0.5
	24-hour[1]	0.14		0.1
	Annual[2]	0.030		0.02
SO_2	3-hour[1]			1,300
	24-hour[1]			260
	Annual[2]			60
PM_{10}[13]	24-hour[3]	150	150	
	Annual[4]	50	50	
PM_{10}	24-hour[5]			150
	Annual[6]			50
$PM_{2.5}$[11,12]	24-hour[7]	65	65	
	Annual[8]	15	15	
CO (ppmv)	1-hour[1]	35		35
	8-hour[1]	9		9
CO	1-hour[1]			40,000
	8-hour[1]			10,000
Ozone (ppmv)	1-hour[9]			0.12
	8-hour[10,11]	0.08	0.08	
NO_2 (ppmv)	Annual[2]	0.053	0.053	0.05
NO_2	Annual[2]			100
Lead	Calendar Quarter Arithmetic Mean	1.5	1.5	1.5

Note: ppmv = part per million by volume.

1 Not to be exceeded more than once per calendar year.
2 Arithmetic mean.
3 Standard attained when the 99th percentile is less than or equal to the standard, as determined by 40 CFR 50, Appendix N.
4 Arithmetic mean, as determined by 40 CFR 50, Appendix N.
5 Not to be exceeded more than once per year, as determined by 40 CFR 50, Appendix K.
6 Standard attained when the expected annual arithmetic mean is less than or equal to the standard, as determined by 40 CFR 50, Appendix K.
7 Standard attained when the 98th percentile is less than or equal to the standard, as determined by 40 CFR 50, Appendix N.
8 Arithmetic mean, as determined by 40 CFR 50, Appendix N.
9 Standard attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than 1, as determined by 40 CFR 50, Appendix H.
10 Standard attained when the average of the annual 4th highest daily maximum 8-hour average concentration is less than or equal to the standard, as determined by 40 CFR 50, Appendix I.
11 The U.S. Court of Appeals for the District of Columbia Circuit (Circuit Court) held that these standards are not enforceable. American Trucking Association v. U.S.E.P.A., 1999 WL300618 (Circuit Court).
12 The Circuit Court may vacate standards following briefing. Id.
13 The Circuit Court held PM_{10} standards vacated upon promulgation of effective $PM_{2.5}$ standards.

Sources: 40 CFR 50.
Section 62-204.240, F.A.C.

Ambient air monitoring data are available with which to generally characterize the existing conditions in the vicinity of the Site. Table 2.3.7-5 lists the ambient monitoring stations closest to the Site for each criteria pollutant, per FDEP reports for calendar years 1997 and 1998. Figure 2.3.7-6 shows the locations of these stations relative to the Site.

Table 2.3.7-5. Ambient Air Quality Monitoring Stations Closest to the BHEC Site

Pollutant	FDEP Station No.	Station Location: County	Station Location: City	Relative to Project Site (km)
PM_{10}	12 111 0012	St. Lucie	Fort Pierce	21 SE
SO_2	12 099 3004	Palm Beach	Riviera Beach	138 SE
NO_2	4760 004 G01	Palm Beach	West Palm Beach	104 SE
	12 099 1004	Palm Beach	West Palm Beach	104 SE
CO	4760 004 G01	Palm Beach	West Palm Beach	104 SE
	12 099 1006	Palm Beach	West Palm Beach	105 SE
Ozone	12 111 1002	St. Lucie	Fort Pierce	15 SE
Lead	12 011 5005	Broward	Coconut Creek	144 SE

Sources: FDEP, 1998 and 1999.
ECT, 2000.

The nearest FDEP ambient air monitoring stations are located in Fort Pierce, St. Lucie County, approximately 15 and 21 km southeast of the Site, respectively. The FDEP monitoring stations in Fort Pierce monitor particulate matter less than or equal to 10 micrometers aerodynamic diameter (PM_{10}), $PM_{2.5}$, and ozone. The nearest FDEP station that monitors for nitrogen dioxide (NO_2) is located in West Palm Beach, Palm Beach County, approximately 104 km southeast of the Project Site. The nearest FDEP stations that monitor for carbon monoxide (CO) are located in West Palm Beach, Palm Beach County, approximately 104 km southeast of the Project Site. The nearest FDEP station that monitors for sulfur dioxide (SO_2) is located in Rivera Beach, Palm Beach County, approximately 138 km southeast of the Site. The nearest FDEP station monitoring for lead is

