# CALPINE
# BLUE HERON
## ENERGY CENTER

# Site Certification Application

Volume 2
Chapters 3-9

Submitted by

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# ABBREVIATIONS, ACRONYMS, AND UNITS OF MEASURE

| | |
|---|---|
| AAP | ABB Alstom Power Environmental Segment |
| AAQS | ambient air quality standards |
| ACSR | aluminum conductor steel reinforced |
| AET | actual evapotranspiration |
| AM | amplitude modulation |
| 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 |
| BPA | Bonneville Power Authority |
| B&R | Burns and Roe Enterprises |
| Btu | British thermal unit |
| $Btu/ft^3$ | British thermal unit per cubic foot |
| °C | degrees Centigrade |
| CAA | Clean Air Act |
| Calpine | Blue Heron Energy Center, L.L.C. |
| CCSI | Catalytica Combustion Systems, Inc. |
| CCVT | coupling capacitor voltage transformer |
| CDM | Camp Dresser & McKee |
| CFR | Code of Federal Regulations |
| $cfm\text{-}ft^2$ | 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 | decibel |
| 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 |

ABBREVIATIONS, ACRONYMS, AND
UNITS OF MEASURE
(Continued, Page 2 of 6)

| | |
|---|---|
| ECT | Environmental Consulting & Technology, Inc. |
| EMF | electric and magnetic fields |
| EMS | Emergency Medical Service |
| EPA | U.S. Environmental Protection Agency |
| ER&M | Electric Research & Management, Inc. |
| ERP | environmental resource permit |
| ESP | electrostatic precipitator |
| °F | degrees Fahrenheit |
| F.A.C. | Florida Administrative Code |
| FAESS | Florida Association of Environmental Soil Scientists |
| FBN | fuel bound nitrogen |
| FCC | Federal Communications Commission |
| 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 |
| FM | frequency modulation |
| FMPA | Florida Municipal Power Agency |
| 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 |

# ABBREVIATIONS, ACRONYMS, AND UNITS OF MEASURE
(Continued, Page 3 of 6)

| | |
|---|---|
| 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 |
| GSU | generator step-up |
| Gulfstream | Gulfstream Natural Gas System, L.L.C. |
| $H_2O$ | water |
| $H_2S$ | 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 |
| kcmil | thousand circular mil |
| kg/km$^2$ | kilogram per square kilometer |
| km | kilometer |
| kV | kilovolt |
| kV/m | kilovolt per meter |
| 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 |
| MCR | maximum current rating |
| mG | milligauss |
| MGD | million gallons per day |
| mg/L | milligram per liter |
| MMBtu/hr | million British thermal units per hour |

ABBREVIATIONS, ACRONYMS, AND
UNITS OF MEASURE
(Continued, Page 4 of 6)

| | |
|---|---|
| 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 |
| MVA | megavolt-amperes |
| MW | megawatt |
| $N_2$ | molecular nitrogen |
| N/A | not applicable |
| NCDC | National Climatic Data Center |
| Neg | negligible |
| NEPA | National Environmental Policy Act |
| NESC | National Electrical Safety Code |
| NESHAP | National Emission Standards for Hazardous Air Pollutants |
| $NH_3$ | ammonia |
| NO | nitric oxide |
| $NO_2$ | 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 |
| OHGW | overhead ground wire |
| 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 |
| PPA | power purchase agreement |
| ppmv | part per million by volume |

# ABBREVIATIONS, ACRONYMS, AND UNITS OF MEASURE
(Continued, Page 5 of 6)

| | |
|---|---|
| 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 |
| SACTI | Seasonal/Annual Cooling Tower Impact |
| SCA | site certification application |
| SCADA | Supervisory Control and Data Acquisition |
| scfm | standard cubic foot per minute |
| SCR | selective catalytic reduction |
| SCRAM | Support Center for Regulatory Air Models |
| SCS | Soil Conservation Service |
| Seminole | Seminole Electric Cooperative, Inc. |
| 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 |
| SNR | signal-to-noise ratio |
| $SO_2$ | sulfur dioxide |
| $SO_3$ | 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 |
| µg/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 |

ABBREVIATIONS, ACRONYMS, AND
UNITS OF MEASURE
(Continued, Page 6 of 6)

| | |
|---|---|
| VMT | vehicle miles traveled |
| VOC | volatile organic compound |
| WWTP | wastewater treatment plant |
| $yd^3$ | cubic yard |

# 3.0 THE PLANT AND DIRECTLY ASSOCIATED FACILITIES

This chapter provides descriptions of the proposed power plant facilities, the key components and systems of the plant and their operations, and the directly associated facilities that will comprise the Calpine BHEC. The descriptions include, to the extent possible, estimates of the expected character, quality, and quantity of discharges and emissions from the plant facilities and operations. Also, proposed measures and systems to control and, as necessary, treat the expected emissions and discharges are described in order to provide reasonable assurance that the plant operations comply with applicable regulatory requirements and standards. The specific sections in this chapter are:

- 3.1—Background.
- 3.2—Site Layout.
- 3.3—Fuel.
- 3.4—Air Emissions and Controls.
- 3.5—Plant Water Use.
- 3.6—Chemical and Biocide Waste.
- 3.7—Solid and Hazardous Waste.
- 3.8—Onsite Drainage System.
- 3.9—Materials Handling.

The descriptions presented in this chapter are based on the current plans and available engineering and design information for the BHEC.

## 3.1 BACKGROUND

The Calpine BHEC will involve the construction and operation of a nominal 1,080-MW combined cycle power plant and directly associated facilities on a 50.5-acre Site in southeastern Indian River County. The main electric generation facilities will consist of four CTGs, four HRSGs, and two steam turbine electric generators. The BHEC will be fired exclusively with natural gas and will be operated in a combined cycle mode.

BHEC's electrical output will vary in response to changes in ambient conditions. Also, the BHEC will be equipped with supplemental duct burners in the HRSGs and fogging of the CTGs' inlet air that can be used to increase the electrical output during periods of peak power demands. Under certain ambient conditions (i.e., lower ambient temperatures), the BHEC will be able to achieve a maximum output of 1,435 MW during peak operations, utilizing maximum supplemental duct firing.

Calpine's selection of the highly efficient combined cycle technology and natural gas fuel will maximize the beneficial use of the Site for electric generation while minimizing environmental, land use, and economic impacts. Further, Calpine's Project development plans have been designed to take full advantage, environmentally and economically, of the Site's location and proximity to key existing support facilities. The Project will connect to and use existing, nearby facilities including potable water and sanitary wastewater pipelines, the drainage canal system and stormwater park for water supply, natural gas pipeline for fuel supply, and 230-kV transmission lines for power grid interconnection.

The BHEC will be constructed in two phases. Phase I will consist of one 540-MW combined cycle unit and Phase II will consist of a second 540-MW combined cycle unit. Phase I of the BHEC is currently scheduled to begin commercial operation in mid 2007. The onsite construction and facility testing activities for Phase I are anticipated to require approximately 24 months with onsite construction activities beginning as soon as possible but not later than mid 2005. All construction activities will be performed in a manner to minimize environmental impacts to the Site and the general locale to the extent possible. The activities will involve the temporary use of an approximately 30-acre property owned by Indian River County. This property lies to the north of the Site and will be used as the construction laydown and parking area. Since the use of this property is temporary, Calpine is not seeking certification of any long-term use of this area as part of the Site in this PPSA proceeding. Descriptions of the construction activities and impacts on the Site, temporary construction laydown/parking area, and surrounding areas are presented in Chapter 4.0.

The following two subsections provide overview descriptions of the major power plant and associated facilities and systems on the Site and the offsite, associated linear facilities. More details on the Site facilities and systems and their operations are provided in the remaining sections of this chapter. More detailed descriptions of the offsite, associated linear facilities and their impacts are provided in Chapter 6.0.

### 3.1.1 MAJOR POWER PLANT FACILITIES AND SYSTEMS

The main electric generating facilities for the nominal 1,080-MW combined cycle BHEC power plant will consist of four Siemens Westinghouse 501F Class CTGs, integrated with four triple-pressure HRSGs and two steam turbine electric generators. This power plant design is commonly referred to as consisting of two "2 by 2 by 1" combined cycle configurations. This integrated, combined cycle power plant design currently represents the *state-of-the-art* proven technology for highly efficient, continuous operation electric generation, while minimizing air emissions and other environmental impacts.

The efficiency of a power plant's electric power generation is improved when the simple cycle CTG design is combined with an HRSG and steam turbine to configure a combined cycle power plant. When CTGs are used in simple-cycle mode (stand-alone) units, the hot combustion gases are released to the atmosphere at approximately 1,100°F. In a combined cycle configuration, the CTG hot exhaust gases are used to generate steam in an HRSG. The steam is then used to drive a steam turbine generator to produce electricity. Thus, the steam turbine generator is able to produce electricity without additional fuel input. Figure 3.1.1-1 presents a schematic representation of the planned combined cycle power plant configuration.

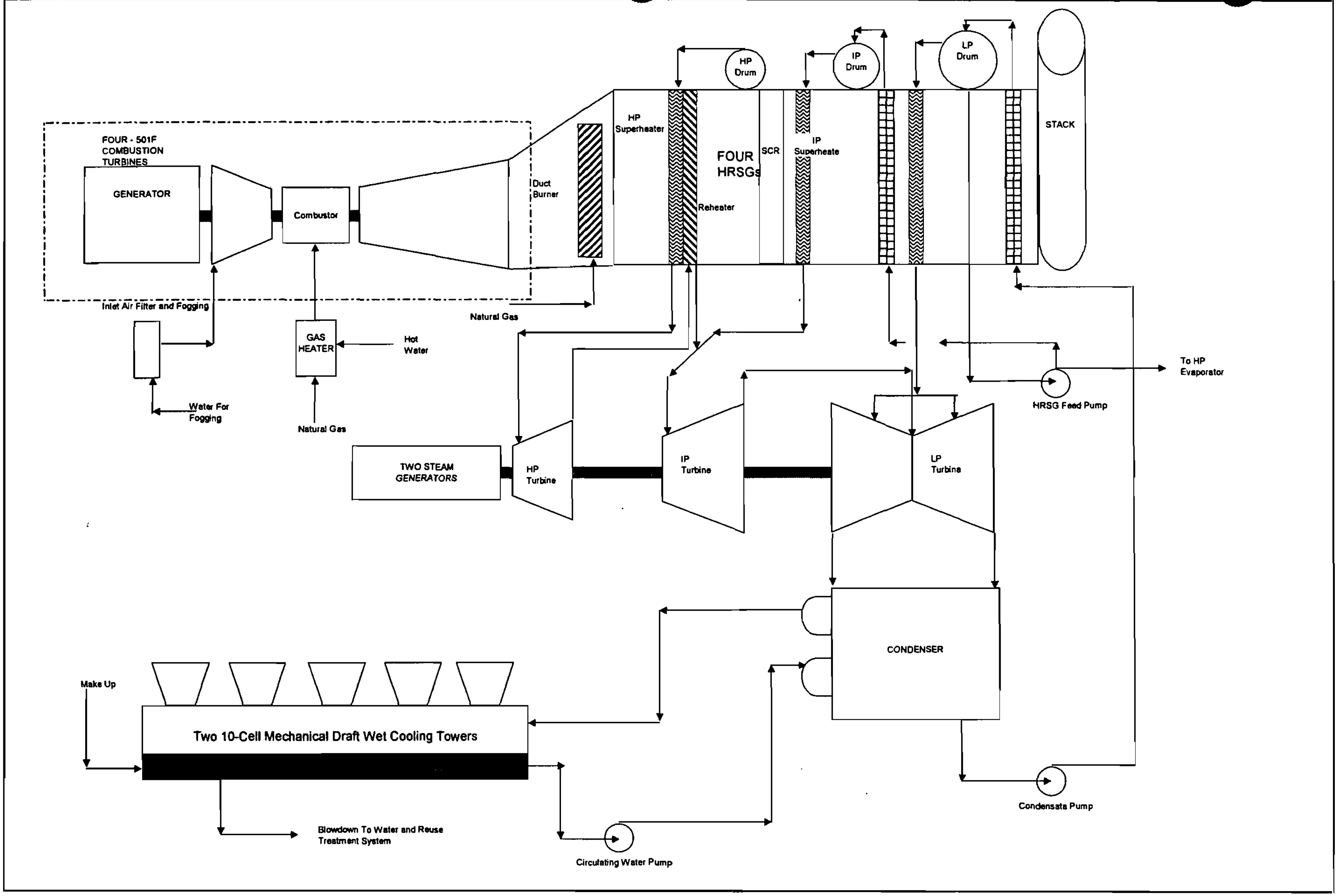



FIGURE 3.1.1-1. (REV. 1—12/04)

COMBINED-CYCLE SCHEMATIC DIAGRAM

Source: Calpine, 2004.

CALPINE BLUE HERON ENERGY CENTER

For the BHEC, each of the four CTGs will be capable of generating a nominal 181 MW of electricity at ISO condition of 59°F ambient temperature. The CTGs will be equipped with DLN combustors to control $NO_x$ air emissions. The four HRSGs will be equipped with SCR systems to further reduce $NO_x$ emissions to current, regulatory agency approved concentrations of 2.0 ppmvd, corrected to 15 percent $O_2$, on a 24-hour block average basis. The HRSGs will also be equipped with oxidation catalyst systems to control CO and VOC emissions.

The DLN combustor design for the CTGs consists of premixed fuel zones plus a standard diffusion flame pilot burner for flame stability. Low $NO_x$ levels are achieved by introducing fuel primarily to the premix zones and reducing the amount of fuel being combusted from the pilot nozzle. The turbine inlet will be equipped with a fogging cooling system to reduce the inlet air temperature. Cooling of inlet air also increases the power output of the CTGs.

Each of the four CTGs' exhausts will be directed into triple-pressure designed HRSGs with low-pressure sections for improved efficiency. Each HRSG will be equipped with supplemental duct burners that will be used for the production of additional steam. Each supplemental burner will be designed for firing natural gas only and will use the best available DLN burner and SCR system technology for minimizing overall air emissions.

The steam produced by the four HRSGs will be utilized in a condensing reheat in the two steam turbine electric generators with a single, low-pressure admission port for each generator. Each of the steam turbine generators will have a nominal capacity of 200 MW, without supplemental duct firing.

The BHEC will be capable of continuous operation at base load for up to 8,760 hours per year (hr/yr). Also, the CTGs will be capable of operating between 35- and 100-percent load with commensurate steam turbine load.

Major associated facilities to be constructed on the Site include two 10-cell mechanical draft cooling tower systems, water supply treatment and storage facilities, wastewater treatment system, and warehouse and administrative/control room buildings. Noncontact stormwater runoff will be collected and routed to an approximately 5.2-acre stormwater detention pond that will be designed in accordance with Indian River County and SJRWMD requirements. Stormwater drainage areas around equipment will be designed to minimize production of contact stormwater. Contact stormwater produced within the facility will be collected and treated in the BHEC's oil/water separator and then recycled to the cooling water system. The onsite facilities will also include a 230-kV switchyard and a natural gas regulating station.

The primary source of cooling makeup water and other plant process water for the Project will be excess stormwater withdrawn from a stormwater treatment park which will be developed by Indian River County. The Project will also use brine discharged from the Indian River County South Plant reverse osmosis drinking water treatment facility. Potable water and sanitary wastewater service will be provided by Indian River County. The BHEC will be designed and operated as a zero-discharge wastewater facility. All plant wastewaters, including cooling tower blowdown, water treatment wastewaters, plant and equipment drains, wastewater after treatment in the oil/water separator, boiler blowdown, and other process wastewaters, will be collected, treated, and reused in the BHEC's water systems. The solids resulting from the zero-discharge wastewater treatment system, which are nonhazardous, will be disposed in a permitted offsite landfill.

Calpine's plan to use stormwater and brine discharge water for the BHEC's water supply, in combination with a zero-discharge wastewater treatment system, will provide significant environmental benefits to the area. These Project plans are consistent with and supportive of SJRWMD, Indian River County, and IRFWCD goals and programs to reduce freshwater flows and pollutant loadings to the Indian River Lagoon system. SJRWMD, Indian River County, and IRFWCD have developed a Master Stormwater Management Plan for the East Indian River County watershed within the IRFWCD. The purposes of this stormwater master plan are to address flood control, water quality, natural and recreational areas, and promote water reuse in the watershed, as well as to provide information necessary for the development of an NPDES Phase II compliance program. The specific goals of this program are to develop and implement hydrologic and hydraulic design alternatives for stormwater 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 freshwater discharges to the Indian River Lagoon. In the master stormwater plan, an Indian River County-owned, 35-acre parcel of land was identified for potential use for treatment of water from the IRFWCD canal system and for storage of water for use by Calpine's proposed BHEC. This parcel will be developed by the County as the Egret Marsh Regional Stormwater Park.

In support of the master stormwater management plan, Calpine entered into an "Agreement Concerning Delivery and Use of Stormwater" (Agreement) with Indian River County and the IRFWCD on August 12, 2004. Under this Agreement, Indian River County will provide stormwater from the Egret Marsh Regional Stormwater Park for use as the primary source of water for the BHEC. The Agreement also allows Indian River County, at its option, to supplement the stormwater with a specified quantity of brine discharge water from its South Plant reverse osmosis water treatment facility. Other aspects of the Agreement include Calpine's commitment to: (a) purchase additional property for expansion of the stormwater park by Indian River County; (b) design and construct, at its expense, the pipelines and pumping stations that will be used to deliver water to the stormwater park and to BHEC; and (c) transfer ownership of the property and facilities to Indian River County or IRFWCD. Therefore, Calpine will "be a contributing partner in the County's stormwater management efforts" (Agreement on page 3). A copy of the Agreement is provided in Appendix 10.9.

More detailed descriptions of these facilities and their planned operations are provided in the remaining sections of this chapter.

### 3.1.2 ASSOCIATED LINEAR FACILITIES

The BHEC will require the construction of several linear facilities to interconnect the power plant with existing facilities and services in the Site vicinity. Some of these linear facilities will be constructed, owned, and operated by Calpine and, as such, will be directly associated facilities that are to be certified in this PPSA proceeding. Certain other linear facilities will be permitted, constructed (some at Calpine's expense), owned, and operated by others and, therefore, are not included for certification in this PPSA proceeding.

The directly associated linear facilities that are to be certified in this PPSA proceeding include:

- A natural gas pipeline for fuel supply from FGT's system.
- Pumping stations and pipelines from the IRFWCD canal system to the Indian River County stormwater park and from the park to the BHEC for water supply.
- Two 230-kV transmission lines to interconnect with FPL's existing lines.

Natural gas for the Project will be supplied to the Site via a new approximately 1,000-ft pipeline running from a new FGT metering station located west of I-95 and the Site. To provide for flexibility in avoiding sensitive areas, the new pipeline will be located within an approximately 800-ft-wide corridor that crosses the I-95 right-of-way, and connects the Site to property that will be owned by Calpine on the west side of I-95. Calpine is seeking certification of this corridor within this PPSA proceeding.

For the BHEC's process/cooling water supply, a new pumping station will be constructed, at Calpine's expense, along the IRFWCD Lateral C Canal in the lower pool of the drainage system, and an approximately 0.5-mile pipeline will be constructed from the pumping station to the Indian River County Egret Marsh Regional Stormwater Park in the IRFWCD right-of-way along the Lateral C Canal. The pumping station and pipeline will be designed to provide sufficient water to meet the BHEC's requirements plus supply the design flow rates for the stormwater park treatment system. A pumping station at the stormwater park and an approximately 3.0-mile pipeline will be constructed, at Calpine's expense, to deliver water from the park to the BHEC Site. The pipeline will be located in the IRFWCD's right-of-way along the Lateral C Canal. Following construction, ownership of the pumping station and pipelines located in IRFWCD rights-of-way will be transferred to IRFWCD. IRFWCD will, in turn, lease the pumping station and pipeline from the Lateral C Canal to the stormwater park to the County. The pipeline from the park to BHEC will be leased by IRFWCD to Calpine for its use for water supply delivery. These pumping structures and pipelines are directly associated facilities to be certified in this PPSA proceeding.

To interconnect the Project with Florida's transmission grid, two 230-kV transmission lines will be constructed from the onsite switchyard to FPL's two existing 230-kV transmission lines located on the west side of I-95. These new transmission lines will be approximately 1,400 ft in length and will be located within a 400- to 500-ft-wide corridor. The corridor for the transmission lines will be certified by Calpine in this PPSA proceeding. More detailed descriptions of the transmission lines and the natural gas and water supply pipeline facilities, their corridors, and construction and operation impacts are provided in Chapter 6.0.

As discussed previously, there are several other linear facilities that will be permitted, constructed (some at Calpine's expense), and operated by others to connect the BHEC with existing facilities and systems in the Site area. These other linear facilities include two pipelines needed to connect the BHEC with the existing Indian River County potable water and sanitary wastewater systems, which currently extend to a point along $74^{th}$ Avenue at $17^{th}$ Street (Lockwood Lane), approximately 0.5 mile north of the Site. Indian River County also may construct a pipeline, with funding from Calpine, from its South Plant water treatment facility. The County's new pipeline will connect with the pipeline delivering water from the stormwater park to BHEC, and will provide reverse osmosis brine to BHEC to supplement the Project's water supply. These pipelines will be constructed at Calpine's full or partial expense, but will be owned and operated by Indian River County. These pipeline facilities are not included for certification in this PPSA proceeding.

## 3.2 SITE LAYOUT

Figure 3.2.0-1 presents the general site layout for the BHEC on the 50.5-acre Site. Figure 3.2.0-2 presents the site layout on a color aerial photograph (April 2000) of the Site. The main power block facilities (i.e., CTGs, HRSGs, and steam turbines) and associated equipment, systems, and buildings (e.g., cooling towers, water and wastewater treatment facilities, switchyard, natural gas regulating station, road and parking areas, and administration/control room and warehouse buildings) will cover approximately 20 acres of the Site. Phase I of the Project will involve construction and operation of the southern combined cycle unit, as shown in Figures 3.2.0-1 and 3.2.0-2. Table 3.2.0-1 provides the preliminary dimensions of the major plant facilities and structures and Figure 3.2.0-3 provides elevation profiles of the facilities on the Site.

**Table 3.2.0-1. Preliminary Dimensions of Major Plant Facilities and Structures for the BHEC**

| Facility | Elevation* (ft) | Length (ft) | Width (ft) |
|---|---|---|---|
| Inlet air filters | 44 | 50 | 50 |
| HRSG stacks | 150 | 18.5† | N/A |
| HRSG | 83 | 100 | 40 |
| Service/fire water tank | 65 | 92† | N/A |
| Demineralizer tanks (2) | 37 | 35† | N/A |
| Control building | 35 | 100 | 80 |
| Warehouse | 27 | 100 | 57 |
| Water treatment building | 27 | 96 | 67 |
| Circulating water pump area | 15 | 30 | 20 |
| Fire pump house | 18 | 63 | 30 |
| CTG electrical room | 18 | 75 | 54 |
| Cooling towers | 52 | 432 | 50 |
| Cooling tower stacks | 62 | 33† | N/A |

*Above ground surface.
†Diameter.

Source: Calpine, 2004.

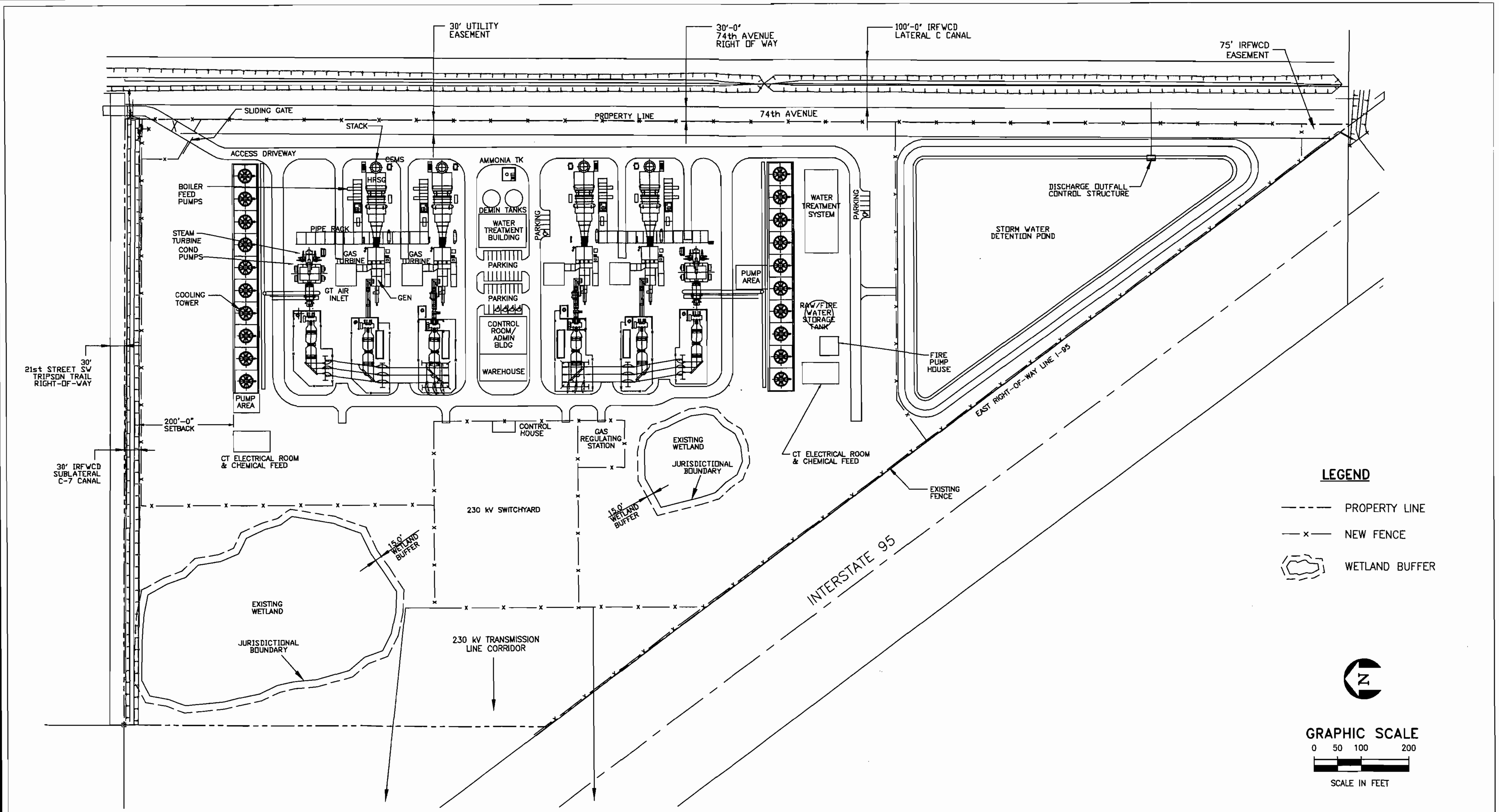



FIGURE 3.2.0-1. (REV. 1 - 12/04)

GENERAL SITE LAYOUT

**Sources: Burns and Roe, 2000; Calpine, 2002; ECT, 2002.**

CALPINE
BLUE HERON
ENERGY CENTER

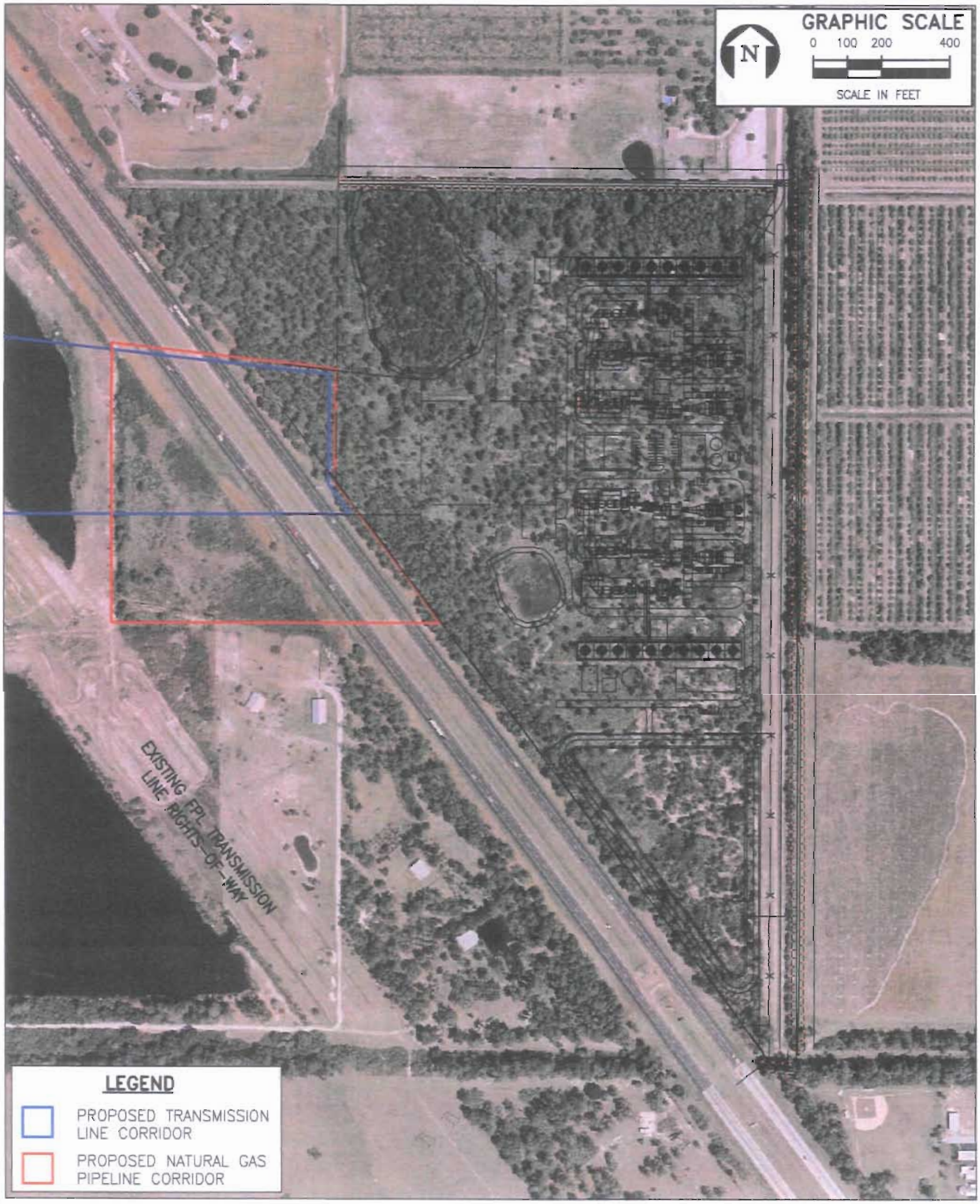


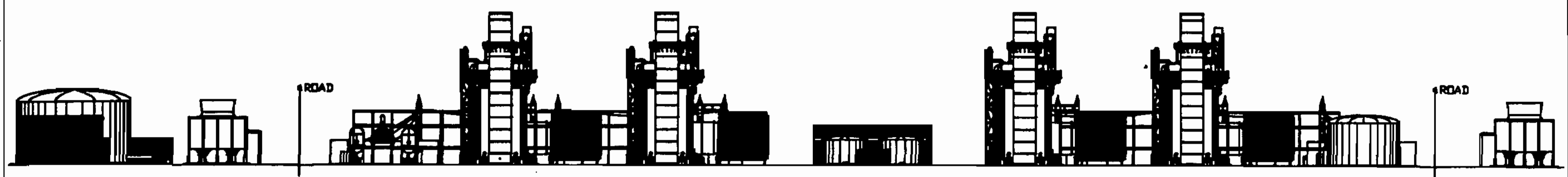

FIGURE 3.2.0-2. (REV. 1 - 12/04)
SITE LAYOUT ON AERIAL PHOTOGRAPH

Sources: Aerial Cartographics of America, 2000; ECT, 2002.

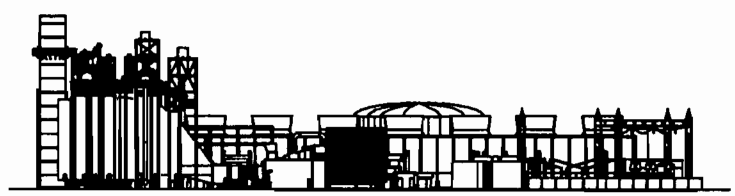
CALPINE
BLUE HERON
ENERGY CENTER

M:\acad\040798\ELEVATION804.DWG

Dec 08, 2004 - 2:53pm by mtorrella




EAST ELEVATION
SCALE=1"=140.0'



NORTH ELEVATION
SCALE=1"=140.0'

GRAPHIC SCALE
0 35 70 140
SCALE IN FEET

FIGURE 3.2.0-3.

SITE ELEVATION PROFILES

Sources: Burns and Roe, 2000; ECT, 2000.

CALPINE
BLUE HERON
ENERGY CENTER

An approximately 5.2-acre stormwater detention pond will be located in the southern portion of the Site. Stormwater discharges from the pond will be routed to the Lateral C Canal. Access to the Site will be provided from 74th Avenue, and the entire Site will be fenced to control access.

As shown in Figures 3.2.0-1 and 3.2.0-2, a 200-ft setback/buffer area will be provided along the northern Site boundary. This area is currently densely vegetated with pine flatwoods, which will not be disturbed by the Project construction. A 30-ft easement/setback buffer will also be provided along the eastern property boundary. Landscaped buffer areas also will be provided on the southern, eastern, and western sides of the Site, as required by the County. Also, as shown in the figures, the two wetland areas on the Site will not be impacted, and a minimum 15-ft and an average 25-ft buffer will surround the wetland areas.

The water supply and other utility pipelines for the Project will access the Site from the north along the County's 74th Avenue and/or IRFWCD canal rights-of-way. The natural gas pipeline will access the Site from the FGT pipeline and new metering station on the west side of I-95. Directional drilling techniques will be used to construct the pipeline under I-95. The transmission line interconnections will run west from the Site over I-95 to the two existing FPL 230-kV transmission lines.

As discussed previously, an approximately 30-acre property located north of the Site will be temporarily used for construction laydown and construction worker vehicle and heavy equipment parking (see Figure 2.1.0-2). This property is owned by Indian River County and is part of the County's landfill property. This offsite property currently consists of an abandoned citrus grove, and many of the dead trees have been previously removed and gathered in waste piles on the parcel. Appropriate grading, fill, stormwater runoff control, and treatment systems and measures will be implemented for the temporary use of this property for construction laydown and parking. During the Phase I construction, the portion of the Site to be used for the northern, Phase II, combined cycle unit will be used for construction laydown and parking.

## 3.3 FUEL

Natural gas will be the only fuel fired in the BHEC Project's CTGs and supplemental duct burners. Natural gas will be delivered to the Site via a new pipeline from the FGT gas transmission pipeline system. For the Project, a new approximately 1,000-ft pipeline will run to the Site from a new FGT gas metering station on the west side of I-95. Section 6.2 provides additional information on the pipeline and its proposed corridor.

Table 3.3.0-1 presents the typical composition of pipeline-quality natural gas in Florida.

**Table 3.3.0-1. Typical Natural Gas Composition**

| Component | Mole Percent (by volume) |
|---|---|
| Gas Composition | |
| Pentane | <0.1 |
| Propane | 0.3 |
| I-butane | 0.1 |
| N-butane | 0.1 |
| Nitrogen | 0.3 |
| Methane | 96.8 |
| Carbon dioxide | 0.8 |
| Ethane | 1.6 |
| Other Characteristics | |
| Heat content (LHV) | 920 Btu/ft$^3$ at 14.7 psia, dry |
| Sulfur content | 2.0 gr/100 dscf |

Note: LHV = lower heating value.
Btu/ft$^3$ = British thermal units per cubic foot.
psia = pound per square inch absolute.
gr/100 dscf = grains per 100 dry standard cubic foot.

Sources: FGT, 1999.
Calpine, 2004.

Fuel usage and the resultant generating capacity of a combined-cycle power plant are affected by ambient temperature, with higher temperatures resulting in less electric production. Greater fuel consumption and power output will occur at lower ambient temperatures. The Project's CTGs will be equipped with inlet air cooling systems that use a fogging technique to reduce the inlet air temperature, which results in increasing power output under higher ambient air temperature conditions. At ISO conditions of 59°F and 60-percent relative humidity, the BHEC will combust approximately 178 million standard cubic feet per day (MMscf/day) of natural gas when all four CTG/HRSG units are operating at full load.

The Project's CTGs would also potentially be capable of firing distillate fuel oil. However, Calpine is requesting that the Project be permitted for natural gas-firing only. The election of natural gas only has significant environmental benefits. These include significantly lower emissions of air pollutants; reduced demand for water (water is needed for emissions reduction when firing oil); the elimination of any potential for spills from oil delivery, storage, and handling; and the elimination of any need for truck traffic (and its related impacts) for fuel delivery. A small quantity of diesel fuel will be stored onsite for back-up/emergency equipment (see next section).

## 3.4 AIR EMISSIONS AND CONTROLS

### 3.4.1 AIR EMISSION TYPES AND SOURCES

The principal sources of air emissions from the BHEC will be the four natural gas-fired CTG/HRSG units. The CTGs and HRSGs, which will include provisions for supplemental, duct burner firing, will both be fired exclusively with natural gas. The pollutants emitted in the largest quantities from these units will be carbon monoxide (CO) and $NO_x$; lesser amounts of particulate matter ($PM/PM_{10}$), $SO_2$, volatile organic compounds (VOCs), and sulfuric acid ($H_2SO_4$) mist will also be emitted from the CTG/HRSG units.

The BHEC facility will also include two natural gas-fired fuel gas heaters, one emergency generator diesel engine, and one fire water pump diesel engine. These diesel engines will operate infrequently, approximately 250 and 100 hr/yr for the emergency generator and fire pump, respectively, and will emit small amounts of the same combustion related air contaminants as the CTG/HRSG units. Due to their low annual fuel consumption rates, the emergency diesel engines are exempt from FDEP permitting procedures pursuant to Rule 62-210.300(3)(a)21., F.A.C.

An additional source of $PM/PM_{10}$ emissions will be from the two plant cooling towers, whose drift will contain dissolved, condensable solids.

As indicated previously, Siemens Westinghouse has been selected as the CTG vendor. Table 3.4.1-1 provides maximum hourly criteria pollutant emission rates (exclusive of startup and shutdown) for each Siemens Westinghouse 501F CTG/HRSG unit. Maximum hourly noncriteria pollutant (i.e., $H_2SO_4$ mist) emission rates are summarized in Table 3.4.1-2. Combustion of natural gas by the CTGs and the HRSG duct burners will also result in minor amounts of organic and metallic noncriteria pollutants. Hourly emission rates for each pollutant are provided, taking into account CTG load, ambient air temperature, and optional use of CTG inlet air evaporative cooling and HRSG duct burner firing. The highest value across the expected range of CTG/HRSG operating conditions was selected to represent the maximum hourly emission rate for each CTG/HRSG unit. With the exception of CO, maximum hourly emission rates for all pollutants, in units of pounds

**Table 3.4.1-1. Maximum Criteria Pollutant Emission Rates for Three Unit Loads and Five Ambient Temperatures (Per CTG/HRSG)**

| Unit Load (%) | Ambient Temperature (°F) | PM/$PM_{10}$* | | $SO_2$ | | $NO_x$ | | CO | | VOC | | Lead | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb/hr | g/s | lb/hr | ppmvd† | lb/hr | ppmvd† | lb/hr | ppmvd† | lb/hr | ppmvd† | lb/hr | g/s |
| 100 | 20‡ | 14.2 | 1.78 | 14.2 | 1.1 | 18.9 | 2.0 | 9.1 | 1.6 | 6.0 | 1.9 | 0.0012 | 0.00016 |
| | 59†† | 13.6 | 1.72 | 13.4 | 1.1 | 17.8 | 2.0 | 8.8 | 1.7 | 5.8 | 1.9 | 0.0012 | 0.00015 |
| | 80†† | 13.2 | 1.66 | 12.9 | 1.1 | 17.2 | 2.0 | 8.5 | 1.7 | 5.8 | 2.0 | 0.0011 | 0.00014 |
| | 90†† | 12.9 | 1.63 | 12.6 | 1.1 | 16.8 | 2.0 | 8.4 | 1.7 | 5.7 | 2.0 | 0.0011 | 0.00014 |
| 60 | 20 | 6.5 | 0.82 | 8.0 | 1.1 | 10.5 | 2.0 | 16.0 | 5.0 | 2.8 | 1.5 | 0.0007 | 0.00009 |
| | 59 | 6.1 | 0.77 | 7.4 | 1.1 | 9.8 | 2.0 | 14.9 | 5.0 | 2.6 | 1.5 | 0.0007 | 0.00008 |
| | 80 | 5.9 | 0.74 | 7.0 | 1.1 | 9.3 | 2.0 | 14.1 | 5.0 | 2.4 | 1.5 | 0.0006 | 0.00008 |
| | 90 | 5.7 | 0.72 | 6.9 | 1.1 | 9.0 | 2.0 | 13.8 | 5.0 | 2.4 | 1.5 | 0.0006 | 0.00008 |
| 35 | 86 | 4.3 | 0.54 | 5.0 | 1.1 | 7.4 | 2.0 | 5.1 | 2.7 | 0.4 | 0.4 | 0.0004 | 0.00005 |

Note: g/s = gram per second.
* As measured by EPA Reference Method 5.
† Corrected to 15-percent $O_2$.
‡ With duct burner firing.
†† With inlet air fogging and duct burner firing.

Sources: Calpine, 2004.
ECT, 2004.
Siemens Westinghouse, 2004.

per hour (lb/hr), are projected to occur for operations at 100-percent CTG load with duct burner firing and 20°F ambient air temperature. The maximum hourly CO mass emission rate, in units of lb/hr, is projected to occur at 60 percent CTG load and 20°F ambient temperature. The maximum CTG/HRSG CO exhaust concentration, in units of ppmvd at 15 percent $O_2$, is projected to occur at low CTG load; i.e., 60-percent load. The CTG/HRSG $NO_x$ exhaust concentration (ppmvd) will remain constant for all operating scenarios due to the use of SCR control technology.

**Table 3.4.1-2. Maximum $H_2SO_4$ Mist Emission Rates for Three Unit Loads and Five Ambient Temperatures (per CTG/HRSG)**

| Unit Load (%) | Ambient Temperature (°F) | $H_2SO_4$ mist lb/hr | $H_2SO_4$ mist g/s |
|---|---|---|---|
| 100 | 20* | 2.61 | 0.329 |
| | 59† | 2.46 | 0.310 |
| | 80† | 2.36 | 0.298 |
| | 90† | 2.32 | 0.292 |
| 60 | 20 | 1.47 | 0.185 |
| | 59 | 1.37 | 0.172 |
| | 80 | 1.29 | 0.163 |
| | 90 | 1.26 | 0.159 |
| 35 | 86 | 0.91 | 0.115 |

*Emission rates include duct burner firing.
†Emission rates include use of inlet air fogging and duct burner firing.

Sources: Calpine, 2004.
ECT, 2004.
Siemens Westinghouse, 2004.

Maximum hourly criteria pollutant emission rates for the facility emergency diesel engines, cooling towers, and fuel gas heaters are provided in Tables 3.4.1-3 through 3.4.1-5, respectively.

**Table 3.4.1-3. Emergency Diesel Engine Maximum Criteria Pollutant Emission Rates**

| Pollutant | Emergency Generator Diesel Engine (lb/hr) | Emergency Generator Diesel Engine (tpy) | Emergency Fire Water Pump Diesel Engine (lb/hr) | Emergency Fire Water Pump Diesel Engine (tpy) |
|---|---|---|---|---|
| PM/$PM_{10}$ | 1.38 | 0.17 | 0.13 | 0.01 |
| $SO_2$ | 0.82 | 0.10 | 0.14 | 0.01 |
| $NO_x$ | 37.24 | 4.66 | 7.41 | 0.37 |
| CO | 8.34 | 1.04 | 1.75 | 0.09 |
| VOC | 1.48 | 0.19 | 1.02 | 0.05 |

Note: tpy = tons per year.

Sources: Calpine, 2004.
ECT, 2004.

**Table 3.4.1-4. Cooling Tower Maximum Criteria Pollutant Emission Rates**

| Pollutant | Cooling Towers (lb/hr) | Cooling Towers (tpy) |
|---|---|---|
| PM | 7.5 | 32.99 |
| $PM_{10}$ | 0.5 | 2.1 |

Sources: Calpine, 2004.
ECT, 2004.

**Table 3.4.1-5. Fuel Gas Heater Maximum Criteria Pollutant Emission Rates**

| Pollutant | Fuel Gas Heaters (lb/hr) | (tpy) |
|---|---|---|
| PM/PM10 | 0.13 | 0.60 |
| $SO_2$ | 0.11 | 0.47 |
| $NO_x$ | 1.77 | 7.76 |
| CO | 1.49 | 6.52 |
| VOC | 0.10 | 0.43 |

Sources: Calpine, 2004.
ECT, 2004.

The CTG/HRSG units will operate under a variety of operating conditions including the optional use of CTG inlet air fogging and HRSG duct burner firing. Five facility CTG/HRSG annual operating profiles were developed to represent the expected range of facility annual operations. Table 3.4.1-6 presents projected maximum annualized criteria and noncriteria emissions for the facility. For each pollutant, maximum annualized rates were conservatively estimated using the highest annual emission rate for any of the five annual operating profiles. Maximum annual emissions for all pollutants are projected to occur under the annual operating profile comprised of 8,760 hr/yr at 100-percent CTG load with inlet air fogging, HRSG duct burner firing, and 80°F ambient air temperature.

**Table 3.4.1-6. Maximum Annualized Emission Rates for BHEC (tpy)**

| Pollutant | CTG/HRSG Units | Cooling Towers | Diesel Engines | Fuel Gas Heaters | Project Totals |
|---|---|---|---|---|---|
| $NO_x$ | 300.6 | N/A | 5.0 | 7.8 | 313.4 |
| CO | 148.9 | N/A | 1.1 | 6.5 | 156.6 |
| PM | 230.6 | 32.9 | 0.2 | 0.6 | 264.2 |
| $PM_{10}$ | 230.6 | 2.1 | 0.2 | 0.6 | 233.4 |
| $SO_2$ | 225.4 | N/A | 0.1 | 0.5 | 226.0 |
| VOC | 100.7 | N/A | 0.2 | 0.4 | 101.4 |
| Lead | 0.02 | N/A | Neg. | Neg. | 0.02 |
| $H_2SO_4$ mist | 41.4 | N/A | Neg. | Neg. | 41.4 |

Note: N/A = not applicable.
Neg. = negligible

Sources: Calpine, 2004.
ECT, 2004.
Siemens Westinghouse, 2000.

Cooling tower, diesel engine, fuel gas heater, and total facility annual emissions are also shown in Table 3.4.1-5.

Details of the hourly and annualized facility emission rate calculations are included in the supporting documentation for the prevention of significant deterioration (PSD) permit application (see Appendix 10.1.1). Stack parameters for the natural gas-fired CTG/HRSG units and facility cooling towers and fuel gas heaters are provided in Tables 3.4.1-7 and 3.4.1-8, respectively.

### 3.4.2 AIR EMISSION CONTROLS

The conceptual design of the BHEC incorporates state-of-the-art technology at every step, starting with the selection of the advanced Siemens Westinghouse 501F CTGs. The high efficiency of these CTGs will reduce emissions per unit of output by producing each MW-hour of electricity with less combustion of fuel. The use of natural gas as the exclusive fuel for the CTGs and HRSG duct burners also has the benefit of reducing air emissions compared to CTG/HRSG units which use distillate fuel oil as a secondary fuel

**Table 3.4.1-7. CTG/HRSG Stack Parameters for Three Unit Loads and Five Ambient Temperatures (Per CTG/HRSG)**

| Unit Load (%) | Ambient Temperature (°F) | Stack Height | | Stack Exit Temperature | | Stack Exit Velocity | | Stack Diameter | |
|---|---|---|---|---|---|---|---|---|---|
| | | ft | meters | °F | K | fps | m/sec | ft | meters |
| 100 | 20‡ | 150 | 45.7 | 165 | 347 | 69.3 | 21.1 | 18.5 | 5.64 |
| | 59†† | 150 | 45.7 | 165 | 347 | 65.3 | 19.9 | 18.5 | 5.64 |
| | 80†† | 150 | 45.7 | 165 | 347 | 62.8 | 19.2 | 18.5 | 5.64 |
| | 90†† | 150 | 45.7 | 165 | 347 | 61.5 | 18.7 | 18.5 | 5.64 |
| 60 | 20 | 150 | 45.7 | 165 | 347 | 49.2 | 15.0 | 18.5 | 5.64 |
| | 59 | 150 | 45.7 | 165 | 347 | 46.6 | 14.2 | 18.5 | 5.64 |
| | 80 | 150 | 45.7 | 165 | 347 | 45.2 | 13.8 | 18.5 | 5.64 |
| | 90 | 150 | 45.7 | 165 | 347 | 44.4 | 13.5 | 18.5 | 5.64 |
| 35 | 86 | 150 | 45.7 | 165 | 347 | 34.7 | 10.6 | 18.5 | 5.64 |

Note: K = Kelvin.
fps = foot per second.
m/sec = meter per second.

‡With duct burner firing.
††With inlet air fogging and duct burner firing.

Sources: Calpine, 2004.
ECT, 2004.
Siemens Westinghouse, 2004.

**Table 3.4.1-8. Cooling Tower Stack Parameters**

| | Stack Height | | Stack Exit Temperature | | Stack Exit Velocity | | Stack Diameter | |
|---|---|---|---|---|---|---|---|---|
| | ft | meters | °F | K | fps | m/sec | ft | meters |
| A. Main Cooling Towers (Per Cell) | 62 | 18.9 | 106 | 314 | 26.1 | 7.9 | 33.0 | 10.1 |
| B. Fuel Gas Heaters (per Heater) | 25 | 7.6 | 850 | 728 | 30.5 | 9.3 | 2.0 | 0.6 |

Sources: Calpine, 2004.
ECT, 2004.

source. The CTGs and supplemental duct burners will employ pollution prevention technology by using DLN combustors and low-$NO_x$ burners, respectively, to reduce the formation of $NO_x$ emissions. In addition, the CTG/HRSG units will utilize post-combustion SCR control technology to further reduce $NO_x$ emissions. At annual average base load conditions, CTG/HRSG $NO_x$ emissions are estimated to be 0.063 lb $NO_x$ per MW-hour. This controlled $NO_x$ emission rate is only 4.0 percent of the recently promulgated 40 CFR Part 60, Subpart Da new source performance standard (NSPS) of 1.6 lb $NO_x$ per MW-hour applicable to newly constructed or modified electric utility steam generating units.

Advanced burner design, good combustion practices, and oxidation catalyst will be utilized to control CO and VOC emissions from the CTG and HRSG duct burners.

Table 3.4.2-1 presents a summary of air emission controls. The exclusive use of low-sulfur and low-ash natural gas, along with highly efficient combustion, will limit PM/$PM_{10}$ emissions from the CTGs and supplemental HRSG duct burners. Because of its low ash and sulfur content, natural gas is generally considered the "cleanest" fossil fuel. $SO_2$ and $H_2SO_4$ mist emissions will be controlled by the use of low-sulfur natural gas containing no more than 2.0 grains of sulfur per 100 dry standard cubic feet (gr S/100 dscf).

**Table 3.4.2-1. Summary of Air Emission Controls**

| Pollutant | Means of Control |
|---|---|
| CTGs and HRSG Duct Burners | |
| $PM/PM_{10}$ | • Exclusive use of low-sulfur and low-ash natural gas. |
| | • Efficient combustion. |
| CO and VOC | • Efficient combustion and oxidation catalyst. |
| $NO_x$ | • Use of advanced DLN combustor and low-$NO_x$ burner technologies and SCR. |
| $SO_2/H_2SO_4$ mist | • Exclusive use of low-sulfur natural gas. |
| Cooling Tower | |
| $PM/PM_{10}$ | • Efficient drift elimination. |

Source: ECT, 2004.

Finally, the use of highly efficient cooling tower drift eliminators will control $PM/PM_{10}$ emissions to no more than 0.0005 percent of circulating water from the facility's main north and south cooling towers.

## 3.4.3 BEST AVAILABLE CONTROL TECHNOLOGY

The PSD air permitting regulations require detailed consideration of alternative means of emission control on a pollutant-by-pollutant basis. The purpose of this control technology review process is to determine the best available control technology (BACT). As defined by Rule 62-210.200, F.A.C., BACT represents an emission limitation that reflects the maximum degree of pollutant reduction achievable, determined on a case-by-case basis, with consideration given to energy, environmental, and economic impacts. BACT emission limitations must be no less stringent than any applicable NSPS (40 Code of Federal Regulations [CFR] 60), National Emission Standards for Hazardous Air Pollutants (NESHAPs)

(40 CFR 61), and state emission standards (Chapter 62-296, F.A.C., *Stationary Sources—Emission Standards*).

A complete BACT evaluation for the BHEC is contained in the PSD permit application in Appendix 10.1.1. Proposed BACT emission limitations for the CTG/HRSG units are summarized in Table 3.4.3-1. An abbreviated discussion of the BACT review is provided in the following sections.

**Table 3.4.3-1. Summary of Proposed BACT Emission Limitations**

| Pollutant | Proposed BACT Emission Limits (ppmvd @ 15% $O_2$) | (lb/hr) |
|---|---|---|
| **Siemens Westinghouse 501F CTG/HRSG (per CTG/HRSG Unit)** | | |
| A. All Operating Scenarios | | |
| $NO_X$ | 2.0* | 18.9 |
| CO | 5.0* | 16.0 |
| VOC | 2.0 | 6.0 |
| $PM/PM_{10}$ | ≤10% opacity | |
| $SO_2$ | Fuel ≤2.0 gr S/100 dscf | |
| $H_2SO_4$ mist | Fuel ≤2.0 gr S/100 dscf | |
| B. Cooling Towers | | |
| Main Cooling Towers | | |
| $PM/PM_{10}$ | 0.0005 percent drift loss rate | |

*CEMS 24-hour block average.