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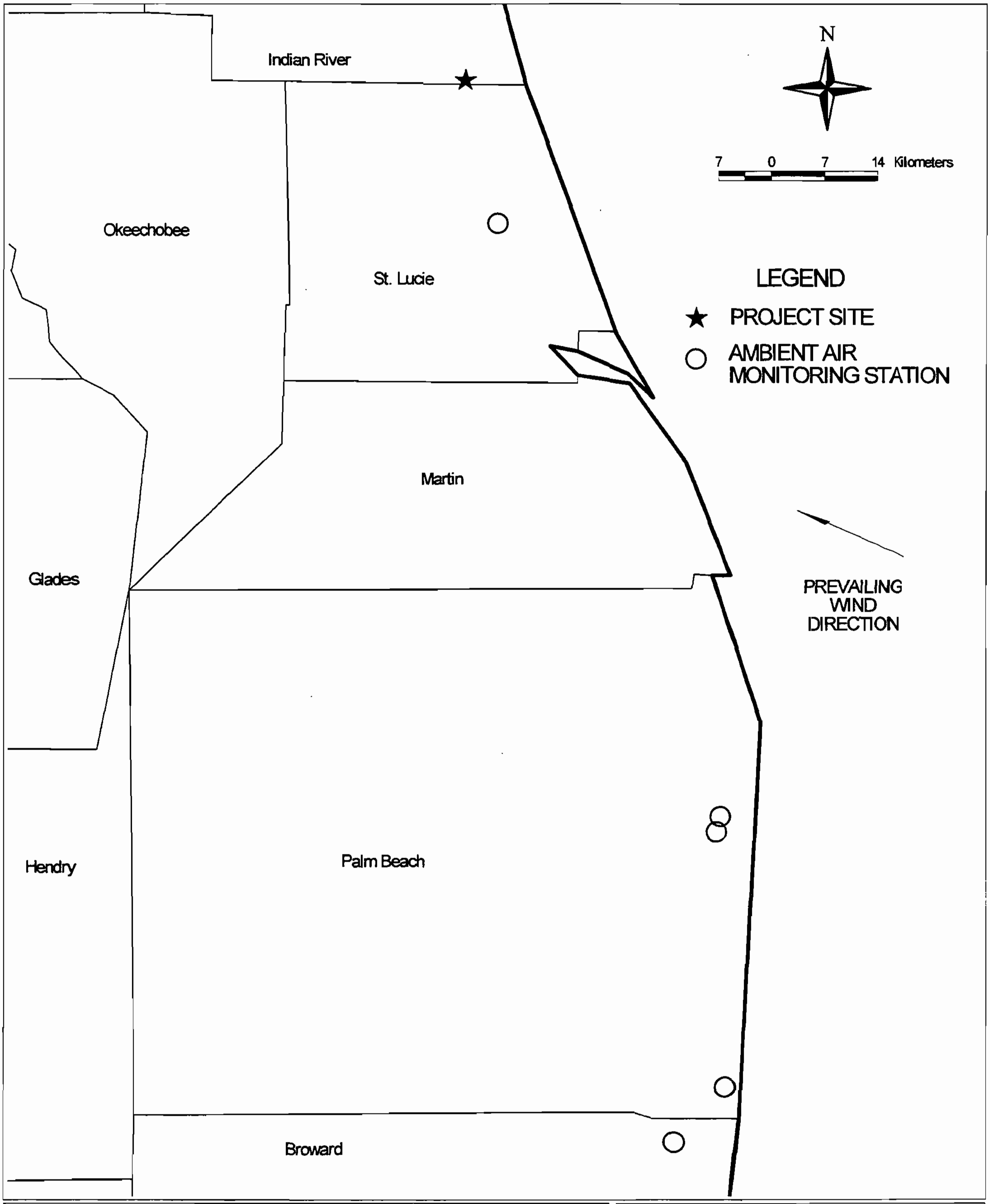

FIGURE 2.3.7-6.

LOCATIONS OF CLOSEST FDEP AMBIENT AIR QUALITY MONITORING STATIONS

Source: ECT, 2000.

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situated in Coconut Creek, Broward County, approximately 144 km southeast of the Site. The monitoring data collected in urban Palm Beach County would not be truly representative of the rural Site location. Accordingly, existing concentrations of SO_2, NO_x, CO, and lead, which are usually associated with urban environments, are likely to be lower at the Site than is indicated by the monitoring data for more urban areas.

Tables 2.3.7-6 through 2.3.7-11 present summaries of the available data. These presentations of data are consistent with the conclusion that the Site is characterized as having good air quality.

Table 2.3.7-6. Summary of FDEP PM_{10} Monitoring Near the BHEC Site

Location	Site Identification Number	Year	24-Hour Measurement Highest (μg/m^3)	24-Hour Measurement Second-highest (μg/m^3)	Annual Arithmetic Mean (μg/m^3)
Fort Pierce	12 111 0012	1997	35	35	17
		1997	41	38	18
Fort Pierce	12 111 0012	1998	45	35	19

Note: The 24-hour ambient PM_{10} standard is 150 μg/m^3, attained when the 99th percentile concentration is less than or equal to the standard; the annual ambient PM_{10} standard is 50 μg/m^3, annual arithmetic mean.

Source: FDEP, 1998 and 1999.

Table 2.3.7-7. Summary of FDEP SO_2 Monitoring Near the BHEC Site

Location	Site Identification Number	Year	Highest 3-Hour Average (μg/m^3)	Highest 24-Hour Average (μg/m^3)	Annual Average (μg/m^3)
Riviera Beach	12 099 3004	1997	165	50	4
		1998	178	23.6	2.6

Note: The 3-hour ambient standard is 1,300 μg/m^3, not to be exceeded more than once per year. The 24-hour ambient standard is 260 μg/m^3, not to be exceeded more than once per year. The annual ambient standard is 60 μg/m^3, arithmetic mean.

Source: FDEP, 1998 and 1999.

Table 2.3.7-8. Summary of FDEP NO_2 Monitoring Near the BHEC Site

Location	Site Identification Number	Year	Annual Average ($\mu g/m^3$)
West Palm Beach	4760 004 G01	1997	25
	12 099 1004	1998	22.6

Note: The annual ambient standard is 100 $\mu g/m^3$, arithmetic mean.

Source: FDEP, 1998 and 1999.

Table 2.3.7-9. Summary of FDEP CO Monitoring Near the BHEC Site

Location	Site Identification Number	Year	Highest 1-Hour Average ($\mu g/m^3$)	Highest 8-Hour Average ($\mu g/m^3$)
West Palm Beach	4760 004 G01	1997	12,597	8,016
West Palm Beach	12 099 1006	1998	6,184	3,436

Note: The 1-hour ambient standard is 40,000 $\mu g/m^3$, not to be exceeded more than once per year.
The 8-hour ambient standard is 10,000 $\mu g/m^3$, not to be exceeded more than once per year.

Source: FDEP, 1998 and 1999.

Table 2.3.7-10. Summary of FDEP Ozone Monitoring Near the BHEC Site

Location	Site Identification Number	Year	1-Hour Measurement Highest ($\mu g/m^3$)	1-Hour Measurement Second-highest ($\mu g/m^3$)
Fort Pierce	12 111 1002	1997	166.9	166.9
		1998	186.5	186.5

Note: The 1-hour ambient ozone standard is 235 $\mu g/m^3$, attained when the 3-year average number of days with a maximum hourly concentration above the standard is less than 1.0.

Source: FDEP, 1998 and 1999.

Table 2.3.7-11. Summary of FDEP Lead Monitoring Near the BHEC Site

Location	Site Identification Number	Year	Quarterly Arithmetic Average ($\mu g/m^3$)			
			1	2	3	4
Coconut Creek	12 011 5005	1997	0.0	0.0	0.0	0.0
		1998	0.01	0.03	0.02	0.01

Note: The ambient standard is 1.5 $\mu g/m^3$, calendar quarterly arithmetic mean.

Source: FDEP, 1998 and 1999.

Another indicator of existing air quality is proximity to other emission sources. Indian River County has, in general, less heavy industry than many counties in Florida. The largest potential sources of air emissions are power plants. The power plant closest to the Site is the City of Vero Beach power plant in Vero Beach. Other point sources of anthropogenic emissions in Indian River County are the Ocean Spray Cranberries food citrus processing facility, and the Piper Aircraft Inc., manufacturing facility; both are located in the vicinity of the Site, as shown in Figure 2.3.7-7.

2.3.7.3 Measurement Programs

No programs to measure existing meteorological or ambient air quality conditions were undertaken for the Project. Given the low impacts predicted for the Project's combustion emissions, the use of existing data was deemed appropriate.

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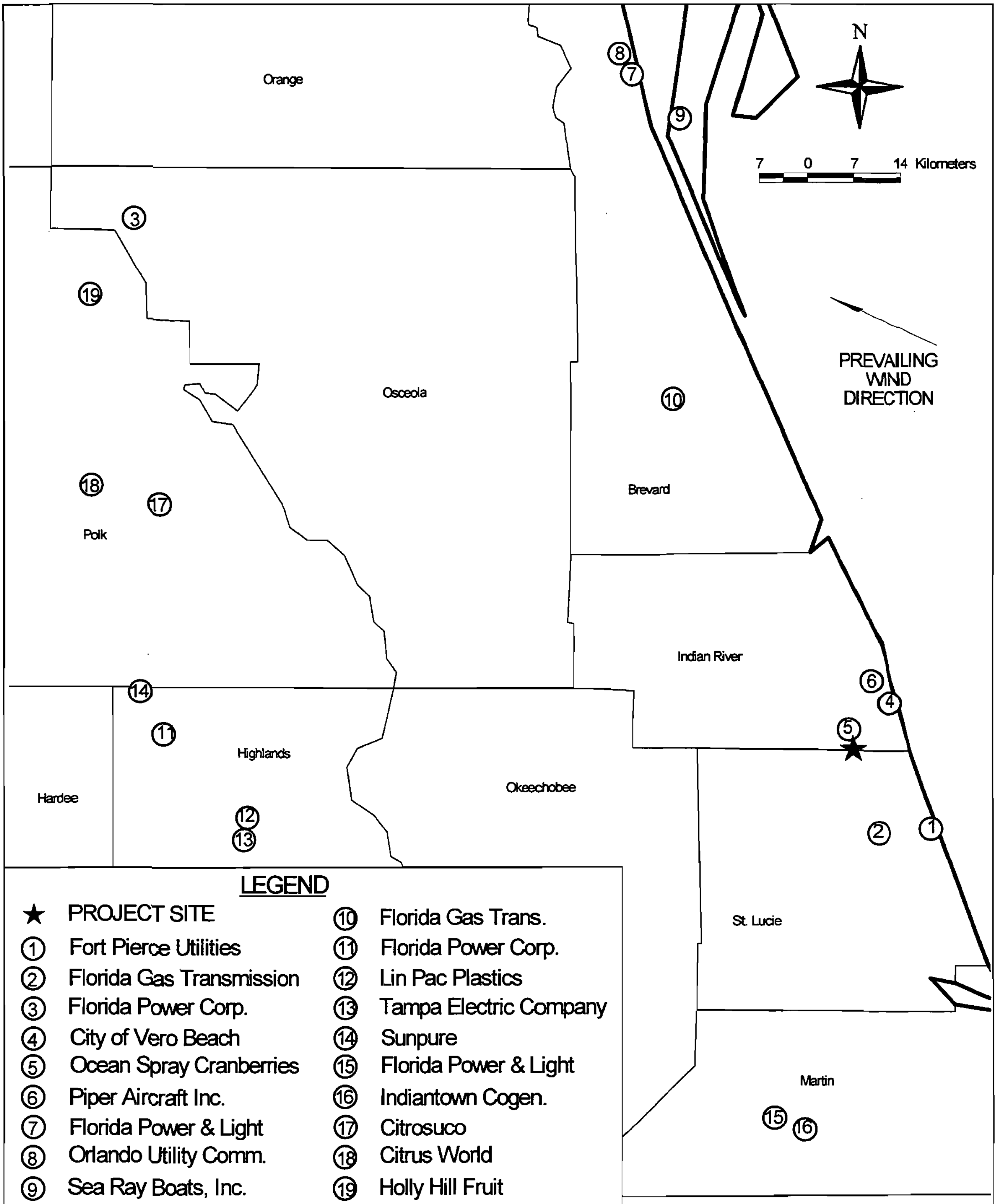

FIGURE 2.3.7-7.