Sources: Calpine, 2004.
ECT, 2004.
Siemens Westinghouse, 2004.

### 3.4.3.1 Methodology

The BACT analysis was performed in accordance with the EPA *top-down* method. The first step in the top-down BACT procedure was the identification of all available control technologies. Alternatives considered included process designs and operating practices that reduce the formation of emissions, post-process stack controls that reduce emissions after they are formed, and combinations of these two control categories. Following the identification of available control technologies, the next step in the analysis was to determine which technologies may be technically infeasible. Technical feasibility was evaluated using the criteria contained in Chapter B of the *EPA New Source Review (NSR) Workshop Manual* (EPA, 1990). The third step in the top-down BACT process was the ranking of the remaining technically feasible control technologies from high to low in order of control effectiveness. Assessment of energy, environmental, and economic impacts was then performed. The economic analyses of the technologies used the procedures found in the Office of Air Quality Planning and Standards (OAQPS) Control Cost Manual (EPA, 2002). The fifth and final step was the selection of a BACT emission limitation corresponding to the most stringent technically feasible control technology that was not eliminated based on adverse energy, environmental, or economic grounds. Control technology analyses using the five step *top-down* BACT method were prepared for combustion products, products of incomplete combustion, and acid gases, respectively. The following is a summary of the BACT analyses that are contained in the PSD permit application.

#### 3.4.3.2 Summary of BACT Determinations

**PM/$PM_{10}$**

Available technologies considered for controlling PM/$PM_{10}$ from CTG/HRSG units include the following post process controls:

- Centrifugal collectors.
- Electrostatic precipitators (ESPs).
- Fabric filters or baghouses.
- Wet scrubbers.

Post-process stack controls for PM/$PM_{10}$ are not appropriate for CTG/HRSG units because of the low concentrations of PM/$PM_{10}$ emissions in the exhaust. The use of good combustion practices and clean fuels is considered to be BACT. The CTGs and supplemental duct burners will use the latest burner technology to maximize combustion efficiency and minimize PM/$PM_{10}$ emission rates. Combustion efficiency, defined as the percentage of fuel that is completely oxidized in the combustion process, is projected to be greater than 99 percent. The CTGs and supplemental duct burners will be fired exclusively with natural gas.

For the cooling tower, the only practical means of limiting $PM/PM_{10}$ emissions in drift are to limit cooling water cycles of concentration (i.e., to keep dissolved solids at lower concentrations) and/or apply drift eliminators. Because of Calpine's desire to limit water use, cooling water will be recycled to the maximum practical degree. Drift eliminators will then be used to limit drift to no more than 0.0005 percent of circulating water flow in the main cooling towers.

**CO**

There are two available technologies for controlling CO from CTG/HRSG units:

- Combustion process design.
- Oxidation catalysts.

Combustion process controls involve CTG combustion chamber and duct burner designs and operation practices that improve the oxidation process and minimize incomplete combustion. Due to the high combustion efficiency of CTGs, approximately 99 percent, CO emissions from CTGs are inherently low.

In addition to utilizing high combustion efficiency burners and good combustion practices, oxidation catalyst technology will be employed to further reduce CTG and HRSG duct burner CO and VOC emissions by 90 and 50 percent, respectively. The proposed combination of controls represents the *top case* BACT control option for reducing CO and VOC emissions from CTG/HRSG units. Maximum CTG/HRSG CO and VOC exhaust concentrations will not exceed 5.0 (on a 24-hour block average basis) and 2.0 ppmvd corrected to 15 percent $O_2$ under all normal operating scenarios, including HRSG duct burner firing and CTG low-load operation.

**$NO_X$**

Available technologies for controlling $NO_x$ emissions from the Siemens Westinghouse 501F CTGs include combustion process modifications and post-combustion exhaust gas treatment systems. A listing of available technologies for each of these categories follows:

Combustion Process Modifications

- Water/steam injection and standard combustor design.
- Water/steam injection and advanced combustor design.
- DLN combustor design.

Postcombustion Exhaust Gas Treatment Systems

- Selective noncatalytic reduction (SNCR).
- Nonselective catalytic reduction (NSCR).
- SCR.
- $SCONO_x$™.

For the Project CTG/HRSG units, DLN (for the CTGs) and low-$NO_x$ burner (for the HRSG duct burners) pollution prevention technologies will be employed. These state-of-the-art process technologies primarily reduce $NO_x$ formation by reducing peak combustion flame temperatures. The emerging pollution prevention catalytic combustor XONON™ technology is presently under development and not commercially available for the Siemens Westinghouse 501F CTGs.

To further reduce $NO_x$ emissions, post-combustion SCR control technology will be utilized. SCR reduces $NO_x$ emissions by reacting ammonia ($NH_3$) with exhaust gas $NO_x$ to yield nitrogen and water vapor in the presence of a catalyst. The catalyst serves to lower the activation energy of these reactions, which allows the $NO_x$ conversions to take place at a lower temperature (i.e., in the range of 600 to 750°F). Typical SCR catalysts include metal oxides (titanium oxide and vanadium), noble metals (combinations of platinum and rhodium), zeolite (alumino-silicates), and ceramics.

Factors affecting SCR performance include space velocity (volume per hour of flue gas divided by the volume of the catalyst bed), $NH_3/NO_x$ molar ratio, and catalyst bed temperature. Space velocity is a function of catalyst bed depth. Decreasing the space velocity (increasing catalyst bed depth) will improve $NO_x$ removal efficiency by increasing residence time but will also cause an increase in catalyst bed pressure drop. The reaction of $NO_x$ with $NH_3$ theoretically requires a 1:1 molar ratio. $NH_3/NO_x$ molar ratios greater than 1:1 are necessary to achieve high-$NO_x$ removal efficiencies due to imperfect mixing and other reaction limitations. However, $NH_3/NO_x$ molar ratios are typically maintained at 1:1 or lower to prevent excessive unreacted $NH_3$ (ammonia slip) emissions.

The Project CTG/HRSG SCR control systems will be designed to achieve a maximum outlet exhaust $NO_x$ concentration of 2.0 ppmvd corrected to 15-percent $O_2$ (on a 24-hour block average basis) with an ammonia slip level of 5.0 ppmvd at 15 percent $O_2$ for all project operating conditions excluding startup, shutdown, and malfunctions. The level of SCR performance represents the top case BACT control option for reducing $NO_x$ emissions from natural gas-fired CTG/HRSG units and is consistent with recent Florida and EPA Region 4 $NO_x$ BACT determinations.

**$SO_2$ and $H_2SO_4$ mist**

Technologies employed to control $SO_2$ and $H_2SO_4$ mist emissions from combustion sources consist of fuel treatment and postcombustion add-on controls (i.e., flue gas desulfurization [FGD]) systems. These controls are applied to facilities burning high-sulfur fuels (e.g., coal). There have been no applications of FGD technology to CTG/HRSG units because low-sulfur fuels are typically utilized. The proposed CTG/HRSG units will be fired exclusively with natural gas. The sulfur content of natural gas is more than 100 times lower than the fuels (e.g., coal) employed in conventional coal-fired boilers utilizing FGD systems. In addition, CTG/HRSG units operate with a significant amount of excess air which generates high exhaust gas flow rates. Because FGD $SO_2$ removal efficiency decreases with decreasing inlet $SO_2$ concentration, application of a FGD system to a CTG/HRSG exhaust stream would result in very low $SO_2$ removal efficiencies. Since the CTG/HRSG will produce a low $SO_2$ exhaust stream concentration, the $SO_2$ removal efficiencies would be unreasonably low, thus making FGD technology technically infeasible and ineffective for CTG/HRSG units.

Because post-combustion $SO_2$ and $H_2SO_4$ mist controls are not appropriate, use of low-sulfur fuel is considered to represent BACT for the CTG/HRSG units. The natural gas fuel supply will contain no more than 2.0 gr S/100 dscf.

Details of the BACT analyses for the Project are provided in the PSD permit application (see Appendix 10.1.1).

### 3.4.4 DESIGN DATA FOR CONTROL EQUIPMENT

Control of air emissions for the Project will be accomplished by the use of pollution prevention in the form of highly efficient process technologies, exclusive use of natural gas (the "cleanest" fossil fuel) for the CTGs and HRSG duct burners, SCR technology for $NO_x$ control, and oxidation catalyst for CO and VOC control. This combination of process technologies, clean fuels, and application of post-combustion control equipment will achieve low emission rates. Process descriptions, emission rates and exhaust gas characteristics, and fuel specifications are provided in Section 3.3 of this SCA.

### 3.4.5 DESIGN PHILOSOPHY

Air emission controls planned for the Project have been designed to fully comply with all applicable state and federal regulations. Specific design concepts are summarized as follows:

- Use of pollution prevention technologies to reduce the formation of pollutants.
- Application of BACT for all affected pollutants and emission sources.
- Use of SCR for $NO_x$ emissions abatement.
- Use of oxidation catalyst for CO and VOC emission control.
- Use of low-sulfur, low-ash natural gas fuel.
- Use of efficient combustion to minimize emissions of pollutants associated with incomplete combustion.

This Project will use the most efficient technology available to convert natural gas to electrical power. On a total power production basis, CTG/HRSG air emissions will be minimized by using technology that produces the most power for each unit of fuel consumed. CTG/HRSG emissions, on a pound-per-MW-hour basis, will be well below the rates generated by conventional natural gas-, oil-, and coal-fired power plants. As previously noted, CTG/HRSG $NO_x$ emissions will be 0.063 lb $NO_x$ per MW-hour or only 4.0 percent of the recently promulgated NSPS of 1.6 lb $NO_x$ per MW-hour applicable to newly constructed or modified electric utility steam generating units.

Air emission control technologies planned for the Project reflect the application of BACT for each affected pollutant and emission source. The proposed BACT limitations are well below applicable state and federal emission standards (e.g., NSPS).

## 3.5 PLANT WATER USE

The BHEC has been designed to minimize impacts to the Indian River County watershed, as well as the Indian River Lagoon estuary system. No ground water wells will be installed and no ground water will be used for the Project. The BHEC will use stormwater withdrawn from the Indian River County Egret Marsh Regional Stormwater Park as its primary water source along with some brine discharge water provided by Indian River County from its South Plant water treatment facility. The largest usage of water for the BHEC operations will be as makeup to the cooling towers. The expected major water usages during continuous plant operation are:

- Cooling tower blowdown.
- Cooling tower evaporation.
- Gas turbine inlet fogging.
- HRSG blowdown.
- Gas turbine on-line compressor water wash.

Other water flows that must be considered include:

- Equipment cooling system losses (leaks, evaporation, etc.).
- Plant washdown.
- HRSG chemical cleaning (typically occurs once every 3 to 5 years).
- Potable water consumption by onsite personnel.
- Site runoff.

Stormwater used by the Project from the Indian River County stormwater park will be provided from the Lateral C Canal. The Lateral C Canal is part of the IRFWCD's 200-mile interconnected network of main canals, lateral canals, and sublaterals which provide flood control for this area. Monthly average and minimum flows for these three canals are shown in Figures 2.3.4-3 and 2.3.4-4, respectively. Historical water quality data for these canals are shown in Table 2.3.4-4.

The canal network has three primary outfalls (i.e., Main Canal, North Relief Canal, and South Relief Canal), which discharge an average of 100 MGD of excess water to the Indian River Lagoon. The BHEC will be connected to the Indian River County water system and publicly owned treatment works (POTW) for potable water supply and disposal of sanitary wastewaters, respectively.

The BHEC Project will be a zero wastewater discharge facility with respect to the NPDES program. This means the BHEC will have no point source discharges of wastewaters or contaminated stormwater to surface waters. Key features of this design include multiple advanced water treatment processes to provide an overall water management system that maximizes water reuse and recycling, while controlling the chemistry of the cooling water system to within industry recognized chemical scale indices to ensure high thermal performance of the cooling system.

Based on this design, quantitative water use diagrams for the BHEC after final development of Phase I and II of the Project are shown in Figure 3.5.0-1 for expected annual average water use, and in Figure 3.5.0-2 for peak water use. As shown in these figures, expected annual average daily water consumption is approximately 5.8 MGD, and expected peak daily water consumption is approximately 8.2 MGD when Phase I and II are completed. The annual average daily water use will be approximately 2.9 MGD and the peak daily water use will be approximately 4.1 MGD after Phase I is completed.

As discussed in Section 3.1.1, Calpine has entered into an Agreement with Indian River County and IRFWCD to obtain stormwater for use by the BHEC from the County's planned Egret Marsh Regional Stormwater Park. According to the County's current plans, the first phase of the stormwater park will be designed to treat a water flow rate of up to approximately 10 MGD through its treatment systems, in addition to the water used by the BHEC. The County is also considering purchasing additional, adjacent property to expand the park's treatment capacity to a total of approximately 20 MGD. The stormwater treated in the park will be discharged back to the IRFWCD canal system and, therefore, the withdrawals from the canal to provide water for treatment in the park are not considered a consumptive use of water.

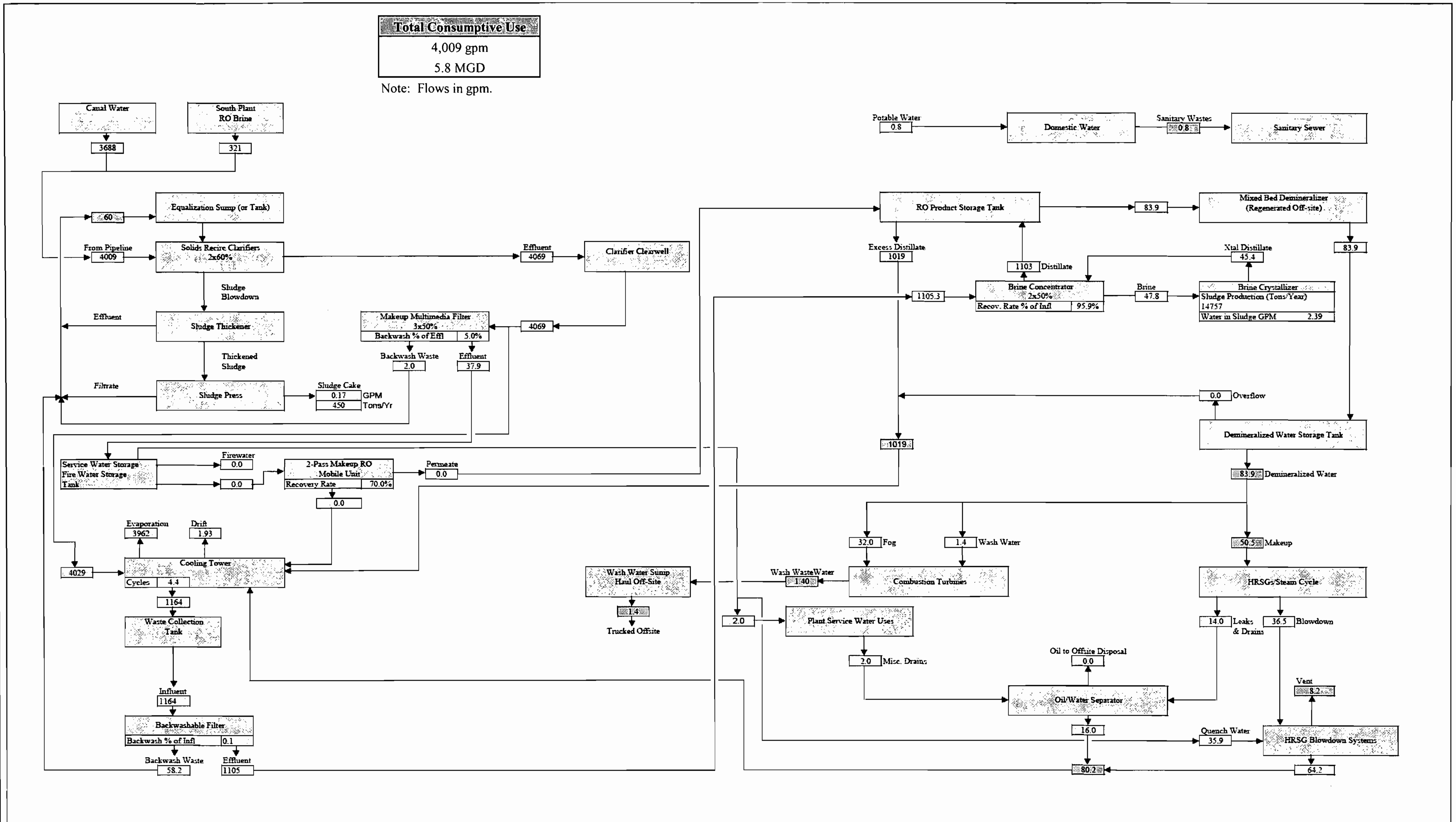



FIGURE 3.5.0-1. (REV. 1—12/04)

WATER BALANCE DIAGRAM—ANNUAL AVERAGE DAILY WATER USE

Source: Calpine, 2004.

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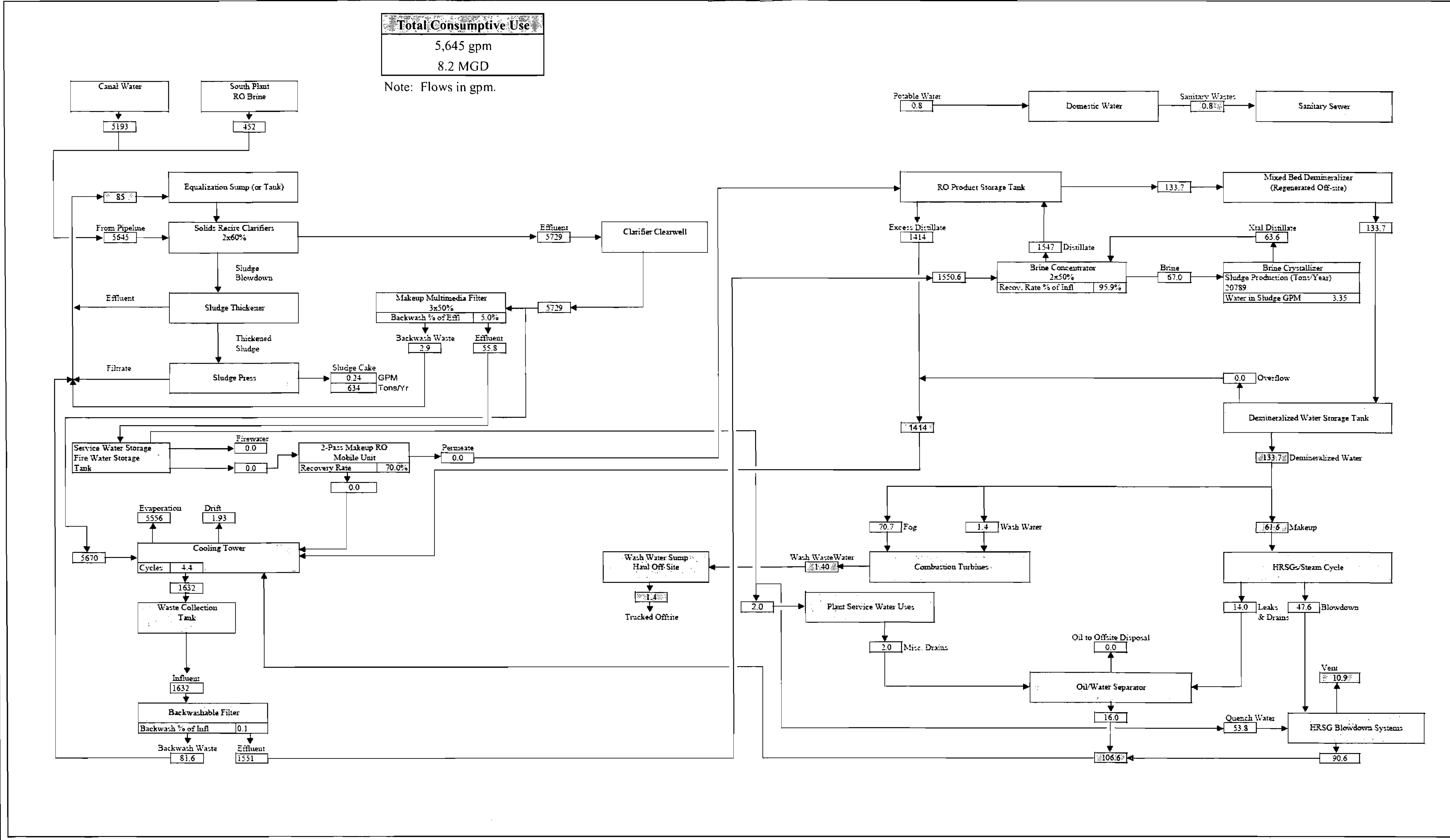


FIGURE 3.5.0-2. (REV. 1—12/04)

WATER BALANCE DIAGRAM—PEAK DAILY WATER USE

Source: Calpine, 2004.

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Stormwater treated in the stormwater park, in addition to the stormwater provided by the County for use by the BHEC, will be withdrawn from the IRFWCD Lateral C Canal through a new pumping station located just downstream of the Lateral C radial gate in the lower pool of the canal system, as shown in Figures 3.5.1-1 and 3.5.1-2. Initially, the pumping station will be designed and constructed to provide the approximately 8.2 MGD peak water requirements for use by the BHEC plus provide the approximately 10 MGD stormwater treatment needs for the first phase of the stormwater park, or a total of approximately 18.2 MGD. The pumping station will also be designed so that additional pumps can be installed to withdraw an additional 10 MGD for the potential expansion of the stormwater park in the future or a total of approximately 28.2 MGD, including the BHEC water supply.

Stormwater pumped from the Lateral C Canal will be discharged to the pretreatment pond at the stormwater park to allow for settling and removal of suspended solids, as shown in Figure 3.5.1-5. From the pretreatment pond, stormwater to be treated in the park and not utilized by the BHEC will be routed through the passive treatment systems in the stormwater park and then discharged back into the canal system. Additionally, up to approximately 8.2 MGD of the water that had been pumped into the pretreatment pond will be withdrawn through a pumping station in the pretreatment pond and conveyed to the BHEC. The pumping station in the stormwater park's pretreatment pond will be designed to pump the peak daily water requirements of the BHEC. At the stormwater park, the piping system will be equipped with flow meters to record flows both from the canal to the park and from the park to the BHEC. Also, as described in the water supply Agreement with Indian River County and IRFWCD, the piping system will include a valved stormwater park bypass pipeline so that stormwater from the Lateral C Canal can be routed directly to the BHEC in the event there are operational or water quality problems at the stormwater park (see Figure 3.5.1-5).

Further, the water supply Agreement allows Indian River County, at its option, to supplement the stormwater provided to the BHEC with a specified quantity (i.e., up to 8 percent of the total stormwater flow) of brine discharge water from the reverse osmosis system at its South Plant water treatment facility. The County would inject the brine into the pipeline at a location between the stormwater park and the BHEC so that no brine water will enter the stormwater park. The average and peak water balances presented in Figures 3.5.0-1 and 3.5.0-2, respectively, include the use of brine water with flows that range from approximately 0.46 MGD on an annual average basis to approximately 0.65 MGD during peak daily operating conditions.

### 3.5.1 HEAT DISSIPATION SYSTEM

The heat dissipation system will include two 10-cell closed-cycle, mechanical draft, evaporative cooling towers.

#### 3.5.1.1 System Design

The primary heat dissipation system consists of two sets of 10-cell cooling towers, each equipped with two 50-percent capacity circulating water pumps; piping, valves, and instrumentation to provide cooling water to the condenser; and the auxiliary cooling water system. Makeup water to the towers will be treated in a solids recirculation clarification system to remove suspended solids and provide water suitable for makeup to the cooling towers. Solids from the clarifier will be thickened and filter pressed prior to disposal as solid waste. Effluents from the thickener and filter press will be recycled to the front end of the clarifier for reuse.

The cooling towers will be evaporative, mechanical draft-type units sized to accommodate the heat load and flow from the condenser and auxiliary cooling water system. Each cell will be provided with a motor-driven fan. The towers will be erected over concrete basins.

The circulating water pumps will be of the vertical, wet pit type. The system will provide for independent pump isolation and protection from flow reversal using motor-operated butterfly valves at each pump discharge.

Two 50-percent capacity cooling tower makeup pumps will be installed to deliver makeup water to the cooling tower basin.

Consumptive use of water by evaporation in the primary cooling towers has been estimated for the annual average meteorological conditions (i.e., average dry bulb and average dew point) and for extreme meteorological conditions (i.e., maximum dry bulb and minimum dew point) (see water balances in Figures 3.5.0-1 and 3.5.0-2).

Blowdown from the cooling towers and other plant wastewaters will be treated to a quality that will allow the wastewaters to be recycled for cooling tower makeup. Wastewater separated within the treatment process will be routed to a brine concentrator to separate salts from the wastewater and allow the recovery of distillate water suitable for recycling to the cooling towers.

The highly concentrated effluent leaving the brine concentrator will flow to a crystallizer, which will separate the solids component for disposal. The pure condensed water from the brine concentrator will be reused within the facility water system.

#### 3.5.1.2 Source of Cooling Water

The primary source of cooling water will be excess stormwater from the IRFWCD canal system, which will be routed through Indian River County's proposed Egret Marsh Regional Stormwater Park. The flows and quality of water in the canal system are described in Section 2.3.4.1. Brine discharge water from the Indian River County South Plant reverse osmosis water treatment facility will also be used as a supplemental source of cooling water.

Stormwater from the IRFWCD canal system will be delivered to the BHEC in two steps. First, water will be withdrawn from the Lateral C Canal through a new pumping station located just downstream of the Lateral C radial gate in the lower pool of the canal system (see Figures 3.5.1-1 and 3.5.1-2). Water withdrawn from this location will be pumped

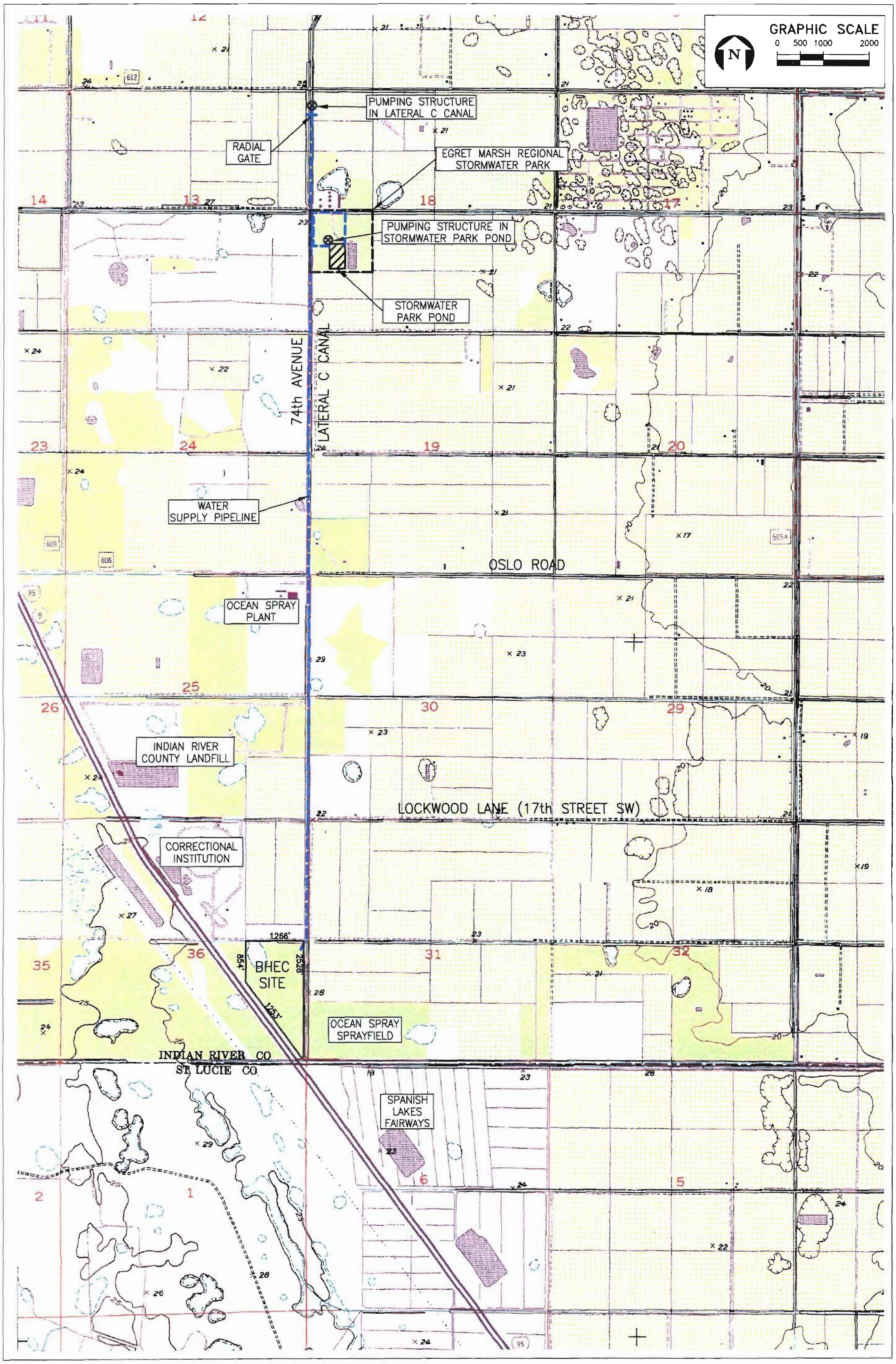


FIGURE 3.5.1-1. (REV. 1 - 12/04)
LOCATION OF PUMPING STATIONS AND PIPELINES FOR PLANT WATER SUPPLY

Sources: USGS Quad: Oslo, FL, 1983; ECT, 2004.

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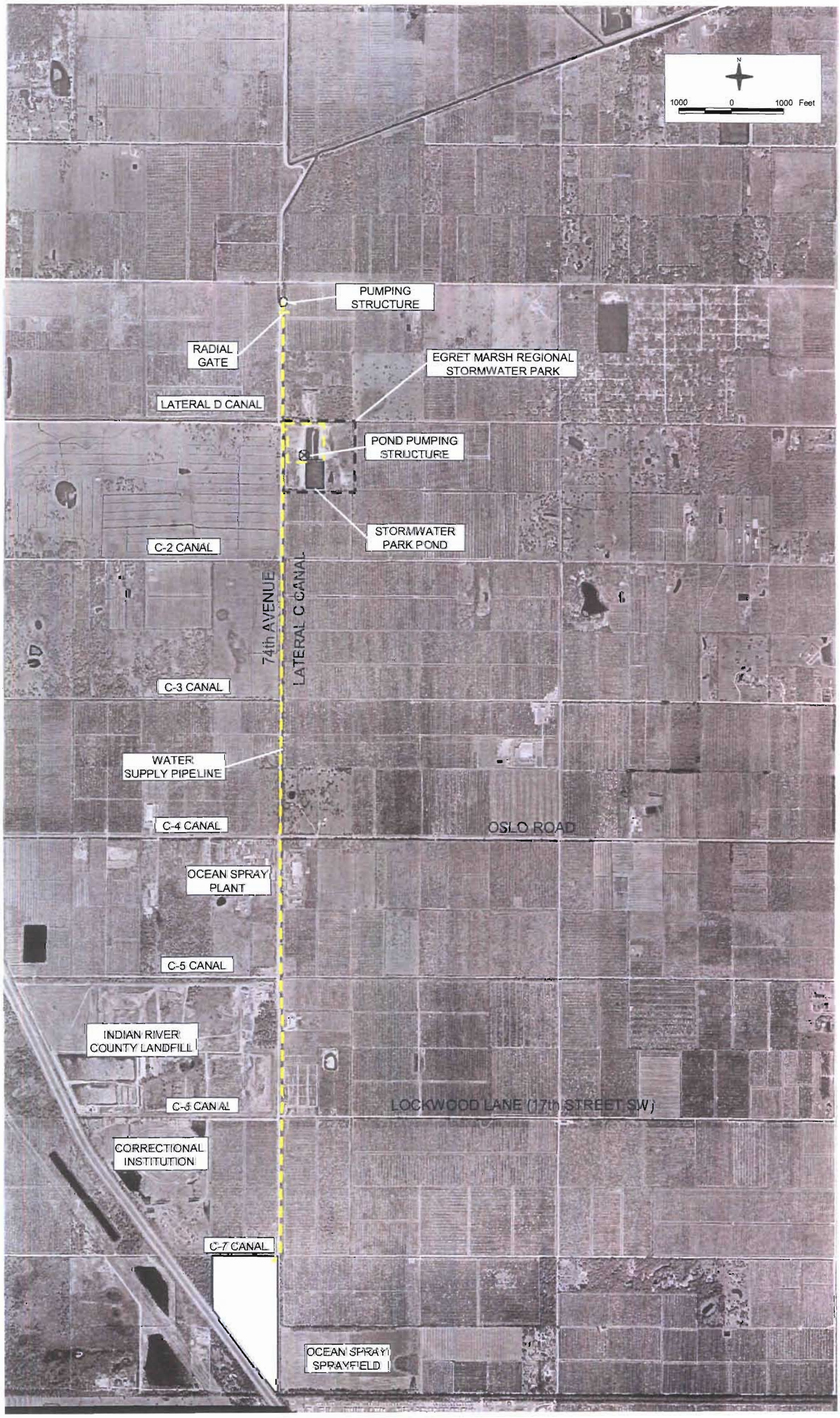


FIGURE 3.5.1-2. (REV. 1- 12/04)

LOCATION OF PUMPING STATIONS AND PIPELINES FOR PLANT WATER SUPPLY - AERIAL PHOTOGRAPH

Sources: Indian River County, 1998; ECT, 2004.

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through a new approximately 0.5-mile pipeline to the pretreatment pond at the Egret Marsh Regional Stormwater Park that will be developed and operated by Indian River County. Along with the water for the BHEC's use, the withdrawals from the Lateral C Canal will include additional stormwater that will be treated in the stormwater park.

Second, to complete the delivery of water to the BHEC, water will be withdrawn from the pretreatment pond at the stormwater park through a new pumping station and will be routed via a new approximately 3.0-mile pipeline to the raw water storage tank at the Site. The water supply system will include a valved stormwater park bypass pipeline, which will be used in the event there are operational or water quality problems at the stormwater park. Figures 3.5.1-1 and 3.5.1-2 show the general locations of the proposed water supply pumping stations, pipelines, and stormwater park relative to the BHEC Site.

As indicated in the water supply Agreement, Indian River County may, at its option, provide brine discharge water from its South Plant drinking water treatment facility as a supplemental source of water for the BHEC. The brine discharge will be delivered via a new approximately 5-mile pipeline and injected into the stormwater supply pipeline between the stormwater park and the BHEC Site. Indian River County will own the brine delivery pipeline and be responsible for its permitting, construction, and operation. Under the water supply Agreement, Calpine will provide some financial assistance to Indian River County for the design and construction of the pipeline. The specific route for the brine pipeline has not yet been identified by Indian River County.

Figures 3.5.1-3 and 3.5.1-4 show the preliminary location and cross section, respectively, of the pumping station on the Lateral C Canal. Figure 3.5.1-5 shows the general layout of the piping and pumping station at the stormwater park. Figure 3.5.1-6 shows a cross section of the pumping station. The hydrologic impacts of the planned water withdrawals are described in Section 5.3 and more detailed descriptions of the pumping stations and pipelines are provided in Chapter 6.0.

### 3.5.1.3 <u>Dilution System</u>

There is no dilution system associated with the planned heat dissipation system.

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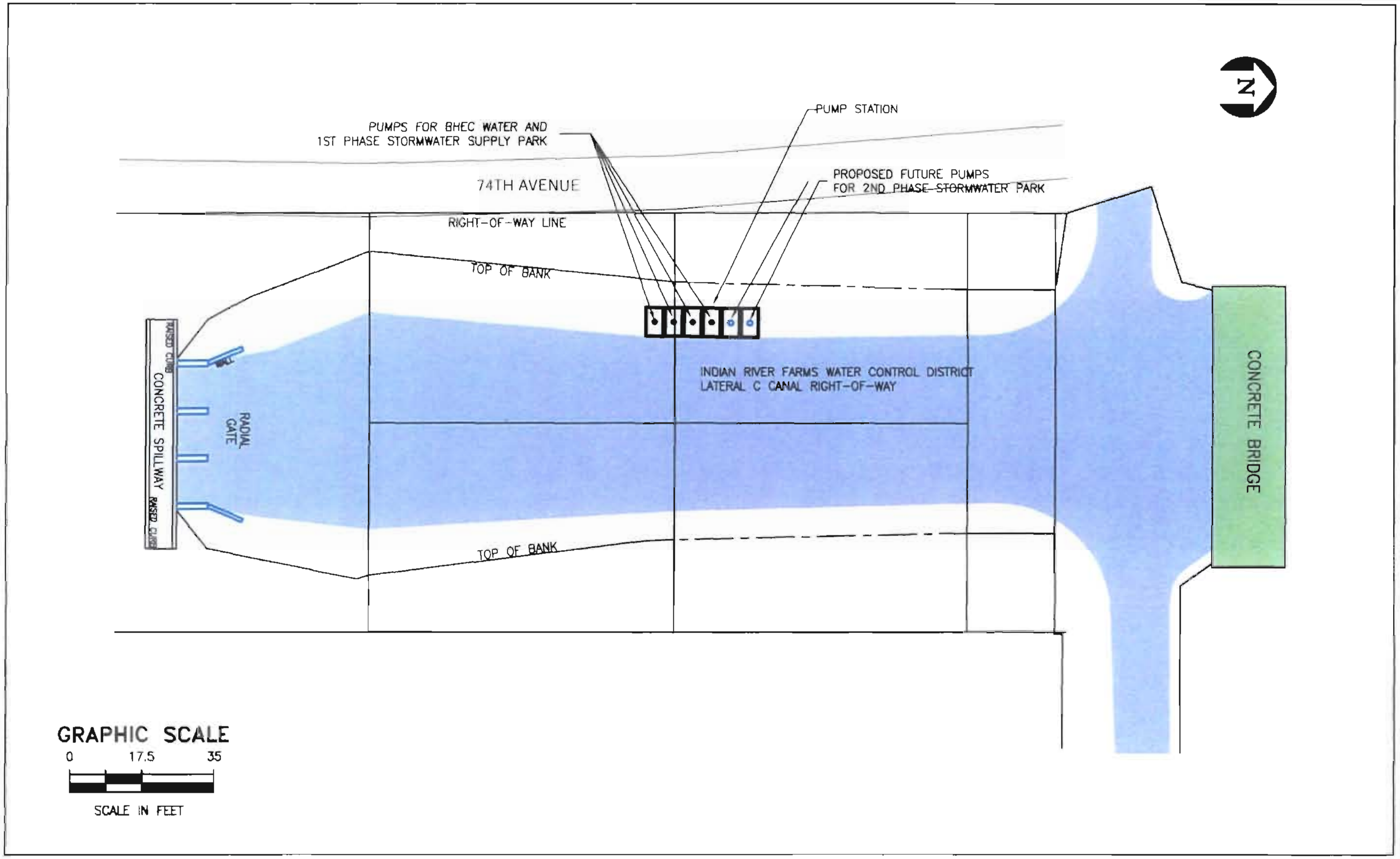


FIGURE 3.5.1-3. (REV. 1 - 12/04)

PUMP STRUCTURE LOCATION IN LATERAL C CANAL

SOURCE: Foster Wheeler Environmental, 2000; ECT, 2004.

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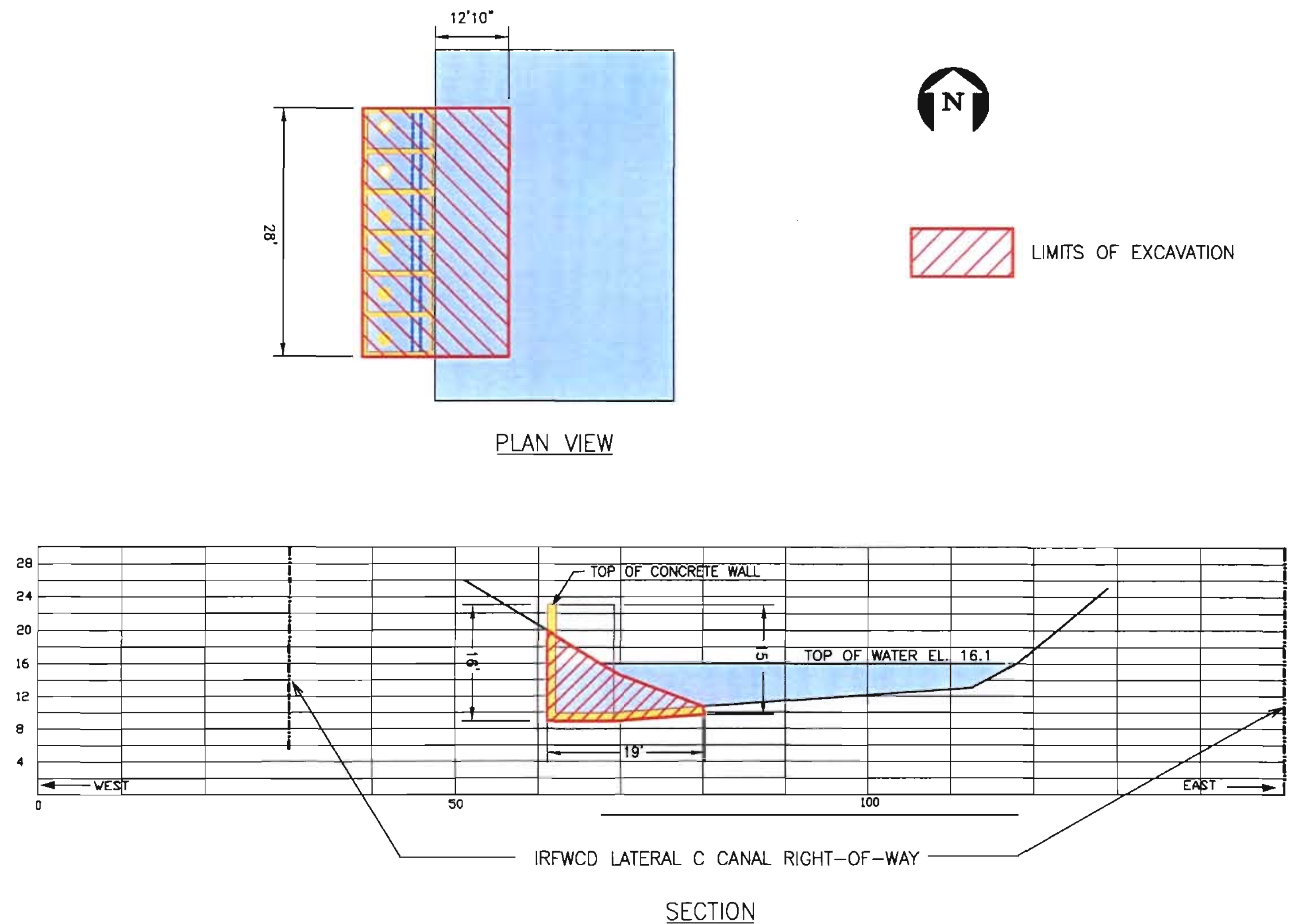


FIGURE 3.5.1-4. (REV. 1 - 12/04)

PUMP STATION CROSS-SECTION IN LATERAL C CANAL

SOURCE: Foster Wheeler Environmental, 2000; ECT, 2004.

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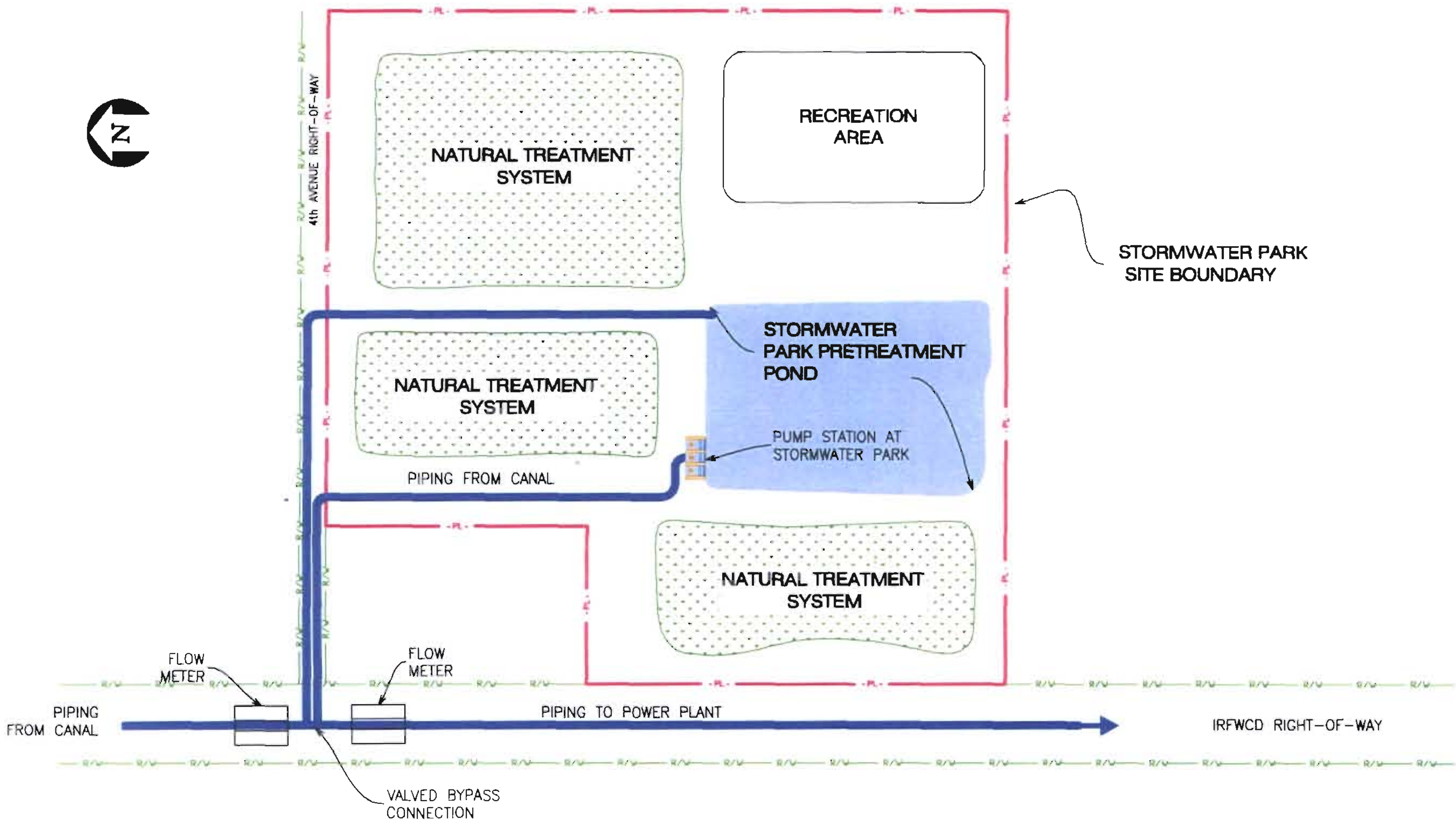


FIGURE 3.5.1-5. (REV. 1 - 12/04)

PIPING AND PUMP STATION LOCATION IN STORMWATER PARK

SOURCE: ECT, 2004.

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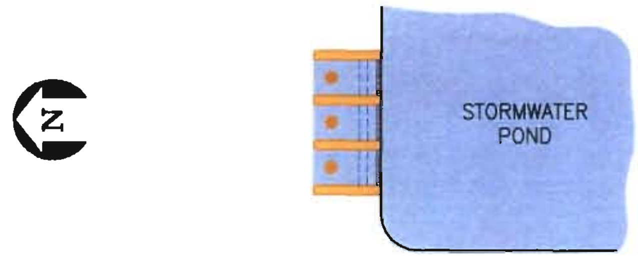
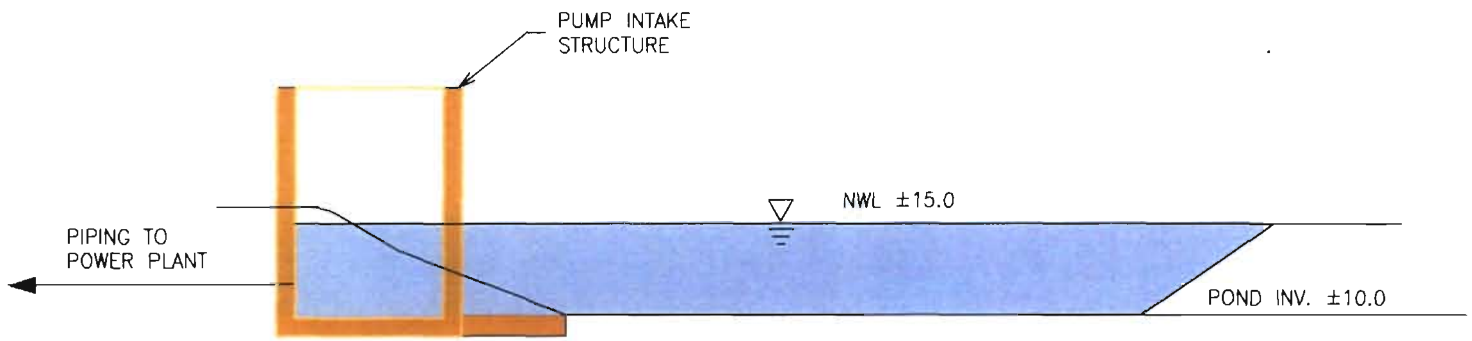



PLAN VIEW




SECTION

FIGURE 3.5.1-6. (REV. 1 - 12/04)

PUMP STATION CROSS SECTION IN STORMWATER PARK

SOURCE: ECT, 2004.

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#### 3.5.1.4 Blowdown, Screened Organisms, and Trash Disposal

The heat dissipation system has no blowdown; it is a zero-discharge system. Wash water for the traveling water screens is supplied by screen-wash pumps which withdraw water from within the pump structure. The discharge from the screens is flushed into a collecting box where debris is retained for offsite disposal, and flush water is drained back to the source.

#### 3.5.1.5 Injection Wells

There are no injection wells associated with the planned heat dissipation system or disposal of other plant wastewaters.

### 3.5.2 DOMESTIC/SANITARY WASTEWATER

Sanitary wastewater will be sent to the Indian River County wastewater system, at a rate estimated to be approximately 1,120 gpd. The County's wastewater system currently extends to 74$^{th}$ Avenue at Lockwood Lane, approximately 0.5 mile north of the Site and has sufficient capacity to provide the Project's service needs. A new pipeline will be constructed at Calpine's expense and the pipeline will be owned, operated, and maintained by Indian River County to serve the Project's needs.

### 3.5.3 POTABLE WATER SYSTEMS

Potable water will be provided to the Site from the Indian River County system at a rate estimated to be 1,120 gpd. The County's potable water system also currently extends to 74$^{th}$ Avenue at Lockwood Lane, approximately 0.5 mile north of the Site, and a new pipeline will be constructed at Calpine's expense to the Site. The County will own, operate, and maintain the pipeline. The County's current potable water system has sufficient capacity to serve the Project's needs.

### 3.5.4 PROCESS WATER SYSTEMS

Process water needs include the following:

- HRSGs and steam turbine.

- CTG inlet fogging.
- Service water.

Makeup to the HRSGs and CTG inlet fogging will undergo demineralization prior to use. Wastewaters from these treatment processes will be routed to the cooling towers.

Service water uses include washdown water, miscellaneous plant uses, and chemical laboratory water. Service water will be taken directly from storage and not treated prior to use. Used service water will be routed to the cooling towers.

Because the BHEC is a zero-discharge wastewater system, the process water system discharges no pollutants to surface water bodies.

## 3.6 CHEMICAL AND BIOCIDE WASTE

The BHEC will produce various chemical wastewaters, none of which will be discharged to the environment. These wastewaters include the following:

- Clean floor drains.
- Potentially oily floor drains.
- Laboratory wastes.
- HRSG blowdown.
- Demineralizer regeneration wastewaters.
- Chemical cleaning wastes.

Chemical cleaning will be performed by outside contractors who will remove their waste products from the Site. Water from potentially oily floor drains will be routed through an oil/water separator, and then sent to transfer sumps, along with the other flows mentioned above, except for chemical cleaning wastes. Water from the transfer sumps will be pumped to the cooling tower basin if the unit is operating; otherwise, it will be pumped to the wastewater collection tank for treatment and reuse in the plant's cooling water system.

## 3.7 SOLID AND HAZARDOUS WASTE

### 3.7.1 SOLID WASTE

During operation, nonhazardous solid wastes will be generated periodically. Wastes generated by the BHEC will include water treatment solids, used air inlet filters, used oil and related maintenance waste materials, and general plant refuse. Because the BHEC will operate on a zero-discharge basis, the water treatment system is expected to generate approximately 40 cubic yards ($yd^3$) per day of solid waste during operation of both Project phases. These wastes will be periodically sampled, characterized, and removed from the BHEC by a licensed waste hauler to a permitted disposal facility. Inlet air filters for the four CTGs will likely require changing on an annual basis. These filters will be disposed at an offsite, licensed landfill. The BHEC will also produce plant maintenance and related waste typical to power generation operations. Used oil collected from the oil/water separator, spent lubricating oils, and used oil filters from the CTGs will be transported offsite by an outside contractor and recycled or disposed. Other maintenance-related wastes will likely include rags; scrap steel, machine parts, and related metal materials; discarded electrical materials; empty containers; and other miscellaneous solid, nonhazardous wastes. The projected combined annual volume of these wastes, coupled with the typical refuse generated by plant personnel, is approximately 16,000 $yd^3$ with both Project phases operational, and will also be disposed in an offsite licensed landfill.