OTHER POINT AIR EMISSION SOURCES

Source: ECT, 2000.

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2.3.8 NOISE

The area surrounding the Site includes residential property, abandoned and active citrus groves, Indian River County landfill, the Indian River County correctional facility, I-95, and a wastewater sprayfield. A single-family residence, the county landfill, the county correctional facility, and an abandoned citrus grove are located north of the Site. A citrus grove and wastewater sprayfield are located to the east. To the southeast of the Site in St. Lucie County is a residential development. I-95 fronts the property to the west. The nearest noise-sensitive receptors are the single-family residence to the north, the correctional facility's guard housing to the west-northwest, and the Spanish Lakes Fairways residential development to the southeast; which are located approximately 400, 1,100, and 1,600 ft, respectively, from the nearest facilities to be developed on the Site.

Anthropogenic (manmade) noise sources in the area include traffic on I-95, 74th Street, and infrequent aircraft overflights. Natural noise sources, such as wind, insects, and birds, may produce noise levels that exceed those from the manmade sources, particularly at night when traffic is minimal.

An ambient sound level survey was conducted in the area during a 24-hour period beginning at 12:00 p.m. on April 11, 2000, and ending at 12:00 p.m. on April 12, 2000. Two monitoring locations, one at the northern boundary of the Site in general proximity to the single-family residence and the correctional facility housing and one along the southernmost property line in general proximity to the Spanish Lakes Fairways development, were selected as representative of ambient conditions at the noise-sensitive receptors. Continuous monitoring was conducted during the entire 24-hour period. The selected monitoring locations are shown in Figure 2.3.8-1.

Weather during the monitoring period was generally pleasant and hot. Winds were light and variable during the entire period. As a result, noise from wind and rustling vegetation was not significant during the monitoring period.

Continuous measurements of the A-weighted sound levels were conducted at both monitoring sites simultaneously over the 24-hour period using two Larson-Davis Model 870B

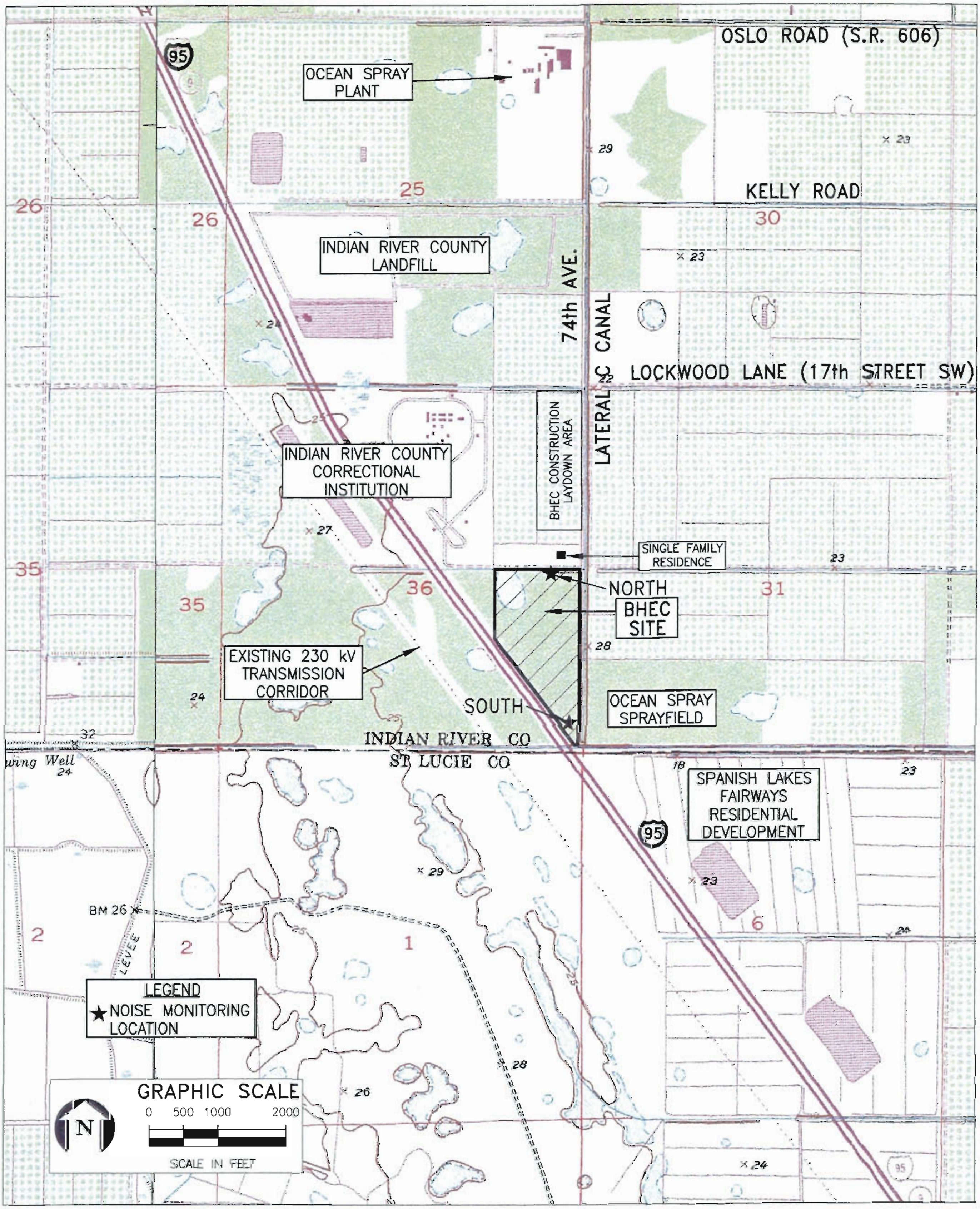

FIGURE 2.3.8-1.

NOISE MONITORING LOCATIONS

Sources: USGS Quads: Oslo and East of Glum Slough, FL, 1983; ECT, 2000.

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sound level meters with integral data loggers. The instruments were equipped with optional circuitry and microphones to meet the requirements of American National Standards Institute (ANSI) S1.4-1983 for Type I precision sound level meters. The microphones were Larson-Davis pre-polarized, random incidence microphones that were remotely mounted (via a 20-ft microphone extension cable and preamplifier) at a height of 5 ft above the ground. Foam windscreens were used to reduce, but not eliminate, wind-generated noise.

The calibration levels of the instruments were checked before and after the 24-hour monitoring period using a Larson-Davis sound level calibrator. The two analyzers were automatically turned on and off at the start and end of the 24-hour monitoring period. The monitors were generally left unattended during the monitoring period.

The monitoring instruments were programmed to measure and record the equivalent continuous sound level (L_{eq}) for each minute and each hour of the monitoring period. At the end of the 24-hour monitoring period, the data were downloaded directly into a computer for storage and further data analysis, including computation of the 24-hour equivalent sound level ($L_{eq}[24]$), the day/night levels (L_{dn}), and the community noise equivalent level (CNEL).

The L_{eq} is a sound energy level averaged over a specified time period and represents, in a single constant numerical value, the amount of actual time-varying sound energy received during the time interval. The strength of the L_{eq} lies in the ability to assess the total time-varying effects of noise on sensitive receptors. The U.S. Environmental Protection Agency (EPA) has selected the L_{eq} as one of the best environmental noise descriptors because of its reliable evaluation of pervasive, long-term noise, simplicity, and good correlation with known effects of noise on individuals (EPA, 1974).

The L_{dn} reflects individuals' enhanced sensitivity to noise at night compared to daytime hours. In determining the L_{dn}, the sound levels recorded between 10 p.m. and 7 a.m. are weighted by 10 A-weighted decibels (dBA) to reflect this sensitivity.

The CNEL is also a time-weighted noise level descriptor that corresponds directly to human sensitivity to noise, particularly during evening and nighttime hours. The CNEL is the summation of hourly L_{eq}s over a 24-hour period with an increased weighting factor applied to the evening and nighttime periods. The daytime period (7 a.m. to 7 p.m.) receives no weighting, while evening (7 p.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) are weighted by 5 and 10 dBA, respectively.

Using the three common 24-hour composite sound level descriptors of the continuous A-weighted sound levels, results of the ambient survey are summarized in Table 2.3.8-1 for the two monitoring locations. Fifteen-minute noise measurements for both monitoring locations are provided in Table 2.3.8-2. As expected, the ambient sound level measured near I-95 (i.e., southern location) is significantly higher than the sound level measured farther from I-95 (i.e., northern location).

Table 2.3.8-1. 24-Hour Composite Ambient Sound Survey Data

Monitoring Location	CNEL (dBA)	L_{dn} (dBA)	$L_{eq}(24)$ (dBA)
Northern portion of property	53.3	53.1	46.9
Southern portion of property (near I-95)	70.7	70.3	65.7

Source: ECT, 2000.

Indian River County has a noise ordinance in Chapter 974, Noise and Vibration Control, entitled the *Indian River County Noise and Vibration Control Ordinance*. Section 974.03 of the ordinance stipulates a general duty for any person to not make any "excessive, unnecessary, or unreasonably loud noise or vibration which disturbs the peace or quiet of any neighborhood or which would cause discomfort or annoyance to any reasonable person of normal sensitivity." Noise and vibration prohibitions for specific types of activities are listed in Section 974.04. Noise prohibitions for activities applicable to the Project include Sections 974.04 (2) and (3) as follows:

Table 2.3.8-2. 15-Minute Ambient Sound Level Survey Data

Date	Time	Sound Level in Decibels A-Scale (dBA) L1	L10	L50
A. Southern Portion of Site (Near I-95)				
4/11/00	12:15:00 PM	74.8	68.8	63.8
4/11/00	12:30:00 PM	74.7	68.7	63.7
4/11/00	12:45:00 PM	75.3	69.3	64.3
4/11/00	1:00:00 PM	76.3	70.3	65.3
4/11/00	1:15:00 PM	74.9	68.9	63.9
4/11/00	1:30:00 PM	74.4	68.4	63.4
4/11/00	1:45:00 PM	74.5	68.5	63.5
4/11/00	2:00:00 PM	74.8	68.8	63.8
4/11/00	2:15:00 PM	74.6	68.6	63.6
4/11/00	2:30:00 PM	75.1	69.1	64.1
4/11/00	2:45:00 PM	74.5	68.5	63.5
4/11/00	3:00:00 PM	74.8	68.8	63.8
4/11/00	3:15:00 PM	74.3	68.3	63.3
4/11/00	3:30:00 PM	74.6	68.6	63.6
4/11/00	3:45:00 PM	74.7	68.7	63.7
4/11/00	4:00:00 PM	74.5	68.5	63.5
4/11/00	4:15:00 PM	75.1	69.1	64.1
4/11/00	4:30:00 PM	74.4	68.4	63.4
4/11/00	4:45:00 PM	74.4	68.4	63.4
4/11/00	5:00:00 PM	74.9	68.9	63.9
4/11/00	5:15:00 PM	74.1	68.1	63.1
4/11/00	5:30:00 PM	75.2	69.2	64.2
4/11/00	5:45:00 PM	74.7	68.7	63.7
4/11/00	6:00:00 PM	74.4	68.4	63.4
4/11/00	6:15:00 PM	74.4	68.4	63.4
4/11/00	6:30:00 PM	74.1	68.1	63.1
4/11/00	6:45:00 PM	74.0	68.0	63.0
4/11/00	7:00:00 PM	74.0	68.0	63.0
4/11/00	7:15:00 PM	74.1	68.1	63.1
4/11/00	7:30:00 PM	74.2	68.2	63.2
4/11/00	7:45:00 PM	73.5	67.5	62.5
4/11/00	8:00:00 PM	72.8	66.8	61.8
4/11/00	8:15:00 PM	73.2	67.2	62.2
4/11/00	8:30:00 PM	73.7	67.7	62.7
4/11/00	8:45:00 PM	73.0	67.0	62.0
4/11/00	9:00:00 PM	73.2	67.2	62.2
4/11/00	9:15:00 PM	72.4	66.4	61.4
4/11/00	9:30:00 PM	71.8	65.8	60.8
4/11/00	9:45:00 PM	72.3	66.3	61.3
4/11/00	10:00:00 PM	72.5	66.5	61.5