### 3.7.2 HAZARDOUS WASTE

Minimal quantities of hazardous waste will be generated occasionally during facility operations. All attempts will be made to select and use solvents, paints, cleaning fluids and the like that produce only nonhazardous wastes. In the event that hazardous wastes are generated by the BHEC, the wastes will be managed in accordance with Chapter 62-730, F.A.C., and other applicable laws.

## 3.8 ONSITE DRAINAGE SYSTEM

This section describes the drainage system that will be used to control storm runoff and potential impacts of erosion and sedimentation on the Project Site and surrounding property. Appendix 10.1.2 contains an ERP application that demonstrates the Project's compliance with the requirements in Chapters 62-330, 62-331, 62-343, 40C-4, 40C-40, 40C-42 and 40C-400, F.A.C. Calculations and design considerations for the drainage system are provided in Appendix 10.1.3.

### 3.8.1 DESIGN CONCEPTS

The site drainage facilities for the BHEC will be constructed and operated to control stormwater runoff on the Site during the construction and operation of the Project. The drainage system will be designed in accordance with Indian River County, IRFWCD, and SJRWMD water quantity and water quality criteria. Offsite drainage is limited to relatively small pervious contributing areas from the I-95 right-of-way and adjacent undeveloped roadway (74$^{th}$ Avenue). The existing drainage patterns will be maintained by grading. The onsite drainage system will consist of inlets, pipes, culverts, and swales designed to intercept runoff from the various pervious and impervious surfaces of the Site and convey it to a stormwater detention pond for treatment and attenuation. Drainage from the 74$^{th}$ Avenue roadway adjacent to the Site, that will be paved by Calpine will also be directed to the onsite detention pond. The discharge from the pond will be directed into the IRFWCD Lateral C Canal via a control structure and outfall culvert.

The detention pond and drainage system will be designed to control the peak runoff from a 25-year, 24-hour storm event and limit the offsite discharge to less than 2 inches over 24 hours as per Indian River County requirements. Flows from storm events in excess of the 25-year storm will pass over the weir into the Lateral C Canal via the outfall culvert.

### 3.8.2 SITE LAYOUT AND IMPERVIOUS AREAS

Of the 50.5-acre Site, approximately 20 acres is impervious surface, including parking, buildings, slabs, and other structures, and associated gravel/crushed stone areas. The detention pond has a surface area of 5.2 acres at the 25-year storm elevation. The remaining

Site areas consist of pervious grass and landscaping areas and undisturbed wetland and pine flatwood/cabbage palm areas. The impervious areas will be sloped to avoid ponding of non-contact stormwater and direct the runoff into the drainage collection system.

### 3.8.3 SURFACE RECEIVING WATERS

Stormwater discharged from the detention pond will flow into the Lateral C Canal, which is classified as Class III surface waters.

### 3.8.4 GROUND RECEIVING WATERS

Rainfall falling on the Site's pervious areas that does not flow offsite as excess runoff will infiltrate to contribute to ground water recharge in the area. Infiltration to ground water in the vicinity of the Site contributes to recharge and storage in the surficial aquifer of south Indian River County.

### 3.8.5 DIVERSION OF OFFSITE DRAINAGE

The proposed grades onsite, varying between elevations 23.0 and 24.0 ft-NGVD, will be designed to maintain existing drainage patterns from the minor contributing areas. No adverse impacts are anticipated to offsite areas as a result of the proposed design.

### 3.8.6 EROSION CONTROL MEASURES

Prior to the commencement of excavation, fill, or construction activities, silt fencing and/or straw bales will be placed at strategic locations to filter sediments where runoff to offsite areas is expected. Silt fencing and straw bales will also be utilized onsite to control transport of sediments into the wetland areas. Ditch bottoms and side slopes will be stabilized to protect against erosion using grass, sod, or other methods as required. Erosion control matting may be used to limit erosion at culvert outlets.

The area disturbed at any one time during construction will be minimized to the extent possible. Areas where fill and grading activity has been completed will be stabilized and protected against non-essential disturbance and vehicular traffic.

During construction, maintaining finished surface slopes to approximately 0.5 to 1.0 percent at all locations not otherwise configured to accommodate specific facility construction activity or runoff management will control site erosion.

### 3.8.7 RUNOFF CONTROL

The proposed drainage collection system will utilize inlets, culverts, swales, and mildly sloped surfaces to convey runoff to the detention pond. Slopes will vary from approximately 1 to 2 percent adjacent to buildings; from 0.1 to 0.2 percent on other open areas; and from 0.3 to 0.5 percent at the inverts of drainage ditches, swales, and culverts. The collection system will route runoff to the detention pond in such a manner as to limit ponding onsite to the maximum extent possible.

Drainage ditches and swales will be designed to convey peak runoff flows from the portions of the Site they serve at non-erosive velocities. Swales/ditches will have a maximum of 3:1 horizontal to vertical side slopes. Ditch/swale bottom slopes will range from 0.2 to 0.5 percent in the direction of flow, depending on location; the bottom will be placed above the normal ground water elevation, where possible, so that runoff from small rainfall events can be detained within the system and allowed to percolate into the ground. Sediment collected in ditches, swales, and the detention pond will be monitored and removed periodically as needed to maintain ditch and pond capacity. The removed sediment will be used for onsite landscaping.

Contact stormwater runoff from the BHEC will be collected and conveyed to an oil/water separator for treatment prior to being routed to the BHEC's water supply/wastewater treatment system.

Drainage culverts will be installed at road crossings and embankments and will be constructed using reinforced concrete or high-density polyethylene pipe or equivalent. All drainage culverts that convey storm runoff under roadways will be designed to pass the 25-year, 24-hour storm flow without developing excessive headwater elevations upstream of the culverts.

### 3.8.8 LOCATION OF DISCHARGE POINTS FOR STORM RUNOFF

Runoff from the Site will be conveyed to the stormwater detention pond located in the southern portion of the Site. The pond will discharge into Lateral C Canal via a control structure and outfall pipe underneath 74th Avenue. The structure and pipe are located in the southeastern part of the pond. The pipe underneath 74th Avenue will be designed to pass the 50-year storm flow from the BHEC Site.

### 3.8.9 STORMWATER DETENTION POND

The detention pond will be constructed at the beginning of the construction phase of the Project on the Site to provide early control of storm runoff and sedimentation during preliminary site work. It will be designed as a roughly triangular wet detention basin with a permanent pool surface area of approximately 4.69 acres (204,296 square feet [$ft^2$]) at the control elevation of 21.0 ft-NGVD, the average normal water level elevation. The surface area at the 25-year storm elevation (23.8 ft-NGVD) is approximately 5.2 acres. A 15-ft-wide maintenance easement will be provided above the 25-year storm elevation. The pond will be excavated to have a permanent pool volume of 17.66 acre-feet, which exceeds the SJRWMD's 21-day residence time requirement volume (non-littoral zone option) during the wet season (June through October, 32 inches over 153 days).

The onsite drainage system and detention pond will be designed to control the peak runoff from the 25-year, 24-hour storm event. In addition, offsite discharge will be limited to less than 2 inches over 24 hours as per Indian River County requirements. The pond will provide wet detention treatment in excess of 4.2 acre-feet (i.e., up to 8.4 acre-feet), the required volume based on 1 inch over the Project area. One-half of the treatment volume will bleed-down via a 3.5-inch-diameter circular orifice within 48 hours of the design storm event as required. The outfall control structure will limit the post-development discharge to the pre-development peak discharge rate of 26.5 cubic feet per second (cfs). Runoff from storm events greater than the 25-year storm will overflow the weir and will be conveyed to the receiving canal via the outfall culvert.

## 3.8.10 OFFSITE CONSTRUCTION LAYDOWN AREA DRAINAGE SYSTEM

As described in Section 4.1 of this SCA, a temporary construction laydown area approximately 30 acres in size is located 500 ft north of the Site along 74th Avenue. The area currently consists of an abandoned citrus grove with scattered trees remaining and previously cleared trees collected in wood waste piles. Shallow drainage ditches running east-west currently direct excess storm runoff into a main ditch running north-south that eventually discharges into the IRFWCD canal system.

The construction laydown area will be cleared of all vegetation, graded for proper drainage, and covered with gravel or crushed shell base material. A stormwater management system meeting the criteria set forth by SJRWMD, IRFWCD, and the County will be constructed and will remain in place after construction activities cease.

The proposed stormwater management system for the area consists of a stormwater pond designed as a rectangular shaped wet detention basin with a surface area of 2.7 acres at elevation 24 ft-NGVD (approximate finished grade around the pond). This detention basin will be located in the northwestern part of the laydown area, at which point it can receive runoff conveyed by overland flow (See Figure 11 of the Stormwater Management Plan, Appendix 10.1.3).

The detention pond will be excavated to have a permanent pool volume to provide at least a 21-day residence time during the wet season (June through October) to assure adequate treatment of stormwater runoff. This residence time is 50 percent greater than the normal 14-day residence time due to the non-littoral zone option chosen for the pond design. Under normal conditions, the permanent pool elevation (normal water elevation or control elevation) of the detention pond will be at approximately 21.0 ft-NGVD, based on the *in-situ* soils and water table elevations in the area. The permanent pool volume at the normal water elevation is approximately 4.28 acre-feet. A 2.8-inch diameter orifice located in the detention pond discharge structure will maintain the permanent pool at the control elevation.

The wet detention pond has been designed to provide water quality treatment equal to 2.78 acre-feet of stormwater runoff. This treatment volume is based on 1.0 inch of runoff from the gravel area assuming 50 percent imperviousness (as discussed with SJRWMD staff). The detention pond outfall structure has been designed to release the detained volume at a rate such that 50 percent of the detained volume will be released from the pond during the first 48 to 60 hours following the rainfall event. The first 24 inches of detention basin storage above the 21.0 ft-NGVD permanent pool elevation will provide the design treatment volume.

For the 25-year/24-hour storm event, the detention pond will function as a detention system to control runoff from the Site such that the maximum runoff rate does not exceed the 17.51 cfs flow experienced under predevelopment conditions. In addition, as required by the IRFWCD, the offsite discharge is limited to less than 2 inches over the Project Site during the 25-year/24-hour storm, which equals 5.0 acre-feet. For storm events in which the runoff exceeds the treatment volume and IRFWCD maximum discharge volume (i.e., when the detention basin water surface elevation exceeds 23.0 ft-NGVD), water will begin to flow over a 10.2-ft-long weir in the discharge structure and the outfall culvert will convey the runoff to the existing north-south ditch that eventually discharges into the IRFWCD canal system.

During construction, the northern portion of the stormwater detention pond will serve as a sedimentation basin to prevent transport of eroded sediment off the Site. The detention basin will be constructed to allow use of sediment removal equipment to maintain the working volume of the detention pond, especially during and immediately after the construction phase of the Project. A mosquito control program will be implemented throughout the construction phase of the project.

Complete calculations for the stormwater management system design are contained in the Stormwater Management Plan, Appendix 10.1.3 of the SCA.

## 3.9 MATERIALS HANDLING

### 3.9.1 CONSTRUCTION MATERIALS AND EQUIPMENT

Access to the BHEC Site is via 74th Avenue, which terminates at the Site. In turn, 74th Avenue provides access to State Roads (SR) 606, 609, and 60; I-95; and U.S. Highway (U.S.) 1. Materials and equipment for the construction of the BHEC will be delivered to the Site using existing roads.

Currently, 74th Avenue is paved from Oslo Road to Lockwood Lane (Figure 2.1.0-3). From that point southward to the road's terminus, 74th Avenue is currently unpaved. Early in the Project's construction phase, Calpine will improve 74th Avenue by constructing a permanent road with sub-base, base course, grading, paving and striping in accordance with FDOT and Indian River County requirements. The improvements will not affect traffic on existing roads. A detailed transportation analysis for the BHEC was not required by the County because traffic volumes expected during construction will be less than threshold levels and because the existing area roads are adequate for the projected construction-related traffic.

Materials and equipment for the construction of the BHEC will be delivered to the Site via standard transport trucks. Larger items, such as the CTGs, steam turbine, generators, and transformers, may be delivered to the general Site vicinity via rail and then delivered to the Site via special heavy-haul vehicles. Materials and equipment will be unloaded and moved around the Site using cranes, trucks, and forklifts. Calpine will comply with all of the applicable FDOT requirements for overweight and over-dimensional trucks.

The total construction laydown, storage, and parking area will be located on a roughly 30-acre portion of an approximately 65-acre parcel north of the Project property in the area shown on Figure 2.1.0-3. The laydown area is owned by Indian River County and will be used on a temporary basis during construction activities. Site improvements planned for the laydown area consist of general grading and surfacing with crushed stone as well as installation of appropriate stormwater runoff control facilities. During the construction of Phase I of the BHEC, the northern portion of the Site will be used for construction laydown and parking.

Construction materials and plant equipment will be stored such that they do not create safety or environmental hazards. Bags, containers, bundles, etc., will be stacked, interlocked (if possible), and limited in height so that they are stable and secure against sliding, shifting or collapse. Storage areas will be kept free from an accumulation of materials that could pose hazards from fire, explosion, or spills. Incompatible materials will be properly segregated. Appropriate fire extinguishing equipment will be kept near flammable materials.

Stormwater runoff control measures for the laydown area include silt fences along the perimeter of the laydown area adjacent to existing drainage swales. Stormwater will be routed to the existing swales.

During the construction phase of the Project, the plant access road, Site area, and laydown and storage areas will be sprayed with water, as necessary, to minimize fugitive dust emissions generated from construction activities during dry weather conditions.

### 3.9.2 OPERATIONS MATERIALS

Materials and supplies used for BHEC operations will be delivered by truck. Natural gas will be delivered via an approximately 1,000-ft underground pipeline originating at a new FGT metering station located on the west side of I-95. The handling and storage of fuels and other operational chemicals are discussed in Sections 3.3 and 3.6, respectively. Handling and storage of solid and hazardous wastes are discussed in Section 3.7. Operational wastes will be handled and stored in accordance with applicable safety and environmental regulations.

During operations, various water treatment chemicals, such as lime, soda ash, and sodium hypochlorite, will be delivered to the Site by truck and stored within tanks or in specifically designed areas of buildings. Also, for the SCR $NO_x$ emission control system, aqueous ammonia with a 19.5-percent concentration will be delivered to the Site by truck and stored in two 30,000-gallon tanks. All operational chemicals will be handled and stored in accordance with applicable safety and environmental regulations.

The source of cooling water for BHEC will consist primarily of stormwater from the IRFWCD canal system delivered from the Indian River stormwater park to the facility via a pipeline, with brine as a supplemental source from the County's South Plant water treatment facility. Potable water and sanitary sewer services will be provided by extending the County's existing pipeline facilities in the area to the Site.

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## 4.1 LAND IMPACT

As discussed in Section 2.3.5, the area to be utilized for the Project (impervious areas: buildings, roads, parking, other structures, gravel, and crushed stone) consists of approximately 21.7 acres of the 50.5-acre property. In addition, the stormwater detention pond encompasses 5.2 acres, for a total Project development area of 26.9 acres. Also, the two existing onsite wetlands—4.2 acres in area—will be left undisturbed. The remainder of the property will be left in its current state to the extent possible. The 26.9-acre portion to be developed primarily includes the power block and ancillary facilities, cooling towers, water and wastewater treatment facilities, buildings, stormwater pond, and switchyard. A 200-ft setback buffer will be maintained along the northern portion of the property, preserving the existing pine flatwoods vegetative community; a 30-ft easement/setback will be provided along the eastern property boundary. The Site is nearly level, and existing elevations for the proposed developed portion of the Site are approximately 23 to 24 ft-msl.

The Site contains two separate wetland areas. One wetland area, a freshwater marsh, is located in the west-central portion of the Site and is approximately 0.7 acre in size. The second wetland area, a mixed wetland hardwood swamp, is located in the northwest corner of the Site and is approximately 3.5 acres in size. These wetland areas, and a minimum 15-ft and average of at least 25-ft buffer around the wetlands, will be preserved and protected during the course of construction and throughout the life of the BHEC. The total area set aside for wetlands, wetland buffer, and green space after development represents approximately 23 acres.

The approximately 30-acre temporary construction laydown/parking area will be located approximately 500 ft north of the Site, also situated along 74th Avenue. The laydown area will be used for temporary storage of building materials and equipment, and will also provide parking area(s) for workers' vehicles and heavy equipment. A canal trending north-south serves as the western boundary of the area, and 74th Avenue is located along the eastern border of the area. An existing unpaved road forms the northern boundary of the laydown area. A 200-ft setback/buffer will be provided on the southern boundary between the laydown area and the single-family residence property. The area currently consists of an abandoned citrus grove with only scattered trees remaining and the previously cleared trees collected in wood waste piles on the area. Shallow drainage ditches running east-west spaced between every two or three rows of the previous citrus trees are present throughout the area. These ditches lack wetland hydrology, soils, and vegetation to qualify them as wetlands. This area is planned for future landfill expansion use.

As a result of the relatively small amount of land required for general Site preparation and construction activities, the BHEC will be constructed in a manner that will minimize the impacts on land resources on the Site.

### 4.1.1 GENERAL CONSTRUCTION IMPACTS

The general site preparation and construction activities associated with the overall development of the Project include the following:

- Clearing/grubbing of the Site construction area and laydown area.
- Construction of temporary stormwater ponds/ditches.
- Stabilizing, grading, filling, and contouring the areas.
- Construction of the permanent stormwater management pond.
- Performing earth work, as necessary, and construction of facility pilings, footings, foundations; and underground utilities including electrical, water, wastewater, and other piping systems.
- Facility construction and equipment installation.
- Final Site cleanup, grading, recontouring, and landscaping.
- Equipment testing and startup.

Site preparation will consist of clearing and grubbing, followed by grading and leveling. Approximately 30 to 35 acres of the 50.5-acre Site and all of the 30-acre construction laydown area will require clearing. Vegetative debris from clearing will be disposed in accordance with local requirements. Topsoil that is suitable for reuse will be stockpiled for landscaping and for establishing vegetation after construction has been completed. During early Site preparation activities, temporary stormwater management structures and soil erosion and sedimentation control devices (e.g., ditches, detention basin, berms, siltation fencing, and/or hay bales) will be used to minimize runoff during the construction phase. Site preparation and construction activities will not require any explosives. If suitable fill material cannot be obtained onsite, appropriate materials will be imported from regional contracted sources. The following subsections provide additional details on general construction impacts.

#### 4.1.1.1 Use of Explosives

Construction of the BHEC facility will not require the use of explosives for any portion of the work.

#### 4.1.1.2 Laydown Area

Laydown areas for storage of construction materials and plant equipment components and worker parking will be required for construction of the BHEC. Approximately 30 acres of County-owned land has been made available for temporary use as the facility's construction laydown yard, for storage and staging of materials and equipment, and to provide parking for construction employees' vehicles and heavy equipment.

The laydown area will be cleared of existing vegetation, graded for proper drainage, equipped with appropriate stormwater runoff controls, and finished with a course of gravel or crushed shell base material. Wood timbers will be used, as appropriate, and where required to help keep plant equipment components and materials stored safely off the ground. After construction is complete and laydown areas are no longer needed, all materials and equipment will be removed and the land returned to the County. As currently requested by the County, the gravel or crushed shell base material and drainage facilities will be left in place on the area. The northern portion of the Site (i.e., area where the Phase II unit will be located) will also be temporarily used for construction laydown and parking for the southern Phase I unit construction.

#### 4.1.1.3 Railroads

Although there are no railroads within, or immediately adjacent to, the Site, certain heavy plant equipment components, including the CTGs, steam turbine generators, HRSGs, transformers, condenser, and boiler feedwater pumps, may be shipped to the general area via railroad. The nearest railroad to the Site is the Florida East Coast Railroad (FECR) line, which runs along U.S. 1, approximately 7 miles east of the Site. If certain plant components are shipped by rail, they will be delivered to the nearest FECR rail siding, unloaded, and transported to the Site by truck or heavy haul trailers. Calpine shall comply with all applicable FDOT rules when transporting overweight and over-dimensional loads.

#### 4.1.1.4 Bridges

There are no major bridges within, or immediately adjacent to, the Site. Any plant equipment to be delivered by truck will be appropriately routed to meet any bridge weight restrictions and height clearances.

#### 4.1.1.5 Service Lines

The Project will operate on natural gas. A new natural gas pipeline will be designed, installed, and maintained to supply natural gas to the Site on a continuous basis (see Section 6.2).

The pipelines for the Project's primary water supply will be installed at Calpine's expense. Following construction, the pipelines will be deeded to and owned by IRFWCD. The pipeline for brine, a supplemental water supply, will be installed by Indian River County, at its option, with financial support from Calpine. Pipelines for sanitary sewer and potable water will be installed at Calpine's expense, and owned and operated by Indian River County to provide these services to the Site.

#### 4.1.1.6 Disposal of Trash and Other Construction Wastes

No significant impacts from construction wastes are anticipated. During construction, the craft and management labor force will utilize portable chemical toilets. A qualified and licensed contractor will furnish chemical toilets, along with routine maintenance and service. Sanitary wastes generated during construction will be removed from the Site, transported, and properly disposed by the contractor in an approved disposal and treatment facility. All portable toilets will be removed from the Site upon completion of the construction phase of the Project.

During construction, the amount of construction waste generated will be minimized, to the extent possible, and will be segregated and recycled as much as possible. Certain construction wastes, such as scrap steel, aluminum, copper, lumber, paper, cardboard, etc., may be segregated for recycling, provided there is sufficient interest from local recycling firms. An authorized and licensed waste-handling contractor will remove all other construction waste materials from the Site for proper disposal.

#### 4.1.1.7 Clearing, Site Preparation, and Earthwork

Construction areas of the plant Site will be cleared of all vegetation and organic matter. Rough grading, excavation, and backfill activities will be performed to prepare the Site for underground utilities, concrete foundations, and surface drainage. Structural backfill materials may be imported to the Site to achieve the design elevations and proper drainage. Piling for concrete foundation supports may also be required and would be performed immediately after clearing, grading, and earthwork activities are substantially complete.

After construction of the Project is essentially complete, any remaining areas that do not have an impervious surface will be re-vegetated with native grasses and other vegetation. A galvanized chain-link fencing system will be installed around the entire perimeter of the facilities.

#### 4.1.1.8 Impact of Construction Activities on Existing Terrain

The existing terrain is relatively flat, with an average of less than 0.5 percent slope; the majority of Site runoff drains to the east and southeast and to the two wetland areas. As previously stated, the Site, excluding the preserved wetland areas and buffer areas, will be cleared, graded, and contoured to ensure adequate drainage.

A stormwater gravity flow collection system and detention pond will be constructed to accommodate the required volume of runoff collected from the plant Site. A series of swales, ditches, and basins will collect surface stormwater and transport it to the detention pond. The post-development drainage pattern for the Site will very closely match the pre-development drainage pattern. The majority of the surface area of the Site will drain to the stormwater detention pond. The stormwater detention pond will drain to the Lateral C Canal located east of the Site.

### 4.1.2 ROADS

74th Avenue currently provides access to the Site and will provide access for the construction activities. 74th Avenue runs south from Oslo Road and parallel to the Site's eastern boundary. The part of 74th Avenue that currently serves the Site is unpaved. This road section will be paved at Calpine's expense in accordance with FDOT and Indian River County standards early in the construction phase. No new roads are proposed for construction as a result of this Project.

### 4.1.3 FLOOD ZONES

As stated previously in Sections 2.1.0 and 2.3.4 of this application, the Site is located outside the 100-year floodplain. The Site is located within Zone X, which is outside the 500-year floodplain. Therefore, construction of the proposed facilities will not affect the 100-year floodplain.

### 4.1.4 TOPOGRAPHY AND SOILS

The plant Site will be altered as needed to construct the new facilities. Existing vegetative cover will be cleared and grubbed, and structural and general fill may be added where needed to grade the Site to the design elevation. Foundations that may require pilings may allow for some areas' existing soil to remain in place. Soil excavated from the stormwater detention pond and major equipment foundations may be used as general fill or structural fill, if appropriate.

The Site is level with changes in elevation in areas to be developed of less than 1 ft. The excavation of the stormwater pond, foundation preparation, and general grading will be the major activities associated with significant soil disturbance. Adverse impacts to the Site topographic conditions are not anticipated. Little storm runoff flows onto the Site, and the proposed grading will not impede the existing drainage patterns. Added fill, with compaction, will shift areas of percolation within the Site. Percolation will be limited to the pervious and green space areas and the stormwater pond.

A discussion of the potential for subsidence and sinkhole formation was provided in Section 2.3.2.2. Based on the low probability of occurrence, construction activities are not expected to cause or exacerbate these phenomena.

Certain structures at the BHEC may be visible from varying distances because the structures will protrude above the existing tree line. However, the Site is immediately adjacent to I-95 and surrounded by other developments, including a solid waste landfill, correctional institution, and a sprayfield for industrial wastewater. It is not expected that the BHEC will obstruct the views of any residential developments. Only the relatively taller plant structures (i.e., exhaust stacks, cooling towers, HRSGs, etc.) may be visible from public viewpoints in the vicinity of the Project. Also, the design plans for the Project incorporate a 200-ft buffer of dense vegetation extending across the northern portion of the Site, which will visibly buffer the facility from the guard housing to the northwest, and the one single-family residence to the north. Similarly, the existing east-west trending berm and dense vegetation to the south of the Site, situated between the Site and the residential development to the south in St. Lucie County, will provide similar visual buffering. Further, as a condition of Indian River County's Special Exception Use and Conceptual Site Plan approval for the Project, a "Type A" vegetative buffer will be provided on the north, south, and west sides of the Site, and a "Type C" buffer will be provided on the east side (see Appendix 10.1.6).

During construction, erosion at the Site will be managed with the erosion control plan, as described in Section 3.8.6. After construction, pervious areas will be planted predominantly with native grasses to control erosion. Sediments suspended in collected runoff water will be controlled in the stormwater detention pond. Routine maintenance of the detention pond will include removal of deposited materials.

## 4.4 ECOLOGICAL IMPACTS

### 4.4.1 IMPACT ASSESSMENT

#### 4.4.1.1 Aquatic Systems

As discussed in Section 2.3.6.1 there are no natural open water aquatic systems (ponds, lakes, or streams) on the Site.

Since excavated canals are located to the east, west, and north of the proposed construction laydown area and east and north of the Site, there is a potential for secondary impacts to these water bodies. Land clearing activities associated with preparation of both areas could create increased turbidity and possible siltation in the canals due to eroded materials being transported by surface water runoff. BMPs, such as silt fencing, and/or haybales, isolation berms, or drainage swales will be utilized to minimize the likelihood of sediments in runoff. With these controls in place, aquatic species will not be significantly impacted by construction activities.

#### 4.4.1.2 Terrestrial Systems—Flora

The power plant and associated onsite facilities such as parking lots, maintenance buildings, offices, stormwater detention pond, water treatment facilities, switchyard, and cooling towers will occupy approximately 26.9 acres of land. This area does not include the area that will be used for the proposed 230-kV transmission lines that will tie in with the existing FPL transmission line corridors west of I-95. Land clearing will occur within upland communities only; no wetland habitat will be affected. Figure 4.4.1-1 depicts the areas affected and the locations and extent of the remaining land use and vegetation types on the Site.

Approximately 10.1 acres of pine flatwoods, and 0.3 acre of cabbage palm forest will be left intact. Approximately 9 acres of the pine flatwoods will be disturbed during the construction activities and will be replanted as green space. The upland and wetland communities and wildlife habitats to be left intact on the Site and other relatively undisturbed uplands and wetlands in the Project vicinity have the potential to be indirectly

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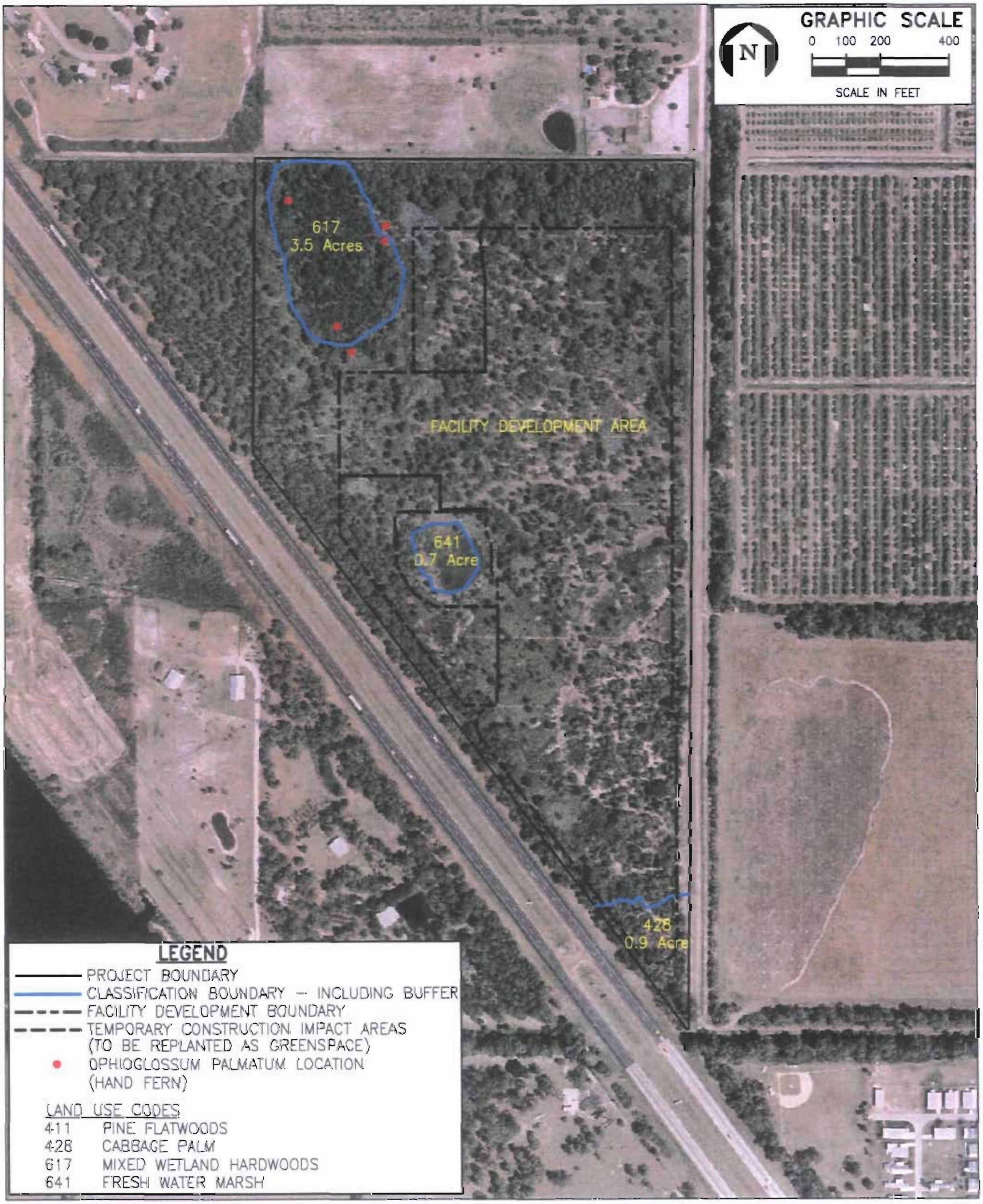


FIGURE 4.4.1-1. (REV. 1 - 12/04)

PROJECT AREA - LAND USE AND VEGETATION CONSTRUCTION IMPACTS

Sources: Aerial Cartographics of America, 2000; ECT, 2004.

CALPINE
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affected. A minimum 15-ft buffer, with an average width of 25-ft, will be preserved around each wetland system on the Site. Secondary effects from construction could include a temporary lowering of ground water levels; increased sedimentation; and increased surface runoff, erosion, fugitive dust, and damage due to heavy equipment movement. However, the utilization of BMPs during construction should ensure minimal or no secondary effects to remaining onsite and offsite plant communities.

All of the plant species considered to be of local and/or regional importance by the USFWS, FNAI, and FDACS were reviewed for actual presence or likelihood of occurrence on the Site based upon range and habitat suitability. Of the 29 plants species reviewed which are known to occur in Indian River County (Table 2.3.6-2), 13 species were determined as possibly occurring on the Site due to availability of suitable habitat, even if limited in extent or marginal in terms of quality. Of these, only four species were observed on the Site; all four are state-listed plants—two commercially exploited and two endangered. Royal fern and cinnamon fern are listed for commercial exploitation rather than any endangerment. Both are found in the mixed hardwood forest on the northern portion of the Site, which will not be affected by power plant construction. However, even if the ferns were affected by Project construction, no significant impacts to regional populations would result. The giant wild pine is an epiphytic plant species that is listed as endangered due to an introduced insect larvae that burrows into the plant stem, causing damage. Several species of this plant were noted at various locations in the mixed wetland hardwood forest. However, even if these species were affected by Project construction, no significant effects to regional populations would result. The state-listed endangered hand fern was noted at four locations within the mixed wetland hardwood forest during the 2000 site surveys (Figure 2.3.5-1). All four hand fern populations are located in the boots of cabbage palms along the perimeter of the wetland. Two populations are located on the east and northwest side of the wetland system, approximately 20 and 40 ft within the wetland, respectively. The two remaining populations are located on the southern limit of the wetland system. One population is located approximately 30 ft within the wetland. The other population, consisting of two plant specimens, was located approximately 20 ft outside the wetland.

During a reinspection survey of the Site in October 2004, one new hand fern population, consisting of two plants, was discovered approximately 25 ft outside the eastern edge of the forested wetland. This new population will be protected by extending the 15-ft (minimum) buffer to include this population. Also, during the reinspection in 2004, it was discovered that the hand fern population located outside the southern perimeter of the wetland no longer existed.

#### 4.4.1.3 Terrestrial Systems—Fauna

Construction impacts to wildlife resources at the Project Site may occur in the form of direct impacts (displacement, mortality) in the proposed construction area or indirect impacts (noise, human presence) in preserved onsite and surrounding habitats. In the area to be cleared for construction, less motile or fossorial species may be lost during clearing and earth-moving activities.

The most conspicuous faunal elements are birds. It is unlikely, however, that the land clearing will impact regional bird populations due to their mobility and similar habitats found nearby. Also, many of the bird species found onsite are adaptable to human-induced habitat changes as evidenced by the presence of nearby highway, institutional, industrial, agricultural, residential, and solid waste disposal land uses.

Reptiles and amphibians are more likely to be affected by construction. To decrease the risk of mortality to these less motile species, the Site will be directionally cleared to provide opportunities for these animals to retreat to onsite preserved areas or offsite habitats.

Power plant construction is not expected to affect regional populations of any endangered, threatened, or species of special concern. As noted in Section 2.3.6, there were very few listed species observed onsite, and the likelihood of listed species' usage of the site is minimal. The gopher tortoise may be present in small numbers and would continue to exist in upland areas of the site and adjacent habitats not affected by construction. Wading birds (i.e., little blue heron) were observed in the adjacent drainage ditches, and

Site construction will not significantly affect any of these habitats. No other listed species would be expected to depend on this Site for their habitat needs.

### 4.4.2 MEASURING AND MONITORING PROGRAM

The results of the ecological program conducted on this Site in support of the SCA are described in Section 2.3.6. No additional monitoring programs are proposed for biological resources during the construction phase of the Project.

## 4.6 IMPACT ON HUMAN POPULATIONS

### 4.6.1 LAND USE IMPACTS

The existing land uses in the area surrounding the Project Site are predominately agricultural, industrial, public uses, and residential. Adjacent land uses are undeveloped land to the northwest; a single-family residence, a barn, and sheds to the north; citrus groves and a permitted effluent sprayfield to the east; citrus groves to the northeast; a single-family subdivision in St. Lucie County to the southeast; and I-95 to the south and west. An electrical power transmission line is located west of the Site across I-95. Agricultural uses are located south and west of I-95.

The Indian River County Board of County Commissioners approved a Special Exception Use and Conceptual Site Plan for the proposed Project on September 18, 2001, subject to various conditions. The Board's approval is contained in Appendix 10.1.6.

### 4.6.2 CONSTRUCTION EMPLOYMENT

The construction workforce is estimated to peak at 425 workers for each Project phase. The average number of construction workers throughout the 24-month construction period for each phase is estimated to be 165 workers.

It is estimated that approximately 85 percent of the construction workers will be hired locally and approximately 15 percent will be hired outside of the local area. A small percentage of these construction workers may be from out of state. Construction is currently scheduled to occur during daylight hours and run one shift per day.

Construction payroll is estimated to be approximately $16.0 million for each phase, a portion of which will be spent locally on goods/services. The construction impacts on local employment opportunities are beneficial although relatively short term. Indirect employment in the local area will occur primarily in retail and wholesale trade, business services, health services, and eating and drinking establishments.

### 4.6.3 CONSTRUCTION TRAFFIC IMPACTS

Construction traffic will access the property from 74th Avenue via Oslo Road with the majority of trips coming to the Site from the east, using major county connecting roads. A substantial number of workers may access the area from the northwest at the I-95/SR 60 interchange. Based on past construction experience and traffic analyses for similar power plants, it is assumed a construction trip generation rate will be 2.0, while a vehicle occupancy rate will be 1.1. Using these numbers along with the estimated peak workforce average of 392 for approximately 8 months for each phase, peak construction traffic will average 713 trips per day. During the average construction work period for each phase using 165 workers, 300 trips per day will be generated. Additionally, a total of 2 to 60 deliveries per day to the Site will occur over the construction period. Temporary traffic impacts are not expected to significantly affect many local residents because residential development is sparse in the immediate vicinity of the Site.

Discussions with the traffic planners with Indian River County indicate that construction traffic generation is viewed by the county as temporary. No public roadway improvements are expected to be required as a result of the Project's construction, except for the paving of 74th Avenue from Lockwood Lane to the Site.

### 4.6.4 HOUSING IMPACTS

Based on the anticipated 85 percent of construction workers hired locally, impacts to housing availability are not expected. Rental units and hotels should be ample to provide for the remaining workforce. It is not anticipated that a significant number of workers will permanently relocate to Indian River County as a result of this Project. As a result, construction of the proposed power plant will not have a significant impact on housing availability in the Indian River County area. It will, however, increase use of rental units/hotels and will provide a positive economic benefit.

### 4.6.5 PUBLIC FACILITIES AND SERVICES

As with potential housing impacts, construction-related impacts to public services and facilities such as police, fire, and medical services and water, wastewater, and solid waste disposal are not expected to be significant. With minimal relocations to the Project area expected, existing facilities and services will be adequate to meet the demands on these services. The selected contractor will be responsible for removing and disposing construction-related debris and for temporary domestic wastewater treatment and disposal (portable toilets). Bottled potable water will be provided until the extension of the county's potable water line occurs during the construction activities.

## 4.7 NOISE IMPACTS

Construction of the Project is expected to be typical of other power plants in terms of schedule, equipment utilized, and types of activities. Power plant construction can generally be divided into several phases, with the noise level varying with the construction phase (based on Barnes *et al.*, 1977). The various construction phases are:

- Site preparation and excavation
- Concrete pouring
- Clean up
- Steel erection
- Mechanical and electrical
- Startup and testing

The typical high-pressure steam- or air-blow activity, a repetitive, short-duration noise, is generally considered separately because of the increased noise levels and the potential for more significant impact.

A construction equipment inventory was developed with the high noise level equipment identified for evaluation. The loudest equipment types generally operating at a site during each construction phase are presented in Table 4.7.0-1. The composite average or equivalent site noise level, representing noise from all equipment averaged over the work day, is also presented.

High-pressure steam- or air-blows produce noise levels of approximately 130 dBA at 50 ft. This level of noise could represent a significant, though short-term (i.e., occurring over a 4- to 6-week period) noise impact. However, no adverse impacts are expected because the steam- or air-blows have a short duration.

As discussed in Section 2.3.8, existing noise levels in the general area of the Site are significantly impacted by traffic on I-95. The Project's construction noise will be audible at the nearest single-family residence to the north of the Site, and possibly at the correctional institution and Spanish Lakes Fairways development when traffic is light on I-95. However, some attenuation of the construction noise will occur due to the vegetation buffers between onsite activities and the receptors. Attenuation will also occur because of the distance between the Site and the correctional institution and Spanish Lakes Fairways.

## Table 4.7.0-1. Construction Equipment and Composite Site Noise Levels

| Construction Phase | Loudest Construction Equipment | Equipment Noise Level at 50 ft (dBA) | Composite Site Noise Level at 50 ft (dBA) |
|---|---|---|---|
| Site clearing and excavation | Bulldozer | 90 | 89 |
| | Truck | 82 | |
| | Backhoe | 84 | |
| | Grader | 85 | |
| | Tractor scraper | 87 | |
| | Compactor | 83 | |
| Concrete pouring | Ready-mix truck | 84 | 87 |
| | Mobile crane | 85 | |
| | Concrete pump | 82 | |
| | Pile driver | 102 | |
| Steel erection | Pneumatic tools | 90 | 90 |
| | Air compressor | 76 | |
| | Mobile crane | 85 | |
| | Cherry picker | 80 | |
| Mechanical | Pneumatic tools | 90 | 89 |
| | Air compressor | 76 | |
| | Mobile crane | 85 | |
| Cleanup | Truck | 84 | 86 |
| | Front-end loader | 87 | |

Sources: Barnes *et al.*, 1977.
Calpine, 2000.

It should be noted that the intermittent and transitory operating nature of construction equipment will reduce the overall average noise levels at noise sensitive receptors. Not all of the construction equipment will be operating simultaneously, at peak load conditions, or in one location during the construction phase. The construction activities for the Project are currently scheduled to occur primarily during daytime. Therefore, the overall noise impacts of the construction activities will be only periodic and temporary.

## 5.1 EFFECTS OF THE OPERATION OF THE HEAT DISSIPATION SYSTEM

As discussed in Section 3.5.1, the primary heat dissipation system for the BHEC will consist of two 10-cell, closed-cycle, mechanical draft, evaporative cooling towers and associated circulating water pumps, piping, valves, and instrumentation. A combination of reverse osmosis, brine concentrator, and crystallizer will be used to treat, reuse, and concentrate blowdown from the cooling towers and other plant wastewaters as part of the zero-discharge design of the Project. The primary source of cooling tower makeup water will be stormwater from the IRFWCD canal system provided through the Indian River County Egret Marsh Regional Stormwater Park. Brine discharge water from Indian River County will be used as a supplemental water source, if brine is provided by Indian River County.

The anticipated impacts associated with the water supply pumping station intake and pipeline are provided in Chapter 6.0.

### 5.1.1 TEMPERATURE EFFECT OF RECEIVING BODY OF WATER

The BHEC will have no thermal discharge to any receiving body of water. Cooling tower blowdown will be treated and recycled as part of the zero-discharge treatment process. Therefore, surface waters in the area will not be adversely affected by any thermal discharge.

### 5.1.2 EFFECTS ON AQUATIC LIFE

There will be no thermal discharges to any surface water bodies, and therefore, the Project will not cause any thermal impacts to aquatic life.

The water supply pumping structure in the IRFWCD Lateral C Canal will be located approximately 0.5 mile north of the Indian River County stormwater park. The submerged sump structure will have a trash rack and screen to minimize the entrainment of trash, debris, and aquatic organisms (see Section 6.3). The water intake velocity of the structure will be designed to be less than 0.5 feet per second (fps). Because the drainage canal system does not contain any significant populations of fish or other aquatic organisms, the potential for impingement and entrainment impacts of the intake structure will be negligible. The pumping structure in the pretreatment pond at the Indian River County stormwater park will have similar design features to minimize potential aquatic impacts.

### 5.1.3 BIOLOGICAL EFFECTS OF MODIFIED CIRCULATION

There will be no cooling water or wastewater discharges to the IRFWCD canals; therefore, the Project operations will not cause any significant biological effects due to changes in circulation patterns within the IRFWCD canal system.

### 5.1.4 EFFECTS OF OFFSTREAM COOLING

#### 5.1.4.1 Blowdown Discharge Effects

Since cooling tower blowdown will not be discharged from the Site, no adverse offstream cooling impacts to any surface waters are anticipated.

#### 5.1.4.2 Cooling Tower Fogging/Drift Effects

Cooling towers will transfer heat from plant processes to the atmosphere through the evaporation and dispersion of cooling water. Depending on the meteorological conditions, warm, moist air leaving the towers may become cooled to the point of saturation, causing the water to condense and form a visible plume. Ground level fogging may occur if this plume does not rise. The drift from the towers carries dissolved and suspended solids, which are deposited locally and may have the potential to affect soils and vegetation. The magnitude of these impacts was assessed using the Seasonal/Annual Cooling Tower Impact (SACTI) model.

SACTI was developed by Argonne National Laboratory for the Electric Power Research Institute (EPRI, 1984) and is generally accepted for plume impact analysis by industry and regulatory agencies. The code used for this modeling study was the most current release (dated September and November 1990). The model requires both meteorological data and cooling tower design information to evaluate plume characteristics.

Hourly surface meteorological data and twice-daily mixing height data collected at the West Palm Beach station by the NWS were used for the years 1987 through 1991. Long-term monthly clearness indices and daily solar insolation values were obtained from the SACTI documentation.

The Project's two linear mechanical draft cooling towers will consist of ten 48- by 50-ft modules. Each module will house a 33-ft diameter fan. The cooling towers will be arranged in an east-west orientation. The circulating flow rate through each tower will be approximately 15,000 gpm per module, and the drift loss rate will be a maximum of 0.0005 percent, producing approximately 0.75 gpm of drift per tower. The effective air flow rate of each tower will be 12,491,865 standard cubic feet per minute (scfm) and will reject 1,372.5 MMBtu/hr.

The SACTI model calculations utilized a polar coordinate receptor grid system centered on the tower. Receptors were placed surrounding the tower at 22.5-degree (°) intervals at varying distances. For the salt deposition and plume length computations, 100-meter intervals out to 10,000 meters were used. For plume fogging hour computations, 100-meter intervals out to 1,600 meters were used. For plume height computations, 10-meter intervals up to 1,000 meters were used.

The SACTI model was run for each tower separately. Because of the identical size, design, and orientation of the tower, the predicted impacts from each tower are identical. The results of the SACTI modeling on a seasonal and annual basis are given in Table 5.1.4-1.

A cooling tower plume may reduce visibility if it crosses the path of ground-based or air traffic. I-95 is located about 141 meters southwest of the southernmost cooling tower. At I-95, the SACTI model predicts a minimum plume height of approximately 35 meters (i.e., more than 105 ft above ground surface).

Because terrain around the plant site is flat, visibility on nearby roads is not expected to be degraded by the formation of this elevated visible plume.

Table 5.1.4-1. SACTI Modeling Results for the BHEC (per tower)

| Season | Maximum Salt Deposition ($kg/km^2$/month) | Fogging (hours/season) | Rime Icing (hours/season) | Typical Plume Length Main Cooling Towers (meter) | Typical Plume Height Main Cooling Towers (meter) | Frequency (%) |
|---|---|---|---|---|---|---|
| Winter | 265.0 @ 200 meters NNW of the tower | 0.8 @ 100 meters NNE of the tower | 0.0 | 500 meters SSE of the tower | 100 meters | 3.7 |
| Spring | 323.1 @ 200 meters NNW of the tower | 0.0 | 0.0 | 500 meters SSE of the tower | 100 meters | 1.3 |
| Summer | 98.8 @ 200 meters N of the tower | 0.0 | 0.0 | 500 meters N of the tower | 100 meters | 2.0 |
| Fall | 85.8 @ 200 meters N of the tower | 0.0 | 0.0 | 500 meters SSE of the tower | 100 meters | 2.9 |
| Annual | 185.5 @ 200 meters NNW of the tower | 0.8 @ 100 meters NNE of the tower | 0.0 | 500 meters SSE of the tower | 100 meters | 2.3 |

Source: ECT, 2004.

The frequency of visible plume formation in all directions decreases to about 10 percent on an annual basis at 400 meters downwind of the tower. With respect to potential visibility impacts to air traffic, the nearest airport is located approximately 7 miles northeast of the plant Site. At that distance, the visible plume is not expected to hinder the safe operation of aircraft during take-off or landing.

Induced ground level fogging may infrequently occur during plume downwash conditions. However, this locally induced fog will dissipate rapidly due to the high winds associated with such plume downwash conditions. Most ground level fogging is predicted to occur in the north-northeast direction out to a distance of 100 meters during the winter season. No fogging was predicted in the south or westerly directions of the towers, which is the approximate location of I-95.

Seasonal and annual salt deposition rates were calculated to a distance of 10,000 meters downwind of the cooling towers. Table 5.1.4-1 shows that the majority of the drift is deposited within 200 meters of the cooling tower on an annual basis. These deposition rates are calculated in units of kilograms per square kilometer per month ($kg/km^2$/month). By applying a factor of 0.0089, this unit can be converted to pounds per acre per month (lb/acre/month). By conservatively assuming the towers are collocated, the salt deposition rates from one tower were doubled to predict the maximum salt deposition rates. The maximum salt deposition rate is predicted to be about 5.8 lb/acre/month. This value occurs 200 meters north-northwest of the towers during the spring season. Land uses that are north-northwest of the cooling tower include an improved pasture, abandoned citrus grove, and guard housing and correctional institution. The maximum annual average deposition onsite was predicted to be 1.2 lb/ acre/month. The maximum annual average offsite salt deposition offsite rate was predicted to be 3.3 lb/acre/month. This value occurred 200 meters north-northwest of the northernmost cooling tower.

One mechanism for the impact of saline drift on plants is through the absorption of salt accumulation in the soil. Accumulation will occur as the annual deposition of salt exceeds the rate at which salt is washed from the soil by rainfall. The result of studies

(Mulchi, C.L. *et al.*, 1978) with sandy loam soil suggest that a deposition rate of about 89 lb/acre/month of sodium chloride can cause some accumulation of salt in the soil. As stated above, the maximum annual average offsite deposition rate (3.3 lb/acre/month) and the overall maximum deposition rate in the spring (5.8 lb/acre/month) are significantly lower than the monthly threshold value that could cause salt accumulation in the soil. Therefore, no significant soil impacts are expected.

Direct salt damage to vegetation is due to the absorption of salt from drift that is deposited on a plant's leaves. The absorbed salt can cause immediate damage or accumulate in the woody tissue of perennial plants until it reaches toxic levels.

An investigation of the potential effects of cooling tower drift on vegetation was conducted in which predicted salt deposition rates were compared to known salt injury thresholds. A predicted salt deposition rate is presented as the amount of salt deposited over a unit area per season and year at a certain direction and distance away from the tower. These predicted deposition rates were compared to the limited literature data available on salt injury thresholds.

Native vegetation associated with pine flatwoods, wetland mixed hardwood forest, freshwater marsh, pasture, and citrus groves occurs onsite or along the property boundaries. Within the proposed power plant Site boundary, maximum predicted salt deposition rates on an annual basis range from 1.2 to 5.8 pound per acre per year (lb/acre/year). These rates are located at distances of 100 to 200 meters from the cooling towers.

Two plant species that are considered intolerant or having very low resistance to salt have been identified on the Site. These are cinnamon fern (*Osmunda cinnamonea*) and royal fern (*Osmunda regalis*). Florida Power Corporation (1988) states that these two plants have a leaf injury threshold similar to that of the flowering dogwood (*Cornus florida*). Curtis *et al.* (1976) found that the leaf injury threshold for the dogwood was 80.1 lb/acre/yr. Given this threshold, it can be concluded that the salt deposition from the Project will have no adverse effect on natural vegetation onsite or near the property boundary.

Citrus, a potentially sensitive plant to salt deposition, is present in large groves east and northeast of the cooling tower. The closest groves are about 250 ft east of the cooling tower. No prevailing winds were predicted to carry salt deposition in the direction of these groves and values of salt deposition did not exceed 0.14 lb/acre/month in an easterly direction. Therefore, no adverse impacts to these groves are anticipated. Additional groves are located approximately 4,000 ft to the north-northwest of the tower. Given the large reduction in deposition rates as downwind distances increase, it is anticipated that salt deposition rates will be well below any value that could result in significant foliar, shoot, or fruit damage or any long-term reductions in growth, yield, or photosynthesis.

### 5.1.5 MEASUREMENT PROGRAM

The Project does not involve any discharge to surface water bodies. Thus, surface water monitoring is not required or proposed.

## 5.3 IMPACTS ON WATER SUPPLIES

The BHEC will use surface water withdrawn from the IRFWCD drainage canal system and routed through the Indian River County Egret Marsh Regional Stormwater Park as the primary source of cooling and process water for the plant operations. Brine discharge water from the Indian River County South Plant water treatment facility will be used as a supplemental water source, when provided by the County. In addition to the water used by the BHEC, surface water will be withdrawn from the canal system for treatment in the stormwater park. The water treated in the park will be discharged back into the canal system and is not considered a consumptive water use. Therefore, the impact assessment in this section focuses only on the water withdrawn from the canal system for use by the BHEC.

Potable water will be provided to the Project from the Indian River County system. The Project involves no withdrawals or consumptive use of ground water.

### 5.3.1 SURFACE WATER

#### 5.3.1.1 Primary Water Supply Impacts

The IRFWCD drainage basin, with a total drainage area of approximately 50,600 acres, is characterized by a network of interconnecting drainage canals with a total length of approximately 200 miles. The canal system can be divided into three zones: upper pool, lower pool, and coastal pool. The water level in the upper pool is controlled by a radial gate located in Lateral C Canal, and is generally maintained at approximately 18.5 ft-msl. The lower pool receives discharge from the upper pool, and its water level is controlled by three radial gates located in the Main Canal, North Canal, and South Canal. The water level in the lower pool is generally maintained at approximately 15.5 ft-msl. The discharges from the lower pool flow to the coastal pool, which is defined by the canals controlled by an overflow weir structure on the Main Canal and the water areas hydraulically connected to the Indian River Lagoon at three primary outfalls located at the ends of the Main Canal, South Canal, and North Canal. The total drainage area of the coastal pool is approximately 10,860 acres.

Since 1949, USGS has maintained three gauging stations at the Main Canal outfall (USGS Station No. 02253000), North Canal outfall (USGS Station No. 02252500), and South Canal outfall (USGS Station No. 02253500). The long-term discharge data from January 1, 1949, through February 19, 2000, are summarized in Table 5.3.1-1.

**Table 5.3.1-1. Historical Discharge Flows for Main, North, and South Canals**

| | Discharge Flows (MGD) | | | |
|---|---|---|---|---|
| | Main Canal | North Canal | South Canal | Total* |
| Daily average | 48.3 | 20.8 | 25.7 | 94.7 |
| Daily maximum | 1,182.7 | 1,021.2 | 1,150.4 | 3,121.6* |
| Daily minimum | 0.01 | 0.39 | 0.35 | 3.65* |

* Flows for the three canals are not additive for total since maximum and minimum flows for each canal occur on different days.

Sources: USGS, 2000.
ECT, 2000.

The data indicate that there has always been a net discharge to the Indian River Lagoon in excess of 3.65 MGD in the last 50 years.

The BHEC Project will use water withdrawn from the lower pool of the canal system at a location immediately downstream of the Lateral C Canal radial gate. From the canal, the water will be pumped to the pretreatment pond at the County's stormwater park and then pumped from the pond to the BHEC Site.

The annual average surface water withdrawal for plant water use is 5.8 MGD, and the peak monthly withdrawal rate is 8.2 MGD after completion of Phases I and II.

The following hydraulic analysis is used to assess the hydraulic/hydrological impacts, including the water level impacts in the lower pool and the freshwater discharge impacts.

**Methodology**

The coastal pool drainage area is approximately 21.5 percent of the total drainage basin of IRFWCD; therefore, the total daily discharge from the lower pool was computed to be 78.5 percent of the total flow from three USGS gauging stations. Data from January 1, 1949, through November 30, 1950, were discarded due to frequent missing values. Therefore, the daily flow data from December 1, 1950, through February 19, 2000, were used for the analysis. The computed lower pool discharge according to historic data is summarized in Table 5.3.1-2.

**Table 5.3.1-2. Computed Historic Discharges from IRFWCD Lower Pool**

| Parameter | Flows (MGD) |
|---|---|
| Daily average | 74.8 |
| Daily minimum | 2.86 |
| Daily maximum | 2,452 |
| Minimum 10-day average | 6.91 |
| Minimum 11-day average | 7.71 |

Source: ECT, 2000.

The computed values indicate that the average discharge flow rate from the lower pool discharge was 74.8 MGD, and the lowest daily flow was 2.86 MGD during the 50-year period.

Real-time simulations were conducted for a 50-year period using historic daily discharge rates from the lower pool and the Project's annual average withdrawal rate (i.e., 5.8 MGD) to predict:

- The daily lower-pool water-level elevation.
- The daily lower-pool discharge rate to the coastal pool.

Subsequently, a variety of statistical analyses were used to evaluate the 50 years of daily data.

The calculations were based on the mass balance in the lower pool, which has a water surface area of approximately 780 acres at 15.5 ft-msl and the stage/discharge relations at the radial gates. Each of the radial gates consist of a composite rectangular weir with multiple control elevations. The lower invert elevations at the North Canal, Main Canal, and South Canal radial gates were 15.08, 15.11, and 15.48 ft-msl, respectively.

**Results**

The results of the 50-year real-time simulations of lower pool water level and discharge rates are summarized in Table 5.3.1-3.

**Table 5.3.1-3. Results of Simulations of Lower Pool Levels and Discharges with Project Water Withdrawals**

| Parameters | Historic Condition | BHEC Use Condition |
|---|---|---|
| Daily average flow (MGD) | 74.8 | 69.0 |
| Minimum daily flow (MGD) | 2.9 | 0.0 |
| Probability of zero flow (%) | 0 | 0.17 |
| Number of days with zero flow in 50 years | 0 | 30 |
| Median water level (ft-msl) | 15.79 | 15.72 |
| Average water level (ft-msl) | 15.95 | 15.89 |
| Minimum water level (ft-msl) | 15.23 | 15.04 |
| Maximum drawdown below existing water level (ft) | — | 0.33 |
| Average drawdown below existing water level (ft) | — | 0.06 |
| Maximum drawdown below weir invert (ft) | — | 0.04 |
| Maximum consecutive days when water level is below weir invert | — | 9 |

Source: ECT, 2004.

The simulation results indicate the proposed water use would reduce the average discharge from the lower pool by 7.8 percent, from 74.8 to 69.0 MGD. It also represents a 6 percent reduction of the total freshwater discharge into the Indian River Lagoon from IRFWCD. The average water level drawdown in the lower pool would be approximately 0.06 ft below the existing water level. These average conditions would not cause any significant adverse impacts.

During extremely dry periods, the proposed withdrawal may cause the water level to drop below the weir control elevation. The proposed water use, under the worst-case conditions, would preclude discharges from the lower pool only 0.17 percent of the time, or less than 1 day per year on a long-term average basis. The absolute worst-case day for the 50 years simulated showed that the lowest water level in the lower pool would be 0.04 ft below the weir control elevation, and the maximum water-level drawdown would be approximately 0.33 ft below the existing water level for the worst-case day of the 50-year period. The longest consecutive number of days with no discharge from the lower pool would be 9 days and this would occur only once in 50 years. Further, it is estimated that the maximum withdrawal rate may change the canal flow velocity by no more than 0.05 fps, a negligible amount.

The results of the hydraulic analyses indicate there is sufficient water supply in the IRFWCD to support the proposed water use for the Project. The induced drawdown in the lower pool would average only 0.06 ft below the existing water level. The lower pool has a large storage volume, and the worst-case minimum water level would only be approximately 0.04 ft below the weir control elevation. Therefore, the proposed water use will not cause significant adverse impacts on the IRFWCD's water supply system.

Although the plant water use may cause zero discharge from the lower pool about 1 day per year on a long-term average basis, the coastal pool will continue to provide freshwater base flow into the Indian River Lagoon. The estimated minimum discharge to the lagoon from IRFWCD out of the coastal pool is about 0.78 MGD. It is estimated that the freshwater discharge into the lagoon from IRFWCD will be more than 4.2 MGD about 99.5 percent of the time. Therefore, the plant water use will not cause significant hydrological impacts on the Indian River Lagoon.

SJRWMD utilizes specific criteria, "a three fold- test," to evaluate potential impacts from a new surface water use that is proposed in the context of a CUP application. To satisfy the SJRWMD *Conditions for Issuance of Permits* (Section 40C-2.301[2], F.A.C.), the applicant must establish that the proposed use of water:

- Is a reasonable beneficial use.
- Is consistent with the public interest.
- Will not interfere with any presently existing legal use of water.

The *Applicant's Handbook: Consumptive Uses of Water* (the "Handbook" [SJRWMD, 1999]) provides guidance on the interpretation of these criteria. Further, a proposed use explicitly does not satisfy these criteria if the proposed use will:

- Significantly induce saline water encroachment; or
- Cause a water level to be lowered so that stages or vegetation will be adversely and significantly affected on lands not controlled by the applicant; or
- Cause a ground water level to be lowered so that significant and adverse impacts will affect existing legal users; or
- Require the use of water that has been reserved from use by Rule 40C-2.301(6); or
- Cause a violation of minimum flows for surface waters established in Chapter 40C-8, F.A.C.; or
- Cause a violation of minimum levels for surface waters or ground waters established in Chapter 40C-8, F.A.C.

In Appendix 10.1.4, these criteria are outlined and evaluated in detail with respect to the effects of the proposed surface water use. For each criterion, the conclusion is that the proposed surface water use is not expected to cause significant adverse impacts. The water supply plan is designed specifically to preclude any significant impacts.

As discussed previously, Calpine's plans to use excess surface water and brine water for the BHEC's water supply, in combination with a wastewater treatment system that will have zero wastewater discharge, are consistent with and supportive of SJRWMD, Indian River County, and IRFWCD current goals and programs to reduce freshwater flows and pollutant loadings to the Indian River Lagoon system. SJRWMD, Indian River County, and IRFWCD have developed a Master Stormwater Management Plan for the East Indian River County watershed within the IRFWCD. The specific goals of this program are to develop and implement hydrologic and hydraulic design alternatives for stormwater 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 freshwater discharges to the Indian River Lagoon. As indicated in the above analysis, the Project's water use will reduce freshwater discharges from the IRFWCD canal system coastal pool to the Indian River Lagoon by 6 percent, which is consistent with the goals of the current master stormwater planning program.

In the master stormwater plan, an Indian River County-owned, 35-acre parcel of land was identified for use for treatment of water from the IRFWCD canal system and for storage of water for use by Calpine's proposed BHEC. This parcel will be developed by the County as the Egret Marsh Regional Stormwater Park. In support of the master stormwater management plan, Calpine entered into an "Agreement Concerning Delivery and Use of Stormwater" (Agreement) with Indian River County and the IRFWCD on August 12, 2004. Under this Agreement, Indian River County will provide stormwater from the Egret Marsh Regional Stormwater Park for use as the primary source of water for the BHEC. The Agreement also allows Indian River County, at its option, to supplement the stormwater with a specified quantity of brine discharge water from its South Plant reverse osmosis water treatment facility. A copy of the Agreement is provided in Appendix 10.9.

The beneficial effects of using the stormwater park as the water source will be similar to the alternative of providing water directly from the canal because the water supply will still be excess surface water from the IRFWCD drainage basin. In addition, the use of some quantity of the reverse osmosis brine discharge from the County's potable water treatment plant as a supplemental water supply will assist in reducing pollutant loading to the Indian River Lagoon.

#### 5.3.1.2 Surface Water Quality Impact

The proposed Project is a zero wastewater discharge facility. All industrial wastewater will be reused or evaporated, and the residual solids will be disposed at a permitted off-site landfill. Therefore, the proposed Project will not have any adverse surface water quality impacts. Again, the Project plans are consistent with and supportive of the current

County and SJRWMD stormwater planning program since all pollutants in the plant's water supply will be removed from the pollutant loads to the Indian River Lagoon system. On an average annual basis, the BHEC will cause a net reduction of approximately 6 percent in the pollutant loading to the Indian River Lagoon.

## 5.3.2. GROUND WATER

### 5.3.2.1 Impacts from Plant Pollutants

The BHEC will not have any direct discharges to ground water or percolation ponds. The BHEC is designed as a zero wastewater discharge facility. Therefore, the normal operations of the plant will not adversely affect ground water quality.

The plant design includes measures to preclude any impacts from plant pollutants on the ground water resources as a result of accidents or other unusual circumstances. These preventive measures are discussed in Sections 5.2, 5.3.4, and 5.4. In the unlikely event that pollutants were to escape and permeate downward into the surficial aquifer system, appropriate measures would be implemented in accordance with local, state, and federal regulations. The uppermost lithologies within the surficial aquifer include appreciable amounts of organic matter, silts, and clays (see Section 2.3.1), which would help adsorb pollutants and attenuate migration. Horizontal migration in the surficial aquifer would also be minimal because the hydraulic gradient is nearly flat.

Currently, no documented contaminant plumes are known to exist within the surficial or Upper Floridan aquifers in the immediate area of the Site, and ground water withdrawals are not proposed for the Project. Therefore, the BHEC is not expected to cause inducement of pollution into the aquifer systems.

### 5.3.2.2 Impacts from Ground Water Withdrawals

Ground water withdrawals are not proposed for the BHEC; consequently, there will be no impacts from ground water withdrawals.

### 5.3.3 DRINKING WATER

Potable water will be provided to the Project from the Indian River County system at a rate estimated to be 1,120 gpd. The County's potable water system currently extends to 74th Avenue at Lockwood Lane (17th Street), approximately 0.5 mile north of the Site. A new pipeline will be constructed to the Site at Calpine's expense. The County will own and operate the pipeline. The County's system has adequate capacity to meet the Project's needs; therefore, no impacts to local or regional drinking water supplies are anticipated due to the Project's operations.

### 5.3.4 LEACHATE AND RUNOFF

During the Project operations, there will be no material storage piles or wastewater ponds on the Site. All materials (e.g., emergency generator and fire pump diesel fuel oil, water treatment chemicals, and ammonia) will be stored in buildings or in aboveground tanks designed with appropriate spill prevention and containment measures. Therefore, no impacts from leachate or runoff from such facilities are anticipated.

The stormwater detention pond will be the only facility that will have discharges from the Site. The stormwater management plan (Appendix 10.1.3) will provide guidance in protecting adjacent water bodies. Erosion and sedimentation will be minimal due to grass and other vegetative cover reducing velocities of runoff, which inhibit suspension of soils. Most silts that do reach suspension will be deposited within the sediment sump at the stormwater pond. The pond will also treat runoff through biological uptake from grassed/sodded side slopes. Regular maintenance of the pond will include removal of sediments and other debris from the sump that may have been washed from the Site.

Increased attention on source control has shifted the NPDES program to not only look at point sources, but also nonpoint sources. Nonpoint sources are loosely defined as stormwater runoff outfalls. To clean up the outfalls, the program proposes to limit the sources that may contribute to pollution associated with runoff, including measures to contain spills in secondary containment, placing high-risk materials under cover, employee training, storage systems, and tracking of materials. These measures will aid in the prevention of impacts to adjacent water bodies.

### 5.3.5 MEASUREMENT PROGRAMS

Since the Project's water withdrawals have the potential to drawdown water levels in the IRFWCD canal system, Calpine will jointly establish a water level monitoring program with IRFWCD. The monitoring will be used to document that the canal water levels are within acceptable operational levels for the IRFWCD canal system.

No ground water withdrawals are proposed for this Project. Therefore, no ground water measurement programs are required or proposed.

## 5.6 AIR QUALITY IMPACTS

### 5.6.1 IMPACT ASSESSMENT

#### 5.6.1.1 Introduction

Analyses were conducted to calculate the potential air quality impacts of emissions from the BHEC. These analyses are described in detail in the PSD permit application contained in Appendix 10.1.1. This section presents a summary of the approach used and the results obtained. The results demonstrate that operation of the BHEC will not cause or contribute to a violation of any PSD increment or AAQS.

#### 5.6.1.2 Regulatory Applicability and Overview of Impact Analyses

Under federal PSD review requirements, all new or modified major sources of air pollutants regulated under the Clean Air Act (CAA) must be reviewed and approved by EPA or by the state agency if PSD review authority has been delegated. A *major stationary source* is defined as any 1 of 28 named source categories that has the potential to emit 100 tpy or more, or any other stationary source that has the potential to emit 250 tpy or more, of any pollutant regulated under CAA. *Potential to emit* means the capability at maximum design capacity to emit a pollutant after the application of control equipment.

The BHEC constitutes a major facility because it falls into one of the named source categories and will have the potential to emit more than 100 tpy of at least one regulated pollutant. Therefore, the facility must undergo PSD review. Furthermore, more than one pollutant is subject to review. Table 5.6.1-1 summarizes the facility's proposed annual emissions and compares the projected totals to the significant emission rate thresholds for PSD review.

## Table 5.6.1-1. Projected Emissions Compared to PSD Significance Rates

| Pollutant | Projected Annual Emissions (tpy)* | Significance Rate (tpy) | Subject to PSD Review? |
|---|---|---|---|
| CO | 156.6 | 100 | Yes |
| $NO_x$ | 313.4 | 40 | Yes |
| $SO_2$ | 226.0 | 40 | Yes |
| Ozone (VOCs) | 101.4 | 40 | Yes |
| PM | 264.2 | 25 | Yes |
| $PM_{10}$ | 233.4 | 15 | Yes |
| Total reduced sulfur (including $H_2S$) | Neg. | 10 | No |
| Reduced sulfur compounds (including $H_2S$) | Neg. | 10 | No |
| $H_2SO_4$ mist | 41.4 | 7 | Yes |
| Fluorides | Neg. | 3 | No |
| Lead | 0.02 | 0.6 | No |
| Mercury | 0.002913 | 0.1 | No |
| Municipal waste combustor organics | N/A | $3.5 \times 10^{-6}$ | No |
| Municipal waste combustor metals | N/A | 15 | No |
| Municipal waste combustor acid gases | N/A | 40 | No |
| Municipal solid waste landfill emissions | N/A | 50 | No |

*See Table 3.4.1-3 for details.

Note: $H_2S$ = hydrogen sulfide.
N/A = not applicable.
Neg = negligible.

Sources: Calpine, 2004.
ECT, 2004.
Siemens Westinghouse, 2004.

PSD review is used to determine whether significant air quality deterioration will result from the new or modified source. PSD review requirements are contained in Chapter 62-212.400, F.A.C., *Prevention of Significant Deterioration*. Major sources may be required to undergo the following reviews related to PSD for each pollutant emitted in significant amounts:

- Control technology review.
- Air quality analysis (monitoring).
- Source impact analysis.
- Source information.
- Additional impact analyses.

The control technology review includes a determination of BACT for each applicable pollutant. BACT emission limits cannot exceed applicable emission standards (e.g., NSPS). The air quality analysis (monitoring) portion of PSD review may require continuous ambient air monitoring data to be collected in the impact area of the proposed source. The source impact analysis requires demonstration of compliance with federal and state AAQS and allowable PSD increment limitations. Projected ambient impacts on designated nonattainment areas and federally promulgated Class I PSD areas must also be addressed, if applicable. Source information, including process design parameters and control equipment information, must be submitted to the reviewing agencies. Additional analyses of the proposed source's impact on soils, vegetation, and visibility, especially pertaining to Class I PSD areas, must be performed, as well as analysis of impacts due to growth in the area associated with the proposed source.

### 5.6.1.3 Analytical Approach

**Air Quality Models**

The Industrial Source Complex Short-Term (ISCST3) model (EPA, 2000) was used for the screening and refined analyses. The ISCST3 model is a steady-state Gaussian plume model that can be used to assess air quality impacts from a wide variety of sources. It is capable of calculating concentrations for averaging times ranging from 1 hour to annual.

The BHEC CTG/HRSG units will operate under a variety of operating scenarios. These scenarios include different loads, ambient air temperatures, and optional use of inlet air fogging and duct burner firing. Plume dispersion and, therefore, ground-level impacts will be affected by these different operating scenarios because emission rates, exit temperatures, and exhaust gas velocities will change. Each of the 16 BHEC CTG/HRSG operating scenarios was evaluated for each pollutant of concern to identify the highest air quality impact.

**Meteorological Data**

Detailed meteorological data are needed for modeling with the ISCST3 model. Consistent with EPA and FDEP guidance, 5 consecutive years of the most recent, readily available, representative meteorological data were processed for the BHEC air quality impact analyses. For Indian River County, FDEP recommends use of West Palm Beach surface and upper air meteorological data for dispersion modeling purposes. For the BHEC air quality impact analysis, surface and mixing height data from West Palm Beach for the 5-year period 1987 through 1991 were employed. This dataset represents the most recent 5 years of West Palm Beach station meteorological data available from EPA's Support Center for Regulatory Air Models (SCRAM) website. Vero Beach surface data were not recommended by the FDEP because 5 consecutive years are not available.

**Emission Source Input Data**

Emission parameters for the BHEC emission sources were based primarily on information provided by equipment vendors. Some emission inputs were derived using EPA and other emission factors and facility design data (see Attachments B and C of the PSD application in Appendix 10.1.1).

#### 5.6.1.4 <u>Summary of Air Quality Impacts</u>

Criteria pollutant emissions from the CTG/HRSGs were modeled using the ISCST3 model. Table 5.6.1-2 summarizes the results of the maximum facility impact modeling runs for criteria pollutants. As appropriate, the maximum impacts are compared to the modeling significance levels. Table 5.6.1-2 shows that impacts were found to be less than significant for all averaging times and all pollutants. Due to the low Project impacts, no further analysis of air quality impacts is required (i.e., evaluation of other, existing air emission sources in the area).

**Table 5.6.1-2. Maximum BHEC Project Criteria Pollutant Impacts**

| Pollutant | Averaging Time | Maximum Impact ($\mu g/m^3$) | Significance Level ($\mu g/m^3$) |
|---|---|---|---|
| $SO_2$ | Annual | 0.31 | 1.0 |
| | 24-hour | 4.3 | 5.0 |
| | 3-hour | 16.0 | 25.0 |
| $NO_2$ | Annual | 0.65 | 1.0 |
| $PM_{10}$ | Annual | 0.30 | 1.0 |
| | 24-hour | 4.8 | 5.0 |
| CO | 8-hour | 132.0 | 500 |
| | 1-hour | 414.7 | 2,000 |

Source: ECT, 2004.

In addition, modeled BHEC impacts are below the PSD *de minimis* ambient impact levels for all pollutants and averaging periods with the exception of ozone. The *de minimis* ambient impact level for ozone is triggered by projects which have potential VOC emissions of 100 tpy or more. Accordingly, the Project qualifies for an exemption from preconstruction ambient air quality monitoring requirements for all pollutants except ozone.

Representative, current, quality-assured ambient ozone data collected by FDEP at the agency's monitoring site located in Fort Pierce, St. Lucie County, were used to satisfy the PSD pre-construction ambient monitoring requirements for ozone. The FDEP Fort Pierce ambient air quality monitoring station is located approximately 15 km southeast of the BHEC Site.

### 5.6.1.5 <u>Nitrogen Deposition</u>

Substances emitted into and transported through the atmosphere are removed from the atmosphere by wet and dry deposition processes. Wet deposition is the transport of a substance from the atmosphere to the earth's surface within, or on the surface of a hydrometer. This is an indirect process with the hydrometer (rain, snow, hail) acting as a vector.

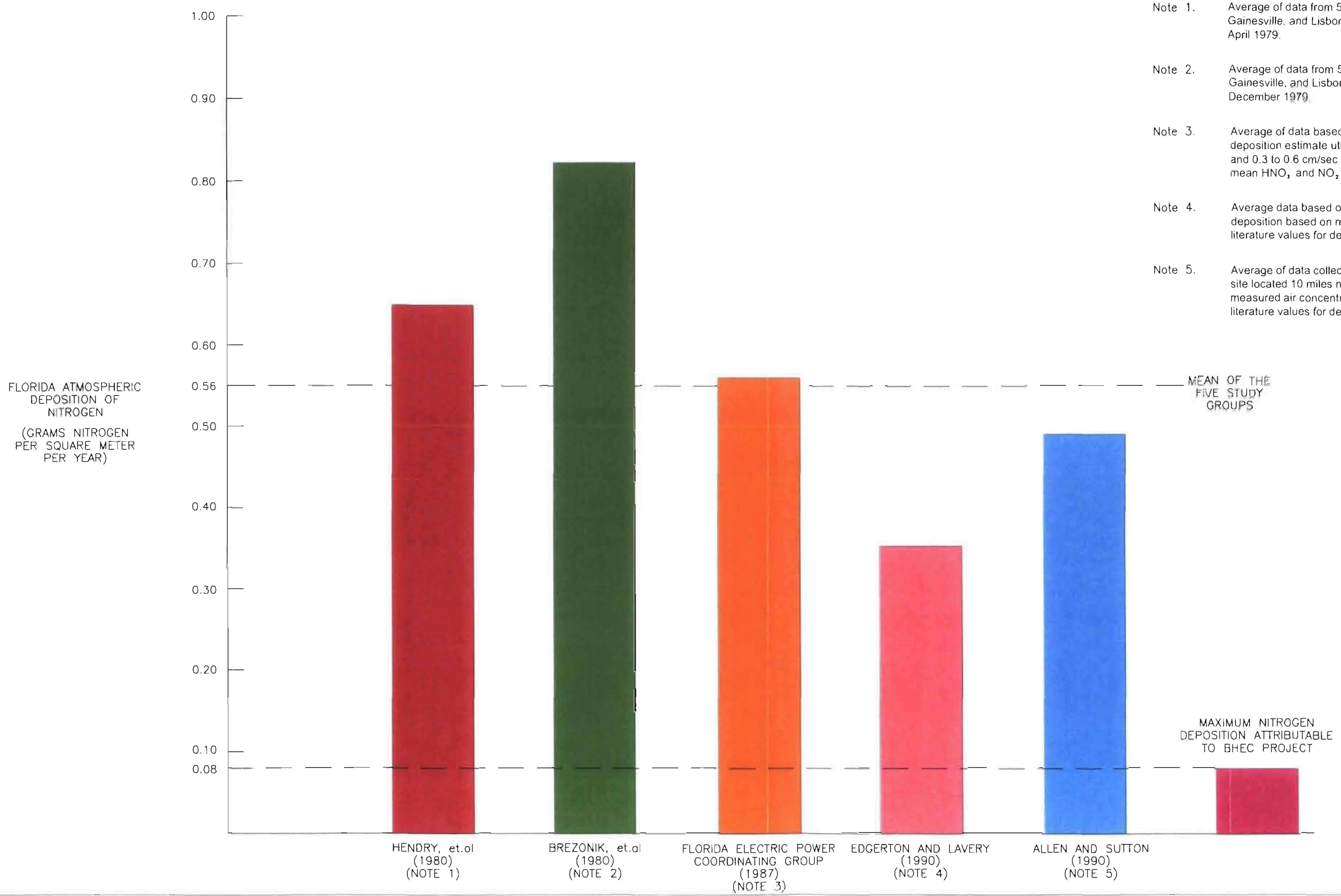
Dry deposition is the direct transfer to and absorption of gases and particles by surfaces (water, soil, vegetation). Gases and aerosols are brought to the earth's surface by turbulent transfer, and subsequent diffusion through the laminar boundary layer completes the deposition process.

A number of studies have been performed to investigate the atmospheric deposition of nitrogen across Florida beginning in the late 1970s and early 1980s. Hendry *et al.* (1981) measured nitrogen deposition in wet, dry, and bulk (wet and dry) forms at 24 locations across Florida from May 1978 through April 1979. Brezonik *et al.* (1982) measured wet, dry, and bulk deposition of nitrogen across Florida from January 1978 through December 1979.

The Florida Electric Power Coordinating Group (FCG) (1987) initiated measurements of wet and dry deposition of nitrogen across Florida beginning in 1981. Edgerton and Lavery (1990) reported data from the FCG network for wet deposition of nitrogen and air quality monitoring data for $NO_2$ and nitric acid ($HNO_3$) for four FCG sites that operated from 1982 to 1990. Dry deposition estimates were calculated based on air quality measurements and literature values for deposition velocities for $NO_2$ and $HNO_3$. Allen and Sutton (1990) measured nitrogen deposition at a forested site 10 miles northeast of Gainesville from July 1988 through December 1989.

The results of the above studies are summarized in Figure 5.6.1-1. As shown, the mean nitrogen deposition rate reported by the five study groups is 0.56 grams nitrogen per square meter per year (gN/m$^2$-yr).

The maximum nitrogen deposition rate attributable to the BHEC Project was calculated by using the highest annual average nitrogen oxides ($NO_2$) air quality impact concentration (0.65 μg/m$^3$) and a conservative deposition velocity of 1 centimeter per second




Note 1. Average of data from 5 sampling sites (Marineland, Hastings, Waldo, Gainesville, and Lisbon) in north central Florida for the period May 1978 - April 1979.

Note 2. Average of data from 5 sampling sites (Marineland, Hastings, Waldo, Gainesville, and Lisbon) in north central Florida for the period January 1978 - December 1979.

Note 3. Average of data based on 5-year (1982-1987) data set for Gainesville. Dry deposition estimate utilizes deposition velocities of 1.0 to 2.0 cm/sec for $HNO_3$ and 0.3 to 0.6 cm/sec for $NO_3$ and the 95 percent confidence intervals on mean $HNO_3$ and $NO_3$ concentrations.

Note 4. Average data based on 8-year (1982-1990) data set for Gainesville. Dry deposition based on measured air concentrations of $HNO_3$ and $NO_3$ and literature values for deposition velocities.

Note 5. Average of data collected from July 1988 - December 1989 at a rural forested site located 10 miles north-east of Gainesville. Dry deposition based on measured air concentrations of particulate $NO_3$, $HNO_3$, and $NO_2$ and literature values for deposition velocities.

FIGURE 5.6.1-1. (REV. 1 - 12/04)

COMPARISON OF BACKGROUND ATMOSPHERIC DEPOSITION OF NITROGEN TO THE MAXIMUM NITROGEN DEPOSITION ATTRIBUTABLE TO THE BHEC PROJECT

**Source: Calpine, 2002; ECT, 2004.**

CALPINE BLUE HERON ENERGY CENTER

(cm/sec). This yields a maximum nitrogen deposition rate of approximately 0.08 gN/m$^2$-yr, which is shown on Figure 5.6.1-1 in comparison to the reported ambient *background* nitrogen deposition rates for north-central Florida. As shown by the figure, the maximum nitrogen deposition from the BHEC is less than one-seventh of the background nitrogen deposition rate.

The maximum ambient air $NO_2$ concentration used in the above analysis is projected to occur within several hundred meters from the proposed BHEC. The Indian River Lagoon is located approximately 13 km from the facility. Since the $NO_x$ emissions from the BHEC will be low, the plant's $NO_x$ emissions should be well mixed in the atmosphere and diluted to background or near background concentrations before they reach any sizeable water body or the Indian River Lagoon. Further, any nitrogen deposition on uplands should not have any meaningful effect on water quality because the nitrogen will be largely assimilated by the leaves and roots of upland plants. Consequently, the BHEC will not change the current nitrogen deposition rates in the Indian River Lagoon.

The permissible nitrogen loading rates to surface waters are generally accepted to be 1.0 to 2.0 gN/m$^2$-yr (Vollenweider, 1968). The maximum rate of nitrogen deposition from the BHEC (0.08 gN/m$^2$-yr) is only 14 percent of the existing *background* deposition rates (0.56 gN/m$^2$-yr) and only 4.0 percent of the nitrogen threshold loading rates (2.0 gN/m$^2$-yr) associated with water quality impacts (e.g., eutrophication).

Given the facts set forth above, it can be concluded that the $NO_x$ emissions from the BHEC will not have any meaningful or measurable impact on the water quality in the Indian River Lagoon or other water bodies.

### 5.6.1.6 <u>Other Air Quality-Related Impacts</u>

**Impacts Due to Associated Growth**

Construction of each phase of the BHEC will occur over an approximately 24-month period. There will be an average of approximately 165 workers during each phase with a peak employment of approximately 425 construction workers. It is anticipated that most (approximately 85 percent) of these construction personnel will be drawn from within Indian River County and will commute to the job site. While not readily quantifiable, the temporary increase in vehicle-miles-traveled (VMT) in the area would be insignificant, as would any temporary increase in vehicular emissions.

Following completion of construction and commencement of commercial operation of Phase II, the BHEC will employ a total of 36 operational workers. The operational workforce may also include annual contracted maintenance workers to be hired for periodic routine services.

In 1990, the population of Vero Beach was 17,350, while the population of Indian River County was 90,208. In 2000, the population of Indian River County is projected to be 111,000. The workforce needed to operate the proposed plant therefore represents a small fraction of the population already present in the immediate area. Therefore, while some small increase in area VMT could occur, the air quality impacts in Indian River County will be minimal.

Finally, a new industrial facility can sometimes generate growth in other industrial or commercial operations needed to support the new facility. Given the Site's proximity to Vero Beach and the Fort Pierce area, however, the existing commercial infrastructure should be more than adequate to provide any support services that the proposed facility might require. Therefore, no air quality impacts due to associated industrial/commercial growth would be expected. Furthermore, any significant industrial development resulting from the establishment of the BHEC would be independently subject to PSD and other environmental review requirements.

**Impacts on Visibility and on Soils, Vegetation, and Wildlife**

No visibility impairment at the local level is expected due to the types and quantities of emissions projected from the BHEC emission sources. The opacity of the CTG/HGRG stacks will be low due to the exclusive use of clean, natural gas. Emissions of primary particulates and sulfur oxides due to combustion will also be low due to the exclusive use of natural gas. The potential to impair visibility at the local level should be relatively low, given the very low expected exhaust opacity. The potential for haze formation in the area due to BHEC emissions of $SO_2$, $NO_x$, and $PM/PM_{10}$ is expected to be minimal. In addition, the aesthetic character of property adjacent to the BHEC Project site is largely influenced by I-95 and agricultural land use. The proposed BHEC will not adversely affect aesthetic or visual qualities in the area, because the BHEC will be largely screened from view by existing trees along the north, west, and south sides of the Site.

Certain air pollutants in acute concentrations or chronic exposures can impact soils, vegetation, or wildlife resources. Based on available literature and air emissions projected for this project, the following summary of potential impacts is provided. The PSD application (Appendix 10.1.1) provides a more detailed analysis of potential air emissions on natural resources.

Soils impacts can result from $SO_2$ and $NO_x$ deposition creating an acidic reaction or lowering of soil pH. In this case, the Site soils are naturally acidic and the low $SO_2$ and $NO_x$ emissions from the Project will not adversely affect plant vicinity soils.

Vegetation is sometimes affected by acute exposures to high concentrations of pollutants often resulting in foliar damage. Lower dose exposure over longer periods of time (chronic exposure) can often affect physiological processes within plants causing internal and external damage. Based on an evaluation of the literature for effects from $SO_2$, acid rain ($H_2SO_4$ mist), $NO_x$, CO, and combinations of these pollutants (synergistic effects), no impacts to regional vegetation are anticipated due to the low emission rates from the BHEC emission sources.

Releases of pollutants can also affect wildlife through inhalation, exposure through skin, or ingestion. However, based on low emission levels from this Project, natural dispersion of emissions, and mobility of wildlife, no impacts to regional wildlife resources are expected.

Based on this assessment, it was concluded that emissions from the BHEC emission sources will not result in impacts that will cause harm to soils, vegetation, or wildlife.

### 5.6.2 MONITORING PROGRAMS

No monitoring of ambient air quality is planned, nor is ambient monitoring warranted given the low impacts on air quality predicted for the BHEC.

The BHEC Project will be subject to 40 CFR 60, Subparts Da and GG (NSPS) and 40 CFR 75 (Acid Rain Program). The monitoring requirements of NSPS Subpart Da, applicable to the HRSG duct burners, include continuous emissions monitoring of $NO_x$ and a diluent (either $O_2$ or carbon dioxide [$CO_2$]). As allowed by Subpart Da, these monitoring requirements will be met using the applicable procedures specified in 40 CFR Part 75. Initial performance testing of the HRSG DBs for $NO_x$ and $SO_2$ emissions will be conducted as required by Subpart Da, §60.48a.

Continuous emissions monitoring of $NO_x$ and a diluent ($O_2$ and $CO_2$) will be conducted in accordance with the provisions of 40 CFR 75. Monitoring of $SO_2$ and $CO_2$ emissions will be conducted using procedures specified in 40 CFR 75, Appendices D and G, respectively. Acid Rain Program monitoring conducted pursuant to 40 CFR Part 75 will also be used to satisfy the $NO_x$ and $SO_2$ monitoring requirements of NSPS Subpart GG.

Initial and periodic compliance testing of pollutants emitted by the BHEC emission sources will be conducted pursuant to FDEP requirements as specified in the conditions of certification for the BHEC. FDEP test methods are specified in Section 62-297.401, F.A.C.

## 5.9 OTHER PLANT OPERATION EFFECTS

### 5.9.1 TRAFFIC IMPACTS

The operation and maintenance workforce at the BHEC at the completion of Phase II will consist of an average of 36 full-time workers. On a typical 24-hour day (three shifts), 32 workers would be at the Site, generating approximately 68 vehicle trips per day based on a vehicle occupancy rate of 1.1 and a trip generation rate of 2.35. Approximately 5 to 10 additional vehicle trips per day will be generated through deliveries of goods/services to the Site. The corresponding total of 73 to 78 vehicle trips per day as a result of operation of the BHEC will have minimal effects on traffic levels experienced on 74th Avenue or other County roadways.

Based on existing traffic volumes and levels of service on available roadways, Indian River County has concluded that if a project's traffic does not exceed 99 trips per day, then the Project will have *de minimis* traffic impacts and no further traffic analysis is required (Indian River Code, Section 952.07[5][a]).

### 5.9.2 MONITORING

Due to the small traffic volume created as a result of operating the BHEC facility, no traffic monitoring studies are required or proposed.

## 5.11 RESOURCES COMMITTED

The major irreversible and irretrievable commitments of state and local resources due to the operation of the BHEC are as follows:

- Use of land.
- Consumption of natural gas.
- Consumptive use of water.
- Consumption of air quality increments.

The use of land by the Project, while irreversible, will be relatively small. The Site consists of 50.5 acres, with approximately 27 acres being used for the Project facilities. The remaining acreage either will remain in its natural state (e.g., wetlands) or if cleared, will be replanted as green space.

Natural gas will be consumed by the CTGs. The quantities are presented in Section 3.3. While the BHEC will produce electricity in an efficient manner using state-of-the-art technology, which will result in efficient use of fuel, the natural gas consumed nonetheless represents an irreversible and irretrievable commitment of energy resources for the beneficial production of electricity.

Water evaporated by the cooling tower as part of the heat rejection process and by the zero-discharge wastewater treatment system represents a consumptive use of water. This consumptive use will be minimized by recycling water, to the extent feasible. Excess surface water from the IRFWCD canal system consumed by the plant operation will be withdrawn in a manner which will result in acceptable impacts, as determined using criteria developed by the SJRWMD. In fact, the Project's use of the canal water is consistent with the SJRWMD regional goals to reduce fresh water flows to the Indian River Lagoon.

The air quality increments consumed by air pollutant emissions from the Project will be negligible. The Project's emissions will create no impediment to any additional industrial growth in the area, nor will they have significant impacts on the area's air quality.

# 6.0 TRANSMISSION LINES AND OTHER LINEAR FACILITIES

In this application, Calpine is seeking certification of:

- An approximately 1,400-ft-long electrical transmission line corridor to interconnect with the FPL 230-kV transmission system.
- An approximately 1,000-ft-long natural gas pipeline corridor to interconnect with the FGT natural gas transmission system.
- An approximately 0.5-mile water supply pipeline from the IRFWCD Lateral C Canal to the Indian River County Egret Marsh Regional Stormwater Park, and an approximately 3.0-mile-long water supply pipeline from the stormwater park to the BHEC Site and associated pumping stations.

These linear facilities are described in this chapter pursuant to FDEP's instruction guide for certification applications (FDEP Form 62-1.211[1], F.A.C.).

## 6.1 TRANSMISSION LINES

### 6.1.1 PROJECT INTRODUCTION

The BHEC Project will be connected to the Peninsular Florida electric transmission grid via FPL's existing Malabar-Midway and Emerson-Malabar 230-kV transmission lines which are located approximately 1,400 ft west of the BHEC Site. Calpine will build two 230-kV line segments from the BHEC switchyard to the existing FPL transmission lines.

The BHEC's switchyard will operate as a switching station that will be capable of delivering the plant's maximum net electrical output (approximately 1,435 MW) to the existing FPL transmission system via the proposed interconnection lines. Each southbound line will have the capacity to deliver 700 megavolt-amperes (MVA), while each northbound line will have the capacity to deliver 370 MVA. Thus, in the event of unavailability of one of the four outgoing interconnecting transmission lines, the remaining three lines will be capable of delivering BHEC's maximum net electrical output of 1,435 MW.

The BHEC substation and electrical interconnection facilities will be designed in accordance with FPL's published facility connection requirements for generation facilities, transmission facilities, and electricity end-user facilities to ensure compliance with applicable planning standards and applicable regional, subregional, power pool, and individual system planning criteria, guides, and facility connection requirements. Calpine is seeking certification of the corridor for this short electrical interconnection within this PPSA proceeding.

### 6.1.2 CORRIDOR LOCATION AND LAYOUT

The proposed corridor will connect the BHEC Site to the FPL transmission lines which parallel I-95 on the west side. Figure 6.1.2-1 depicts the BHEC Site and proposed corridor on an FDOT county highway map (scale: 1:126,720), including major landmarks within a 5-mile radius. Figures 6.1.2-2 and 6.1.2-3 show the proposed corridor on a USGS topographic map at a scale of 1:24,000 and on an aerial photograph, respectively.

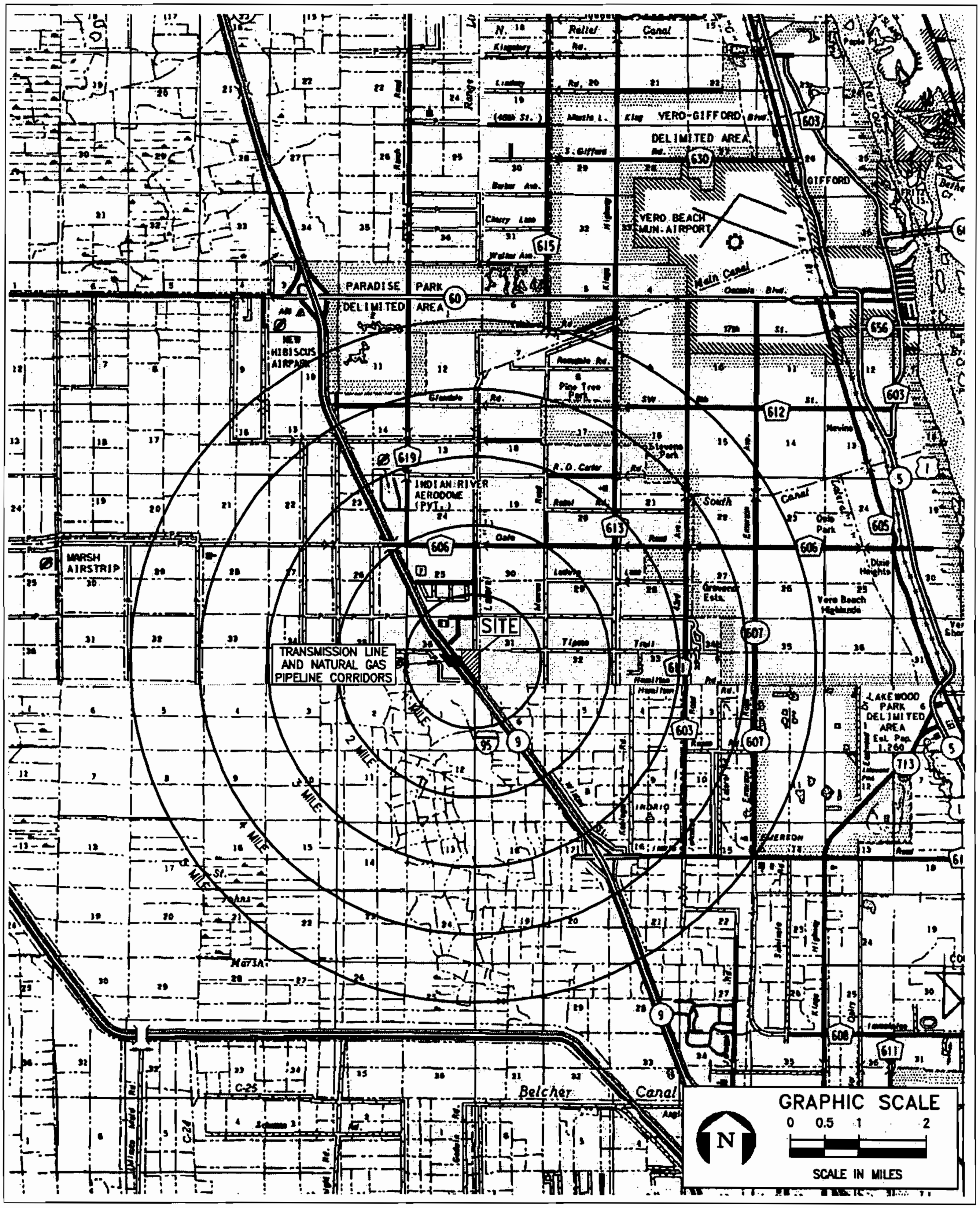



FIGURE 6.1.2-1. (REV. 1 - 12/04)
FDOT MAP WITH 5-MILE RADIUS (1 MILE INTERVALS) FROM TRANSMISSION LINE AND NATURAL GAS PIPELINE CORRIDORS

Sources: FDOT: St. Lucie, FL, 1986, Indian River, FL, 1998; ECT, 2004.

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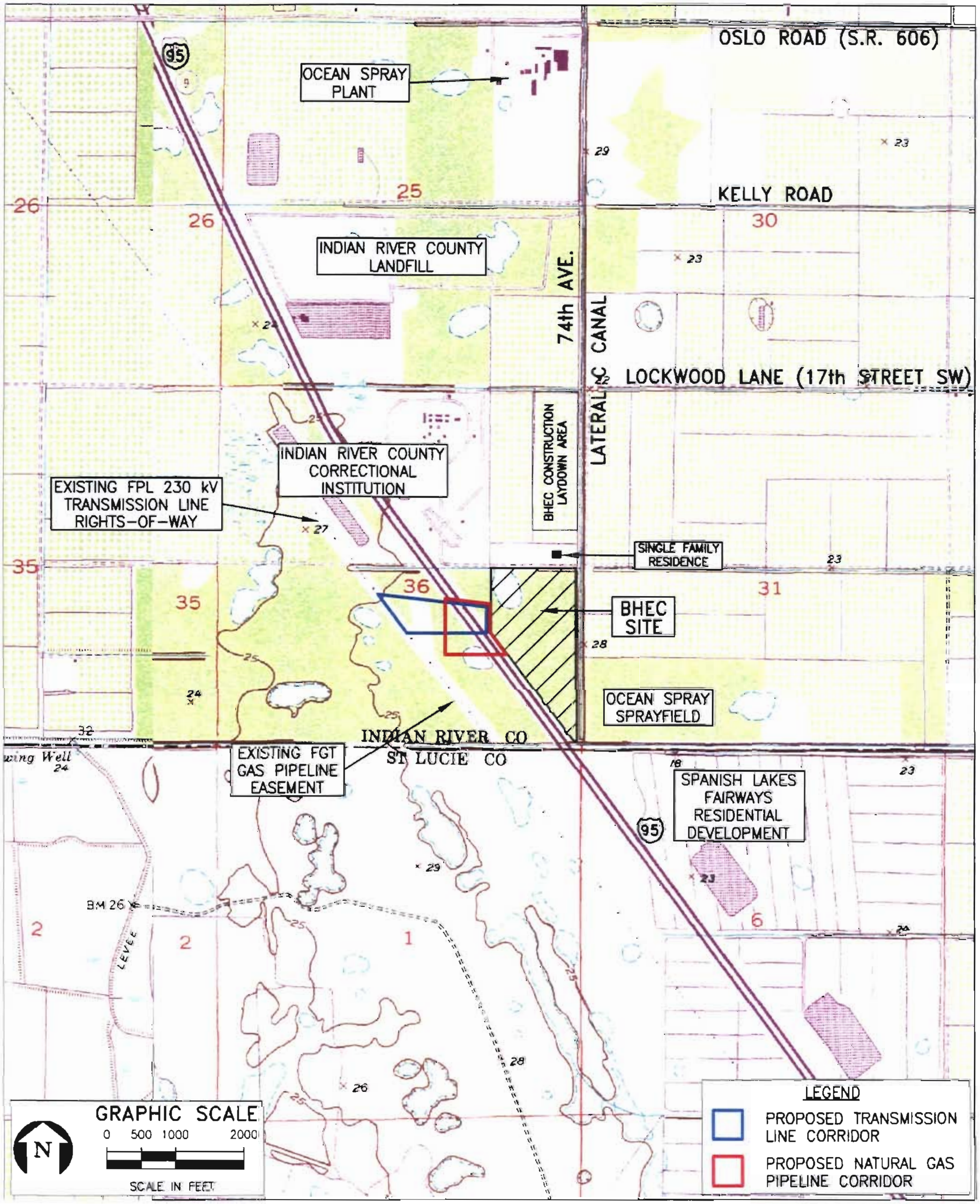


FIGURE 6.1.2-2. (REV. 1 - 12/04)

TRANSMISSION LINE AND NATURAL GAS PIPELINE CORRIDORS VICINITY MAP

Sources: USGS Quads: Oslo and East of Glum Slough, FL, 1983; ECT, 2004.

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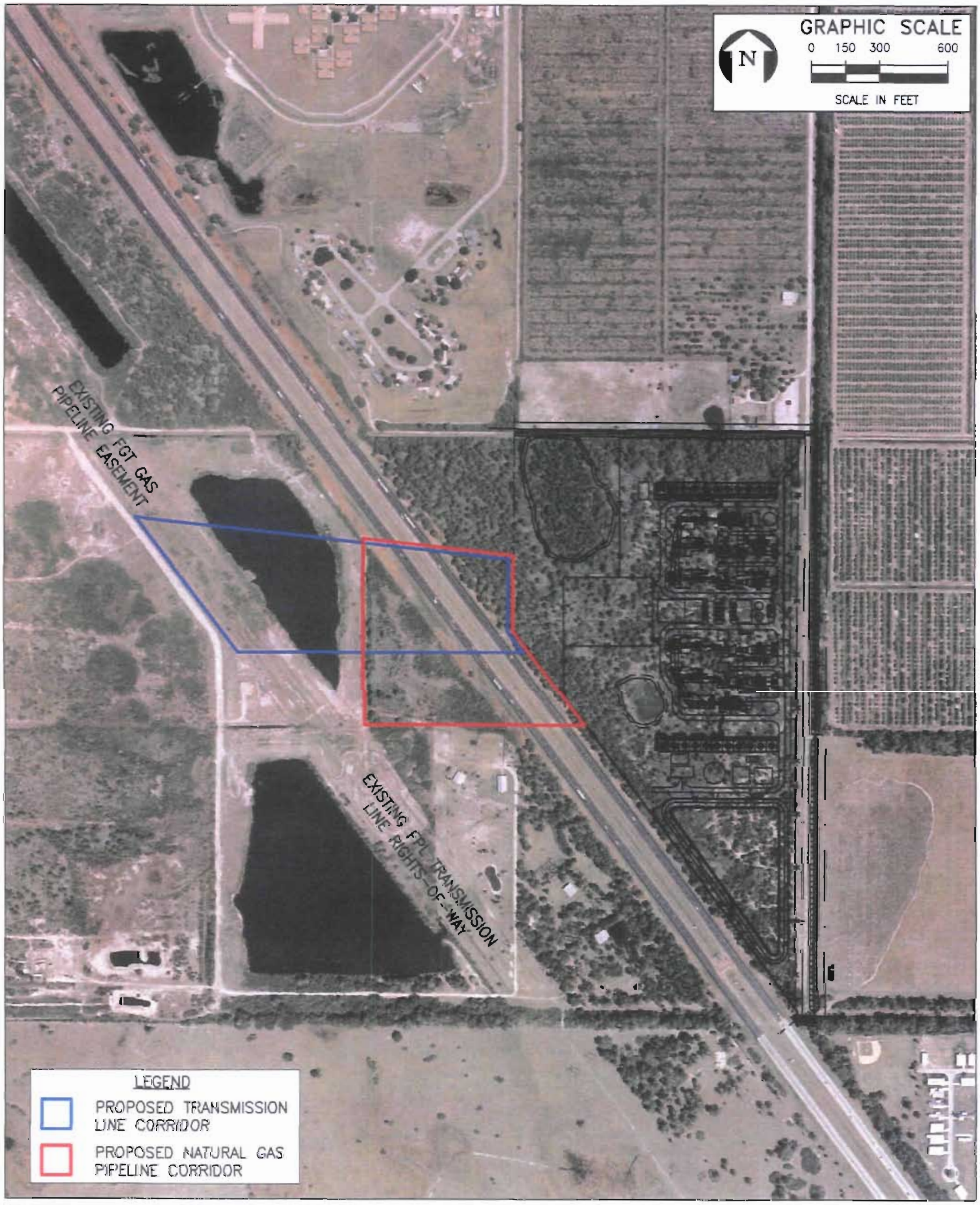


FIGURE 6.1.2-3. (REV. 1 - 12/04)

AERIAL PHOTOGRAPH OF CORRIDORS FOR PROPOSED TRANSMISSION LINE AND NATURAL GAS PIPELINE INTERCONNECTIONS

Sources: Aerial Cartographics of America, 2000; ECT, 2004.

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The proposed corridor is approximately 1,400 ft long with varying width from 400 to 500 ft. Calpine is seeking a 300-ft right-of-way for placement of the two 230-kV lines within this corridor. Figures 6.1.2-1 and 6.1.2-2 depict major features in the region and Site vicinity, respectively. The existing FPL transmission line rights-of-way are shown on Figures 6.1.2-2 and 6.1.2-3.

### 6.1.3 TRANSMISSION LINE DESIGN CHARACTERISTICS

#### 6.1.3.1 General Arrangement

The design of the electrical transmission line will consider ease of line construction, maintenance, and aesthetic compatibility. The transmission lines will be constructed using galvanized, single-pole tubular steel structures. A typical configuration of the single-pole structure is shown in Figure 6.1.3-1. The right-of-way will be approximately 300 ft wide and 1,400 ft long.

#### 6.1.3.2 Electrical Characteristics

The proposed electrical transmission lines will have a maximum current rating (MCR) of 2,000 amperes and a maximum continuous capacity of 700 MVA. The MCR is the nominal capacity that would be expected to result in the conductor reaching its design temperature limit of 100°C (212°F).

Final conductor selection has not been completed. The optimum conductor size will be determined based on economics and performance considerations. A typical conductor design for this type of construction consists of two conductors per phase, sized 795 thousand circular mils (kcmil) with 26 aluminum and 7 steel strands, resulting in an aluminum conductor steel reinforced (ACSR) unit with a nominal operating voltage of 230,000 volts. The overhead ground wire will be 3/8-inch extra high strength steel and may contain fiber optic communications circuits. The selected conductors will be compatible with conductors installed in the FPL transmission lines.

Proposed line profiles for double conductor, double circuit configuration are shown in Figure 6.1.3-1.