Table 2.3.8-2. 15-Minute Ambient Sound Level Survey Data

		Sound Level in Decibels A-Scale (dBA)		
Date	Time	L1	L10	L50
4/11/00	10:15:00 PM	73.9	67.9	62.9
4/11/00	10:30:00 PM	72.4	66.4	61.4
4/11/00	10:45:00 PM	71.0	65.0	60.0
4/11/00	11:00:00 PM	72.7	66.7	61.7
4/11/00	11:15:00 PM	72.8	66.8	61.8
4/11/00	11:30:00 PM	71.5	65.5	60.5
4/11/00	11:45:00 PM	69.5	63.5	58.5
4/12/00	12:00:00 AM	72.0	66.0	61.0
4/12/00	12:15:00 AM	71.8	65.8	60.8
4/12/00	12:30:00 AM	72.3	66.3	61.3
4/12/00	12:45:00 AM	72.1	66.1	61.1
4/12/00	1:00:00 AM	70.9	64.9	59.9
4/12/00	1:15:00 AM	71.6	65.6	60.6
4/12/00	1:30:00 AM	70.1	64.1	59.1
4/12/00	1:45:00 AM	71.7	65.7	60.7
4/12/00	2:00:00 AM	69.6	63.6	58.6
4/12/00	2:15:00 AM	68.1	62.1	57.1
4/12/00	2:30:00 AM	69.5	63.5	58.5
4/12/00	2:45:00 AM	69.8	63.8	58.8
4/12/00	3:00:00 AM	69.5	63.5	58.5
4/12/00	3:15:00 AM	70.1	64.1	59.1
4/12/00	3:30:00 AM	70.7	64.7	59.7
4/12/00	3:45:00 AM	68.8	62.8	57.8
4/12/00	4:00:00 AM	69.0	63.0	58.0
4/12/00	4:15:00 AM	70.4	64.4	59.4
4/12/00	4:30:00 AM	69.2	63.2	58.2
4/12/00	4:45:00 AM	71.8	65.8	60.8
4/12/00	5:00:00 AM	70.8	64.8	59.8
4/12/00	5:15:00 AM	70.1	64.1	59.1
4/12/00	5:30:00 AM	71.2	65.2	60.2
4/12/00	5:45:00 AM	71.1	65.1	60.1
4/12/00	6:00:00 AM	72.3	66.3	61.3
4/12/00	6:15:00 AM	72.5	66.5	61.5
4/12/00	6:30:00 AM	72.1	66.1	61.1
4/12/00	6:45:00 AM	72.6	66.6	61.6
4/12/00	7:00:00 AM	72.6	66.6	61.6
4/12/00	7:15:00 AM	73.2	67.2	62.2
4/12/00	7:30:00 AM	73.5	67.5	62.5
4/12/00	7:45:00 AM	72.0	66.0	61.0
4/12/00	8:00:00 AM	73.2	67.2	62.2
4/12/00	8:15:00 AM	73.8	67.8	62.8
4/12/00	8:30:00 AM	73.3	67.3	62.3
4/12/00	8:45:00 AM	73.3	67.3	62.3
4/12/00	9:00:00 AM	73.2	67.2	62.2

Table 2.3.8-2. 15-Minute Ambient Sound Level Survey Data

		Sound Level in Decibels A-Scale (dBA)		
Date	Time	L1	L10	L50
4/12/00	9:15:00 AM	73.1	67.1	62.1
4/12/00	9:30:00 AM	74.9	68.9	63.9
4/12/00	9:45:00 AM	75.6	69.6	64.6
4/12/00	10:00:00 AM	76.2	70.2	65.2
4/12/00	10:15:00 AM	76.5	70.5	65.5
4/12/00	10:30:00 AM	76.6	70.6	65.6
4/12/00	10:45:00 AM	76.6	70.6	65.6
4/12/00	11:00:00 AM	77.0	71.0	66.0
4/12/00	11:15:00 AM	76.7	70.7	65.7
4/12/00	11:30:00 AM	77.2	71.2	66.2
4/12/00	11:45:00 AM	76.9	70.9	65.9
4/12/00	12:00:00 PM	76.8	70.8	65.8