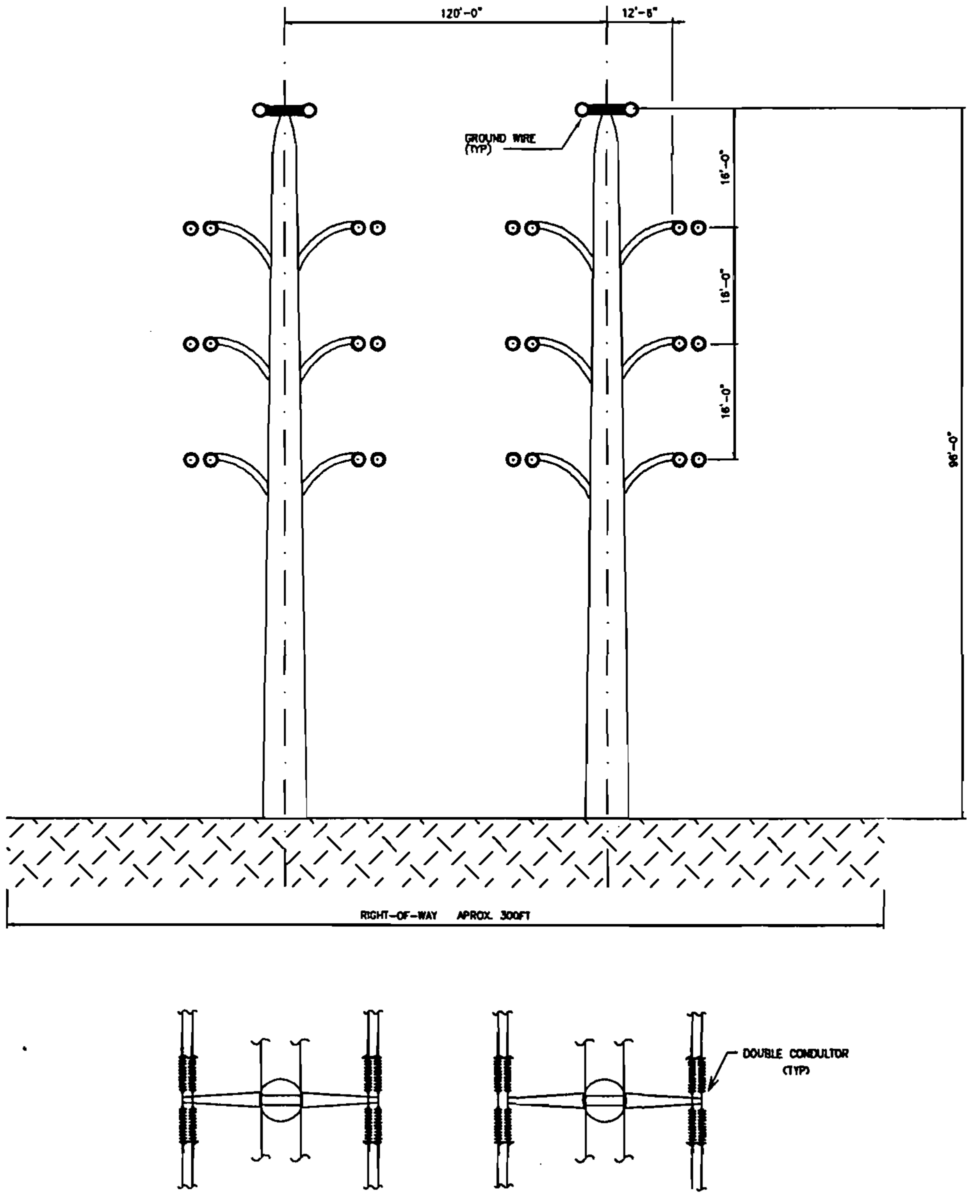


FIGURE 6.1.3-1. (REV. 1 - 12/04)

TYPICAL SINGLE POLE TRANSMISSION CONFIGURATION

Sources: Burns and Roe Enterprises, 2001; ECT, 2004.

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The largest conductor span length will be approximately 675 ft. The topography of the route and width of the right-of-way will determine exact span lengths. The entire line will meet National Electrical Safety Code (NESC) standards for clearance to ground and obstructions.

### 6.1.3.3 Switchyard and Collector Bus Arrangement

The 230-kV switchyard will be with a breaker 1-1/2 configuration. The two main buses will be of rigid bus aluminum design. Each bus will be capable of carrying the total generating plant output. A total of nine circuit breakers of dead-tank design are proposed as shown in Figure 6.1.3-2.

The switchyard will be built with phase-to-phase and phase-to-ground clearances compatible for 230-kV nominal system voltage and 1,050 kV basic insulation level. The ambient air contamination level in this area is considered of medium density. Therefore, the external insulators with 35 millimeters per kilovolt are proposed. The exposure to lightning damage in the area is estimated at 80 thunderstorms per year.

Disconnect switches will be provided on each side of the circuit breaker and at each transmission line. A grounding switch will be furnished as part of the phase disconnect switch for safety and isolation from the transmission lines for maintenance.

Each outgoing line will be provided with two line traps and three coupling capacitor voltage transformers (CCVTs). Carrier accessories will be provided for line protection and communications compatibility with FPL communication and protection system at the switchyard and the receiving-end substations. Additional CCVTs will be furnished at each incoming line for synchronization, metering, and control purposes.

The Supervisory Control and Data Acquisition (SCADA®) system will be used for components status and control system. The signals from the switchyard control house will be sent remotely to the generating plant distribution control system and to the FPL central control system via a remote terminal unit.

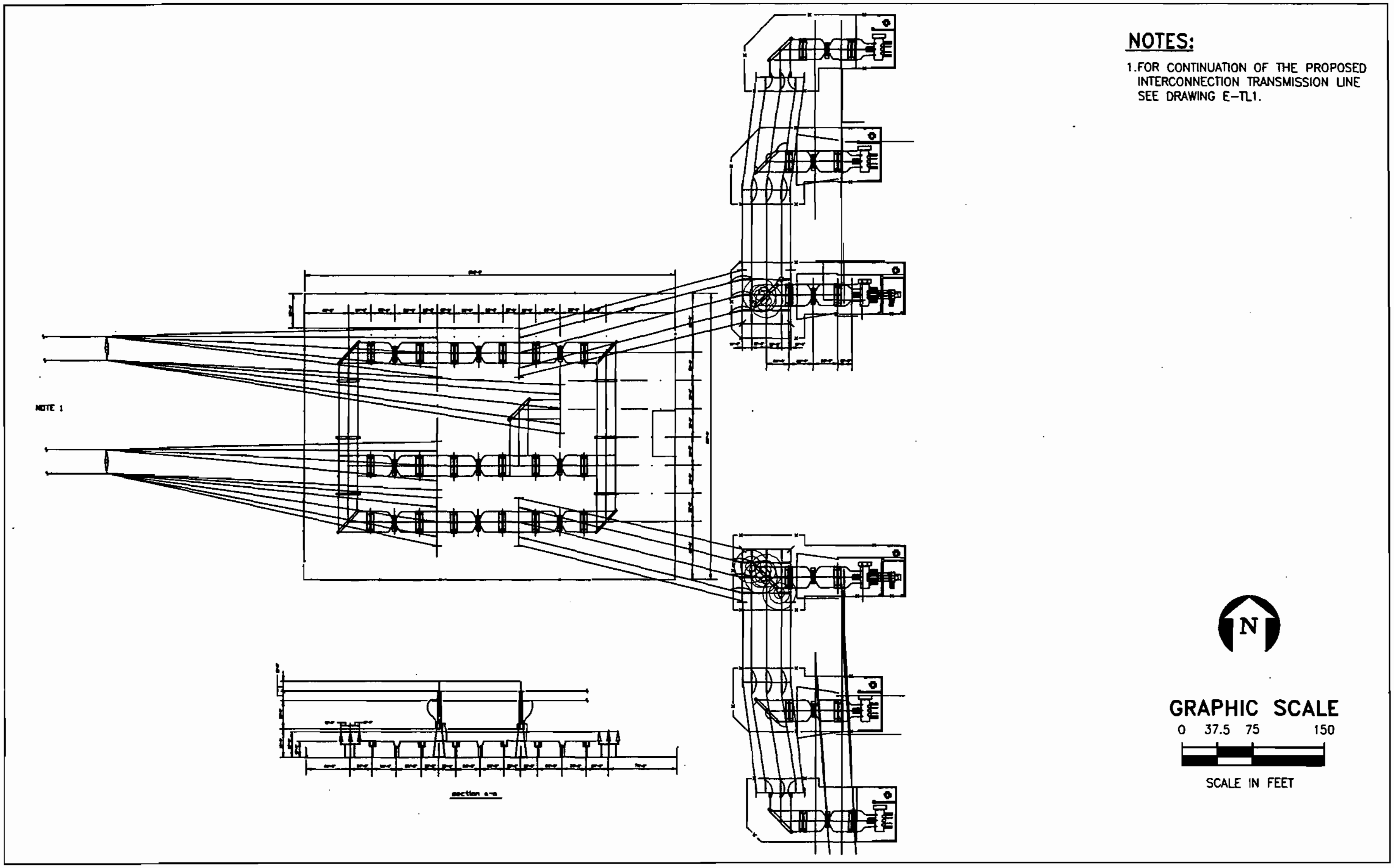


FIGURE 6.1.3-2. (REV. 1 - 12/04)

PROPOSED ONSITE SWITCHYARD ARRANGEMENT

Sources: Burns and Roe Enterprises, 2001; ECT, 2004.

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Surge arrester and shielding protection will be included to protect the installation from a lightning strike directly or in the vicinity of the facility. Auxiliary AC/DC and an ancillary system will be provided to operate the switchyard protective devices to isolate the transmission line in the event of fault or maintenance.

The design parameters for collector buses will be same as the switchyard equipment. The plant collector buses will be designed with radial configuration that collect power generated by two CTGs and one steam turbine.

The collector bus will be designed using rigid bus and flexible conductors for each feeder connected to the generator step-up (GSU) transformers. Each GSU will be protected by an individual high-voltage circuit breaker and can be isolated from the bus via a motor-operated disconnect switch.

The entire facility design will be in accordance with the FPL recommended design clearances and in compliance with the NESC and applicable state and federal regulations.

### 6.1.4 COST PROJECTIONS

The cost estimated to build this proposed interconnect is $450,000 (2001 dollars). This estimate is based on all right-of-way preparation costs, equipment costs, and construction and restoration costs. Calpine will own the property crossed by the corridor with the exception of I-95 right-of-way and the existing FPL transmission line rights-of-way.

### 6.1.5 CORRIDOR SELECTION

The proposed corridor was selected to best minimize environmental and land use impacts, while meeting the needs of the BHEC Project and FPL's bulk transmission grid. The proposed corridor is the shortest alternative and lies primarily on property which will be owned by Calpine. I-95 will be crossed at a near perpendicular angle to minimize impacts along its right-of-way. FPL has analyzed and approved the interconnect location on its 230-kV system.

## 6.1.6 SOCIO-POLITICAL ENVIRONMENT OF THE CORRIDOR AREA

### 6.1.6.1 Governmental Jurisdictions

As shown on Figure 6.1.2-1, the corridor, like the BHEC Site, is located within the unincorporated area of Indian River County. The nearest incorporated area to the corridor is the City of Vero Beach which lies approximately 5 miles northeast of the corridor. There are no local, regional, state, or federal environmentally protected areas within 5 miles of the corridor.

### 6.1.6.2 Zoning and Land Use Plans

As previously shown in Figure 2.2.2-1, the corridor will be located in an area identified as AG-2 (Agriculture) under Indian River County's Comprehensive Plan Future Land Use Map (Indian River County, 1998). The proposed Project has been found to be in compliance with the Indian River County Comprehensive Land Use Plan. The transmission lines are an integral component of the Project and have been reviewed for compliance by the Indian River County Planning Department.

Figure 2.2.2-2 depicts zoning districts for the Site and proposed transmission corridor area. As shown in this figure, the corridor will lie within the A-2 (Agriculture) zoning designation. Electric transmission lines are defined as essential services in Section 901.03 of the Code of Indian River County (Indian River County, 2000) and are not specifically prohibited in any zoning designation. Public/Private Utilities, Heavy, are allowed in agricultural zoned districts with approval of a Special Exception Use. Indian River County has approved a Special Exception Use for the Project as well as a Conceptual Site Plan (see Appendix 10.1.6). The Conceptual Site Plan included the transmission corridor. In accordance with Section 914.07 of the Code of Indian River County, the final transmission line alignments will be reviewed through the administrative approval process for the final Site Plan.

### 6.1.6.3 Easements, Title, Agency Works

Calpine will require an overhead crossing easement from the FDOT for the crossing of I-95. No structures will be placed at grade within the right-of-way of FDOT or any other agency. This approval will be requested as part of the post-certification process, based on selection of the final right-of-way.

#### 6.1.6.4 Vicinity Scenic, Cultural, and Natural Landmarks

No scenic, cultural, or natural landmarks are found on or near the proposed corridor, as previously detailed in Section 2.2.5 of this SCA.

#### 6.1.6.5 Archaeological and Historic Sites

A review of the area within the proposed BHEC Site and the proposed natural gas pipeline and electrical transmission line corridors was conducted by DHR. No known archaeological or historic sites are identified for this area as discussed in Section 2.2.6 and Appendix 10.6 of this SCA.

### 6.1.7 BIOPHYSICAL ENVIRONMENT OF THE CORRIDOR AREA

#### 6.1.7.1 Land Use/Vegetation

The existing land use/land cover types on the transmission line corridor and for the area extending 0.50-mile from the corridor are shown in FLUCFCS Level II classifications in Figure 6.1.7-1. Major features in the vicinity of the proposed transmission line corridor include the I-95 right-of-way; several borrow ponds; the Indian River County correctional facility institutional use; the FPL 230-kV transmission line corridor; citrus lands; and areas of herbaceous vegetation and shrub and brushlands.

In December 2000, an ecological site survey of the proposed transmission line corridor and immediate surrounding areas was conducted. Based on this survey, SJRWMD data, and aerial photograph interpretation, the vegetative communities and land uses on and surrounding the proposed corridor are shown in FLUCFCS Level III classifications on an aerial photograph in Figure 6.1.7-2. As shown in this figure, the corridor includes an area of pine flatwoods (FLUCFCS Code 411) on the east side of I-95, which is similar to the predominant vegetative community on the BHEC Site. To the west of I-95, the corridor crosses areas of shrub and brushland (FLUCFCS Code 320), and other open land (FLUCFCS Code 194) which borders a borrow pond (FLUCFCS Code 534). The existing

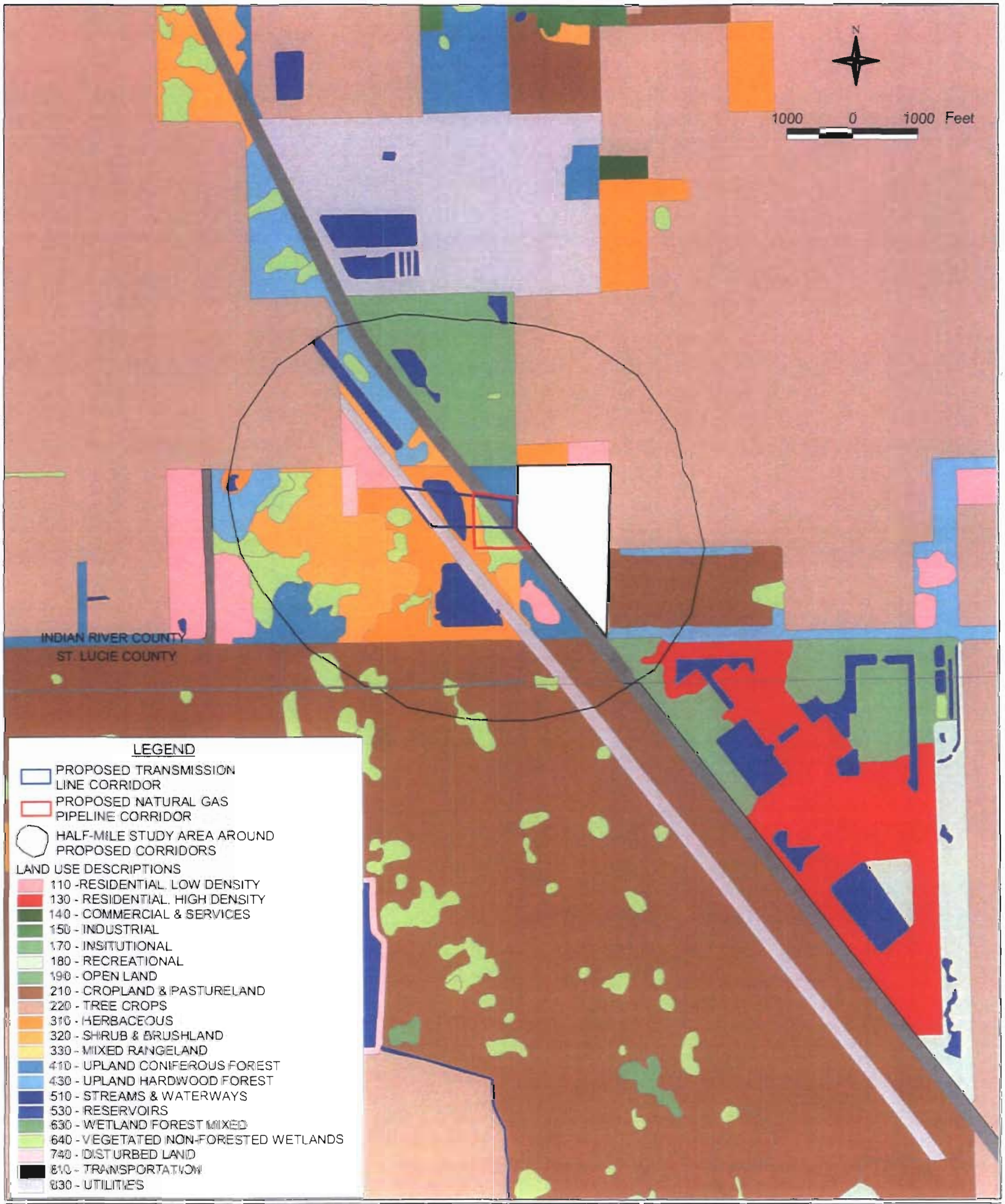


FIGURE 6.1.7-1. (REV. 1 - 12/04)
LAND USE/LAND COVER TYPES ON AND IN THE VICINITY OF THE PROPOSED TRANSMISSION LINE AND NATURAL GAS PIPELINE CORRIDORS

Sources: SJRWMD, 1995; SFWMD, 1995; ECT, 2004.

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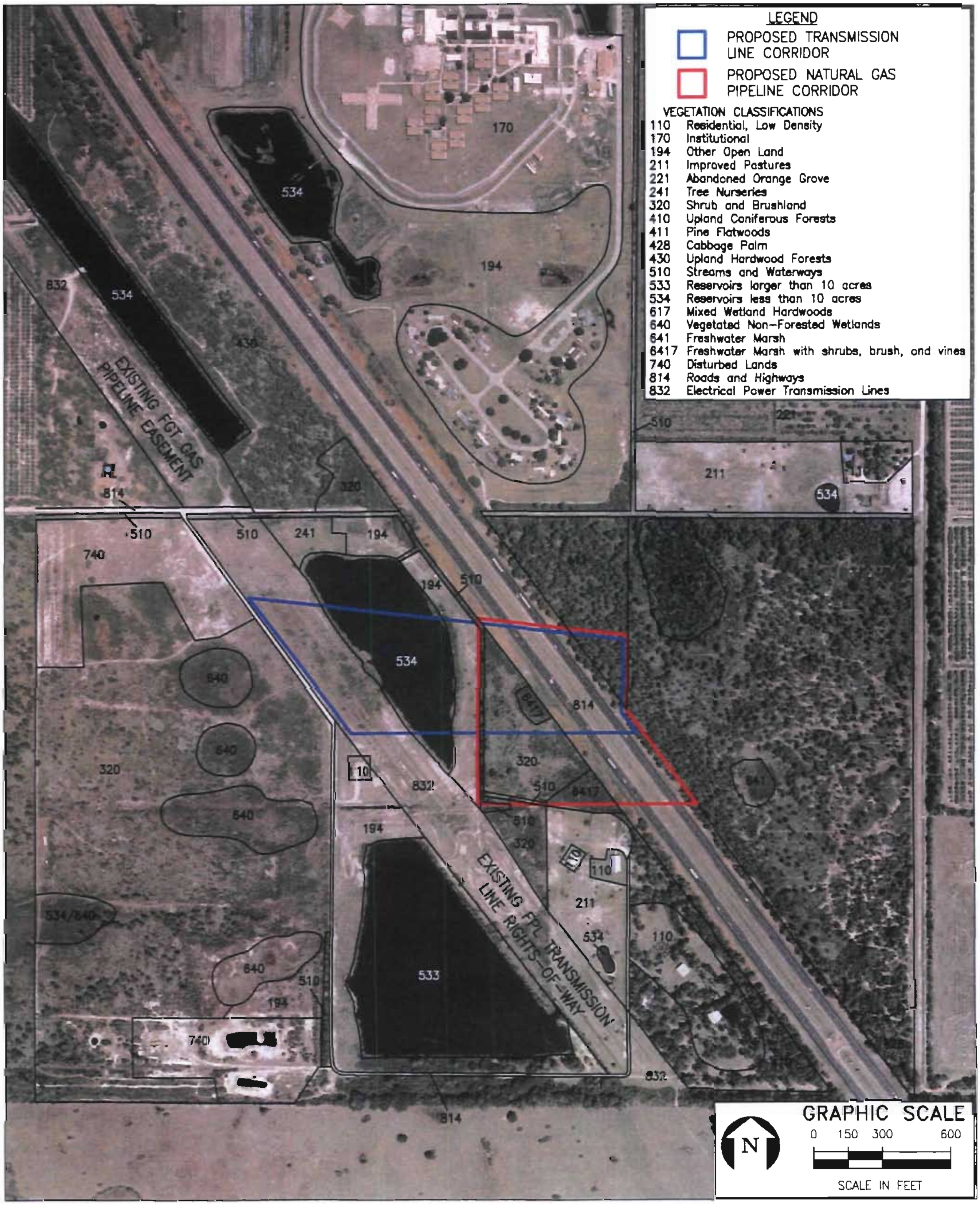


FIGURE 6.1.7-2. (REV. 1 - 12/04)
VEGETATIVE COMMUNITIES ON AND SURROUNDING PROPOSED TRANSMISSION LINE AND NATURAL GAS PIPELINE CORRIDORS
Sources: Aerial Cartographics of America, 2000; Florida Land Use, Cover, and Forms Classification System (FLUCFCS, 1999); ECT, 2004.

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FPL 230-kV transmission line rights-of-way are located just to the west of the borrow pond. In addition to the borrow pond, the corridor area includes a small (0.3 acre) freshwater marsh with shrubs, brush, and vines (FLUCFCS Code 6417) adjacent to the I-95 right-of-way and a small, manmade drainage ditch (FLUCFCS Code 510) running north-south to the east of the pond.

The predominant vegetative communities surrounding the corridor include shrub and brushland and disturbed and other open lands. The nearest residential land uses (FLUCFCS Code 110) to the corridor are several scattered residences located to the south.

### 6.1.7.2 Affected Waters and Wetlands

The only water bodies crossed by the proposed corridor are the manmade borrow pond on the east edge of FPL's transmission line right-of-way and a drainage ditch running north-south to the east of the pond. The borrow pond ranges from 250 to 500 ft wide within the corridor. Only limited vegetation exists on the banks of the pond due to its steep side slopes.

Isolated vegetated areas along the pond perimeter consist of scattered Carolina willow (*Salix caroliniana*), wax myrtle (*Myrica cerifera*), swamp fern (*Blechnum serrulatum*), and para grass (*Panicum purpurescens*).

The drainage ditch is approximately 10 ft wide at the top of bank, with side cast spoil along the edge. Vegetation within the ditch is limited due to dense cover by Brazilian pepper (*Schinus terebinthifolius*). The borrow pond and drainage ditch will be spanned by the proposed transmission lines. No structures will be constructed in these water bodies.

Figure 6.1.7-2 shows the wetland areas within and in the vicinity of the proposed transmission line corridor. The wetlands within and immediately surrounding the corridor were delineated during the ecological field investigations. As shown in Figure 6.1.7-2, an approximately 0.3-acre freshwater marsh with shrubs, brush, and vines (FLUCFCS Code 6417) is located within the corridor adjacent to the west side of the I-95 right-of-way.

This wetland is considered to be low quality and is dominated by wax myrtle, salt bush (*Baccharis halimifolia*), Brazilian pepper, primrose willow (*Ludgwigia peruvinia*), St. John's wort (*Hypericum fasciculatum*), broomsedge (*Andropogon glomeratus*), red ludwigia (*Ludwigia repens*), and smartweed (*Polygonum punctatum*).

Calpine will attempt to avoid impacts to this wetland in selecting the final right-of-way and structure locations. Once the specific right-of-way and structure locations are identified, Calpine will prepare appropriate information to support any wetland approvals, as required, under FDEP and USACE guidelines.

#### 6.1.7.3 Ecology

The upland and wetland vegetative communities within and surrounding the proposed corridor are shown in Figures 6.1.7-1 and 6.1.7-2. The following describes the key communities in the area by FLUCFLS code.

**Water and Wetland Areas:**

**Reservoirs Less than 10 Acres—534**

The open water area of the 7.7-acre borrow pond exists on the western portion of the corridor. The pond has limited vegetation on the banks due to steep side slopes. Isolated vegetated areas exist along the perimeter and consist of scattered Carolina willow, wax myrtle, swamp fern, and para grass. A small ditch exits the pond on the northeastern side of the pond and connects to a larger drainage ditch. The small ditch has a dirt road crossing with an 8-inch culvert.

**Streams and Waterways—510**

Several minor and larger ditches exist on and in the vicinity of the corridor. The previously mentioned small ditch exits the borrow pond and connects to a larger ditch which runs along the west side of the I-95 right-of-way. No water was in this small ditch at the time of inspection. Species noted within the ditch include torpedo grass (*Panicum repens*), cattail (*Typha* sp.), climbing hemp vine (*Mikania scandens*), and wax myrtle. Periodic maintenance of the borrow pond perimeter has restricted vegetation in this area.

A large ditch runs north-south through the corridor between the I-95 right-of-way and the borrow pond. This ditch collects water from the south between the borrow pond and I-95. This ditch connects with the Sublateral C-7 Canal to the north of the corridor. The ditch is approximately 12-ft at the top of bank. Vegetation within the ditch is limited due to dense cover by Brazilian pepper, though one population of royal fern (*Osmuda regalis*) was noted. The ditch turns south and connects with two smaller ditches.

Two small ditches exist to the south of the transmission line corridor. It appears that the southern ditch was excavated prior to the northern ditch. Side cast spoil was noted during the field investigation and is evident on the aerial photograph. These small ditches drain a low quality shrub wetland that is located to the south of the corridor along the I-95 right-of-way.

**Freshwater Marsh with Shrubs, Brush, and Vines—6417**

A low quality shrubby wetland exists in the center of the corridor adjacent to the west side of the I-95 corridor. This wetland is dominated by wax myrtle, salt bush, Brazilian pepper, primrose willow, St. John's wort, broomsedge, red ludwigia, and smartweed.

A Brazilian pepper dominated shrub wetland exists to the south of the corridor, directly adjacent to the I-95 corridor. This wetland area collects drainage that is discharged through the above mentioned ditch system. Other species noted within this area include wax myrtle, primrose willow, dog fennel (*Eupatorium capillifolium*), broomsedge, climbing hemp vine, and grape vine (*Vitus rotundifolia*).

**Upland Areas:**

**Shrub and Brushland—320**

Shrubs, palmettos (*Serenoa repens*), and short herbs and grasses dominate in this area. Wax myrtle, Brazilian pepper, slash pine saplings (*Pinus elliottii*), dog fennel, and plume grass (*Erianthus giganteus*) were noted in this area. A thick band of palmetto and scattered slash pine exists east of the borrow pond. Canopy closure of 10 percent is lacking and the majority of pines exist on the ditch spoil piles. This area could be a remnant of native pine flatwoods that once dominated the landscape in the area.

**Other Open Land—194**

The eastern and northern perimeter of the borrow pond is bordered by a maintained grass corridor. A storage shed is located adjacent to the I-95 corridor. The property also contains dog pens, stored boats, and other equipment in this area. Vegetation consists mainly of mowed bahia grass (*Paspalum notatum*) and other weedy forbs.

**Electrical Power Transmission Lines—832**

The existing FPL transmission line rights-of-way parallel the I-95 corridor on the west side of the borrow pond. Evidence was noted in the field that the FPL corridor has been utilized in the past as an ornamental palm nursery.

**Tree Nurseries (Abandoned)—241**

Evidence of a remnant tree farm exists to the north of the borrow pond. Planting furrows remain with scattered landscape palms. Species noted include broomsedge, white beggar-ticks (*Bidens pilosa*), ragweed (*Ambrosia* sp.), cogon grass (*Imperata cylindrical*), natal grass (*Melinis repens*) and salt bush.

**Disturbed Lands—740**

These lands are located to the west of the FPL right-of-way and west of the proposed corridor, and include areas that appear to have been cleared within the last few years. Evidence of recent fill activities were noted. A population of gopher tortoises were noted in the northwestern portion of this land use. Species noted in this land included: broomsedge, smut grass (*Sporobolus indicus*), flattop goldenrod (*Euthamia graminifolia*), ragweed, foxtail grass (*Alopecurus* sp), Brazilian pepper, scattered palmetto and brakenfern (*Pteridium aquilinum*), and prickerly pear (*Opuntia humifusa*) in the vicinity of the gopher tortoise burrows.

According to FNAI and FFWCC databases, no listed plant or wildlife species are known to occur within or in the vicinity of the proposed corridor. Tables 2.3.6-2 and 2.3.6-3 provide the state or federally listed plant and wildlife species, respectively, potentially occurring on the BHEC Site and in the proposed transmission line corridor. During the December 2000 onsite ecological survey, no listed species were observed within the proposed corridor. In the vicinity of the corridor, one population of royal fern which was located in the large drainage ditch adjacent to the I-95 right-of-way, to the north of the corridor. The royal fern species is common within the State of Florida and is listed to discourage commercial exploitation. Also, outside of the proposed corridor, a population of gopher tortoises was observed to the west of the FPL transmission line rights-of-way.

#### 6.1.7.4 Other Environmental Features

No other special or significant environmental features are present along the transmission corridor.

### 6.1.8 EFFECTS OF RIGHT-OF-WAY PREPARATION AND TRANSMISSION LINE CONSTRUCTION

#### 6.1.8.1 Construction Techniques

**Right-of-Way Clearing**

All trees, stumps, and brush in the right-of-way will be cleared. Trees beyond the boundary of the right-of-way may be trimmed or cut if it is determined that the trees present a hazard. Equipment used may include bulldozers, shearing machines, chainsaws, or other heavy or light equipment. Burning may be used to eliminate vegetative debris from the right-of-way. All burning will be conducted in accordance with local and state burning regulations.

**Road and Pad Construction**

Access roads will be required in areas where the final transmission line right-of-way does not follow or is not adjacent to existing roads. The overall objective of the access roads will be to provide efficient and safe ingress and egress to the transmission line structures, while minimizing environmental impact and cost. These access roads will be required for construction and maintenance of the transmission line facilities.

The use of fill will be minimized in the construction of access roads, and wherever possible, roads will be constructed by blading natural soil from both sides of the intended road. Where fill is required, it will be trucked in and spread, compacted, and shaped to the desired elevation. Access roads will be constructed to have a maximum surface width of 16 to 20 ft. Dump trucks may be used for hauling, and bulldozers and graders may be used for spreading and compacting.

Structures will be framed and erected using cranes and other support vehicles. Overhead ground wires and conductors will be installed with wire-pulling equipment. Vehicles used to support line construction may include bulldozers, tractors, and other heavy or light vehicles.

Foundations for structures may be native soil, crushed rock, or concrete backfill. In addition, poured concrete foundations may be used where an extra strong foundation is required. With native soil or crushed rock backfill, a hole is augered and the pole is inserted into the hole. The backfill material is then compacted around the pole up to the surrounding ground level. In the case of poured concrete foundations, the required concrete foundation is poured and the pole is set into the concrete.

**Erosion Control**

Disturbance to natural vegetation will be kept to a minimum to reduce the potential for erosion. Where necessary, erosion control measures such as staked hay bales or fabric fences will be used to eliminate erosion during construction. After construction, areas susceptible to high erosion potential may be reseeded. Routine maintenance of the right-of-way will be designed to minimize ground cover disturbance and, therefore, reduce the potential for erosion.

**Pole Foundation**

The proposed single-pole design will minimize the impact on the existing land. The depth and width of the foundation will be in accordance with the detailed engineering design that will satisfy the loading withstand requirement.

**Line Construction/Erection**

The transmission line construction will be planned to minimize the time required, especially for the highway crossing and the interconnection into the existing FPL transmission system.

The proposed conceptual construction sequence of the interconnection lines is as follows:

- Prior to crossing a cable above I-95, construction of all dead-end poles, structures, hardware, insulators, and cables, and connection to the switchyard will be completed. Close coordination with the FPL portion of the work will be considered to create an integrated schedule and logical work sequence that will minimize down time and delays.
- A detailed contingency plan will be prepared and will be implemented in case of unforeseen events.
- A crane with large bum in the center of the highway aisle will be used while installing a pilot cable from one side of the road to the opposite end. Immediately after that work is completed, the cable will be tensioned, clearance over the highway will be checked, and the cable will be secured and tied to both dead-end structures. This clearance will comply with the NESC and any federal and state highway requirements.

Figure 6.1.8-1 depicts the proposed crossing profile of I-95.

#### 6.1.8.2 Impacts on Water Bodies and Uses

Currently, Calpine does not anticipate constructing in any wetland or in the borrow pond on this corridor. Should this be necessary, Calpine will prepare a joint FDEP/USACE ERP application, once the final right-of-way has been selected and structure locations are finalized.

Use of I-95 and the Calpine property on each side of I-95 will minimize the need for new permanent access roads. No bridges will be required to cross any water bodies. The borrow pond is currently on private property which will be primarily owned by Calpine and, therefore, does not provide public recreation opportunities.

#### 6.1.8.3 Solid Wastes

Any solid wastes generated from transmission construction will likely consist of trash and cleared vegetation. Any vegetation debris may be burned onsite in accordance with state

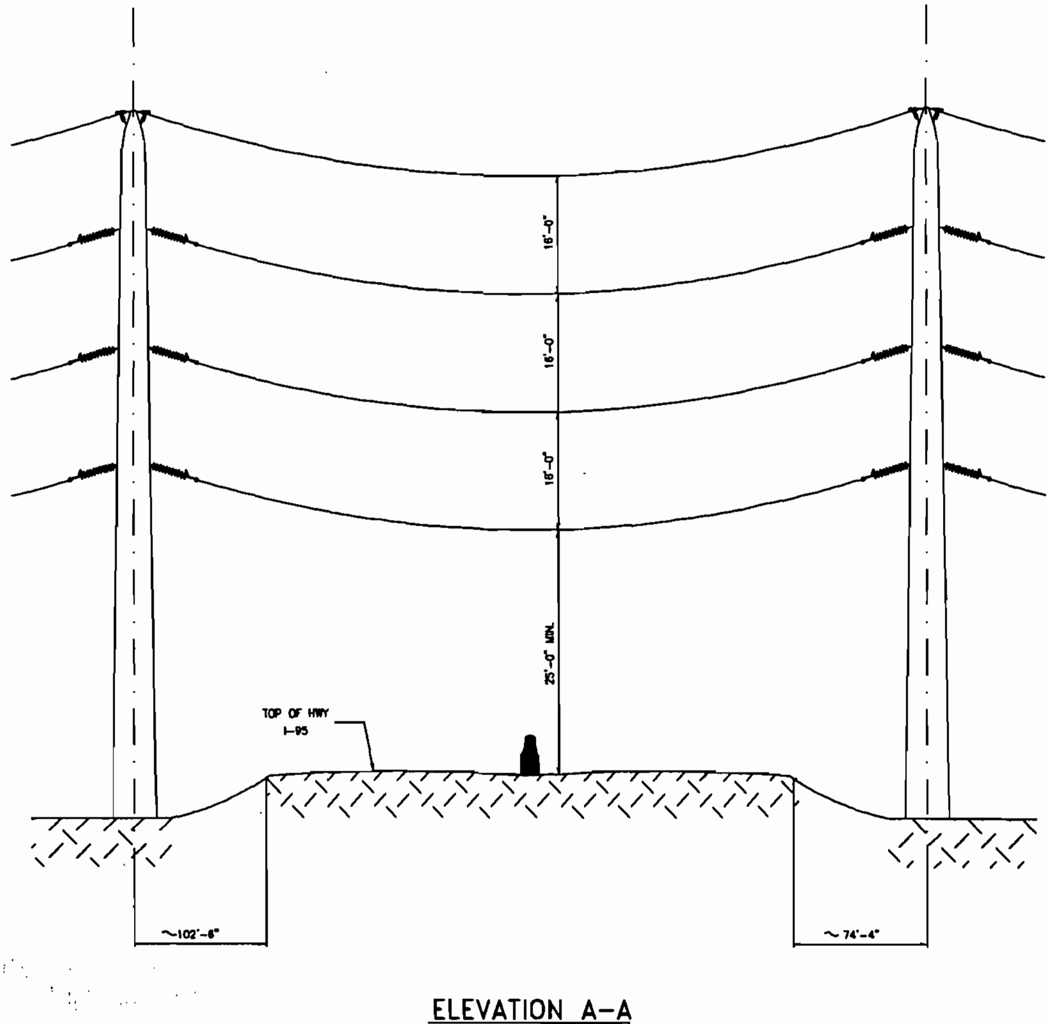


FIGURE 6.1.8-1. (REV. 1 - 12/04)

PROPOSED TRANSMISSION LINE CROSSING OF I-95

Sources: Burns and Roe Enterprises, 2001; ECT, 2004.

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and local regulations. If burning is not allowed, solid wastes will be hauled to a local approved landfill.

### 6.1.8.4 Changes to Vegetation, Wildlife, and Aquatic Life

Since a majority of the proposed corridor crosses disturbed/developed lands (I-95, borrow pond), construction impacts to native vegetation communities will be minimal. Where natural communities are crossed, construction will require the removal of all tall-growing vegetation on the right-of-way. Ground cover or low-growing shrubs will be allowed to remain up to a height of approximately 14 ft.

Along the west Site boundary under the transmission lines, existing, low-growing shrubs will not be removed and/or additional plantings with lower growing landscape species will be made to establish a 30-ft-wide Type A buffer in accordance with Indian River County landscape and buffer regulations. Vegetation in this buffer area will be selected and maintained to not exceed a height of approximately 14 ft in accordance with FPL's safety guidelines and NESC requirements.

Wildlife impacts are expected to be minimal to nonexistent due to the disturbed nature of the corridor. Most wildlife species will retreat to offsite habitats during construction. Some wildlife inhabiting low-growing vegetation communities will reinhabit the right-of-way once construction is complete. No impacts are expected to occur to any listed species or to any regional wildlife populations.

Aquatic life that may inhabit the borrow pond or the herbaceous wetland crossed by the eventual right-of-way should only be minimally impacted during construction. No structures will be placed in any wetlands or the pond. If any clearing in wetlands is required, it will be done so manually, with root mats left in place. Minor turbidity may occur in such areas but will be minimized using BMPs. Calpine will adhere to any conditions required by FDEP or USACE if wetland permitting is necessary.

#### 6.1.8.5 Impact on Human Populations

No residences occur within the corridor and the area around the corridor is sparsely populated. Construction of the transmission line may result in minor inconveniences to local landowners/farmers due to equipment/construction movement. Minor traffic slowdowns on I-95 may be necessary during erection of the conductors across the highway. However, with the exception of the I-95 and FPL transmission line rights-of-way, all construction will occur on lands which will be owned by Calpine.

#### 6.1.8.6 Impacts on Regional Scenic, Cultural, and Natural Landmarks

No scenic, cultural, and natural landmarks are found along the corridor; therefore, no impacts will occur.

#### 6.1.8.7 Impacts on Archaeological and Historic Sites

No known cultural resources occur on the proposed corridor, according to DHR. If cultural resources are found during construction, Calpine will halt construction in the immediate area and consult with DHR regarding appropriate evaluation and mitigation measures.

### 6.1.9 POST-CONSTRUCTION IMPACTS AND EFFECTS OF MAINTENANCE

#### 6.1.9.1 Maintenance Techniques

Little maintenance of the right-of-way is anticipated due to the already cleared/disturbed nature of much of the proposed corridor. Maintenance efforts in vegetated portions of the right-of-way will consist of maintaining a low-growing vegetation cover across the right-of-way. Tall-growing trees and shrubs (>14 ft high) will be periodically cut, mowed, or treated with an approved herbicide. Any herbicide applications will meet with state and federal requirements and only be applied by a licensed herbicide applicator.

Due to the paucity of natural habitats on the corridor, maintenance techniques are not anticipated to have a significant impact on local flora and fauna.

#### 6.1.9.2 Multiple Uses

Calpine will own all of the eventual right-of-way except for the I-95 and FPL transmission line rights-of-way. I-95 will continue to serve as a major transportation corridor with no effects from operation of this transmission line. The borrow pond will also remain intact, serving as a storm water collection area.

Calpine does not anticipate any other uses along its right-of-way.

#### 6.1.9.3 Changes in Species Populations

Operation of the transmission line will not have any permanent effects on local or regional populations of plant or wildlife species.

#### 6.1.9.4 Effects of Public Access

Minimal new access roads are anticipated on this right-of-way. Existing roads including I-95 will be unaffected by transmission operation. Calpine will honor local landowner and FPL requests for ingress/egress into FPL's transmission corridor.

### 6.1.10 OTHER POST-CONSTRUCTION EFFECTS

#### 6.1.10.1 Introduction

This section provides computations and analyses of the electric and magnetic fields (EMF) and corona effects associated with the proposed transmission lines to be built for the Calpine BHEC. The calculation and analysis procedures are summarized in Section 6.1.10.2 along with the underlying data used for the calculations. The source of the data and any required assumptions are also documented in that section.

At this time, the specific phasing of the various conductors in the four transmission circuits has not been determined. Therefore, two alternative phase arrangements with similar field and corona performance were identified and analyzed. Sections 6.1.10.3 and 6.1.10.4 contain the results of calculations and analyses based on the alternative phase arrangements, Option 1 and Option 2, respectively.

All calculations, assumptions, and results were made by Electric Research & Management, Inc. (ER&M) of Pittsburgh, Pennsylvania, under contract to Calpine, and their report as well as other references are cited at the end of this chapter.

**6.1.10.2 Procedures, Data, and Assumptions**

**Calculation Procedures**

All of the EMF levels, audible noise levels, radio noise levels, and television interference levels used in this analysis were computed using the Bonneville Power Authority (BPA) Corona and Field Effects Program. That computer program is public domain software developed by the U.S. Department of Energy's BPA. This is also the computer program specifically identified in the Florida EMF rule (Chapter 62-814, F.A.C.) as appropriate for demonstrating compliance with FDEP's rule.

The BPA Corona and Field Effects Program computes the strength of the EMF as well as several corona phenomena for transmission lines based on specific line characteristics such as conductor heights, spacings, and sizes; the voltage on and current in those conductors; the electrical phase arrangement of those conductors; and other site parameters such as altitude.

**Data and Assumptions**

The design and parameter data required for the analysis were developed by Burns and Roe Enterprises (B&R). Table 6.1.10-1 summarizes the parameter data provided by B&R.

Because some data have not been finalized, various assumptions were made. The parameter values in the right column of Table 6.1.10-1 were ultimately selected as input data for the field and corona effects calculations. The following paragraphs describe the way in which some of the ultimate parameter values were reached.

Electrical Phase Arrangement

The phase arrangement of the proposed transmission line conductors has not yet been determined. FPL was contacted to determine the configuration and phasing of the existing transmission lines with which the proposed lines will interconnect. The existing lines are single-circuit, wooden-spar H-frame structures with horizontal phase arrangement. Both of the existing circuits are similarly phased. Because it will be necessary to roll the existing horizontally configured lines into a vertical configuration to interconnect with the proposed transmission lines, one of the existing circuits can be rolled clockwise and the other counterclockwise to obtain opposite phasing on the two circuits of the proposed double-circuit transmission lines. The resulting opposite phasing of the two circuits on each double-circuit line minimizes the EMF produced at ground level but worsens the corona performance.

Since the exact conductor phasing has not been determined, two alternative phase arrangements were used as indicated as Option 1 and 2 in Table 6.1.10-1. The phase arrangement identified as Option 2 in Table 6.1.10-1 was found to perform nearly as well as the first option and may be easier to physically implement. The mirror symmetry of the two lines in Option 2 means that there will be a corresponding symmetry of the structures required at the interconnection point to connect with the existing transmission lines.

The definition of Phases A, B, and C in Table 6.1.10-1 are not intended to infer any absolute phase reference or direction of phase arrangement. They only indicate the placement of like phases on all four circuits. For example, Phases A and C can be interchanged (or A and B, etc.) as long as the same interchange is applied to all four circuits.

Power Flow at MCR

The Florida EMF rule requires that magnetic field calculations be carried out with the maximum continuously-rated current in all parallel transmission lines. Since the BHEC generating capacity is significantly less than the capacity to fully load all four circuits, the only possible scenario is that the loading result from power flowing through the BHEC switching station. For purposes of the magnetic field calculations, power is assumed to flow into the station from the two lines from the south and out through the lines to the north. The resulting magnetic fields would be identical if the power flowed in from the north and out to the south.

**Table 6.1.10-1. Transmission Line Parameter Data (received from B&R January 12, 2001, and Values Used in the Analysis)**

| Parameters | B&R Values | Values Used | |
|---|---|---|---|
| MIDSPAN CHARACTERISTICS: | | | |
| Configuration | | | |
| Number of circuits: | 4 | 4 | |
| Number of lines: | 2 | 2 | |
| Line configuration: | double circuit vertical one circuit on each side | double circuit vertical one circuit on each side | |
| Phase Arrangement (A, B, or C) | | Option 1 | Option 2 |
| Northernmost circuit | | | |
| Top phase: | | A | A |
| Middle Phase: | | B | B |
| Bottom phase: | | C | C |
| Second circuit from north | | | |
| Top phase: | | C | C |
| Middle Phase: | | B | B |
| Bottom phase: | | A | A |
| Third circuit from north | | | |
| Top phase: | | A | C |
| Middle Phase: | | B | B |
| Bottom phase: | | C | A |
| Southernmost circuit | | | |
| Top phase: | | C | A |
| Middle Phase: | | B | B |
| Bottom phase: | | A | C |
| Power flow at MCR (into or out of Blue Heron station) | | | |
| Northernmost circuit: | | OUT | |
| Second circuit from north: | | OUT | |
| Third circuit from north: | | IN | |
| Southernmost circuit: | | IN | |
| Right-of-way configuration | | | |
| Right-of-way width: | 300 ft | 300 ft | |
| CL north line to right-of-way edge: | 90 ft | 90 ft | |
| CL south line to right-of-way edge: | 90 ft | 90 ft | |
| Line to line spacing: | 120 ft | 120 ft | |
| Poleline configuration (each of two lines) | | | |
| Horizontal spacing from centerline to center of conductor | | | |
| OHGW: | 4.5 ft | 4.5 ft | |
| Top phase: | 14.5 ft | 14.5 ft | |
| Middle phase: | 14.5 ft | 14.5 ft | |
| Bottom phase: | 14.5 ft | 14.5 ft | |
| Height of conductor center above ground at suspension point | | | |
| OHGW: | 96 ft | 96 ft | |
| Top phase: | 80 ft | 80 ft | |
| Middle phase: | 64 ft | 64 ft | |
| Bottom phase: | 48 ft | 48 ft | |

**Table 6.1.10-1. Transmission Line Parameter Data (received from B&R January 12, 2001, and Values Used in the Analysis)**

| Parameters | B&R Values | Values Used |
|---|---|---|
| Height of conductor center above ground at midspan for max sag | | |
| OHGW: | 80 ft | 80 ft |
| Top phase: | 55 ft | 55 ft |
| Middle phase: | 39 ft | 39 ft |
| Bottom phase: | 23 ft | 23 ft |
| Height of conductor center above ground at midspan over highway for max sag | | |
| OHGW: | 80 ft | 80 ft |
| Top phase: | 57 ft | 57 ft |
| Middle phase: | 41 ft | 41 ft |
| Bottom phase: | 25 ft | 25 ft |
| Height of conductor center above ground at midspan for typical operating condition | | |
| OHGW: | 80 ft | 80 ft |
| Top phase: | 60 ft | 60 ft |
| Middle phase: | 44 ft | 44 ft |
| Bottom phase: | 28 ft | 28 ft |
| Voltage | | |
| Nominal: | 230 kV | 230 kV |
| Typical: | 230 kV | 236 kV |
| Maximum: | 250 kV | 250 kV |
| Conductor | | |
| Phase conductors | | |
| Size and Type:: | 795 kcmil, 26/7 ACSR (Drake) | 795 kcmil, 26/7 ACSR (Drake) |
| Conductor Diameter: | 1.08 inches | 1.108 inches |
| Subconductors per bundle: | 2 | 2 |
| Subconductor spacing: | 18 inches | 18 inches |
| MCR/bundle: | 2000A | 2000A |
| OHGW | | |
| Type: | 3/8-inch EHS w/optical core | 3/8-inch EHS w/optical core |
| Conductor diameter: | 0.375 inch | 0.360 inch |
| CHARACTERISTICS AT SWITCHYARD PROPERTY LINE | | |
| Height of conductor bundle center above ground at property line for max sag | | |
| OHGW: | | 92.35 ft |
| Top phase: | | 74.75 ft |
| Middle phase: | | 58.75 ft |
| Bottom phase: | | 42.75 ft |

Note: OHGW = overhead ground wire.

Sources: B&R, 2001.
ER&M, 2001.

Midspan Clearances

Corona effects depend upon the average conductor height along the transmission line. The average conductor height used in these corona calculations is the midspan height under typical operating conditions plus one-third of the sag.

Typical Operating Voltage

The transmission lines are proposed to operate at their nominal voltage. However, lines in the Florida system typically operate between the nominal and maximum values. Hence, a system voltage of 236-kV was assumed for the corona studies.

Conductor Diameters

The outside diameters of the phase and overhead ground wires were changed slightly from the values supplied by B&R to agree with values in conductor tables.

Conductor Heights at the Station Property Line

To test compliance of the BHEC switchyard with the Florida EMF rule, calculations must be made for the transmission line geometries at the point where they cross the BHEC property line. Span length (658 ft) and distance from the property line to the structure (less than 40 ft) were assumed to represent accurate dimensions for this project.

**Impact Analysis Procedures**

Electric and Magnetic Fields

Florida has adopted an EMF rule (Chapter 62-814, F.A.C.) which establishes limits on the strength of EMF beneath transmission lines or near substations with the intent of protecting 'public health and welfare from such electrical facilities.' Hence, the impact analysis for EMF consists of demonstrating compliance with the rule.

Audible Noise

The impact analysis demonstrated that the noise level of the transmission lines will be much less than the ambient noise level. Furthermore, the noise levels will be much less than EPA-recommended limits (EPA, 1974).

Transmission line audible noise will also be lower than the applicable Indian River County noise ordinance for agricultural and residential areas.

AM Radio Interference

Interference with amplitude modulation (AM) radio reception is determined by applying the criterion of a 24-decibel (dB) signal-to-noise ratio (SNR) between the minimum radio station signal strength required to meet various Federal Communications Commission (FCC) criteria and the mean radio noise level of the transmission line at the frequency of the station. If the SNR is less than 24 dB at any particular location or in any particular weather condition, interference is said to be possible. If the SNR is greater than 24 dB, no interference is assumed.

The 24-dB SNR criterion is the standard criterion used within the power industry to determine the possibility of interference from transmission line corona. This criterion came from tests in which a jury of listeners rated the quality of reception associated with different SNRs. The 24-dB criterion corresponds to the *background unobtrusive* threshold in those studies.

FM Radio Interference

The use of frequency modulation (FM) makes FM radio reception essentially immune to interference from transmission lines. For that reason, there will be no FM radio interference.

Television Interference

The impact analysis methodology for television reception is the same as that discussed above for AM radio interference except that the appropriate SNR criterion for interference-free video reception is 40 dB. The audio portion of the television signal is FM and, therefore, immune to interference from transmission line electrical noise.

### 6.1.10.3 Electric And Magnetic Fields and Other Post-Construction Effects for Phasing Option 1

**Transmission Line Electric and Magnetic Fields Values**

Electric fields associated with transmission lines are a function of voltage on the line, the conductor arrangement, and conductor height. Magnetic fields are a function of the current carried by the line, conductor arrangement, and conductor height. EMF, therefore, vary along a transmission right-of-way.

The proposed transmission lines with phasing Option 1 will comply with Florida's EMF rule (Chapter 62-814, F.A.C.), which requires 230-kV lines to not exceed 2.0 kilovolts per meter (kV/m) for electric fields and 150 milligauss (mG) for magnetic fields at the edge of the right-of-way. The electric field must also not exceed 8 kV/m anywhere on the right-of-way. The calculated maximum EMF values for the proposed lines with phasing Option 1 are shown in Table 6.1.10-2. The estimates are based on a model (BPA Corona and Field Effects Program) and show calculated estimates for the maximum operating voltage and MCR. Data are shown for the absolute minimum midspan conductor height over open ground (23 ft) and the absolute minimum conductor height over the highway (25 ft).