Peak Sound Level = 74 dBA

B. Northern Portion of Site

4/11/00	12:15:00 PM	55.3	49.3	44.3
4/11/00	12:30:00 PM	56.9	50.9	45.9
4/11/00	12:45:00 PM	56.2	50.2	45.2
4/11/00	1:00:00 PM	61.2	55.2	50.2
4/11/00	1:15:00 PM	54.9	48.9	43.9
4/11/00	1:30:00 PM	55.7	49.7	44.7
4/11/00	1:45:00 PM	54.5	48.5	43.5
4/11/00	2:00:00 PM	54.1	48.1	43.1
4/11/00	2:15:00 PM	55.4	49.4	44.4
4/11/00	2:30:00 PM	55.5	49.5	44.5
4/11/00	2:45:00 PM	55.8	49.8	44.8
4/11/00	3:00:00 PM	55.4	49.4	44.4
4/11/00	3:15:00 PM	56.6	50.6	45.6
4/11/00	3:30:00 PM	54.5	48.5	43.5
4/11/00	3:45:00 PM	54.6	48.6	43.6
4/11/00	4:00:00 PM	54.7	48.7	43.7
4/11/00	4:15:00 PM	53.9	47.9	42.9
4/11/00	4:30:00 PM	54.6	48.6	43.6
4/11/00	4:45:00 PM	53.5	47.5	42.5
4/11/00	5:00:00 PM	56.9	50.9	45.9
4/11/00	5:15:00 PM	54.8	48.8	43.8
4/11/00	5:30:00 PM	53.9	47.9	42.9
4/11/00	5:45:00 PM	53.6	47.6	42.6
4/11/00	6:00:00 PM	54.4	48.4	43.4
4/11/00	6:15:00 PM	52.5	46.5	41.5
4/11/00	6:30:00 PM	56.9	50.9	45.9
4/11/00	6:45:00 PM	58.8	52.8	47.8

Table 2.3.8-2. 15-Minute Ambient Sound Level Survey Data

		Sound Level in Decibels A-Scale (dBA)		
Date	Time	L1	L10	L50
4/11/00	7:00:00 PM	54.3	48.3	43.3
4/11/00	7:15:00 PM	52.7	46.7	41.7
4/11/00	7:30:00 PM	53.7	47.7	42.7
4/11/00	7:45:00 PM	52.4	46.4	41.4
4/11/00	8:00:00 PM	53.8	47.8	42.8
4/11/00	8:15:00 PM	54.1	48.1	43.1
4/11/00	8:30:00 PM	54.6	48.6	43.6
4/11/00	8:45:00 PM	55.0	49.0	44.0
4/11/00	9:00:00 PM	55.4	49.4	44.4
4/11/00	9:15:00 PM	55.9	49.9	44.9
4/11/00	9:30:00 PM	55.0	49.0	44.0
4/11/00	9:45:00 PM	55.3	49.3	44.3
4/11/00	10:00:00 PM	55.2	49.2	44.2
4/11/00	10:15:00 PM	56.0	50.0	45.0
4/11/00	10:30:00 PM	55.4	49.4	44.4
4/11/00	10:45:00 PM	55.3	49.3	44.3
4/11/00	11:00:00 PM	55.8	49.8	44.8
4/11/00	11:15:00 PM	56.6	50.6	45.6
4/11/00	11:30:00 PM	55.0	49.0	44.0
4/11/00	11:45:00 PM	54.9	48.9	43.9
4/12/00	12:00:00 AM	56.3	50.3	45.3
4/12/00	12:15:00 AM	55.9	49.9	44.9
4/12/00	12:30:00 AM	56.2	50.2	45.2
4/12/00	12:45:00 AM	55.9	49.9	44.9
4/12/00	1:00:00 AM	55.9	49.9	44.9
4/12/00	1:15:00 AM	56.0	50.0	45.0
4/12/00	1:30:00 AM	55.0	49.0	44.0
4/12/00	1:45:00 AM	55.6	49.6	44.6
4/12/00	2:00:00 AM	54.9	48.9	43.9
4/12/00	2:15:00 AM	54.2	48.2	43.2
4/12/00	2:30:00 AM	53.8	47.8	42.8
4/12/00	2:45:00 AM	53.5	47.5	42.5
4/12/00	3:00:00 AM	54.1	48.1	43.1
4/12/00	3:15:00 AM	54.6	48.6	43.6
4/12/00	3:30:00 AM	54.5	48.5	43.5
4/12/00	3:45:00 AM	52.9	46.9	41.9
4/12/00	4:00:00 AM	53.0	47.0	42.0
4/12/00	4:15:00 AM	52.9	46.9	41.9
4/12/00	4:30:00 AM	52.5	46.5	41.5
4/12/00	4:45:00 AM	53.4	47.4	42.4
4/12/00	5:00:00 AM	52.4	46.4	41.4
4/12/00	5:15:00 AM	52.3	46.3	41.3
4/12/00	5:30:00 AM	52.8	46.8	41.8
4/12/00	5:45:00 AM	52.0	46.0	41.0