**Table 6.1.10-2. Calculated Maximum EMF for the BHEC 230-kV Transmission Lines (Phasing Option 1)**

| | Electric Field (kV/m)[1] | | Magnetic Field (mG)[2] | |
|---|---|---|---|---|
| | On Right-of-Way | Edge of Right-of-Way | On Right-of-Way | Edge of Right-of-Way |
| Minimum Midspan Height (23 ft) | | | | |
| All Circuits Operating | 4.98 | 0.12 | 444.6 | 21.3 |
| Only Two Circuits Operating | 5.74 [3] | 0.19 [4] | 396.6 [3] | 45.1 [4] |
| Minimum Height Over Highway (25 ft) | | | | |
| All Circuits Operating | 4.28 | 0.10 | 385.6 | 20.9 |
| Only Two Circuits Operating | 5.04 [3] | 0.16 [4] | 349.1 [3] | 44.3 [4] |

[1] Electric field values based on maximum operating voltage (242 kV).
[2] Magnetic field values based on MCR for the lines (2000 amperes).
[3] Occurs with middle circuits operating.
[4] Occurs with the most northerly and southerly circuits operating.

Source: ER&M, 2001.

Because of the conductor phase arrangement selected for these transmission lines, the EMF produced by one circuit tend to cancel part of the fields produced by the other circuit on the same structure. For that reason, EMF are higher in some locations when only one circuit of each line is energized. While these lines are not intended to operate with only one circuit energized, they may occasionally do so because of maintenance or an unexpected outage of a circuit. Table 6.1.10-2 shows modeled field levels for only one circuit on each structure energized at maximum voltage and MCR.

Figures 6.1.10-1 and 6.1.10-2 depict the horizontal profile for EMF, respectively, for the proposed transmission lines at the absolute minimum conductor heights for open ground (23 ft) and for over the highway (25 ft) when all circuits are operating at their maximum voltage (250 kV) and MCR (2,000 amperes). Figures 6.1.10-3 and 6.1.10-4 show EMF profiles for similar conditions except that only the outer (northernmost and southernmost) circuits are operating. Figures 6.1.10-5 and 6.1.10-6 give the corresponding profiles of EMF with only the inner (middle) circuits energized at maximum voltage and MCR.

**Substation Line Electric and Magnetic Field Values**

EMF are associated with the switching station, collector buses, and tie lines within the BHEC. These devices collectively constitute a 'substation' under Florida's EMF rule (Chapter 62-814, F.A.C.). Under the requirements of the Florida EMF rule, the strength of the EMF associated with a substation are determined by computing the fields associated with the transmission lines entering or leaving the substation at the point where they cross the facility property line. The calculated maximum EMF values for the proposed lines where they enter the BHEC property are shown in Table 6.1.10-3 and Figures 6.1.10-7 and 6.1.10-8. As with the preceding transmission line field data, these estimates are based on a model (BPA Corona and Field Effects Program) and show calculated estimates for the maximum operating voltage and MCR.

With phasing Option 1, the BHEC substation will comply with Florida's EMF rule (Chapter 62-814, F.A.C.), because, as indicated in Table 6.1.10-3, the electric field does not exceed 8 kV/m on the right-of-way or 2 kV/m at the edge of the right-of-way and the magnetic field does not exceed 150 mG at the edge of the right-of-way.

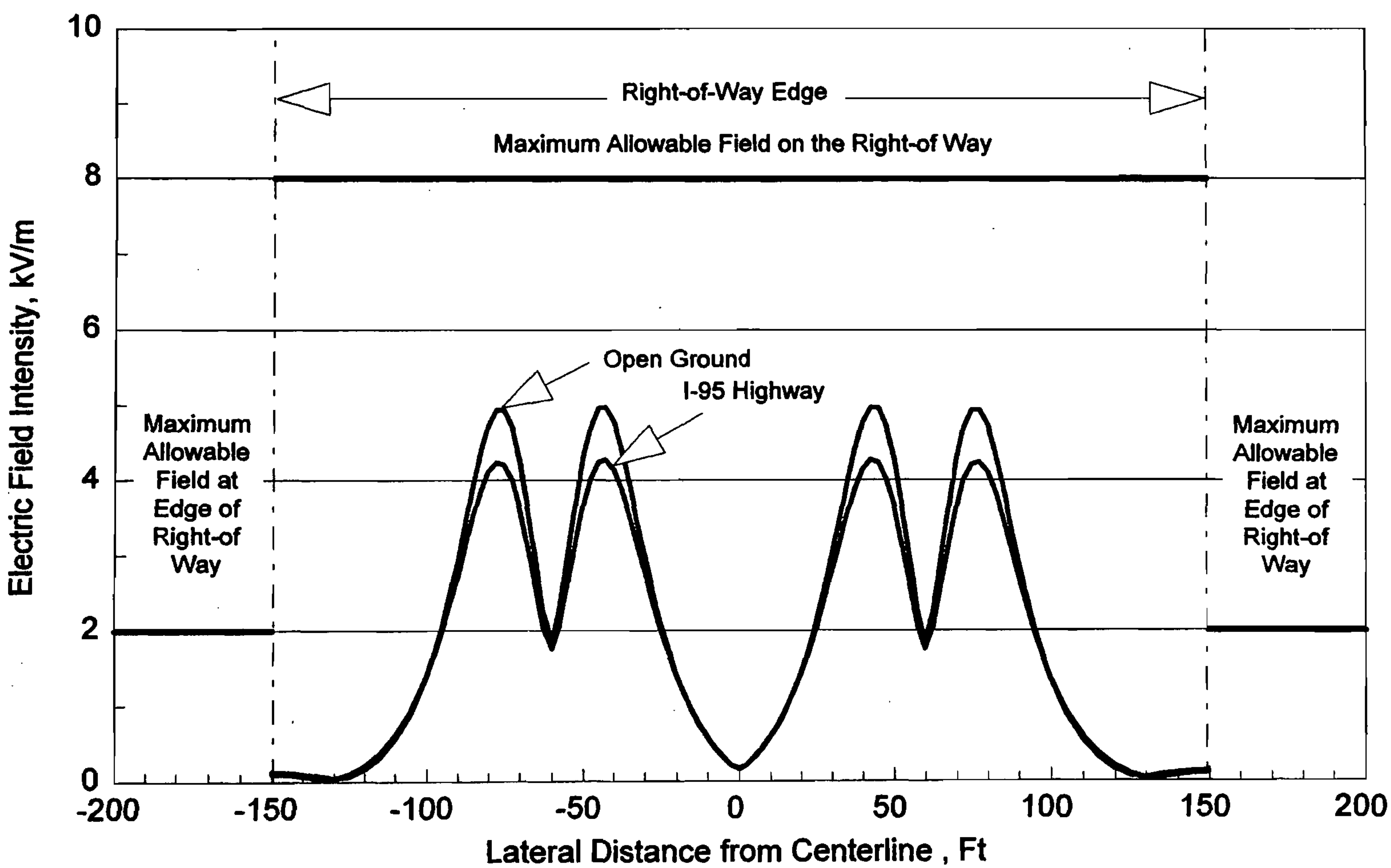


FIGURE 6.1.10-1. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH ALL FOUR CIRCUITS OPERATING (PHASING OPTION 1)
Source: ER&M, 2001.

CALPINE
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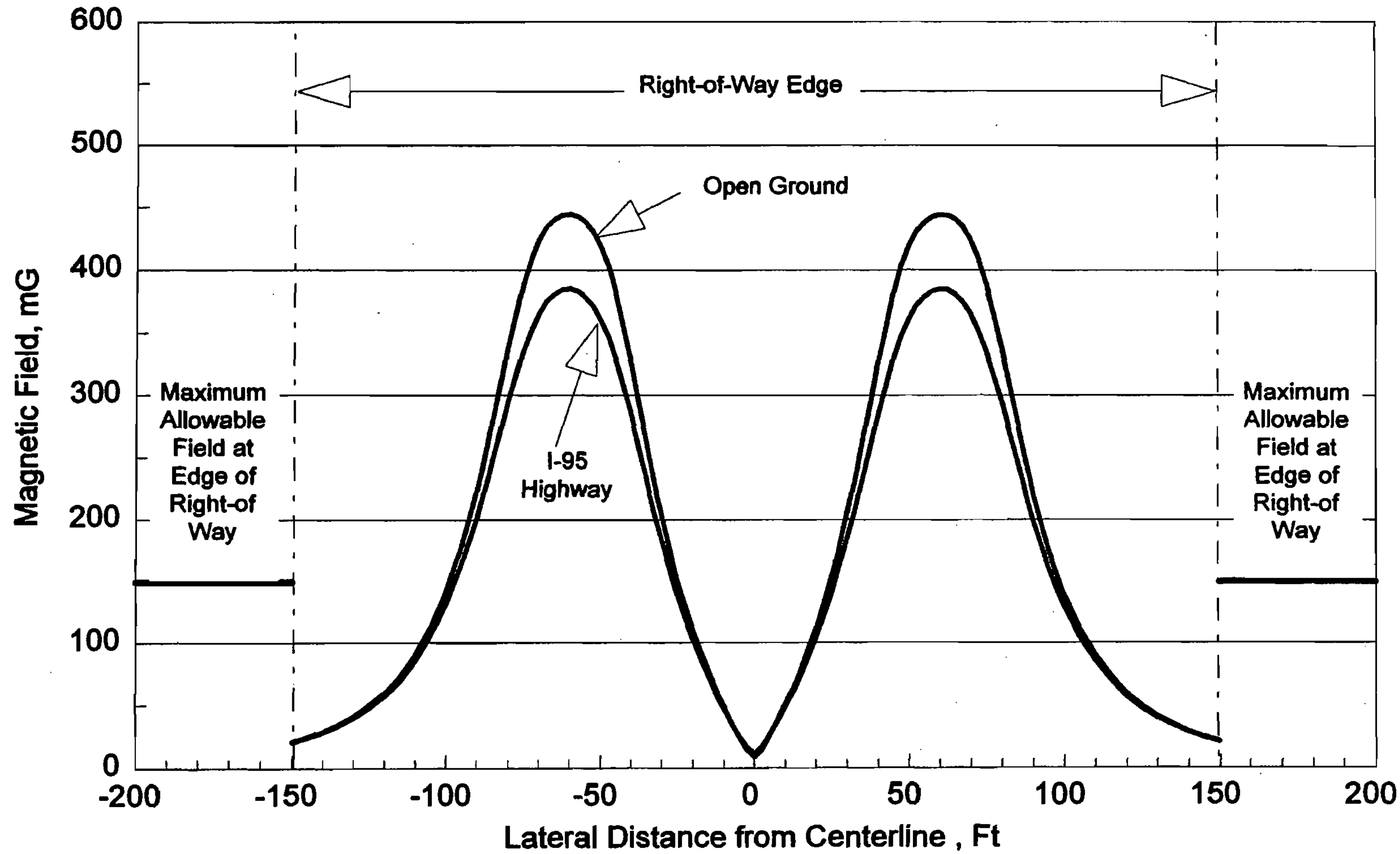


FIGURE 6.1.10-2. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CONDUCTOR RATING FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH ALL FOUR CIRCUITS OPERATING (PHASING OPTION 1)
Source: ER&M, 2001.

CALPINE
BLUE HERON
ENERGY CENTER

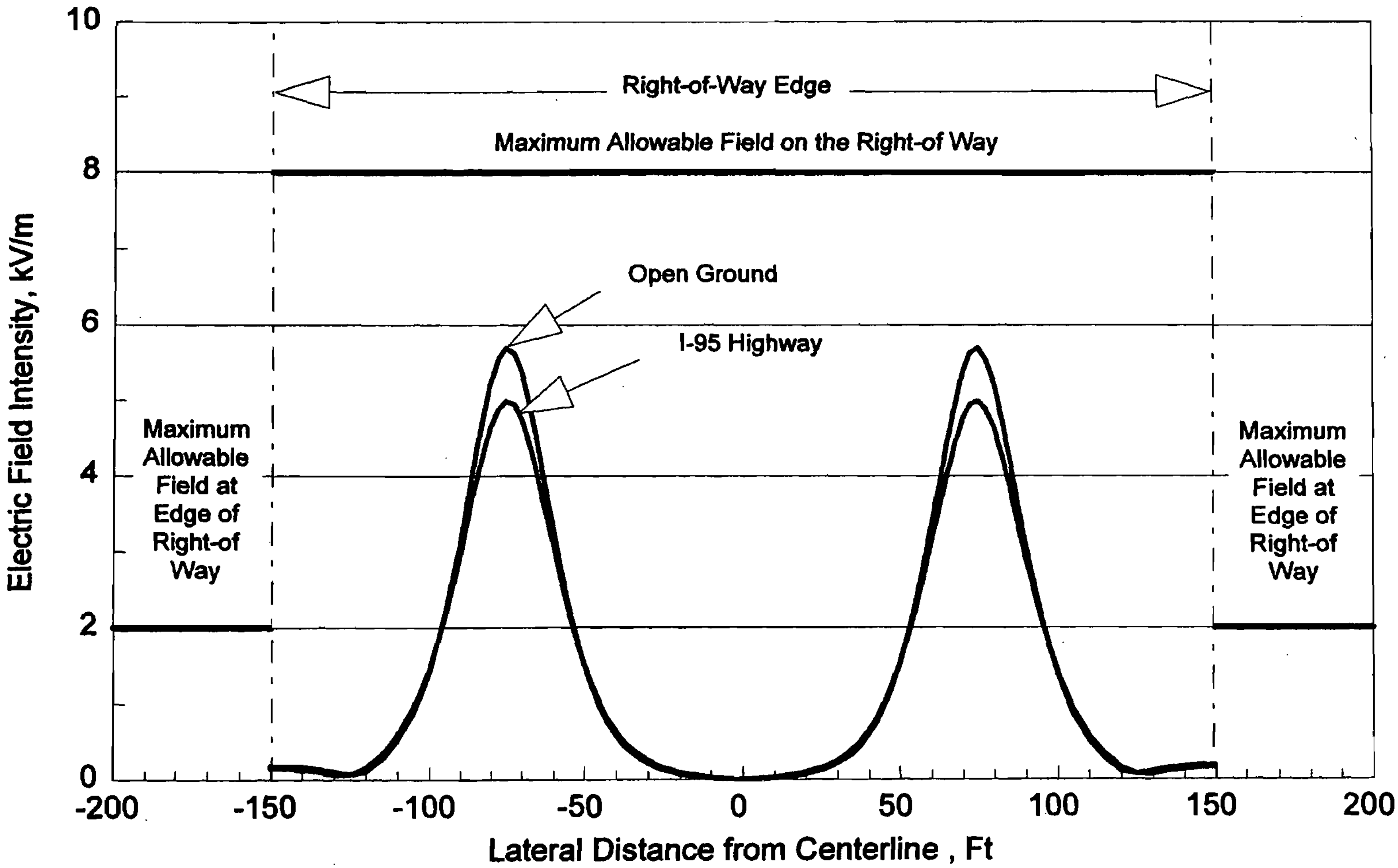


FIGURE 6.1.10-3. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH THE TWO OUTER CIRCUITS OPERATING (PHASING OPTION 1)

Source: ER&M, 2001.

CALPINE
BLUE HERON
ENERGY CENTER

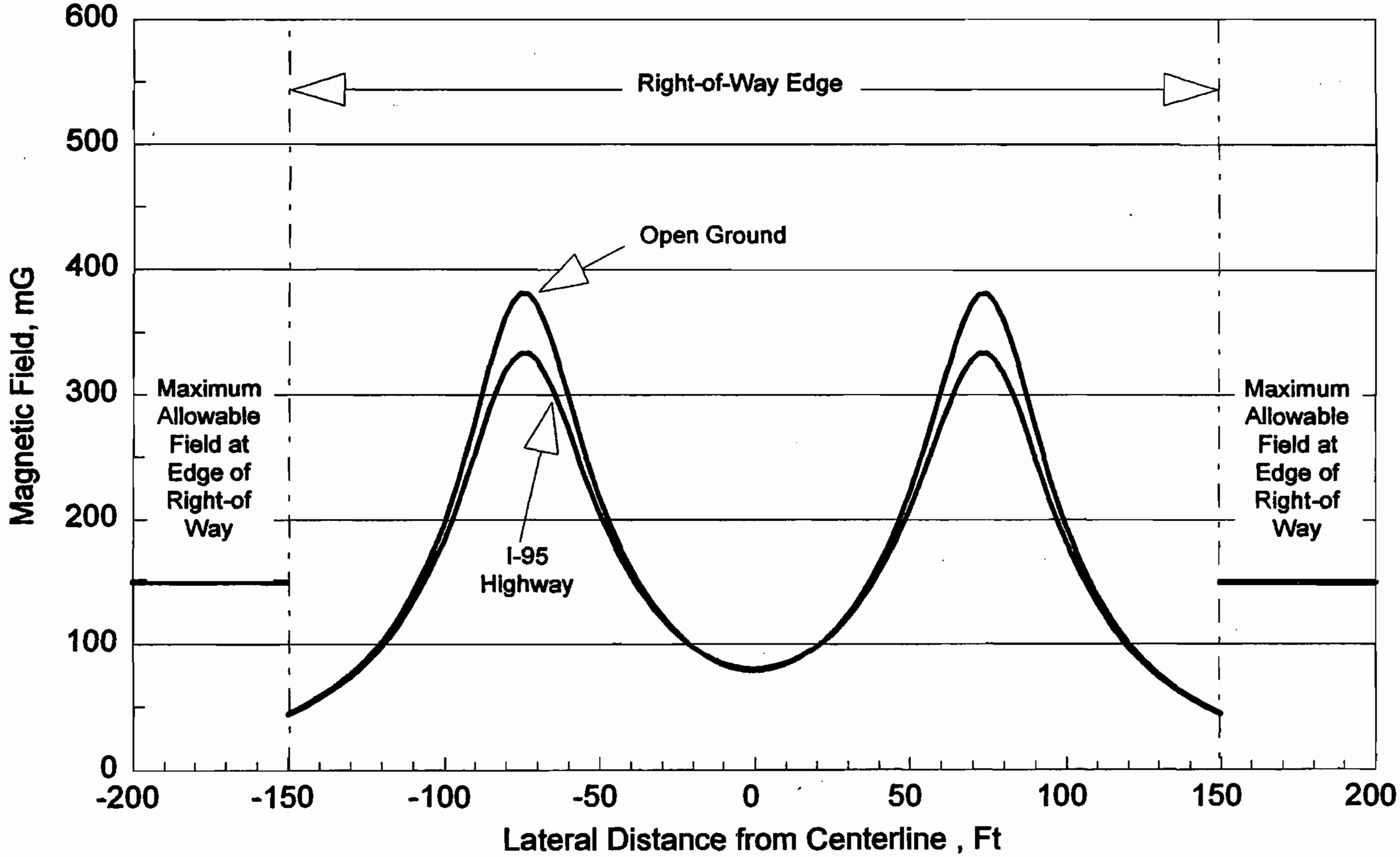


FIGURE 6.1.10-4. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CONDUCTOR RATING FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH THE TWO OUTER CIRCUITS OPERATING (PHASING OPTION 1)

Source: ER&M, 2001.

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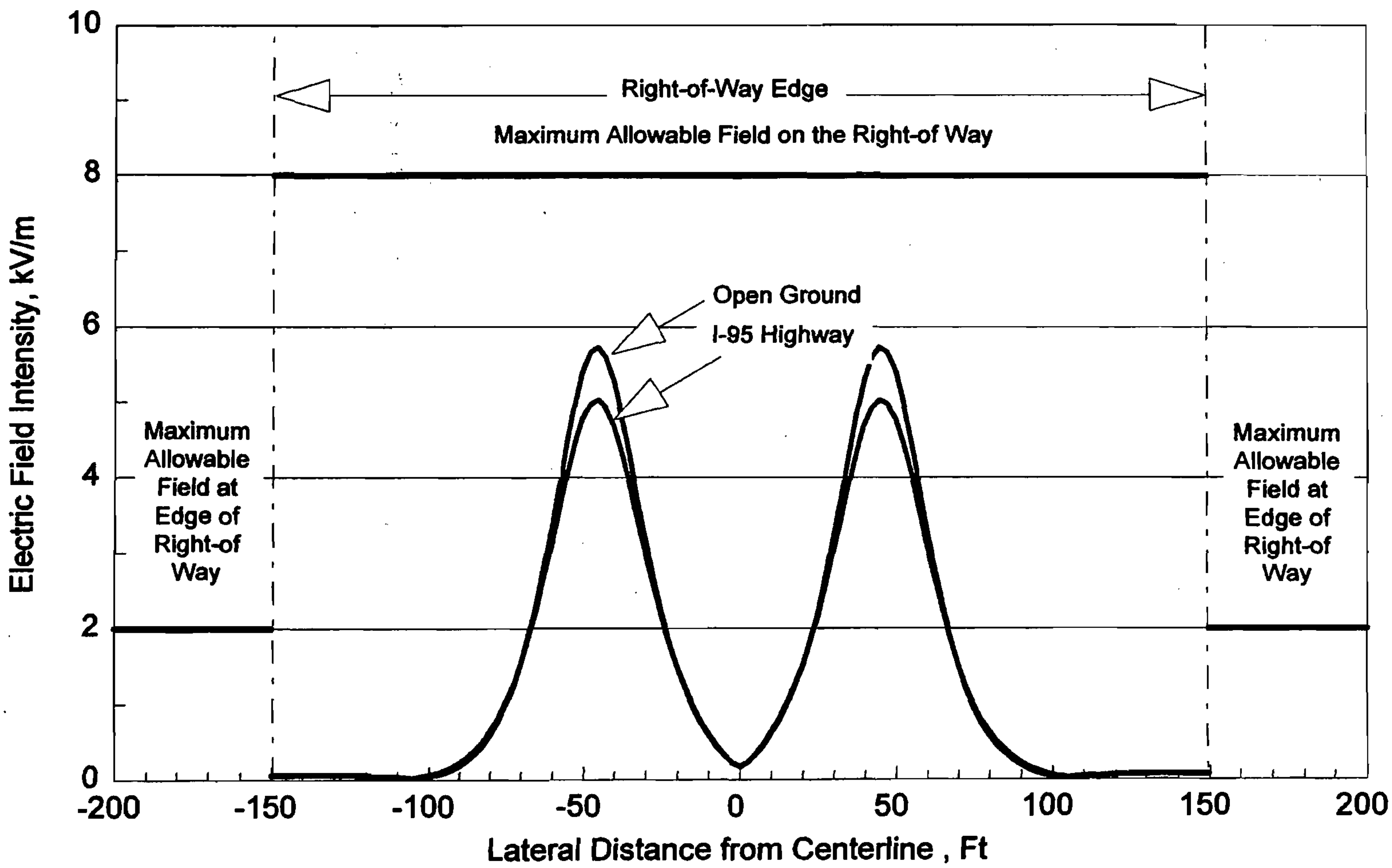


FIGURE 6.1.10-5. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH THE TWO INNER CIRCUITS OPERATING (PHASING OPTION 1)

Source: ER&M, 2001.

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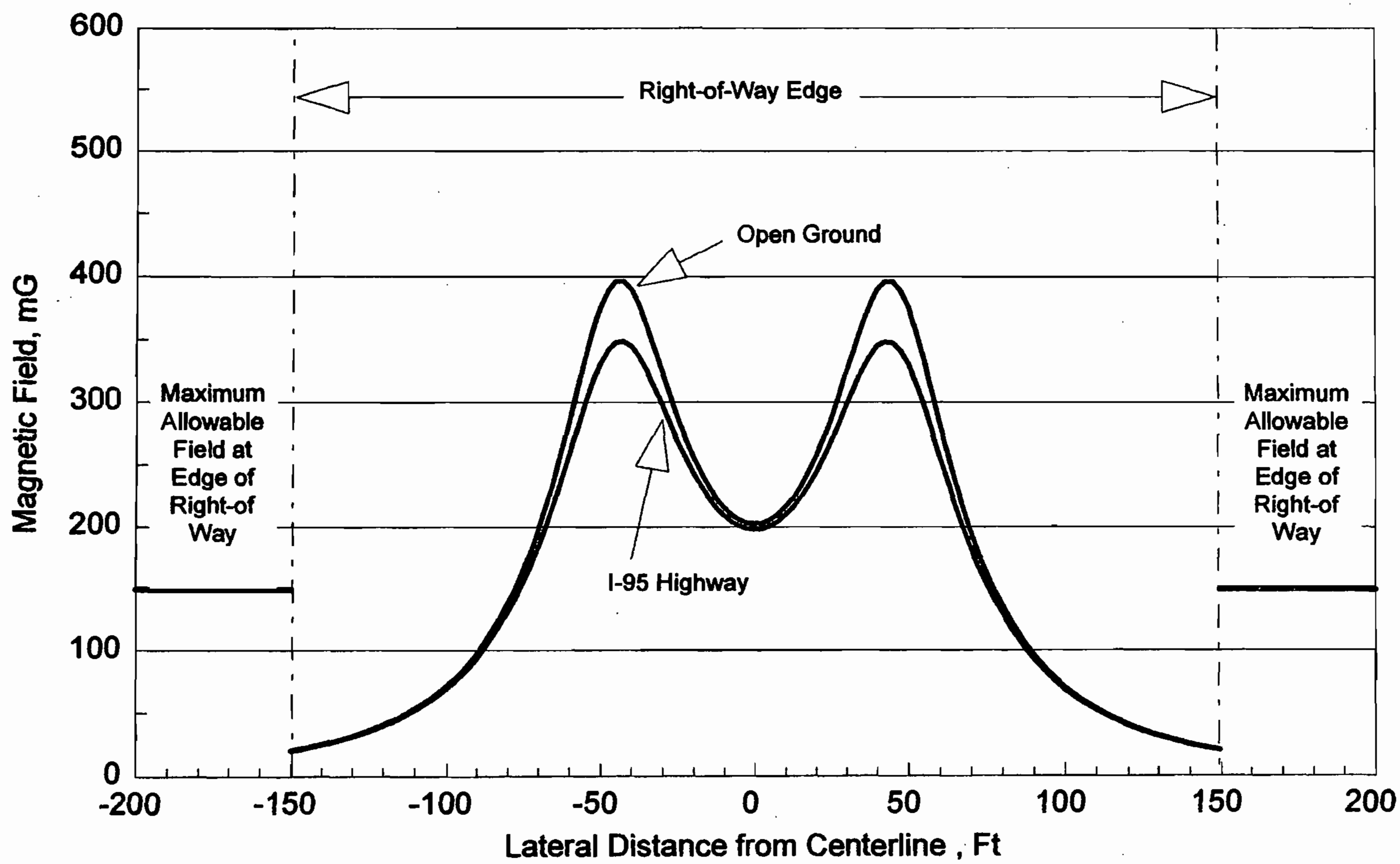


FIGURE 6.1.10-6. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CONDUCTOR RATING FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH THE TWO INNER CIRCUITS OPERATING (PHASING OPTION 1)

Source: ER&M, 2001.

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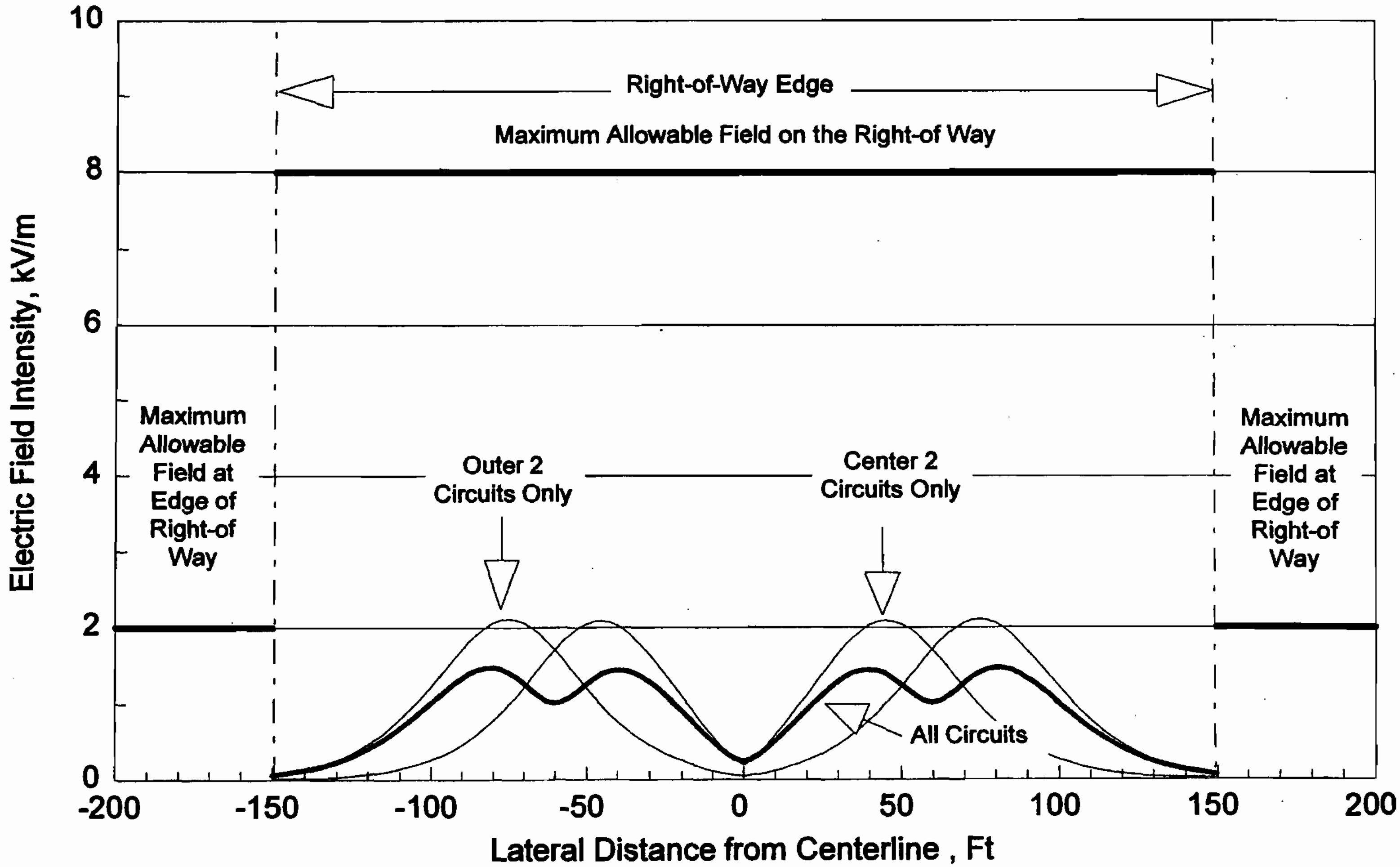


FIGURE 6.1.10-7. (REV. 1—12/04)
LATERAL PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE FOR MINIMUM CONDUCTOR HEIGHT AT THE CROSSING OF THE SUBSTATION PROPERTY LINE (PHASING OPTION 1)

Source: ER&M, 2001.

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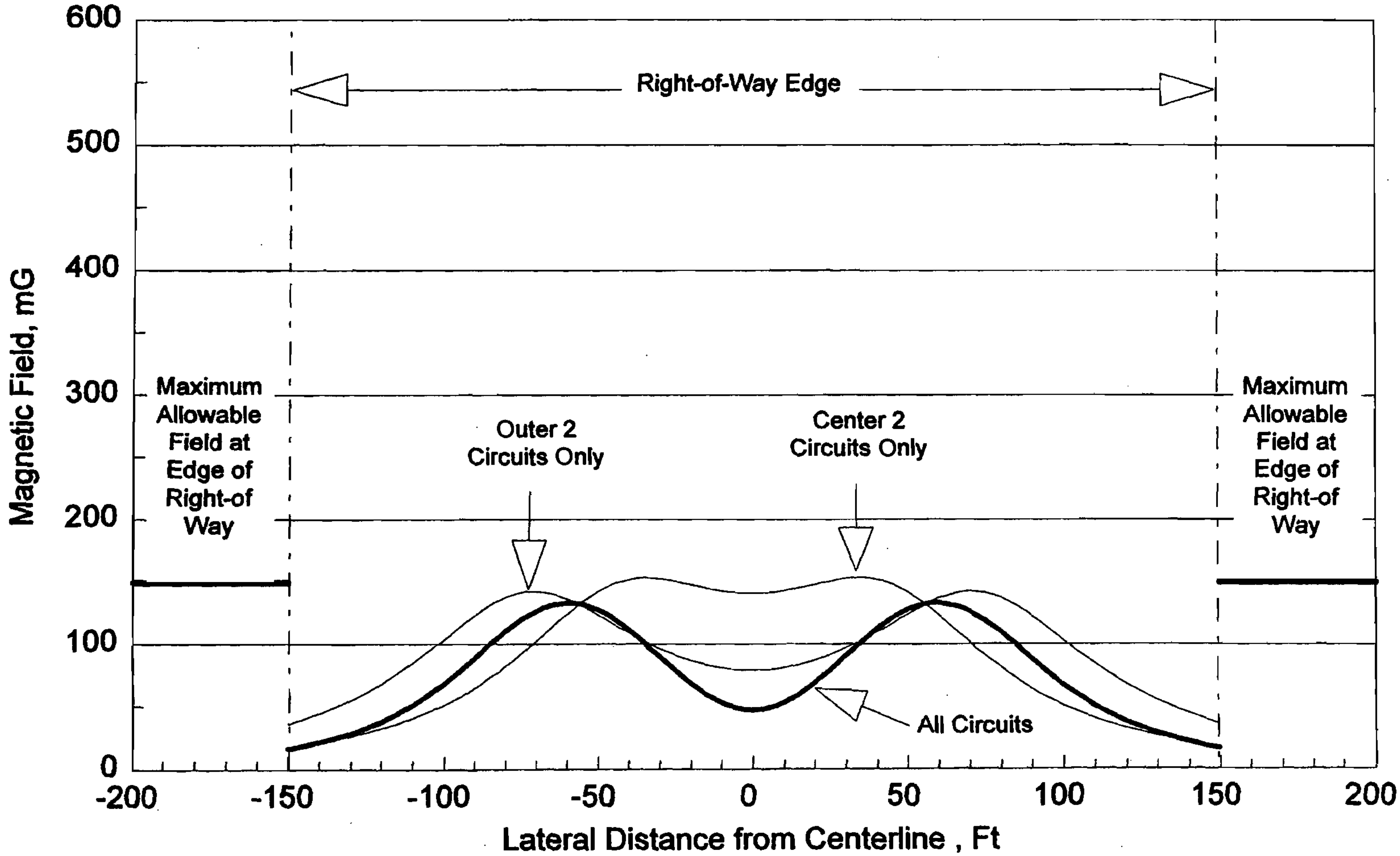


FIGURE 6.1.10-8. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CONDUCTOR RATING FOR MINIMUM CONDUCTOR HEIGHT AT THE CROSSING OF THE SUBSTATION PROPERTY LINE (PHASING OPTION 1)

Source: ER&M, 2001.

CALPINE
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**Table 6.1.10-3. Calculated Maximum EMF for the BHEC 230-kV Transmission Lines at the Point of Entry to the Facility Property—Phasing Option 1 (42.75 ft minimum conductor height)**

| | Electric Field (kV/m)[1] | | Magnetic Field (mG)[2] | |
|---|---|---|---|---|
| | On Right-of-Way | Edge of Right-of-Way | On Right-of-Way | Edge of Right-of-Way |
| All Circuits Operating | 1.47 | 0.07 | 133.3 | 16.6 |
| Two Circuits Operating | 2.11 [3] | 0.05 [3] | 153.5 [4] | 36.6 [3] |

[1] Electric field values based on maximum operating voltage (250 kV).
[2] Magnetic field values based on MCR for the lines (2000 amperes).
[3] Occurs with the most northerly and southerly circuits operating.
[4] Occurs with middle circuits operating.

Source: ER&M, 2001.

**Corona Effects**

The intense electric field at the surface of transmission line conductors can, under some conditions, result in localized ionization of the air near the conductors. This phenomena is called corona. Corona activity at the surface of transmission line conductors produces low levels of acoustic and radio-frequency electric energy which, under some conditions, can result in audible noise and radio or television interference.

Audible Noise

The primary cause of audible noise on high voltage transmission lines is corona resulting from water droplets on the conductors. As a result, rainy weather conditions produce the highest noise levels. The background noise of the falling rain tends to mask the transmission line noise to some extent. Gap-type discharges on hardware or scintillations on dirty or salt-contaminated insulators can also lead to audible noise in certain situations but are not anticipated to be significant noise sources on the 230-kV transmission lines associated with the BHEC. This is because the proposed lines will use noise-free hardware and the frequent heavy rain in east-central Florida will keep the insulators free of dirt and salt contamination.

During fair weather conditions, when the conductors are dry, the audible noise levels produced by the 230-kV transmission lines associated with the BHEC will be less than normal outdoor ambient noise levels. Dry conditions occur more than 90 percent of the time in the east-central Florida area.

Transmission line audible noise will increase when rain or very dense fog deposits water droplets on the transmission line conductors. This will occur less than 10 percent of the time. During these wet conditions, the median A-weighted sound pressure level (L50 level) of the proposed lines will be 33.4 dBA or less at the edge of the right-of-way. This noise level is well below the median sound pressure level of rainfall in open fields and on trees and shrubs (42 and 46 dBA, respectively) and well below the levels identified by the EPA as requisite to protect public health and welfare (EPA, 1974).

Indian River County has a noise ordinance (Indian River County, 1990) which establishes noise limits by land use category and by time of day. The applicable noise limit at the property boundary for agricultural districts, the category of land use in which the siting of the transmission lines is proposed, is 65 dBA (L50 level) in both daytime and night-time. The 33.4 dBA L50 noise level expected for the proposed transmission lines at the edge of the right-of-way is much less than the 65 dBA limit permitted by the County ordinance. The L10 and L1 noise levels (the noise level exceeded 10 and 1 percent of the time, respectively) for the transmission lines will be 37.9 and 42.2 dBA, respectively, at the edge of the right-of-way. These values are also much less than the corresponding limits of 70 dBA L10 and 75 dBA L1 specified by the County noise ordinance. In fact, the audible noise level of the proposed transmission lines will comply with the Indian River County Noise and Vibration Control Ordinance for all land use categories and times of day.

Radio and Television Interference

Electrical noise in the radio-frequency range can be produced by corona on transmission line conductors or by gap discharges on transmission line hardware. Corona noise is most significant in the lower frequencies such as those used for AM radio broadcast. Noise from gap discharges, on the other hand, extends to very high frequencies and is often a source of interference with television broadcast reception. Since the 230-kV transmission lines associated with the BHEC will be constructed with noise-free hardware, gap discharges are not anticipated to occur. Should a gap discharge develop on a damaged, defective, or improperly installed piece of hardware and lead to interference, it will be located and the associated hardware repaired or replaced. Therefore, the following analysis focuses on interference from corona on the transmission line conductors.

Communications systems making use of FM such as FM radio broadcast and business and public service communications are not affected by transmission line noise. Systems using AM such as AM radio and the video (picture) portion of the television broadcasts are sometimes affected if the broadcast signal strength is weak, the noise level is high, or both.

AM radio stations providing broadcast signals sufficiently strong to be free of naturally occurring atmospheric interference (static) at least 90 percent of the time are classified as providing Type A signal service by the FCC. Stations with Type A signal service will not experience objectionable interference from the proposed BHEC transmission lines during fair weather if the radio receiver is outside the right-of-way.

Weaker AM radio stations which are likely to experience naturally occurring atmospheric interference 10 to 50 percent of the time are defined as Type B signal service. Even these weak stations minimally meeting the Type B criterion will be free of objectionable interference from the proposed transmission lines during fair weather if the radio receiver is outside the right-of-way.

During rainy weather, naturally occurring radio interference from atmospheric electricity (static) increases significantly, causing interference with all but the stronger local AM radio stations. Consequently, interference from transmission line corona during rain is not a significant concern.

Grade A television signal strengths have been defined by the FCC as those capable of providing acceptable reception at 70 percent of the receiver locations more than 90 percent of the time. The proposed transmission lines will not cause interference with any Grade A television station under any weather condition regardless of antenna location outside the right-of-way.

Grade B television signals generally provide acceptable reception at 50 percent of the receiver locations 90 percent of the time. The proposed transmission lines will not interfere with the reception of these weaker Grade B signals at locations outside the right-of-way during any weather.

Some television viewers with outdoor antennas may attempt to use weak signals from distant television stations that do not meet the FCC's Grade B criteria. The proposed transmission lines will not interfere with the reception of these fringe stations during fair weather at locations off of the right-of-way. However, during heavy rain, there is a potential within 100 ft of the right-of-way for interference with the weakest fringe stations operating on Channels 2 through 6 that fall well short of meeting the Grade B criterion. Weak fringe stations operating on Channels 7 and above will receive no interference during rain at any location off of the right-of-way.

Although this analysis indicates the possibility of interference with some very weak fringe television stations during rain, the probability of such interference is low because it requires the simultaneous occurrence of several rare events. There will not be interference unless there is heavy rain falling, the station is well short of meeting the minimal Grade B criteria, the station is operating on Channel 2 through 6, and the antenna is in near proximity to the line and oriented in such a way that it collects the maximum amount of radio frequency noise from the transmission lines. Because of the short length of the proposed transmission lines and the land use of nearby parcels, there is essentially no probability of television interference resulting from the proposed transmission lines.

The proposed transmission lines will not interfere with cable television, satellite television, or normal or cellular telephone reception.

### 6.1.10.4 Electric and Magnetic Fields and Other Post-Construction Effects for Phasing Option 2

**Transmission Line Electric and Magnetic Fields Values**

The proposed transmission lines with phasing Option 2 will comply with Florida's EMF rule (Chapter 62-814, F.A.C.), which requires 230-kV lines to not exceed 2.0 kV/m for electric fields and 150 mG for magnetic fields at the edge of the right-of-way. The electric field must also not exceed 8 kV/m anywhere on the right-of-way. The calculated maximum EMF values for the proposed lines with phasing Option 2 are shown in Table 6.1.10-4. The estimates are based on a model (BPA Corona and Field Effects Program) and show calculated estimates for the maximum operating voltage and MCR. Data are shown for the absolute minimum midspan conductor height over open ground (23 ft) and the absolute minimum conductor height over the highway (25 ft).

**Table 6.1.10-4. Calculated Maximum EMF for the BHEC 230-kV Transmission Lines (Phasing Option 2)**

| | Electric Field (kV/m)[1] | | Magnetic Field (mG)[2] | |
|---|---|---|---|---|
| | On Right-of-Way | Edge of Right-of-Way | On Right-of-Way | Edge of Right-of-Way |
| Minimum Midspan Height (23 ft) | | | | |
| All Circuits Operating | 4.95 | 0.11 | 428.4 | 24.9 |
| Only Two Circuits Operating | 5.68 [3] | 0.23 [3] | 355.6 [3] | 57.1 [3] |
| Minimum Height Over Highway (25 ft) | | | | |
| All Circuits Operating | 4.26 | 0.09 | 369.0 | 24.4 |
| Only Two Circuits Operating | 4.98 [3] | 0.20 [3] | 308.3 [3] | 56.0 [3] |

[1] Electric field values based on maximum operating voltage (250 kV).
[2] Magnetic field values based on MCR for the lines (2000 amperes).
[3] Occurs with the most northerly and southerly circuits operating.

Source: ER&M, 2001.

Because of the conductor phase arrangement selected for these transmission lines, the EMF produced by one circuit tend to cancel part of the fields produced by the other circuit on the same structure. For that reason, EMF are higher in some locations when only one circuit of each line is energized. While these lines are not intended to operate with only one circuit energized, they may occasionally do so because of maintenance or an unexpected outage of a circuit. Table 6.1.10-4 shows modeled field levels for only one circuit on each structure energized at maximum voltage and MCR.

Figures 6.1.10-9 and 6.1.10-10 depict the horizontal profile for EMF, respectively, for the proposed transmission lines with phasing Option 2 at the absolute minimum conductor heights for open ground (23 ft) and for over the highway (25 ft) when all circuits are operating at their maximum voltage (250 kV) and MCR (2,000 amperes). Figures 6.1.10-11 and 6.1.10-12 show EMF profiles with phasing Option 2 for similar conditions except that only the outer (northernmost and southernmost) circuits are operating. Figures 6.1.10-13 and 6.1.10-14 give the corresponding profiles of EMF with only the inner (middle) circuits energized at maximum voltage and MCR.

**Substation Line Electric and Magnetic Fields Values**

EMF are associated with the switching station, collector buses, and tie lines within the BHEC. These devices collectively constitute a *substation* under Florida's EMF rule (Chapter 62-814, F.A.C.). Under the requirements of the Florida EMF rule, the strength of the EMF associated with a substation are determined by computing the fields associated with the transmission lines entering or leaving the substation at the point where they cross the facility property line. The calculated maximum EMF values for the proposed lines with phasing Option 2 where they enter the BHEC Site are shown in Table 6.1.10-5 and Figures 6.1.10-15 and 6.1.10-16. As with the preceding transmission line field data, these estimates are based on a model (BPA Corona and Field Effects Program) and show calculated estimates for the maximum operating voltage and MCR.

With phasing Option 2, the BHEC substation will comply with Florida's EMF rule (Chapter 62-814, F.A.C.), because, as indicated in Table 6.1.10-5, the electric field does not exceed 8 kV/m on the right-of-way or 2 kV/m at the edge of the right-of-way and the magnetic field does not exceed 150 mG at the edge of the right-of-way.

Transmission line audible noise will increase when rain or very dense fog deposits water droplets on the transmission line conductors. This will occur less than 10 percent of the time. During these wet conditions, the median A-weighted sound pressure level of the proposed lines under phasing Option 2 will be 33.3 dBA or less at the edge of the right-

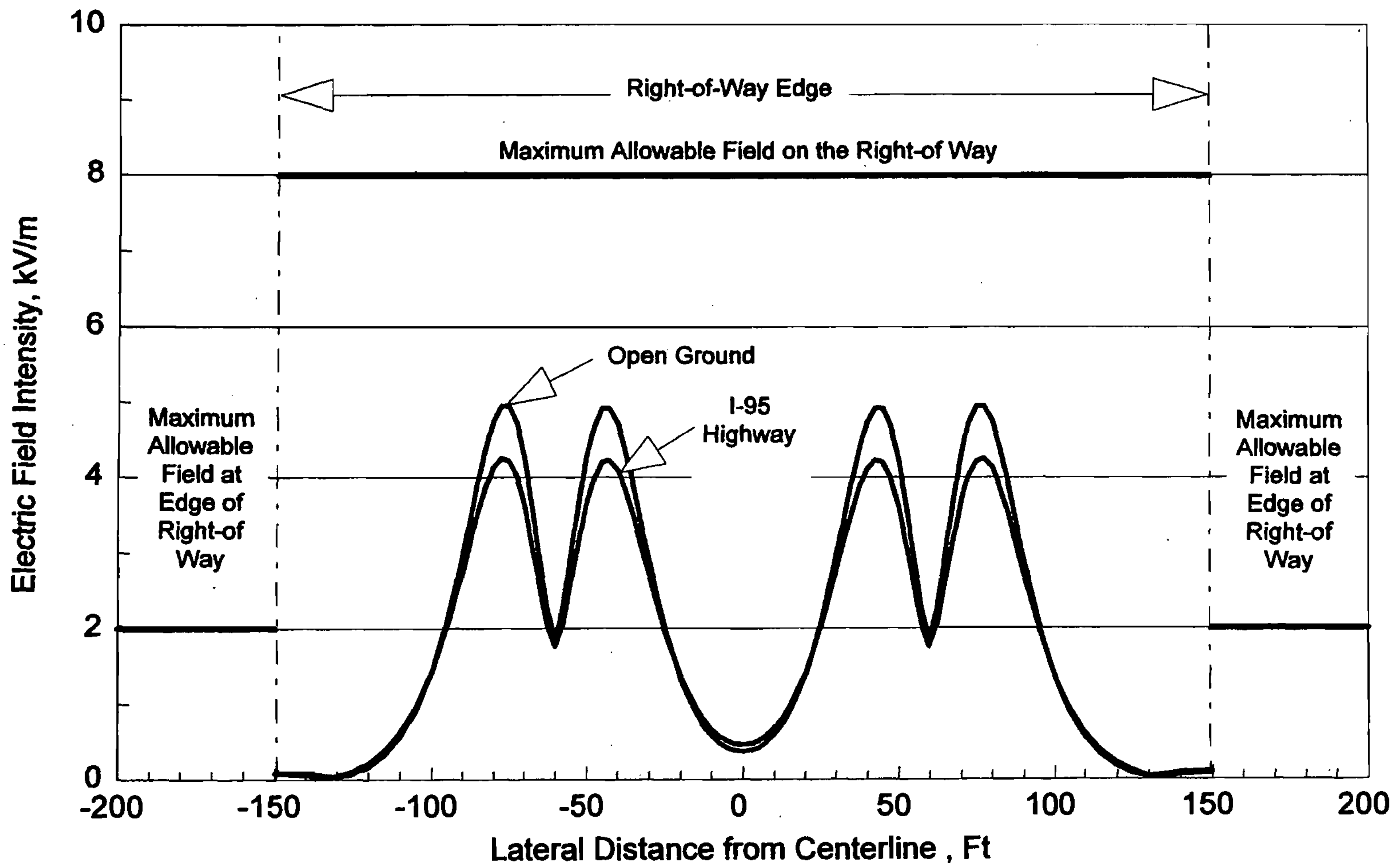


FIGURE 6.1.10-9. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLAGE FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH ALL FOUR CIRCUITS OPERATING (PHASING OPTION 2)

Source: ER&M, 2001.

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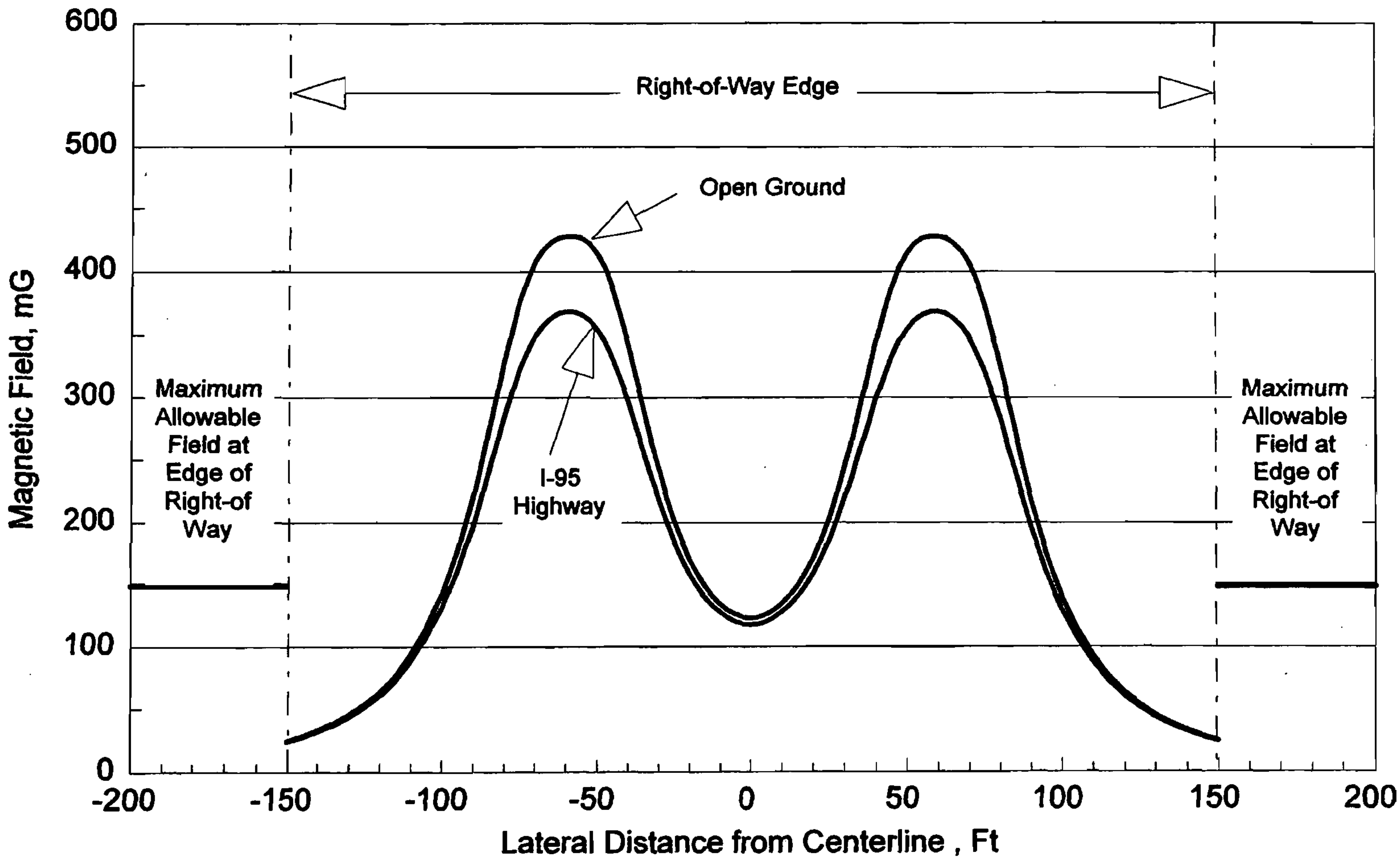


FIGURE 6.1.10-10. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CONDUCTOR RATING FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH ALL FOUR CIRCUITS OPERATING (PHASING OPTION 2)

Source: ER&M, 2001.

CALPINE
BLUE HERON
ENERGY CENTER

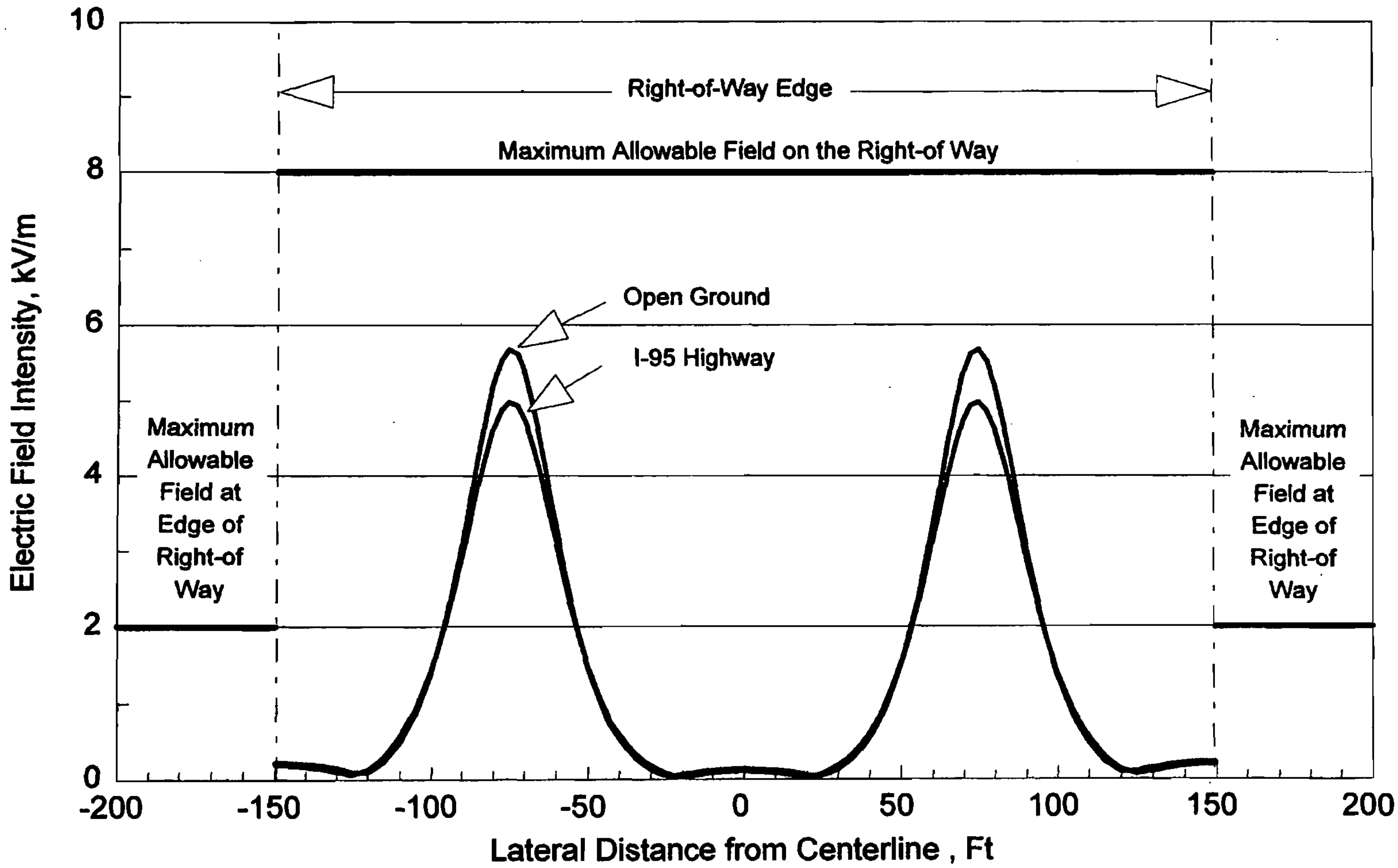


FIGURE 6.1.10-11. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLAGE FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH THE TWO OUTER CIRCUITS OPERATING (PHASING OPTION 2)

Source: ER&M, 2001.

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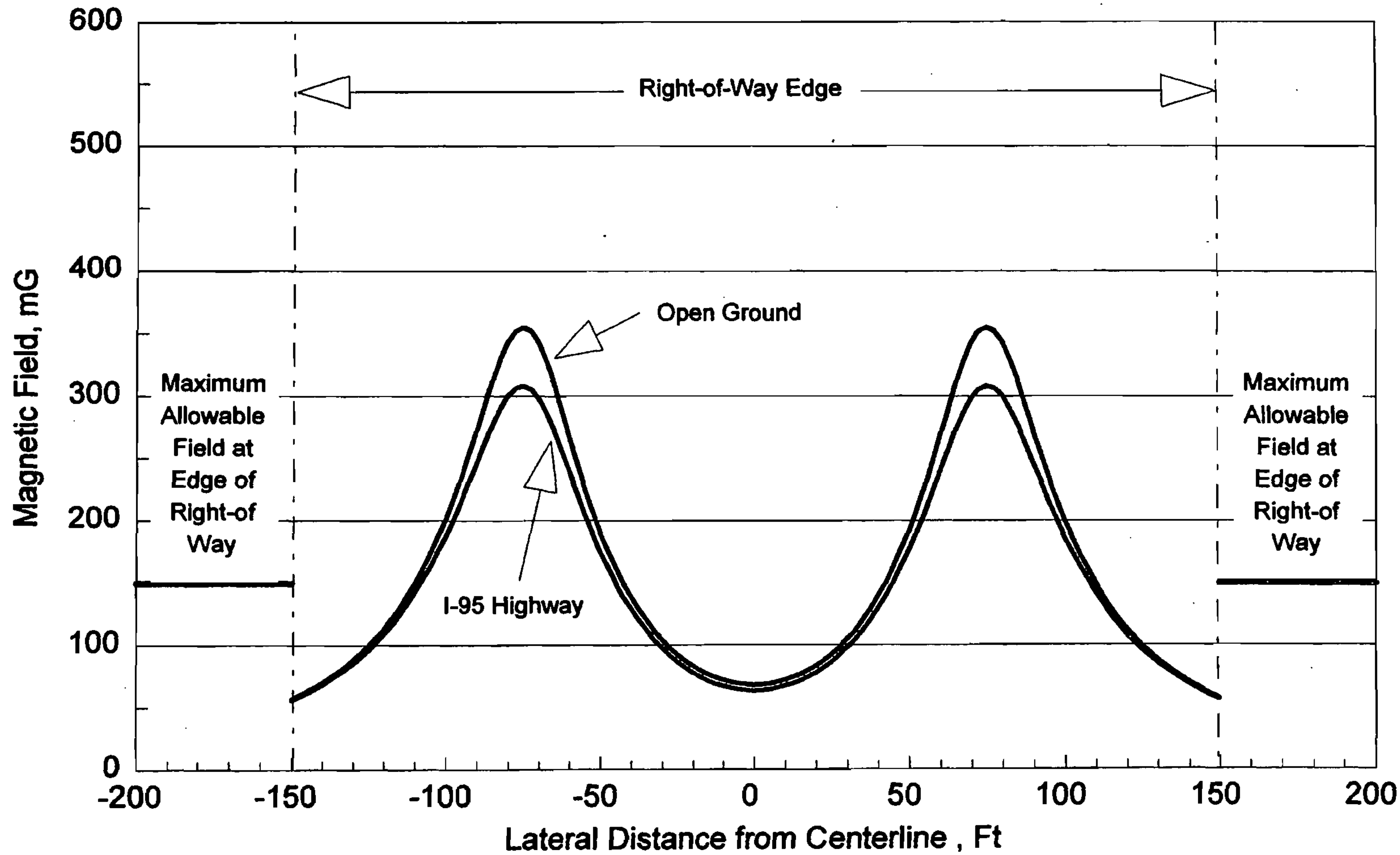


FIGURE 6.1.10-12. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CONDUCTOR RATING FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH THE TWO OUTER CIRCUITS OPERATING (PHASING OPTION 2)
Source: ER&M, 2001.

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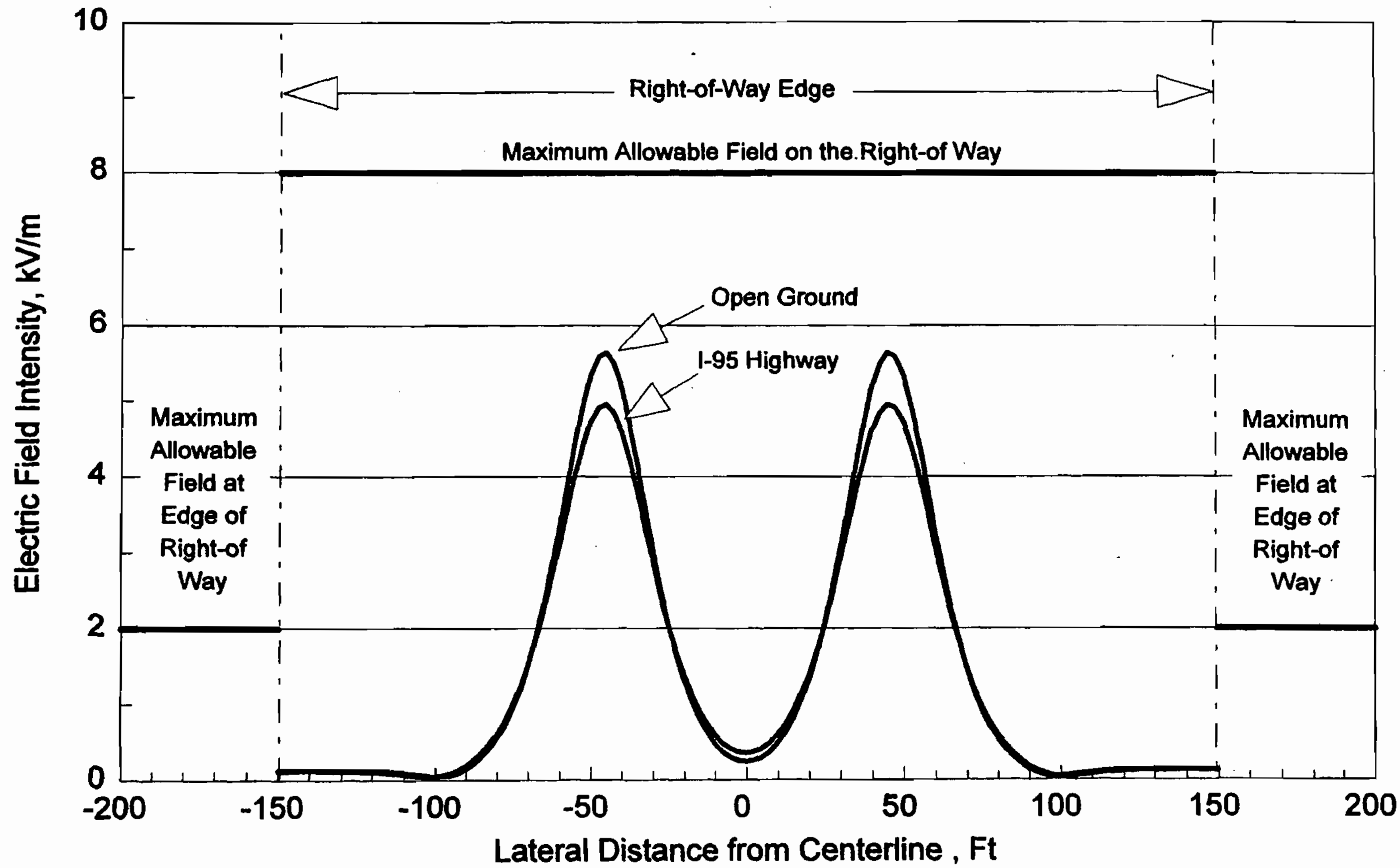


FIGURE 6.1.10-13. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLAGE FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH THE TWO INNER CIRCUITS OPERATING (PHASING OPTION 2)

Source: ER&M, 2001.

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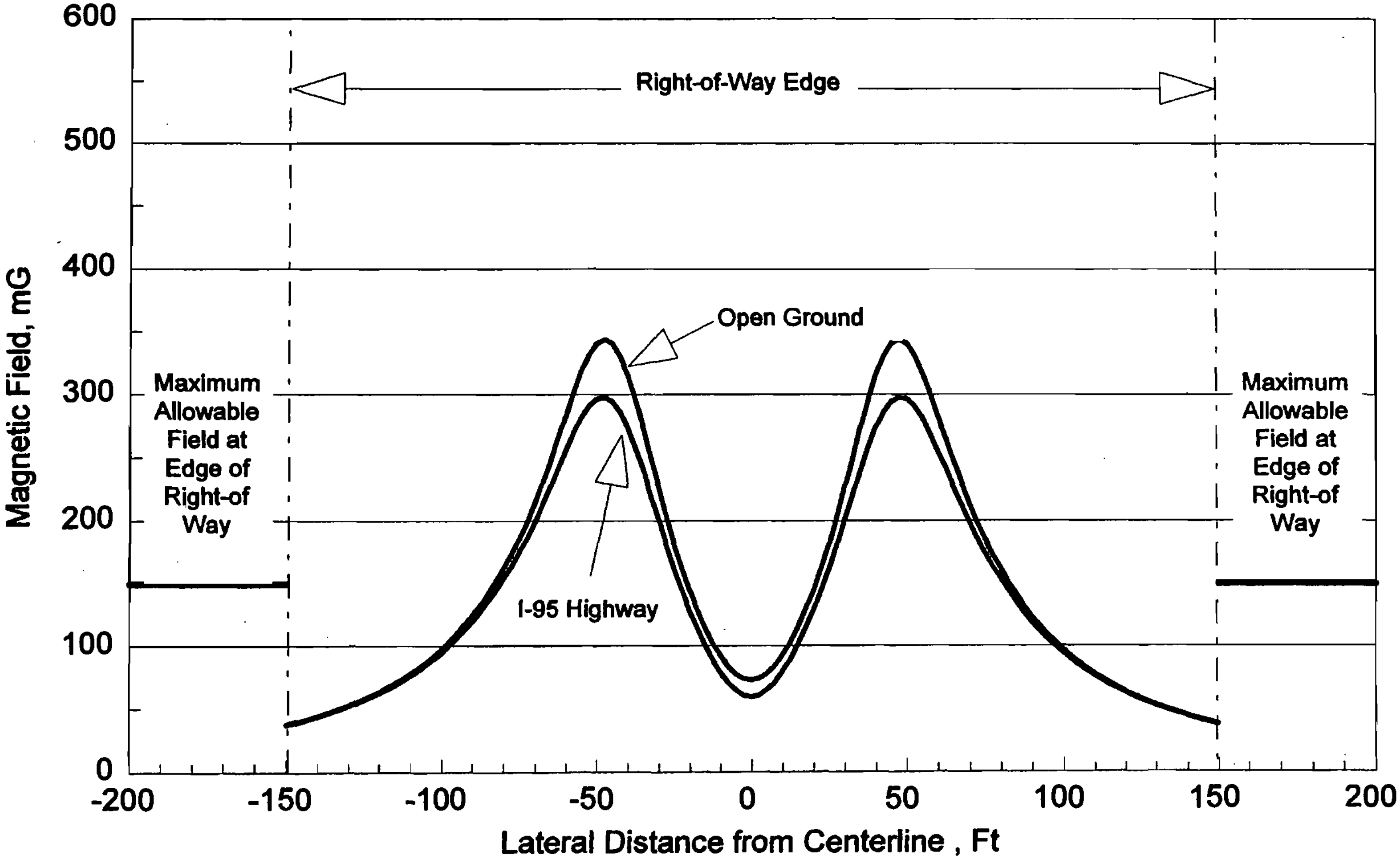


FIGURE 6.1.10-14. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CONDUCTOR RATING FOR MINIMUM CONDUCTOR HEIGHTS OVER OPEN GROUND (23 FT) AND AT HIGHWAY CROSSINGS (25 FT) WITH THE TWO INNER CIRCUITS OPERATING (PHASING OPTION 2)
Source: ER&M, 2001.

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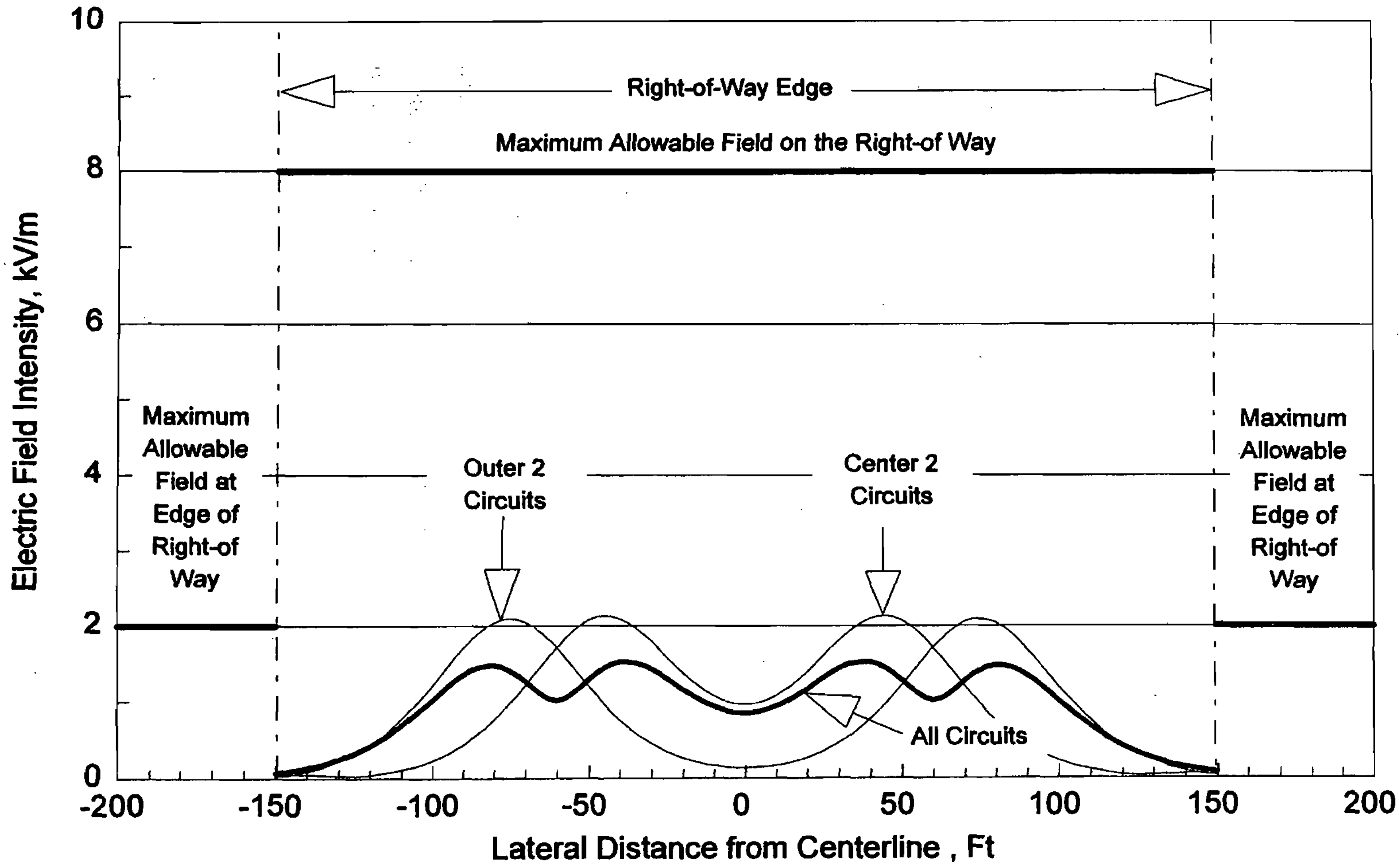


FIGURE 6.1.10-15. (REV. 1—12/04)
LATERAL PROFILE OF ELECTRIC FIELD AT MAXIMUM OPERATING VOLTAGE FOR MINIMUM CONDUCTOR HEIGHT AT THE CROSSING OF THE SUBSTATION PROPERTY LINE (PHASING OPTION 2)

Source: ER&M, 2001.

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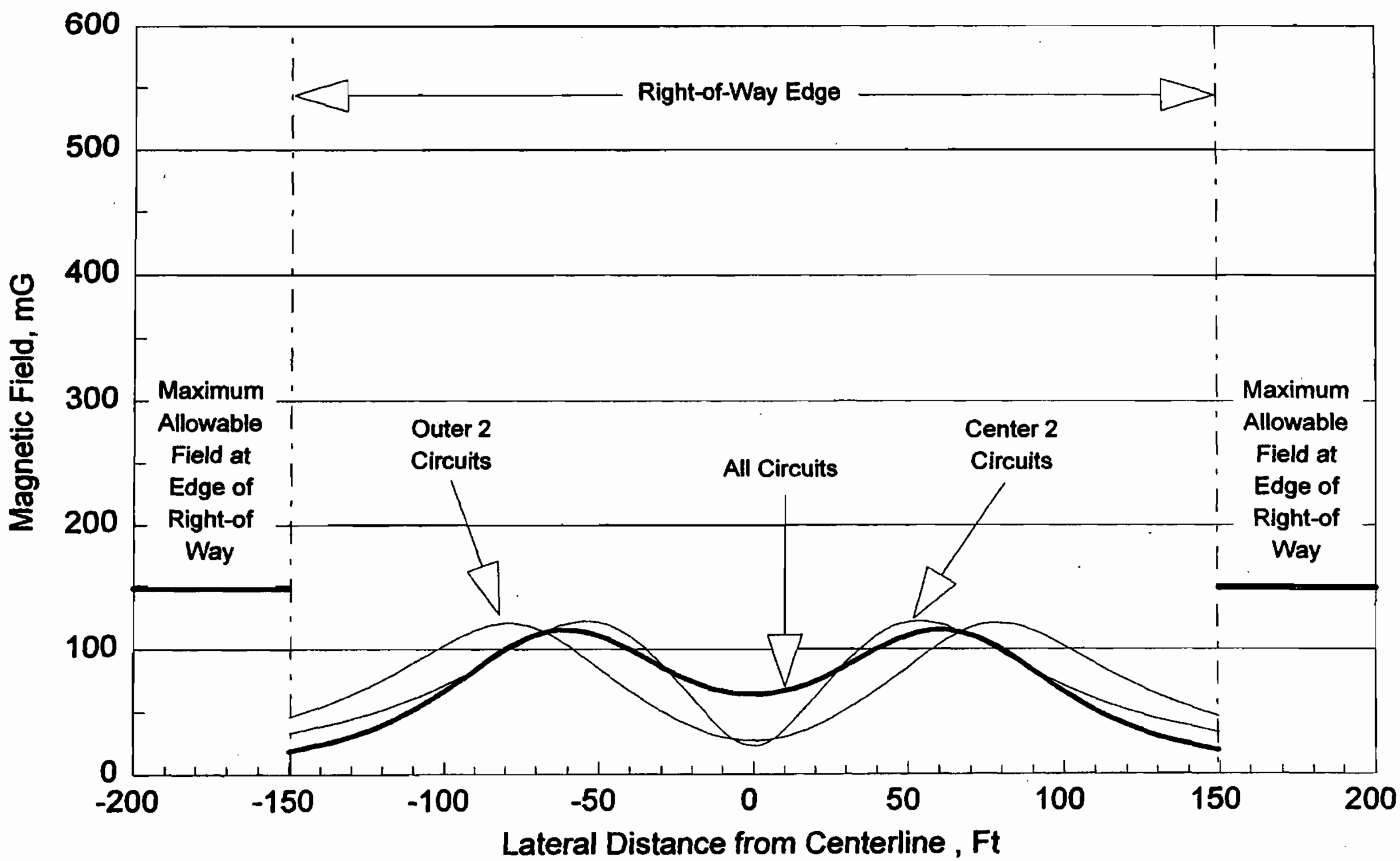


FIGURE 6.1.10-16. (REV. 1—12/04)
LATERAL (MID-SPAN) PROFILE OF MAGNETIC FIELD AT MAXIMUM CONDUCTOR RATING FOR MINIMUM CONDUCTOR HEIGHT AT THE CROSSING OF THE SUBSTATION PROPERTY LINE (PHASING OPTION 2)

Source: ER&M, 2001.

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**Table 6.1.10-5. Calculated Maximum EMF for the Blue Heron Energy Center 230-kV Transmission Lines at the Point of Entry to the Facility Property—Phasing Option 2 (42.75 ft minimum conductor height)**

| | Electric Field (kV/m)[1] | | Magnetic Field (mG)[2] | |
|---|---|---|---|---|
| | On Right-of-Way | Edge of Right-of-Way | On Right-of-Way | Edge of Right-of-Way |
| All Circuits Operating | 2.09 | 0.08 | 115.8 | 19.2 |
| Two Circuits Operating | 2.13 [3] | 0.06 [3] | 123.0 [3] | 46.4 [4] |

[1] Electric field values based on maximum operating voltage (250 kV).
[2] Magnetic field values based on MCR for the lines (2000 amperes).
[3] Occurs with middle circuits operating.
[4] Occurs with the most northerly and southerly circuits operating.

Source: ER&M, 2001.

of-way. This noise level is well less than the median sound pressure level of rainfall in open fields and on trees and shrubs (42 and 46 dBA, respectively) and well below the levels identified by the EPA as requisite to protect public health and welfare (EPA, 1974).

Indian River County has a noise ordinance (Indian River County, 1990) which establishes noise limits by land use category and by time of day. The applicable noise limit at the property boundary for agricultural districts, the category of land use in which the siting of the transmission lines is proposed, is 65 dBA (L50 level) in both daytime and night-time. The 33.3 dBA L50 noise level expected for the proposed transmission lines with phasing Option 2 at the edge of the right-of-way is much less than the 65 dBA limit permitted by the County ordinance. The L10 and L1 noise levels (the noise level exceeded 10 and 1 percent of the time, respectively) for the transmission lines will be 37.8 and 42.1 dBA respectively at the edge of the right-of-way. These values are also much less than the corresponding limits of 70 dBA L10 and 75 dBA L1 specified by the County noise ordinance. In fact, the audible noise level of the proposed transmission lines will comply with the Indian River County Noise and Vibration Control Ordinance for all land use categories and times of day.

Radio and Television Interference

Radio and television interference as a result of this transmission line were previously discussed in Section 6.1.10.3. Those conclusions apply to phasing Option 2 as well.

**6.1.10.5 Electric and Magnetic Fields Summary**

As shown in the preceding sections, either transmission phasing design option will meet Florida's standards for EMF at the edge of the right-of-way and maximum electric field standards on the right-of-way.

Audible noise produced by the lines will be minimal and well below Indian River County's noise standards. No radio or television interference is likely.

No other post construction or operation impacts are expected with the proposed transmission line interconnection.

## 6.2 NATURAL GAS PIPELINE

### 6.2.1 PROJECT INTRODUCTION

The proposed BHEC will utilize natural gas exclusively for fuel. Natural gas will be supplied to the BHEC from the FGT natural gas transmission system. FGT will permit, construct, own, and operate a natural gas pipeline lateral from its existing pipeline system, which is located between the FPL electric transmission rights-of-way to a new metering station, also located west of I-95. FGT will be responsible for permitting and constructing the new metering station. The station will be located on property that will be owned by Calpine. Accordingly, Calpine is not seeking certification of the FGT natural gas pipeline lateral and new metering station in this proceeding.

Calpine proposes to construct an approximately 1,000-ft natural gas pipeline interconnection from the FGT metering station to a gas regulating station located within the BHEC Site. The approximately 1,000-ft interconnection will be a single 12-inch pipeline extending from the metering station to the Site. Therefore, Calpine is seeking certification of the proposed corridor for this natural gas pipeline interconnection in this PPSA proceeding.

The baseline descriptions and impacts associated with the proposed pipeline are discussed in this section in accordance with FDEP's instruction guide for associated linear facilities.

### 6.2.2 CORRIDOR LOCATION AND LAYOUT

The proposed natural gas pipeline corridor to the BHEC Site is approximately 800 ft wide and varies in length from 700 to 1,000 ft to the BHEC Site property. The corridor overlaps the proposed electric transmission line corridor described previously in Section 6.1. The northern boundary of the pipeline corridor is the same as the northern boundary of the transmission line corridor, while the southern pipeline boundary extends approximately 350 ft to the south of the transmission line corridor boundary. Except for the 300-ft I-95 right-of-way, the proposed pipeline corridor is located on property, which will be owned by Calpine outside of the BHEC Site. The pipeline will run to a gas regulating station constructed on the BHEC Site.

Figure 6.1.2-1 shows the BHEC Site and the proposed natural gas pipeline corridor location on an FDOT county highway map (scale: 1:126,720), including major landmarks within a 5-mile radius. Figures 6.1.2-2 and 6.1.2-3 show the proposed corridor and major features in the corridor vicinity at a scale of 1:24,000 on a USGS topographic map and at a scale of 1 inch equals 600 ft on an aerial photograph, respectively. As shown on these figures, the existing FGT natural gas pipeline system is located in an easement between the two FPL 230-kV transmission lines which parallel I-95, approximately 500 ft to the west of the highway right-of-way.

### 6.2.3 PIPELINE DESIGN CHARACTERISTICS

The proposed pipeline will be a 12-inch steel pipe installed underground approximately 36 inches below grade. Greater depths will occur where crossing under I-95. Directional drilling methods will be employed by Calpine at the I-95 crossing. The pipeline will require a 50-ft permanent right-of-way with an approximately 10-ft-width over the pipe being maintained in a grassy/herbaceous state. Calpine will require up to 95 ft of right-of-way for construction work space.

### 6.2.4 COST PROJECTIONS

The estimated total cost to construct this proposed pipeline interconnection is $800,000 (2001 dollars), excluding land acquisition costs. This estimate is based on the following assumptions:

- All parts, labor, and equipment.
- Directional drilling at the I-95 crossing.
- Restoration costs.

### 6.2.5 CORRIDOR SELECTION

The proposed corridor was selected to minimize environmental and land use impacts, while meeting the needs of the BHEC Project. The proposed corridor is the shortest route to interconnect with the FGT natural gas transmission system and, except for the I-95 right-of-way, lies within property which will be owned by Calpine. I-95 will be crossed underground by directional drilling to minimize impacts on the highway.

## 6.2.6 SOCIO-POLITICAL ENVIRONMENT OF THE CORRIDOR AREA

### 6.2.6.1 Governmental Jurisdictions

As shown in Figures 6.1.2-1 and 6.1.2-2, the proposed natural gas pipeline corridor is located within the unincorporated area of Indian River County. The unincorporated area of St. Lucie County is located approximately 1,300 ft south of the corridor. The nearest incorporated area to the corridor is the City of Vero Beach, which is located approximately 5 miles northeast of the corridor. There are no local, regional, state, or federal environmentally protected areas within 5 miles of the corridor.

### 6.2.6.2 Zoning and Land Use Plans

As previously shown in Figure 2.2.2-1, the corridor will be located in an area identified as AG-2 (Agriculture) under Indian River County's Comprehensive Plan Future Land Use Map (Indian River County, 1998). The proposed Project has been found to be in compliance with the Indian River County Comprehensive Land Use Plan. The proposed natural gas pipeline interconnection is an integral component of the Project and has been reviewed for compliance by the Indian River County Planning Department.

Figure 2.2.2-2 depicts zoning districts for the Site and proposed natural gas pipeline corridor area. As shown in this figure, the corridor will lie within the A-2 (Agriculture) zoning designation. Similar to electric transmission lines, natural gas pipelines are defined as essential services in Section 901.03 of the Code of Indian River County (Indian River County, 2000) and are not specifically prohibited in any zoning designation. Public/Private Utilities, Heavy, are allowed in agricultural zoned districts with approval of a Special Exception Use. Indian River County has approved a Special Exception Use for the Project as well as a Conceptual Site Plan (see Appendix 10.1.6). The Conceptual Site Plan included the natural gas pipeline corridor. In accordance with Section 914.07 of the Code of Indian River, the final natural gas pipeline alignment will be reviewed through the administrative approval process for the final Site Plan.

### 6.2.6.3 Easements, Title, Agency Works

Calpine will require an underground crossing easement from the FDOT for the crossing of I-95. No structures will be placed at grade within the right-of-way of FDOT or any other agency. This approval will be requested as part of the post-certification process, based on selection of the final right-of-way.

#### 6.2.6.4 Vicinity Scenic, Cultural, and Natural Landmarks

No scenic, cultural, or natural landmarks are found on or near the proposed corridor, as previously detailed in Section 2.2.5 of this SCA.

#### 6.2.6.5 Archaeological and Historic Sites

A review of the area within the proposed BHEC Site and the proposed natural gas pipeline transmission line corridors was conducted by DHR. No known archaeological or historic sites are identified for this area as discussed in Section 2.2.6 and Appendix 10.6 of this SCA.

### 6.2.7 BIO-PHYSICAL ENVIRONMENT OF THE CORRIDOR AREA

#### 6.2.7.1 Land Use/Vegetation

The existing land use/land cover types on the proposed natural gas pipeline corridor and the surrounding area are shown in Figures 6.1.7-1 and 6.1.7-2 and discussed in Section 6.1.7.1. The predominant vegetative communities within the corridor include pine flatwoods, shrub and brushland, and two small freshwater marshes with shrubs, brush, and vines. The nearest residential land uses to the corridor are several scattered residences located to the south.

#### 6.2.7.2 Affected Waters and Wetlands

As shown in Figure 6.1.7-2, the only water bodies within the proposed corridor are several drainage ditches. Two small drainage ditches are located in the southwest portion of the corridor. These ditches drain a small freshwater marsh into a larger ditch which is located east of the borrow pond along the west boundary of the proposed natural gas pipeline corridor area.

Also, as shown in Figure 6.1.7-2, the proposed corridor includes two small freshwater marshes with shrubs, brush, and vines (FLUCFCS Code 6417) located adjacent to the I-95 right-of-way. The northern wetland is approximately 0.3 acre and the southern wetland is approximately 0.8 acre. These shrub wetlands are considered to be low quality and are dominated by wax myrtle, Brazilian pepper, salt bush, and primrose willow. Calpine will attempt to avoid impacts to these wetlands in selecting the final pipeline right-of-way. It should be noted that FGT will be responsible for permitting and constructing its pipeline to the proposed corridor on the east side of the drainage ditch which runs north-south on the east side of the borrow pond (see Figure 6.1.7-2).

#### 6.2.7.3 Ecology

The ecological communities within and surrounding the proposed natural gas pipeline corridor are shown in Figures 6.1.7-1 and 6.1.7-2 and are described in Section 6.1.7.3.

According to FNAI and FFWCC databases, no listed plant or wildlife species are known to occur within or in the vicinity of the proposed corridor. Tables 2.3.6-2 and 2.3.6-3 provide the state or federally listed plant and wildlife species, respectively, potentially occurring on the BHEC Site and in the proposed transmission line and natural gas pipeline corridors. During the December 2000 onsite ecological survey, no listed species were observed within the proposed corridor. In the vicinity of the corridor, one population of royal fern was located in the large drainage ditch adjacent to the I-95 right-of-way, but north of the corridor. The royal fern species is common within the State of Florida and is listed to discourage commercial exploitation. Also, outside of the proposed corridor, a population of gopher tortoises was observed to the west of the FPL transmission line rights-of-way.

#### 6.2.7.4 Other Environmental Features

No other special or significant environmental features are present on or in the vicinity of the proposed corridor that would merit additional discussion in this section.

### 6.2.8 EFFECTS OF NATURAL GAS PIPELINE CONSTRUCTION

#### 6.2.8.1 Construction Techniques

Pipeline construction for the BHEC will typically begin with the marking or staking of the construction right-of-way. As the marking is completed, it will be followed by these operations: clearing, fencing, grading, trenching, stringing, bending, welding, pipe laying, coating, lowering-in, backfilling, testing (hydrostatic), and cleanup and restoration. An area that will require special construction techniques will be the I-95 right-of-way crossing. A typical right-of-way configuration for construction of natural gas pipelines is depicted in Figure 6.2.8-1.

**Marking Right-of-Way**

Land survey crews will mark by flags and/or stakes the boundaries of the construction right-of-way and extra workspaces to show the approved work areas. Also, avoidance areas such as wetland boundaries, and sensitive species habitat that are to be avoided will be marked with appropriate fencing or flagging based on environmental surveys.

The centerline for the pipeline will be marked at 100-ft intervals, at known crossings of foreign lines (i.e., I-95 right-of-way and other utilities), and at points of intersection. Pipeline locators and other methods will be used to identify these crossings.

**Clearing, Grading and Fencing**

The construction right-of-way will be cleared and graded to remove brush, trees, and roots and other obstructions such as large rocks and stumps. Non-woody vegetation may be mowed while other vegetation, such as grasses, may be left in place to limit soil erosion. The construction right-of-way will possibly undergo some grading to create a safe working area, accommodate pipe-bending equipment, and allow the operation and travel of construction equipment. The natural drainage will be preserved to the extent possible. A fence crew, typically operating in conjunction with the clearing crews, will cut and brace fences along the proposed route. Temporary gates will be installed to control livestock and limit public access. The fence crew will also fence off the avoidance areas with temporary construction fence.

Timber will only be removed when absolutely necessary for construction purposes. Merchantable timber may be limbed, cut, and removed from the right-of-way. Timber that is not merchantable and other vegetative debris may be chipped, burned, or disposed according to applicable regulations. Burning, if used, will be conducted in accordance with

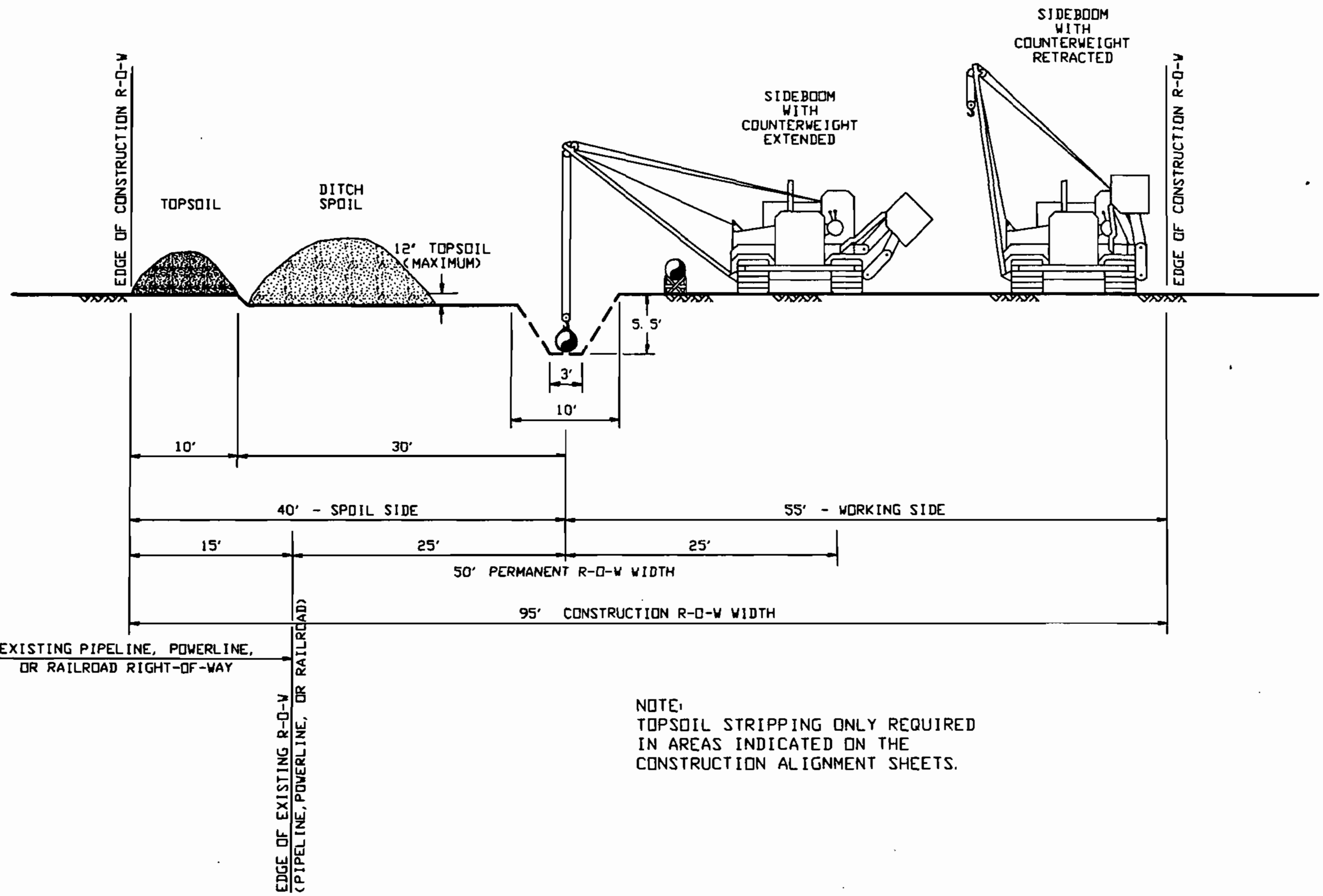


FIGURE 6.2.8-1. (REV. 1 - 12/04)

RIGHT-OF-WAY CONFIGURATION FOR 24-INCH OD PIPE COLLOCATED WITH EXISTING PIPELINE, POWERLINE, OR RAILROAD RIGHT-OF-WAY

**Source: ENSR, 2000; ECT, 2004.**

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state and local burn permits and regulations, and also be performed in a manner to minimize fire hazard and prevent heat damage to surrounding vegetation. Stumps may be buried on the construction right-of-way. Stumps and other timber considered to be nonmerchantable may be used to construct off-road vehicle barriers. Disposal of materials taken offsite will be done at commercial facilities or at other approved locations.

After the right-of-way has been cleared and the stumps removed, grading may be necessary. Minimal grading will be required in flat terrain. A maximum of 12 inches of topsoil will typically be removed or stripped and segregated. If the topsoil is less than 12 inches in depth, the actual depth of the topsoil will be removed and segregated. The actual depth, if less than 12 inches, will be determined during construction in the field by the contractor. The contractor will strip to a depth where the topsoil and lower horizon of soil are visible in equal amounts as determined by soil color. Topsoil that has been removed or stripped will typically be stored on the spoil side of the construction right-of-way. However, circumstances may require the topsoil be stored or placed on the working side adjacent to the ditch or at the edge of the construction right-of-way.

**Trenching**

Rotary wheel ditching machines, backhoes, or rippers will generally be used to excavate the trench. The depth of the trench will vary depending on soil type and the class of pipe being buried. Calpine will meet or exceed U.S. Department of Transportation (DOT) requirements for the depth of trench. Typically when backhoes are used, the trench will be excavated before the welding of the pipe. Typically when rotary wheel ditching machines are used, the trench will be excavated after the welding of the pipe and shortly before the pipe laying. If backhoes are used to excavate, the trench will typically be wider than a rotary wheel ditched trench due to the trench being open for a longer period of time and due to soil stability concerns, particularly in areas with high water tables.

Before construction starts, one-call systems for the areas involved will be contacted to have buried utilities identified and flagged. Trenching near these foreign utilities will only begin after completing the appropriate procedures.

BMPs will be developed for the project and will be employed to minimize erosion during trenching operations and construction activities (see BMPs Upland Erosion Control, Revegetation, and Maintenance Plan and Wetland and Water Body Construction and Mitigation Procedures in Appendices 10.8.1 and 10.8.2, respectively). Measures will also be taken to minimize free flow of water into the trench and through the trench into water bodies. Also, the pipeline will be constructed so as not to interfere with the construction of foreign utilities. All existing permanent survey and reference monuments within the right-of-way will be protected during construction.

**Pipe Laying**

Prior to construction, pipe is moved into the project area by rail or truck and placed in pipe storage yards. The pipe laying or stringing operation involves transporting pipe sections (joints) from pipe storage yards into position along the prepared right-of-way. Typically, trucks or other vehicles will travel along the right-of-way and lay or string the individual joints parallel to the centerline of the trench so they are easily accessible to construction personnel. The joints are usually strung on the working side of the trench for bending, welding, coating, and lowering-in operations and the associated inspection activities.

**Bending, Welding, Coating, and Lowering-In**

Typically, pipe will be delivered to the construction area in straight sections where it is then bent to conform to changes required for pipeline alignment and to conform with natural ground contours. Bending of the sections is performed by track-mounted, hydraulic pipe-bending machines.

After the pipe has been bent, it is aligned and welded. All bending, welding, and coating in the field will comply with DOT CFR Title 49, Part 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards*, and will also comply with the latest edition of American Petroleum Institute Standard 1104.

All pipe is protected with an external coating designed to protect the pipe from corrosion. Except for a small area at the end of the pipe joint, this coating is applied at the pipe mill before shipment to the site. After welding together in the field, pipe joints are coated with similar or compatible materials. Before lowering-in, the pipe coating is inspected for defects called *holidays*, with special attention given to all field-applied coatings. All holidays are repaired prior to lowering-in following construction specifications.

In some locations it may be necessary to provide negative buoyancy to the pipe by means of set-on concrete weights, concrete coating, pipe sacks, and/or soil anchors. Set-on weights and concrete coating may be purchased or fabricated in the Project area. Typically, set-on weight or concrete coating fabrication activities will not take place within 100 ft of water bodies or wetlands. However, there may be locations where, due to the weight of the high-pressure, large-diameter pipe, weight coating may need to take place in wetlands.

Side boom tractors will be used to lower the pipe into the trench. The ditch will be free of debris and foreign material. If the bottom of the trench is rocky, the pipe may be lowered onto sandbags or support pillows. Alternative sources of padding for pipe in rocky soil may be sand, gravel, or screened soil, excluding topsoil. In areas where the excavated trench material may damage the pipe, the pipe will be protected with a protective wrap of rock shield. The pipe is placed in the ditch, conforming to the alignment of the ditch and without damage to the coating. Trench dewatering may be required in certain locations to prevent the pipe from floating, and also to perform certain limited activities in the trench. Trench dewatering will be performed in accordance with state and local permits.

**Backfilling**

After lowering the pipe in the trench, the trench is backfilled using a bulldozer, backhoe, auger-type backfilling machine, mormon board, or other suitable equipment. Backfill usually consists of the material originally excavated from the trench. However, in some cases additional backfill from other sources may be required. Any excess excavated materials or materials unsuitable for backfill will be spread evenly over the right-of-way, or disposed in accordance with applicable regulations. In areas where topsoil has been segregated, the subsoil will be placed in the trench first and then the topsoil will be placed over the subsoil. Backfilling will occur to grade or higher to accommodate any future soil settlement. Tilling of the subsoil and topsoil will be done, as appropriate.

During backfilling, special care will be taken to minimize erosion, restore the natural contour of the ground, and restore surface drainage patterns as close to preconstruction conditions as practicable.

The pipeline will be hydrostatically tested in accordance with 49 CFR 192 to verify integrity and to ensure its ability to withstand the designed maximum operating pressures. Prior to hydrostatically testing the pipeline, it will be cleaned using a cleaning pig. After the testing is completed, the line will be depressurized and the water discharged by means of displacement pigs.

Test water intake and discharge will be in accordance with all applicable state water regulations and federal and state discharge requirements. Test water will be taken only from approved sources. The water intake will be screened to prevent entrainment of fish. After the testing is complete, the test water will be typically discharged on land within the same watershed into well vegetated areas, utilizing energy dissipation devices such as hay bales to minimize erosion and sedimentation. If the water is discharged into a dry waterway (i.e., intermittent stream), the discharge rate will not exceed the flow of the stream during normal flow periods. No chemicals will be added to the test water, nor will chemicals be used to dry the pipeline after the testing.

The testing will be conducted in segments and will be dependent on parameters such as surface topography, class locations, and available water sources.

**Clean-up and Restoration**

After the completion of backfilling, all disturbed areas will be finish graded and any remaining trash and debris will be properly disposed in compliance with federal, state, and local regulations. After construction is completed, the entire right-of-way will be protected by the implementation of erosion control measures, including site-specific contouring, permanent slope breakers, mulch, and reseeding or sodding with soil-holding grasses. Contouring will be accomplished using acceptable excess soil from construction. If sufficient soil is not available, it will be obtained from approved borrow pits. The erosion control measures used will be in accordance with the local soil conservation districts, appropriate state agencies, and Upland Erosion Control, Revegetation and Maintenance Plan (see Appendix 10.8.1). The disturbed areas will be revegetated in compliance with seed, fertilizer, and soil additive recommendations obtained from the local soil conservation authority.

**Pipeline Depth**

The trench will be of sufficient depth to provide a minimum of 36 inches of soil cover over the pipeline in all class location areas. If the pipeline is being buried in an area containing rock, the pipeline may be placed in a ditch with a minimum 18 inches of cover for Class I areas (areas containing 10 or fewer inhabitable buildings within 220 yards of the centerline of a continuous 1-mile length of pipe). Typically, the pipeline will be at a greater depth when crossing a foreign line. The depth of the trench will be dependent upon the depth of the foreign line. At least 12 inches of vertical clearance will be maintained when crossing foreign lines.

**Road Crossings**

The impact upon traffic and transportation facilities and public inconvenience at the I-95 crossing will be minimized to the extent practicable. All appropriate safety procedures will be implemented to protect workers and the public. Traffic warning signs, detour signs, and other traffic control devices will be used as required by federal, state, and local departments of transportation and other regulating bodies. All crossings will be completed in accordance with the requirements of road crossing permits.

**Wetland Construction**

Calpine will attempt to avoid impacts to wetlands in selecting the final pipeline right-of-way. If wetlands cannot be avoided, construction of the pipeline in wetlands will be done in accordance with standard construction and mitigation procedures (see Appendix 10.8.2). In addition, a project-specific storm water pollution prevention plan; the spill prevention, containment, and control plan; and BMPs will be used to minimize the potential for impacts to wetlands.

In general, the method of pipeline construction and the required construction right-of-way width in wetlands will depend upon the soil stability and the existing use of the wetland. Where soils are unstable and saturated, stable temporary work surfaces in the wetlands may be constructed. Timber rip-rap or travel pads or gravel on geotextile fabric are possible methods of stabilization. Typically, temporary extra work spaces are located a minimum of 50 ft from the edge of designated wetlands. Within wetlands, vegetation will be cut to ground level. Grading and stump removal will be performed only over the trench, except where safety conditions dictate additional removal on the working side of the right-of-way.

The construction procedures used to cross unsaturated wetlands will be similar to those used on dry land areas. Topsoil will be segregated in unsaturated wetlands in the same manner as agricultural lands. If the trench contains water, ditch plugs will be left in the trench prior to its entrance to the wetland. The ditch plugs are designed to minimize sediment discharges into the wetland from the open wetland trench. Points at which the trench enters and exits the wetland will be sealed with trench sack breakers or foam breakers to maintain the hydrologic integrity of the wetland where deemed necessary by qualified representatives. Silt fences and/or straw bales will be installed at edges of the construction right-of-way in wetlands where there is a possibility for spoil to flow into undisturbed areas of the wetlands. Backfill will be well compacted, especially near the edges of the wetlands. Excess backfill will be spread over adjacent upland areas and stabilized during cleanup. Original topographic conditions and contours will be restored after completion of construction.

Construction techniques in highly saturated areas may involve the "push technique" or the "pull technique." These techniques involve pushing the prefabricated pipe from the edge of the wetland or pulling the pipe from the opposite bank of the wetland with a winch. The trench will be made with a backhoe, dragline, clamshell dredge, or a combination of the equipment. The push and pull sites, the pipe storage sites, and fabricating areas are located outside the saturated portion of the wetland. Floats may be attached to the pipe to achieve positive buoyancy. After the pipe is floated into place, the floats are cut and removed and the pipe, which has lost its buoyancy, will settle to the bottom of the trench. This operation is repeated as necessary until the wetland crossing is complete. Excavated material is used as backfill and placed over the pipe to fill in the trench. Any excess soil is removed rather than mounded over the pipeline in an effort to maintain ground water and surface flow patterns within the wetland.

A detailed listing of the water body and wetland construction procedures that could be used for the Project is provided in the standard construction and mitigation procedures (see Appendix 10.8.2).

#### 6.2.8.2 Impacts on Wetlands, Water Bodies, and Uses

Currently, Calpine does not anticipate constructing the pipeline in any wetland or water body. If wetland impacts cannot be avoided, Calpine will prepare a joint FDEP/USACE ERP application for the construction activities. Construction methods for the pipeline in wetlands or water bodies will be specifically developed to avoid or minimize impacts to these systems. Use of erosion control plans and BMPs will further reduce potential for long-term impacts.

The primary impact to wetlands would be the temporary loss of wetland habitat. However, wetland species will be restored and allowed to regenerate after construction. Wetland functions should resume after construction activities are completed. No loss of flow or storage capacity will occur in any wetland system. Turbidity impacts will be temporary and minimal due to use of BMPs. Topsoil will be replaced after trenching, allowing a sufficient seed source for regeneration of wetland plants.

#### 6.2.8.3 Solid Wastes

Solid wastes generated from pipeline construction generally consists of trash and cleared vegetation. Any combustible trash and vegetation may be burned onsite in accordance with state and local regulations. If burning is not allowed, solid waste will be hauled to a local approved landfill.

### 6.2.8.4 Changes to Vegetation, Wildlife, and Aquatic Life

Since the majority of the pipeline corridor crosses shrub and brushland, palmetto prairie, and pine flatwoods, construction impacts to native vegetation communities will be minimal. Construction will result in a temporary loss of vegetation in the construction right-of-way. However, replacement of topsoil or reseeding where necessary will quickly allow reestablishment of ground/shrub cover. Trees will be allowed to regenerate over all of the right-of-way except the 10-ft permanent right-of-way over the pipe.

Wildlife impacts will be minimal due to the small area of impact and the allowance of vegetation to regenerate over the right-of-way. The 95-ft maximum construction right-of-way will be cleared. Less mobile wildlife species may be lost during this activity, but most wildlife are sufficiently mobile to retreat to offsite habitats. Wildlife will then re-inhabit the right-of-way once vegetation regeneration begins. No significant impacts are expected to occur to any listed wildlife species or to any regional populations of any wildlife species.

Aquatic life inhabiting the nearly canals or ditches, or small streams will not be significantly affected by construction of the pipeline due to the BMP guidelines Calpine will employ. No significant aquatic resource areas will be crossed by the pipeline.