Table 2.3.8-2. 15-Minute Ambient Sound Level Survey Data

Date	Time	Sound Level in Decibels A-Scale (dBA)		
		L1	L10	L50
4/12/00	6:00:00 AM	52.7	46.7	41.7
4/12/00	6:15:00 AM	54.3	48.3	43.3
4/12/00	6:30:00 AM	54.3	48.3	43.3
4/12/00	6:45:00 AM	54.5	48.5	43.5
4/12/00	7:00:00 AM	53.5	47.5	42.5
4/12/00	7:15:00 AM	51.3	45.3	40.3
4/12/00	7:30:00 AM	50.2	44.2	39.2
4/12/00	7:45:00 AM	49.3	43.3	38.3
4/12/00	8:00:00 AM	47.4	41.4	36.4
4/12/00	8:15:00 AM	53.6	47.6	42.6
4/12/00	8:30:00 AM	48.5	42.5	37.5
4/12/00	8:45:00 AM	47.3	41.3	36.3
4/12/00	9:00:00 AM	56.1	50.1	45.1
4/12/00	9:15:00 AM	56.4	50.4	45.4
4/12/00	9:30:00 AM	58.2	52.2	47.2
4/12/00	9:45:00 AM	56.8	50.8	45.8
4/12/00	10:00:00 AM	56.6	50.6	45.6
4/12/00	10:15:00 AM	60.4	54.4	49.4
4/12/00	10:30:00 AM	52.4	46.4	41.4
4/12/00	10:45:00 AM	53.2	47.2	42.2
4/12/00	11:00:00 AM	50.1	44.1	39.1
4/12/00	11:15:00 AM	50.0	44.0	39.0
4/12/00	11:30:00 AM	56.1	50.1	45.1
4/12/00	11:45:00 AM	53.4	47.4	42.4
4/12/00	12:00:00 PM	51.2	45.2	40.2

Peak Sound Level = 63 dBA

Note: L1 = That noise (A-weighted sound level) exceeding 1 percent of the measurement time equivalent to at least 15 minutes.
L10 = That noise (A-weighted sound level) exceeding 10 percent of the measurement time equivalent to at least 15 minutes.
L50 = That noise (A-weighted sound level) exceeding 50 percent of the measurement time equivalent to at least 15 minutes.

Source: ECT, 2000.

"(2) Construction activity is prohibited between the hours of 8 p.m. and 6 a.m., unless an administrative approval has been issued by Indian River County.

(3) Internal combustion engines must be equipped with a muffler or other device which will effectively prevent loud or explosive noises."

In addition to the prohibitions specified in Section 974.04, quantitative noise limits for various zoning districts are contained in Section 974.05. The zoning districts of the properties adjacent to and in the vicinity of the Site in Indian River County are designated as Agriculture. The county's noise limits are summarized in Table 2.3.8-3.

Table 2.3.8-3. Indian River County Noise Limits

	Sound Level in Decibels A-Scale (dBA)					
	Day (6 a.m. – 10 p.m.)			Night (10 p.m. – 6 a.m.)		
Zoning District	L1	L10	L50	L1	L10	L50
A. 15-Minute Measurement Period Noise Level Limits						
Conservation	65	10	50	60	10	50
Residential	70	60	55	65	55	55
Commercial	75	65	60	70	60	55
Industrial	75	70	65	75	70	60
Agriculture	75	70	65	75	70	65

B. Peak Noise Level Limits

Zoning District	Sound Level in Decibels A-Scale (dBA)
Conservation	75
Residential	80
Commercial	85
Industrial	85
Agriculture	85

Note: L1 = That noise (A-weighted sound level) exceeding 1 percent of the measurement time equivalent to at least 15 minutes.
L10 = That noise (A-weighted sound level) exceeding 10 percent of the measurement time equivalent to at least 15 minutes.
L50 = That noise (A-weighted sound level) exceeding 50 percent of the measurement time equivalent to at least 15 minutes.
Residential developments within Agricultural Zoning Districts are subject to the noise limits applicable to Residential Zoning Districts.
Night noise levels are applicable at any time on Sundays or holidays.
Noise limits are applicable at the property boundary of the receiving parcel.

Source: Indian River County Noise Ordinance, Chapter 974.

On a case-by-case basis, the Indian River County community development director may grant an administrative approval exempting specific activities from the Chapter 974 noise limits pursuant to Section 974.07.

St. Lucie County also has a noise ordinance in Chapter 1-13.8 entitled Noise Control. According to Section 1-13.8-1 of the ordinance:

> "It shall be unlawful for any person to make, continue, or cause to be made or continued any excessive, unnecessary or unusually loud noise or any noise which either annoys, disturbs, injures or endangers the comfort, repose, peace or safety of others, within the unincorporated areas of the county."

The St. Lucie County ordinance specifies limits on sound or noise projected from one property into another property which exceeds either noise limits set by use classification or exceeds the ambient noise level by more than 3 decibels when measured as specified under County-adopted noise enforcement practices. The applicable noise limits are provided in Table 2.3.8-4.

According to Section 1-13.8-20, an application for a permit for relief from the applicable noise levels on the basis of undue hardship may be made to the Board of County Commissioners.

Table 2.3.8-4. St. Lucie County Applicable Noise Limits

A. 15-Minute Measurement Period

Use Classification	Sound Level in Decibels A-Scale (dBA)					
	Day 0700—2200			Night 2200—0700		
	L1	L10	L50	L1	L10	L50
Residential	70	65	60	65	60	55
Commercial	75	70	65	70	65	60
Industrial	75	70	65	75	70	65

B. Peak Noise Levels

Use Classification	Sound Level in Decibels A-Scale (dBA)
Residential	80
Commercial	85
Industrial	85

Note: L1 = That noise (A-weighted sound level) exceeding 1 percent of the measurement time equivalent to at least 15 minutes.
L10 = That noise (A-weighted sound level) exceeding 10 percent of the measurement time equivalent to at least 15 minutes.
L50 = That noise (A-weighted sound level) exceeding 50 percent of the measurement time equivalent to at least 15 minutes.
If the noise occurs at any time on Sunday or holidays, the decibel level applicable between 10 p.m. and 7 a.m. shall prevail.
Noise limits as measured at property boundary of the receiving parcel.

Source: St. Lucie County Noise Ordinance, Chapter 1-13.8.

2.3.9 OTHER ENVIRONMENTAL FEATURES

The previous sections have provided detailed descriptions of the pertinent environmental features of the Site and surrounding area. No other special or significant environmental features are present at the Site that would merit additional discussion in this section.

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