### 6.2.8.5 Impact on Human Populations

No residences occur within the corridor and the area around the corridor is sparsely populated. Construction of the pipeline may result in minor inconveniences to local landowners/farmers due to equipment/construction movement. Minor traffic slowdowns on I-95 may be necessary during construction under the highway. However, with the exception of the I-95 right-of-way, all construction will occur on lands which will be owned by Calpine.

The pipeline must be designed, built, and operated in accordance with the DOT *Minimum Federal Safety Standards* in 49 CFR Part 192. Therefore, pipe material, design, and corrosive protection is dictated by four area classifications which are based on increased density of inhabitable buildings within 220 yards on either side of the proposed centerline of a continuous 1-mile stretch of pipe. The corridor is located in an area of low density residential areas. Final class assignment for the pipeline will be determined after the right-of-way is selected.

#### 6.2.8.6 Impact on Scenic, Cultural, and Natural Landmarks

No scenic, cultural, or natural landmarks are found along the corridor; therefore, no impacts will occur.

#### 6.2.8.7 Impact on Archaeological/Historic Sites

No known cultural resources occur on the proposed corridor, according to DHR. If cultural resources are found during construction, Calpine will halt construction in the immediate area and consult with DHR regarding appropriate evaluation and mitigation measures.

### 6.2.9 POST-CONSTRUCTION IMPACTS AND EFFECTS OF MAINTENANCE

#### 6.2.9.1 Maintenance Techniques

The proposed facilities will be operated and maintained in accordance with standard procedures designed to ensure public safety and the integrity of the pipeline, to minimize any potential for pipe failure, and to provide itself with a safe and dependable natural gas supply. The facilities will be designed, constructed and operated in accordance with requirements of the Florida PSC, FERC, applicable permit conditions, and industry-proven practices and techniques. All facilities will be marked and identified in accordance with applicable regulations.

Design and construction criteria will be incorporated to enhance the system's ability to withstand possible natural phenomena and accidents. Concrete coating and/or pipe weights will be utilized to prevent flotation. In areas of known potential for subsidence, pipeline construction and operation and maintenance procedures will be designed to maximize stability and to minimize the possibility of damage. Combustible and hazardous materials will be stored and handled in the manner prescribed by applicable codes and regulations.

Overall, maintenance activities will be in compliance with all requirements of an upland erosion control, revegetation, and maintenance plan (see Appendix 10.8.1), as well as all other applicable regulatory requirements.

The pipeline right-of-way will be clearly marked at public roads (i.e., I-95) and in other areas as necessary. This will reduce the possibility of damage or interference as a result of third-party construction activities, and will allow the rapid identification of the pipeline during aerial surveillance. Periodic ground inspections will be conducted to visually inspect for the following: possible leaks, evidence of excavation activity on or near the permanent right-of-way, erosion and wash-out areas, areas of sparse vegetation, damage to permanent erosion control devices, exposed pipe, and any other potential concerns that may affect the safety and operation of the pipeline. Aerial surveys of the pipeline system will be performed in accordance with the requirements of 49 CFR, Part 192. Pipeline markers and signs will be inspected, maintained, and replaced as necessary. Necessary repairs to the right-of-way may include regrading and reseeding with appropriate plant species or installing other soil stabilization measures.

**Corrosion Prevention/Detection**

Periodic surveys will also be conducted to ensure the continuity of the cathodic protection system and to indicate where possible corrective action is required. Any required repairs to the pipe will be made promptly, or, if necessary, the pipe will be replaced. In making repairs, all safety precautions will be observed.

Cathodic protection will typically be provided by ground beds located on the pipeline easement and may be supplemented at some locations with magnesium/zinc anodes attached to the pipe. Detailed records will be kept and will supplement the corrosion protection program as necessary to meet the requirements of 49 CFR Part 192. The pipeline will be inspected by crews conducting pipe-to-soil potential surveys. As part of its ongoing pipeline integrity program, Calpine will also inspect the pipeline using an electronic internal corrosion inspection tool to create a baseline data set. Thereafter, at periodic intervals determined as a result of the baseline data obtained during the original internal corrosion inspection, the pipeline will be inspected again for data comparison.

**Vegetation Management**

A 50-ft-wide permanent right-of-way will be maintained in a grassy or light vegetation condition to ensure reasonable access. In most cases, the right-of-way will be returned to its previous vegetation except for a 10-ft-wide strip centered over the pipeline which will be maintained in an herbaceous state as necessary. If needed, herbicides will be applied in compliance with applicable laws and regulations. The erection of permanent structures within the permanent right-of-way will not be allowed.

### 6.2.9.2 Multiple Uses

Normally preconstruction uses of the pipeline right-of-way will be allowed to continue with the exception of tree-growing activities over the interior 10-ft-wide pipeline right-of-way. Activities such as silvicultural operations and citrus production will not be permitted directly over the pipeline. However, these activities may be allowed within the remainder of the 50-ft-wide right-of-way on a case-by-case basis.

Since the property along the right-of-way will be owned by Calpine except for the I-95 right-of-way, public access will not be permitted.

### 6.2.9.3 Changes in Species Population

Operation and maintenance of the pipeline right-of-way will not have any permanent effects on local (or regional) populations of wildlife or plant species.

### 6.2.9.4 Effects of Public Access

As previously mentioned, public access will be restricted by the use of locked gates and absence of an access road.

### 6.2.9.5 Other Post-Construction Effects

Other impacts of pipeline maintenance will be minimal. Maintenance activities will be infrequent and will not significantly affect local residents. The pipeline will produce no noise or odors when operating.

As with construction of the pipeline, operational safety is of paramount importance. Calpine will again employ the safety standards required in 49 CFR Part 192 for operation of this facility. This will include, among other things, procedures for:

- Receiving, identifying, and classifying emergency events.
- Establishing and maintaining communications with local fire, police, and public emergency response officials.
- Having adequate personnel and equipment available for any emergencies.
- Protecting the public first, and then property.
- Emergency shutdown and safe restoration of service.

## 6.3 WATER SUPPLY PIPELINE

### 6.3.1 INTRODUCTION

The primary source of water for the BHEC will consist of excess stormwater withdrawn from the Indian River County Egret Marsh Regional Stormwater Park. Water for the stormwater park and the BHEC use will be withdrawn from the IRFWCD Lateral C Canal. Therefore, the pipeline system used to deliver stormwater to the BHEC will consist of two segments. First, as shown in Figure 6.3.1-1, water will be withdrawn from the Lateral C Canal through a new pumping station located just downstream of the Lateral C radial gate, in the lower pool of the canal system. Water withdrawn from this location will be pumped through a new approximately 0.5-mile, 36-inch pipeline to the stormwater park and discharged into a pretreatment pond. The 36-inch pipeline will be capable of delivering the peak flow rate of 8.2 MGD for the BHEC, plus the additional design flow rate of 10 MGD for treatment in the first phase of the stormwater park. The second segment of the water delivery system will consist of an approximately 3.0-mile, 24-inch pipeline from the pumping station at the pretreatment pond in the stormwater park to the BHEC Site. This pipeline will be capable of delivering the total average 5.8 MGD and peak 8.2 MGD flow requirements for both Phase I and II of the BHEC. The pipeline system will include a valved stormwater park bypass so that water can be delivered from the Lateral C Canal directly to the BHEC, in case of operational problems at the park.

The entire pipeline corridor will follow existing Indian River County road and IRFWCD canal rights-of-way. Except for the short segments within the County's stormwater park, the pipelines will be constructed primarily in the IRFWCD right-of-way along the Lateral C Canal, while portions of the County's 74th Avenue right-of-way will be used for construction access.

In accordance with the water supply Agreement with Indian River County and IRFWCD, Calpine will be responsible for all costs and construction of the pipelines and pumping stations. The County and IRFWCD will allow Calpine to utilize all rights-of-way and easements needed for construction of the pipeline. After the construction is complete, Calpine will transfer ownership of the pipelines and the Lateral C Canal pumping station

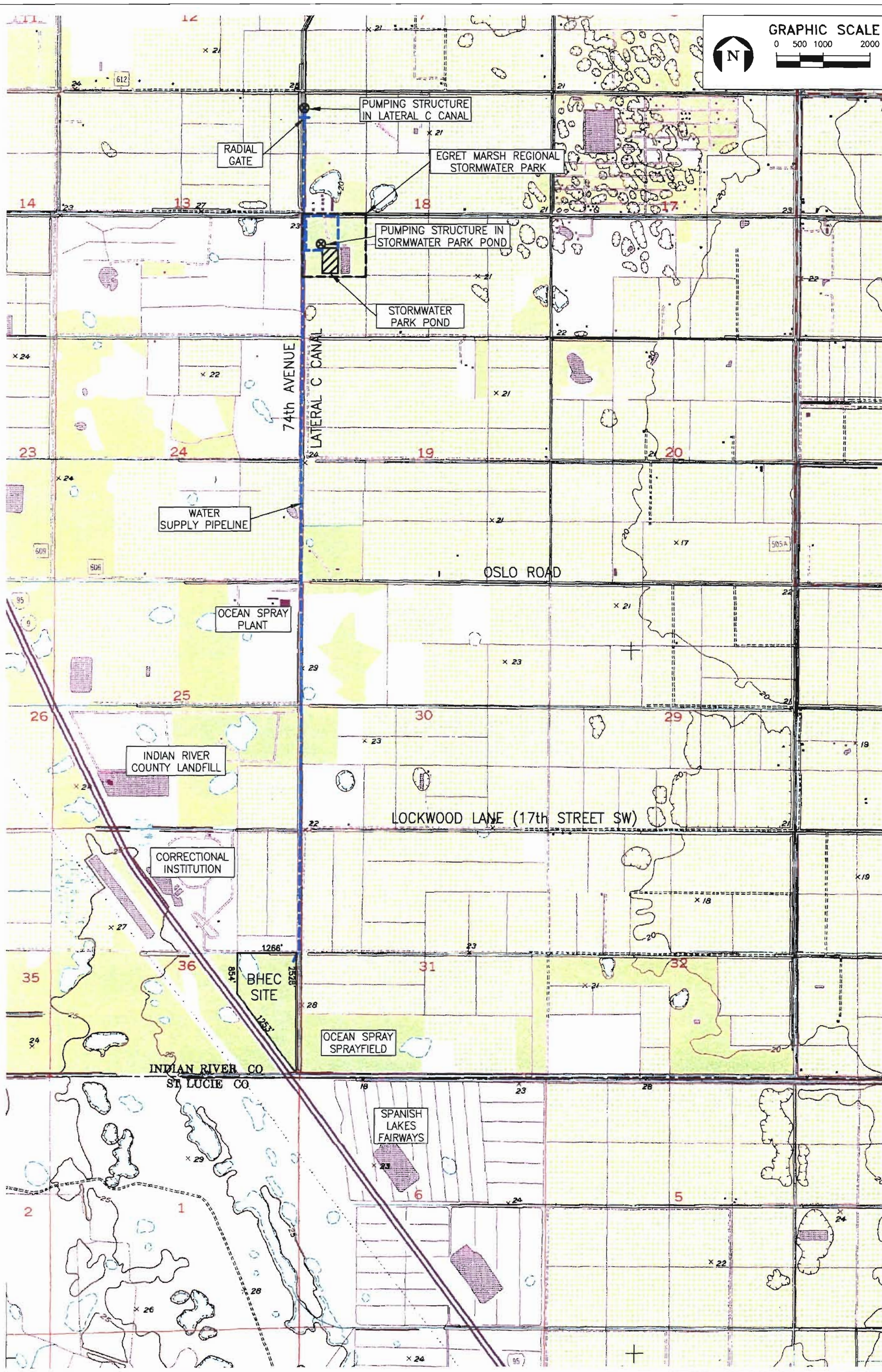


FIGURE 6.3.1-1. (REV. 1 - 12/04)
LOCATION OF PUMPING STATIONS AND PIPELINES FOR PLANT WATER SUPPLY

Sources: USGS Quad: Oslo, FL, 1983; ECT, 2004.

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located in the IRFWCD rights-of-way to the IRFWCD. IRFWCD will, in turn, lease the Lateral C Canal pumping station and the pipeline from the canal to the stormwater park to the County, and the County will be responsible for the operation and maintenance of these facilities. IRFWCD will also lease the pipeline from the stormwater park to the BHEC Site to Calpine, and Calpine will be responsible for the operation and maintenance of this pipeline as well as the pumping station at the stormwater park and the stormwater park bypass piping.

Calpine is seeking certification of the pipeline and pumping station facilities through the certification process. For the pumping station structure in the Lateral C Canal, Calpine is also seeking USACE Nationwide 12 approval through the joint USACE/FDEP ERP application contained in Appendix 10.1.2.

### 6.3.2 CORRIDOR LOCATION AND LAYOUT

The water supply pipeline corridor proposed for certification is depicted on an aerial photograph in Figure 6.3.2-1. The corridor route originates at a pumping structure in the Lateral C Canal in the lower pool of the IRFWCD drainage canal system. The proposed pumping structure is located on the west side of the Lateral C Canal, downstream (north) of the radial gate which separates the upper and lower pools of the IRFWCD system. From the pumping structure, the pipeline will run south along the west side of the Lateral C Canal to the intersection of 74$^{th}$ Avenue and 4$^{th}$ Street. At this intersection, the pipeline will turn east, cross the canal, and run to the pretreatment pond at the stormwater park. From the pumping station at the pond, the pipeline will cross to the west side of the Lateral C Canal at 4$^{th}$ Street and run south in the IRFWCD canal right-of-way to the BHEC Site. At the Site, the pipeline will turn west and run approximately 75 ft through the County's 74$^{th}$ Avenue right-of-way and utility easement into the Site. The total length of the pipeline facilities is approximately 3.5 miles.

### 6.3.3 WATER SUPPLY PIPELINE DESIGN CHARACTERISTICS

At this time, the design calls for 36-inch-diameter pipe for the segment from the Lateral C Canal to the stormwater park and 24-inch-diameter pipe from the park to the BHEC Site. The pipe will be buried under at least 2 ft of cover in a trench that will likely

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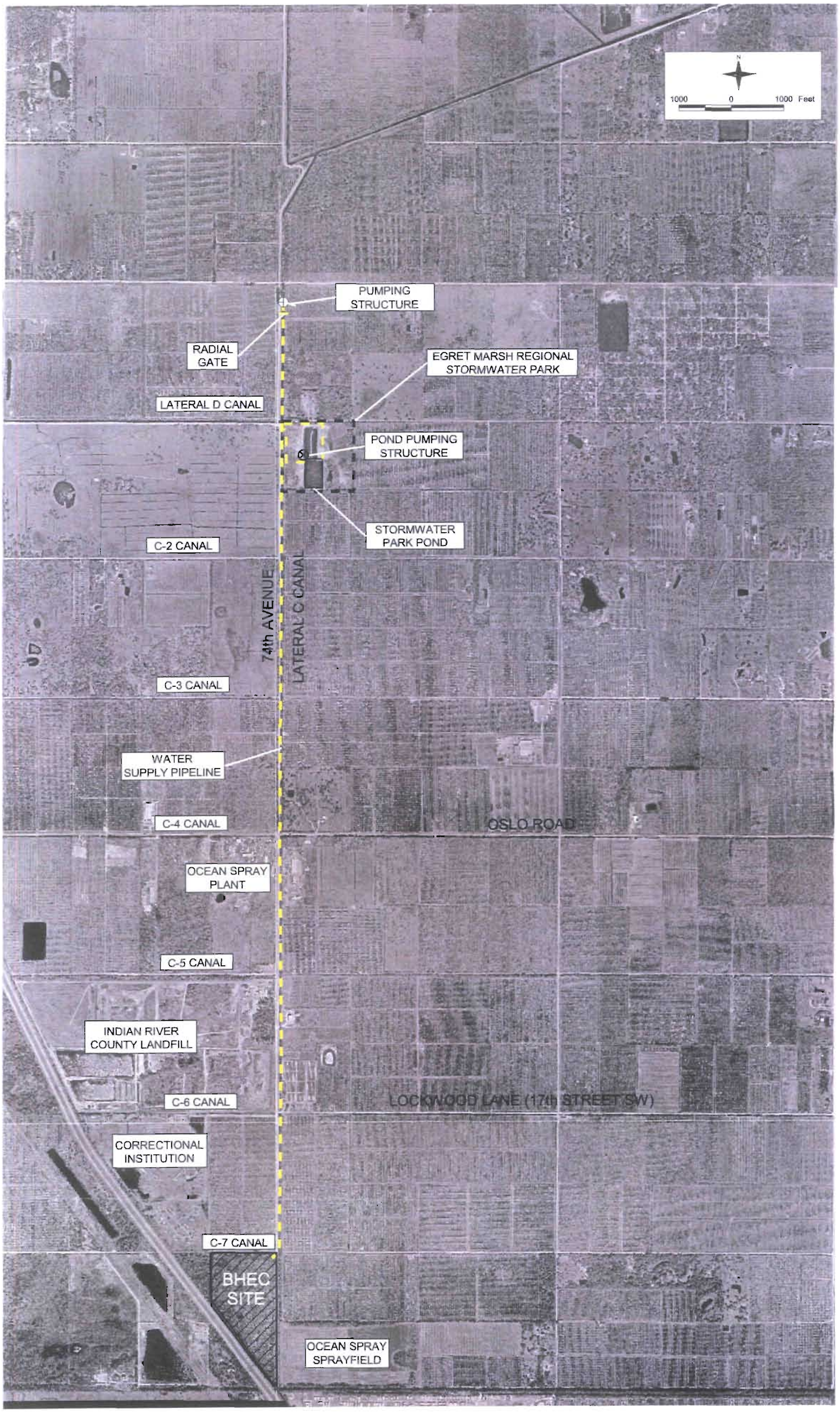


FIGURE 6.3.2-1. (REV. 1- 12/04)

LOCATION OF PUMPING STATIONS AND PIPELINES FOR PLANT WATER SUPPLY - AERIAL PHOTOGRAPH

Sources: Indian River County, 1998; ECT, 2004.

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only be 6 to 8 ft wide. Burial will be deeper where required to pass under ditches or roads.

The pumping facilities will consist of a sump submerged in the water source. The intake will be protected by a trash rack and screen to minimize entrainment of trash, debris, or aquatic organisms. Schematics of the proposed sump design are depicted in Figures 6.3.3-1 and 6.3.3-2 for the canal pumping structure and Figures 6.3.3-3 and 6.3.3-4 for the structure at the stormwater park. More details on the pumping facility are contained in the Joint FDEP/ USACE 404 ERP application contained in Appendix 10.1.2.

### 6.3.4 COST PROJECTIONS

Cost projections for the pipeline on an average per foot basis are approximately $160 per foot for the 36-inch pipe segment and $100 per foot for the 24-inch pipe segment, including materials (e.g., pipe, valves, fittings, etc.), installation, and restoration costs.

### 6.3.5 CORRIDOR SELECTION

The route for the proposed pipelines was selected to follow existing linear facilities (roads, canals) to minimize impacts and eliminate the need to build new access roads. The pipeline route will be located primarily in IRFWCD canal rights-of-way and also will cross some Indian River County rights-of-way and property. The presence of 74$^{th}$ Avenue will provide construction and maintenance access.

### 6.3.6 SOCIO-POLITICAL ENVIRONMENT OF THE CORRIDOR

#### 6.3.6.1 Governmental Jurisdictions

The pipeline corridor is entirely contained within either the IRFWCD canal rights-of-way or within Indian River County. Under the water supply Agreement with the County and IRFWCD, Calpine is authorized to use these rights-of-way and easement for construction of the pipeline facilities. The corridor does not cross any municipal boundaries.

No parks or recreation areas are found within or adjacent to the corridor.

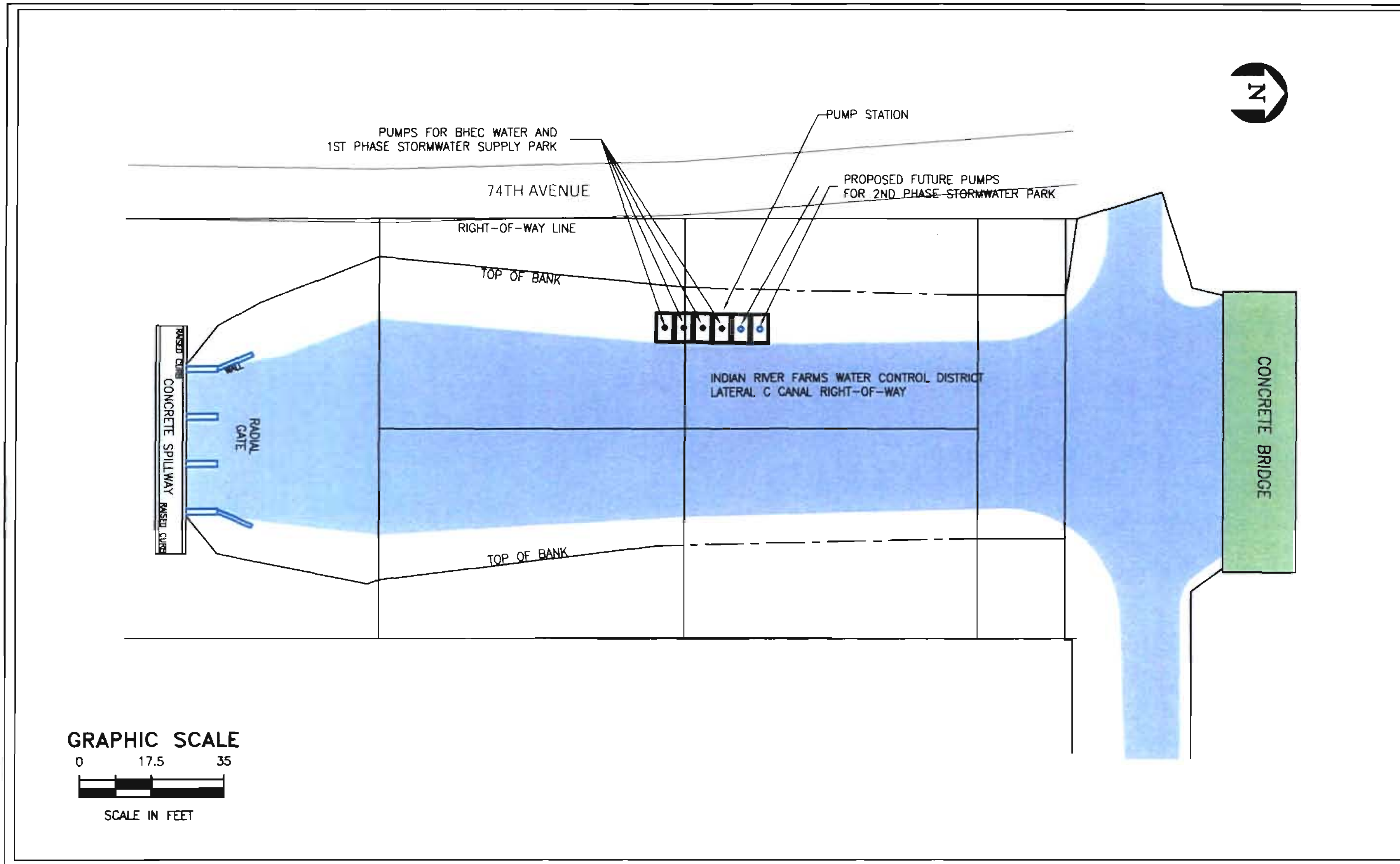


FIGURE 6.3.3-1. (REV. 1 - 12/04)

PUMP STRUCTURE LOCATION IN LATERAL C CANAL

SOURCE: Foster Wheeler Environmental, 2000; ECT, 2004.

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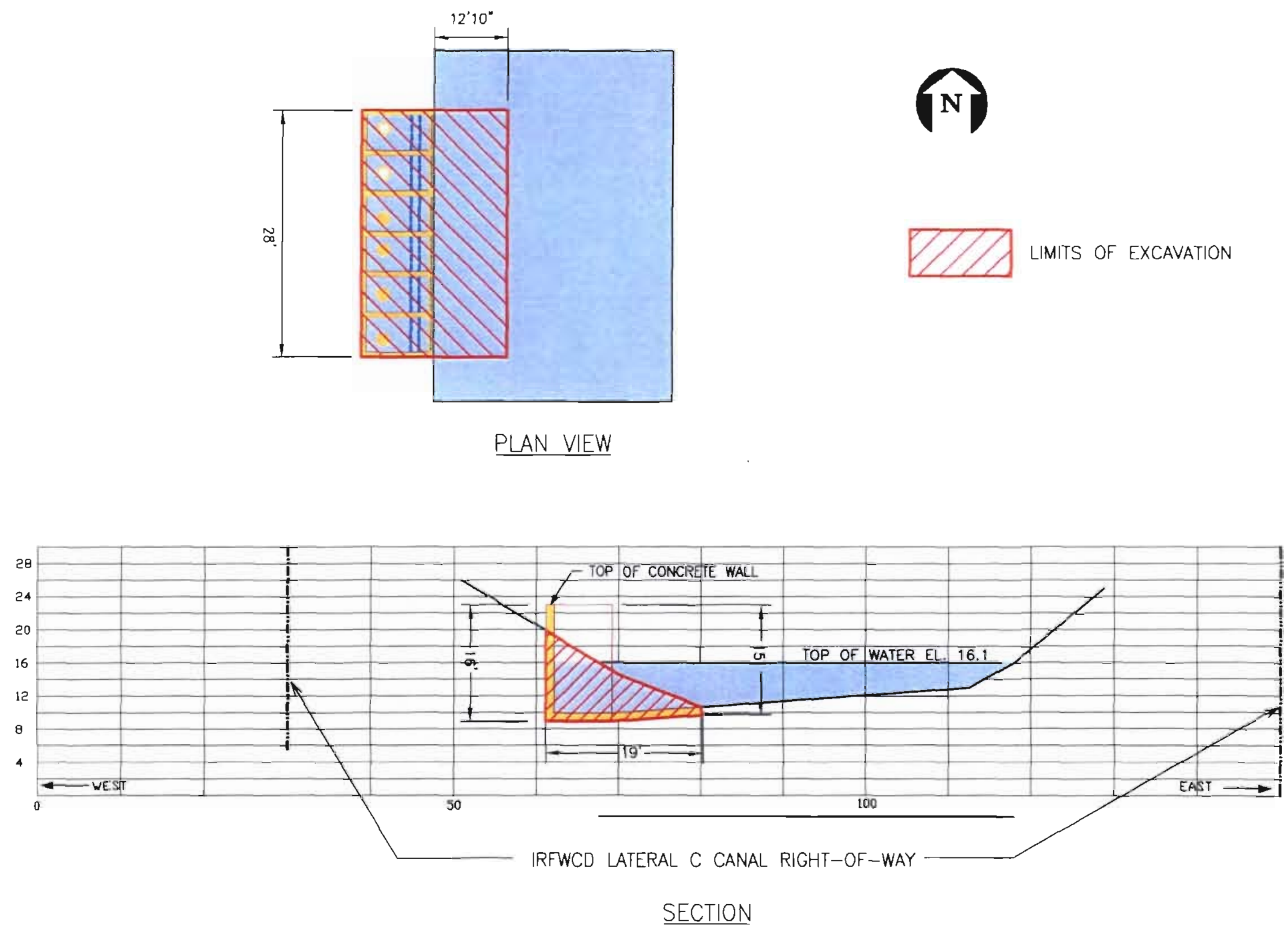


FIGURE 6.3.3-2. (REV. 1 - 12/04)
PUMP STATION CROSS-SECTION IN LATERAL C CANAL

SOURCE: Foster Wheeler Environmental, 2000; ECT, 2004.

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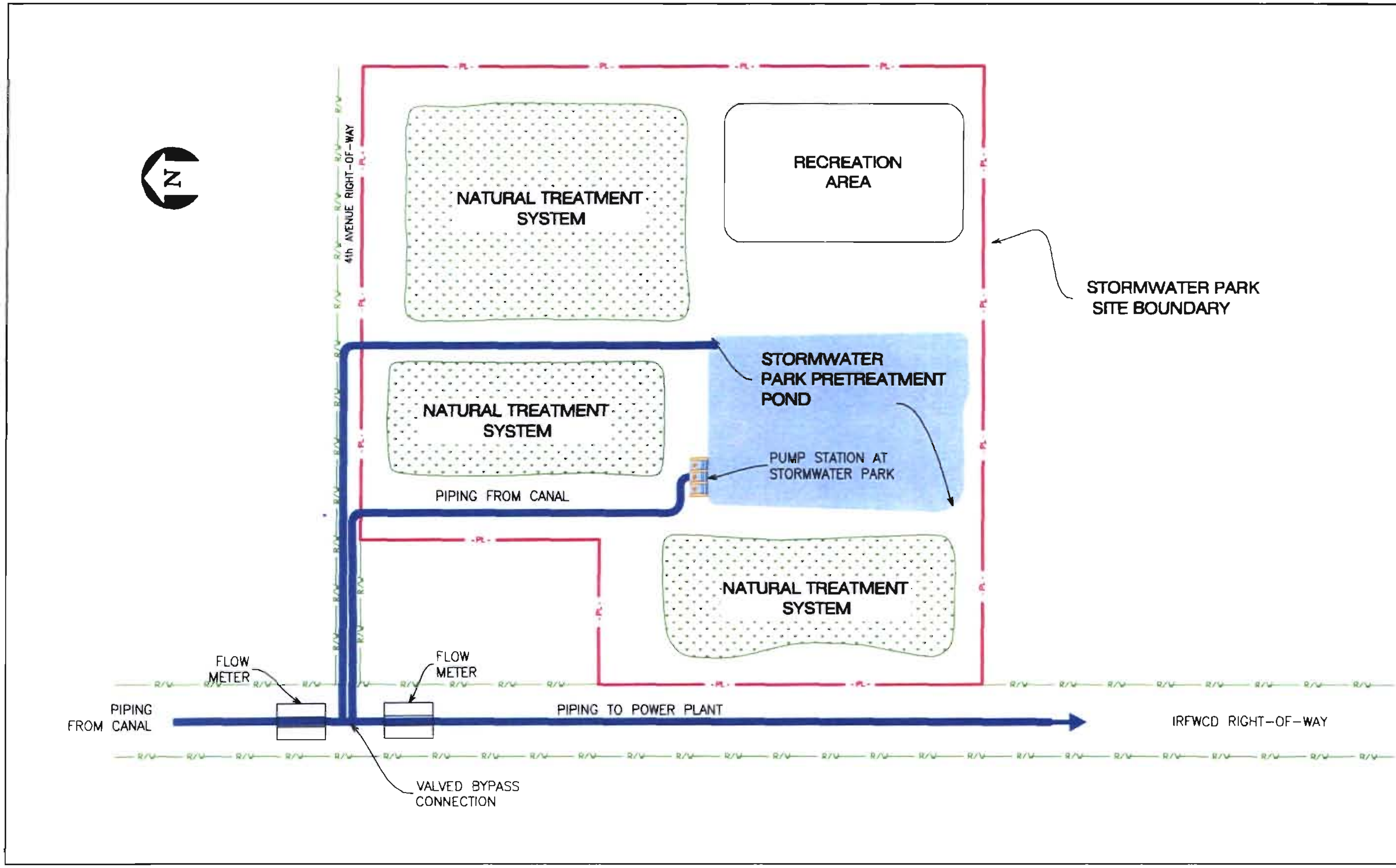


FIGURE 6.3.3-3. (REV. 1 - 12/04)

PIPING AND PUMP STATION LOCATION IN STORMWATER PARK

SOURCE: ECT, 2004.

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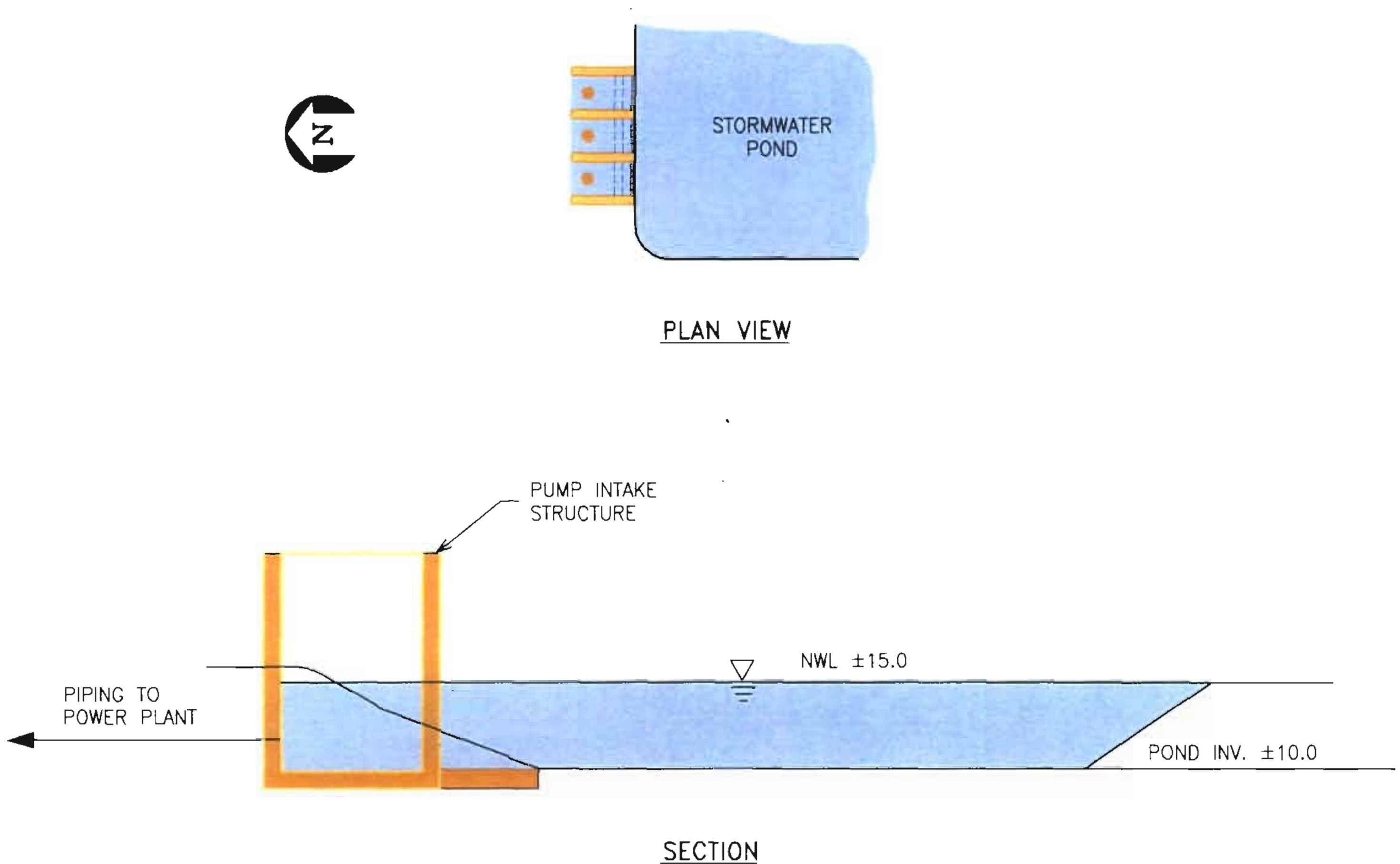


FIGURE 6.3.3-4. (REV. 1 - 12/04)

PUMP STATION CROSS SECTION IN STORMWATER PARK

SOURCE: ECT, 2004.

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#### 6.3.6.2 Zoning/Land Use Plans

The corridor falls entirely within Indian River County land use designation AG-1 and zoning districts A-1 and A-2.

Based on language in the comprehensive plan and zoning code for the County (Indian River County, 1998 and 2000), utility pipelines such as the proposed water pipeline are allowed in all zoning districts.

#### 6.3.6.3 Easements, Title, Agency Works

No crossings of state or federal roadways are required for the corridor. However, the pipeline will cross or parallel the County's roadways and, therefore, must receive approval from Indian River County. The County has approved Calpine's use of its rights-of-way and easements as part of the water supply Agreement.

#### 6.3.6.4 Vicinity Scenic, Cultural, and Natural Resource Features

Sections 2.2.5 and 2.2.6 described natural resource and cultural resource features in the Project vicinity. None occur along the pipeline route.

#### 6.3.6.5 Archaeological and Historic Sites

No archaeological/historic sites are known to occur along the proposed pipeline route.

### 6.3.7 BIO-PHYSICAL ENVIRONMENT OF THE CORRIDOR

#### 6.3.7.1 Land Use/Vegetation

Land cover/land uses crossed are shown in Section 2.3.5 and on Figure 2.3.5-1 for the Project vicinity. The corridor primarily follows maintained rights-of-way belonging to IRFWCD. No natural vegetative communities will be affected.

#### 6.3.7.2 Affected Waters and Wetlands

The pumping station structure for the pipeline will be located in the lower pool of the IRFWCD Lateral C Canal. Although other canals and roadside ditches will be crossed, the pipeline will not affect any other surface water features or wetlands. The water source is a manmade water and does not represent significant aquatic communities.

#### 6.3.7.3 Ecology

Due to existing disturbance from right-of-way maintenance of the pipeline route, no significant ecological features are found along the route.

No listed species are known to occur along the route. Figure 2.3.6-1 shows listed species known to occur within 5 miles of the BHEC Site.

#### 6.3.7.4 Other Environmental Features

No other environmental features are known to occur along the proposed pipeline route.

### 6.3.8 EFFECTS OF RIGHT-OF-WAY PREPARATION AND PIPELINE CONSTRUCTION

#### 6.3.8.1 Construction Techniques

Pipeline construction activities differ slightly from pipeline to pipeline, but generally include the following (which are described in the subsequent paragraphs):

- Surveying and right-of-way preparation.
- Ditching/trenching.
- Installation.
- Testing.
- Right-of-way restoration.
- Other specialized activities may take place, such as:
  - Boring and installation of road and ditch crossings,
  - Installation of pumping station and two wooden utility poles, and
  - Installation of valve assemblies.

**Surveying and Right-of-Way Preparation**

The only clearing required will be small trees and brush. Where needed, the right-of-way will first be cleared in accordance with the contract specifications and permit or regulatory limitations.

Next, the topsoil layer within the right-of-way will be stripped where excavation will occur with a bulldozer, grader, or backhoe and bermed to one side of the working strip. The work platform will then be graded to provide smooth access to all equipment used in the following phases of construction.

**Right-of-Way Restoration**

During construction, topsoil will be saved to be spread back over the stripped area during right-of-way restoration following pipe installation. Once the pipeline is buried in place, the stripped topsoil, when present, will be spread back in place to its original location and topography. Mulching and/or seeding will be undertaken as necessary to quickly stabilize soils which formerly had a vegetation cover.

#### 6.3.8.2 Impacts on Water Bodies and Uses

The Project has been designed to not interfere with the Lateral C Canal at the pumping structure. IRFWCD has been consulted in the design of the location and water quantity needs of the Project to ensure IRFWCD's agricultural interests in the canal system are not affected. Therefore, no significant impacts to water bodies will occur.

Construction will involve minor wetland impacts and temporary turbidity at the pumping station location in the Lateral C Canal. Calpine is filing a joint FDEP/USACE ERP application with this submittal to address those impacts (see Appendix 10.1.2)

#### 6.3.8.3 Solid Wastes

Construction of the water pipeline will generate minimal solid waste, which will primarily consist of trash and cleared vegetation. Combustible trash and vegetation will be hauled to the local landfill.

#### 6.3.8.4 Changes to Vegetation, Wildlife, and Aquatic Life

Construction will not affect local plant or wildlife populations due to the current disturbed nature of the pipeline route. The canal right-of-way is currently used by IRFWCD for maintenance access for the canal. Aquatic life in the Lateral C Canal is not regionally significant and should not be affected by intake construction.

#### 6.3.8.5 Impact on Human Populations

Construction will have minimal effect on human populations since the pipeline route has relatively limited access. Few homes occur along the proposed right-of-way. Some minor inconveniences due to construction traffic/activities may occur along $74^{th}$ Avenue.

#### 6.3.8.6 Impact on Scenic, Cultural, and Natural Landmarks

No impacts will occur to any such resources.

#### 6.3.8.7 Impact on Archaeological and Historic Sites

No known sites are present along the proposed pipeline route. However, DHR will be consulted if such resources are found during construction.

### 6.3.9 POST-CONSTRUCTION IMPACT AND EFFECTS OF MAINTENANCE

#### 6.3.9.1 Maintenance Techniques

The primary regular maintenance activity will consist of a visual inspection of the right-of-way. These patrols can be carried out on foot and by vehicle. These inspections will ensure that no activity detrimental to the safety of the pipeline is taking place within, or in the vicinity of, the right-of-way. During the life of the pipeline, repairs that would require heavy equipment and materials to be mobilized should not be necessary. If such repairs do become necessary, they would take place on an emergency basis and be of very short duration.

Minor repairs and maintenance of the pumping facilities will be conducted as necessary. The intake screen will be self-cleaning with screenings and screen wash water being returned to the Lateral C Canal. The trash rack will periodically be cleaned of all collected trash and debris.

The operating parameters for the water pipelines, intake structures, water use, and controls for the operation, will be subject to the final Agreement between Calpine, Indian River County, and IRFWCD. A copy of this Agreement is provided in Appendix 10.9.

#### 6.3.9.2 Multiple Uses

Existing uses of the proposed pipeline route by IRFWCD will continue.

#### 6.3.9.3 Changes in Species Populations

No local or regional effects to plant and wildlife species are anticipated due to the existing highly disturbed nature of the pipeline route. The maximum intake flow velocity of less than 0.5 fps, coupled with use of intake screens, will have minimal effects on any aquatic life.

#### 6.3.9.4 Effects of Public Access

Public access policy will remain the same as pre-construction access. The IRFWCD controls access to the pipeline route. No new access road will be created for this pipeline.

### 6.3.10 OTHER POST-CONSTRUCTION EFFECTS

No other post-construction effects are anticipated.

## REFERENCES

ENSR. 2000. Electronic personal communication in May 2000.

Florida Department of Environmental Protection (FDEP). 1996. 1996 Water Quality Assessment for the State of Florida: Section 306(b), Main Report. Bureau of Water Resources Protection, Division of Water Facilities. Tallahassee, Florida.

Indian River County. 2000. Zoning map (electronic version).

Indian River County. 1998. Indian River County 2020 Comprehensive Plan.

U.S. Geological Survey (USGS). 1983. 7.5-minute topographic quadrangle map of Oslo, FL.

# 7.0 ECONOMIC AND SOCIAL EFFECTS OF PLANT CONSTRUCTION AND OPERATION

Construction and operation of the BHEC will result in economic and social effects. These effects will largely be beneficial. This chapter is in two parts—Section 7.1 describes the direct and indirect effects of the construction of the Project and the operation of the power plant, and Section 7.2 describes the temporary and long-term costs associated with the Project. Direct socioeconomic effects are benefits and costs that are the direct result of the construction and operation of the Project, such as tax revenues paid directly to local and state governments and the jobs and wages of workers directly employed for the Project construction and operation. Indirect effects are those that are indirectly related to or induced by the Project, such as expenditures by Project workers at local businesses and other indirectly, induced benefits and costs that change local and regional socioeconomic and environmental conditions. All costs and benefits which can be measured or quantified are based on 2001 dollar values, unless otherwise indicated.

## 7.1 SOCIOECONOMIC BENEFITS

The primary benefit to Peninsular Florida as a result of the BHEC will be the provision of a clean and cost-efficient source of electricity to the public. The Project will provide benefits to the City of Vero Beach, Indian River and St. Lucie Counties, the east-central Florida region, and the State of Florida in terms of employment, tax and business interest revenues, and further such sustainable practices as the use of brine discharged from the Indian River County's water treatment facility for Project operation.

### 7.1.1 TAX REVENUES

The construction and operation of the BHEC will create both direct and indirect tax benefits. Direct effects are realized from the actual construction and operation of the Project. Indirect effects are the result of expenditures by the construction and operation personnel in the local area. Local revenues will be generated from property taxes levied on the plant site and facilities. Based on 2004 Indian River County millage rates and an estimated property and total plant taxable value (Phase I and II) of approximately $390 to $450 million, the yearly tax revenue for the BHEC is currently estimated to be approximately $6.8 to $7.8 million from ad valorem taxes, for both realty and tangible personal property. These tax revenues will be distributed to the County (general fund, municipal service, and emergency medical services), the school board, the SJRWMD, mosquito control district, the hospital district, and voter-approved purposes such as land acquisition and schools. Table 7.1.1-1 provides an estimated breakdown of the annual property tax revenues, based on 2004 millage rates for Indian River County.

**Table 7.1.1-1. BHEC Estimated Local Tax Revenue**

| Taxing Authorities | Range of Estimated Annual Tax Revenues (000s of $) |
|---|---|
| County (General Fund, Municipal Service, and Emergency Medical Service) | $2,784.6—$3,213.0 |
| School Board (State, Local, Voter-Approved) | $3,127.4—$3,608.6 |
| SJRWMD | $180.2—$207.9 |
| Independent Districts (Mosquito Control, Hospital District, Florida Inland Navigation) | $433.9—$500.7 |
| Voter-Approved (Land Acquisition Bond, School Bond) | $269.3—$310.8 |
| **TOTAL** | $6,795.4—$7,840.9 |

Note: Based on 2004 millage rates from Indian River County Property Appraiser Office and estimated total plant (Phase I and II) taxable value.

Sources: Calpine, 2004.
ECT, 2004.

As shown in Table 7.1.1-1, Indian River County will receive between $2.8 and $3.2 million annually in ad valorem tax revenues, and the Indian River County School District will receive between $3.1 and $3.6 million annually from the BHEC.

Construction of the Project will also generate significant revenues through sales tax assessments on goods purchased directly for the plant and indirectly from purchase of goods and services by worker/employees. Construction of the plant will cost approximately $600 million, of which approximately 50 percent will be spent for equipment and materials purchased in Florida. These purchases equate to approximately $18 million in state sales taxes.

Indirect economic benefits accrue to the Indian River and St. Lucie County areas and the region from the construction and operation wages paid by Calpine. The wages will create increased demands for additional goods and services such as rental housing, eating and retail establishments, and business services. These increased demands will result in indirect or secondary benefits by creating additional jobs, earnings, and economic activity in local areas and, through multiplier effects, the region. For example, the estimated total construction payroll of approximately $32.0 million will indirectly create an additional $32.5 to $39 million in total earnings in the region and state over the construction periods for Phase I and II. In addition, the operational labor payroll for the 36 employees at the completion of Phase II of approximately $2.0 million will indirectly create approximately $2.5 to $3.0 million annually in additional earnings, and 85 to 90 additional jobs in the region.

### 7.1.2 CONSTRUCTION EMPLOYMENT

Construction employment, even though short term, will be a positive socioeconomic benefit to the region. As previously discussed in Section 4.6, construction employment will average 165 workers for the 24-month construction period for each of the two project phases. A peak of 425 workers will be needed for approximately 1 month with a peak average of 392 workers over 8 months for each phase.

The construction payroll will total approximately $32 million for the two phases. Approximately 85 percent of the workforce is anticipated to be hired locally. It can be anticipated that a majority of the construction wages will accrue to Indian River and St. Lucie Counties' and nearby municipalities' residents. Another economic benefit from construction will be the use of local subcontractors and vendors to provide labor and goods. Although included in the construction workforce estimates, use of these local subcontractors and vendors will contribute to the local economy through the direct purchase of goods and services and indirectly through an increase in employment and spending in other economy sectors.

### 7.1.3 OPERATION EMPLOYMENT

The BHEC Project will employ approximately 36 full-time employees at the completion of Phase II. It is estimated that nearly all of the employees will be hired locally. All employees will most likely reside in the County or nearby municipalities such as Vero Beach, Fort Pierce, and Port St. Lucie. Annual operations labor payroll will be approximately $2.0 million at full operation. Since it is assumed that the operations workforce will reside locally, they will pay ad valorem taxes and purchase housing and other goods and services locally, providing further positive benefits to the local economy. State tax revenue will also accrue from the direct and indirect effects of operational employment.

### 7.1.4 BRINE USE

The Project's operation could use up to 0.46 MGD of the County's brine discharge. Use of brine provides a benefit to the County and the local environment by lessening discharges of this water to surface waters. Solids from the Project's zero-discharge system will be disposed in a permitted landfill and, if the County landfill is used, will provide further revenue to the County.

### 7.1.5 OTHER BENEFITS

The BHEC Project minimizes the potential environmental impacts associated with electrical generation by relying on natural gas and by avoiding wetlands and the habitat of the only threatened species identified onsite. The Project also assists in addressing a regional environmental issue by reducing the flow of freshwater and pollutant loadings to the Indian River Lagoon. The Project supports the goals of the current master stormwater planning efforts being conducted by the SJRWMD, Indian River County, Vero Beach, and IRFWCD. The goals of this program are to reduce freshwater flows and pollutant loadings to the Indian River Lagoon. The Project will provide an average of approximately 6 percent reduction in freshwater discharges into the Indian River Lagoon from the IRFWCD basin as well as an estimated 6 percent reduction in pollutant loadings. Use of brine will provide environmental benefits by reducing the discharge of brine to surface waters and ultimately to Indian River Lagoon. The Project will also help meet the state's needs for electrical power generation.

The BHEC will use less fuel than a majority of the power plants currently operating in Florida. If the Project displaces existing coal- or oil-burning power plants, there would be a significant reduction in the amount of air emissions ($NO_x$, $SO_2$, and PM) associated with electrical power generation in the state. For example, assuming the BHEC Project will displace a 50/50 percent mix of existing gas and oil-fired power generation, estimated BHEC fuel displacements (savings) from existing power generation facilities are 6 to 9 billion cubic feet of natural gas and 0.95 to 1.45 million barrels of No. 6 fuel oil per year. Based on AP-42 emission factors for natural gas and 1.0 weight percent sulfur No. 6 fuel oil combustion, $NO_x$ emission reductions will range from 1,218 to 1,848 tpy and $SO_2$ emission reductions will range from 3,134 to 4,783 tpy.

The Project's primary energy conversion efficiency of approximately 50.2 percent is significantly better than almost all existing utility generating capacity in Florida. To the extent that the Project displaces generation from less efficient oil- 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 a 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 a savings of approximately 1.9 to 2.9 million barrels of fuel oil per year.

## 7.2 SOCIOECONOMIC COSTS

### 7.2.1 TEMPORARY EXTERNAL COSTS

The temporary external costs associated with the Project deal primarily with short-term traffic impacts due to construction. This may result in increased wear on existing roadways and cause minor traffic congestion along Oslo Road and intersections east of the interstate during morning or evening hours when workers are arriving and departing.

### 7.2.2 LONG-TERM EXTERNAL COSTS

The operational impacts resulting from the BHEC Project are expected to be minimal and localized. The following subsections summarize some of these minor potential impacts.

#### 7.2.2.1 Aesthetics

The Project location is not near any recreational areas, parks, or scenic viewsheds. Although the plant's tallest structures will be approximately 150 ft tall (exhaust stacks), the lack of these natural resources and relatively low population density of the area will minimize aesthetic impacts. Motorists driving I-95 will see the plant's tallest structures, but the view will be short term and not incongruous with the adjacent transmission towers and a radio tower. Therefore, impacts to the aesthetic quality of the vicinity are minimal. Buffering and screening will be maintained along the northern and southern property boundaries as well as along most of the I-95 western property boundary.

#### 7.2.2.2 Public Services/Facilities

Operation of the proposed power plant will not negatively affect essential services or facilities. While it will rely on local police and fire protection, the plant site will be equipped with its own fire protection systems, and the Site will be secured with controlled, fenced access.

The number of employees working at the plant during operation is anticipated to be 36 at the completion of both Project phases. This low number of employees will not materially affect the provision of services, schools, or degrade roadways. Local medical facilities are sufficient to handle staff medical emergencies.

### 7.2.2.3 Land Use

The Project Site is located adjacent to the interstate highway and in proximity to electrical transmission towers and a radio tower. No residents or public use areas will be displaced by development of the proposed power plant. The development of the Site will increase the industrial and employment base of the County and will provide an ongoing source of tax revenue. The proposed Project is located near a County correctional institution and landfill and solid waste management facility. The proposed location of the power plant is compatible with the type of development in the area.

# 8.0 SITE AND DESIGN ALTERNATIVES

According to the FDEP instruction guide for certification applications (FDEP Form 62-1.211[1], F.A.C.), this chapter is optional and is not necessary for the BHEC Project. The Project will not require major federal approvals or actions which are subject to the review requirements of the National Environmental Policy Act (NEPA); therefore, an analysis of alternatives is not required under NEPA.

Nevertheless, it should be noted that throughout its development planning efforts, Calpine has analyzed alternatives and selected designs to avoid or minimize environmental impacts due to the construction and operation of the BHEC. These planned, environmentally protective designs are described in detail in other sections of this SCA. Highlights of the planned Project designs to avoid or minimize potential environmental impacts include:

- Use of combined cycle technology with advanced CTGs for higher efficiency electric generation and lower environmental impacts compared to other technologies.
- Use of natural gas only as fuel for the CTGs for lower air emissions compared to oil-fired power plants.
- Use of advanced DLN combustor design for the CTGs and SCR systems which represent BACT for minimizing $NO_x$ air emissions.
- Use of oxidation catalyst represents BACT for minimizing CO and VOC emissions.
- Development of facility layout to avoid and preserve existing wetlands on the Site.
- Use of excess surface water and brine for plant water supply is consistent with SJRWMD's CUP criteria (i.e., avoid use of ground water) and supportive of the current master stormwater planning program for the IRFWCD drainage basin to reduce pollutant loading and freshwater flows to the Indian River Lagoon.

- Use of a zero-discharge wastewater treatment system, even though it is more expensive than other alternatives, to avoid cooling tower blowdown and wastewater discharges to surface waters. This system is also supportive of the master stormwater planning program to reduce pollutant loadings and fresh-water inflow to the Indian River Lagoon.